All Abstracts Included in the Original
Search for Microplastics Literature for
The Microplastics Scoping Review

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Description: Abstracts pulled from several databases relating to microplastics and the environment

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Fundamentally sound?

> The article discusses the Institute of Scrap Recycling Industries (ISRI) 2016 Convention & Exposition regarding the plastic scrap on recycling chain at the Mandalay Bay Convention Center in Las Vegas, Nevada. It mentions the increase in plastic scrap pricing. It also presents the views of Mark Eramo, vice president at IHS Chemical, regarding chemicals production into plastic commodities.

Plastic waste: ecological and human health impacts. Science for Environment Policy In-depth Report. Plastic waste: ecological and human health impacts. Science for Environment Policy In-depth Report; 2011. :44 pp. many ref. Bristol, Science for Environment Policy, European Commission DG Environment News Alert Service.

> This report summarises and collates current research on the ecological and human health impacts of plastic waste in the environment. Using the Drivers Pressures State Impact Response (DPSIR) framework, & highlights major issues and concerns, as well as outlining questions around existing responses and possible strategies for the future.

SCS Participates in Phase One of the Circular Plastics Alliance.

> The article offers information on the working meetings of the Circular Plastics Alliance to promote value chain cooperation with the aim to ensure that 10 million tons of recycled plastics are used in new products by 2025. It mentions the views of Chief executive officers (CEO) Kevin McQuade, that SCS is working to make styrenics truly circular for use in food contact applications; and also mentions SCS reconfirmed its commitment to have a chemical recycling demo plant in place by 2020.

(1973). "REMOVING FINE PLASTIC PARTICLES FROM WASTE WATER." BELGIAN PATENT BE 798884. ISSUED AUGUST 16, 1973. DERWENT BELGIAN PATENTS REPORT, VOL. U, NO. 41, P D2, AUGUST, 1973.

> A PATENT FOR A METHOD OF REMOVING FINE PARTICLES OF PLASTIC MATERIAL, ESPECIALLY POLYVINYL CHLORIDE, FROM WASTE WATER HAS BEEN GRANTED. THIS TREATMENT PROCESS INCLUDES THE FOLLOWING STEPS: ADDING A SURFACTANT WHICH PRODUCES A FOAM IN THE WASTE WATER; SUBJECTING THE WASTE WATER TO THE ACTION OF A STREAM OF GAS BUBBLES; AND, REMOVING THE FOAM WHICH HAS ACCUMULATED AT THE SURFACE OF THE BATH AND CONTAINS A HIGH CONCENTRATION OF FINE PLASTIC PARTICLES BY RAKING. ESSENTIALLY COMPLETE REMOVAL OF THE FINE PLASTIC PARTICLES FROM THE WASTE WATER IS ACHIEVED USING A RELATIVELY SMALL QUANTITY OF SURFACE ACTIVE AGENT. (SANDOSKI-FIRL)

(1974). "REMOVING FINE PLASTIC PARTICLES FROM WASTE WATER." FRENCH PATENT FR 2182128, ISSUED DECEMBER 7, 1973. FRENCH PATENTS ABSTRACTS, VOL U, NO 5, P D7, MARCH 7, 1974.

A PROCESS FOR REMOVING FINE PLASTIC PARTICLES FROM WASTE WATER BY FLOTATION AFTER FOAMING WITH SURFACTANT AND A STREAM OF GAS BUBBLES HAS BEEN PATENTED. FINE PARTICLES OF PLASTIC MATERIAL, ESPECIALLY POLYVINYL CHLORIDE (PVC), ARE REMOVED FROM THE WASTE WATER BY ADDING A SURFACE ACTIVE AGENT, WHICH CAN PRODUCE A FOAM, TO THE WASTE WATER; SUBJECTING THE WASTE WATER TO THE ACTION OF A STREAM OF FINE GAS BUBBLES; AND, REMOVING THE FOAM WHICH HAS ACCUMULATED AT THE SURFACE OF THE BATH BY RAKING. THIS FOAM CONTAINS A HIGH CONCENTRATION OF PLASTIC PARTICLES. THE FOAM IS DEHYDRATED IN A CENTRIFUGE, OR BY A DRUM FILTER COATED WITH A FILTER AID. ALMOST COMPLETE ELIMINATION OF THE FINE PLASTIC PARTICLES FROM THE WASTE WATER IS ACHIEVED USING A RELATIVELY SMALL AMOUNT OF SURFACE ACTIVE AGENT. (MURPHY-FIRL)

(1990). "Soil and water conservation using plastics." KTBL Arbeitspapier **143**(107).

This publication contains twelve papers presented at the 1989 annual meeting of the German Society for plastic materials in agriculture. Four papers are concerned with various aspects of soil and water conservation through the use of plastics such as wide plastic tyres, plastic films and recycled plastic waste. The remainder of the papers deals with the use of plastics in construction and technology in horticulture and specialized cultures.

(1990). "Waste action." Environmental Action **21**(6): 4.

Reports on two solid waste proposals being addressed by Massachusetts legislators. Testimony supporting a Mass PIRG initiative to require `environmentally sound' packaging submitted by Lisa Collaton of the Environmental Action Foundation; Testimony backing legislation that would erase the `chasing arrows' symbol from the state's plastic resin coding system.

(1994). "13th International congress on plastics in agriculture. Volume 2. Proceedings of a conference held in Verona, Italy, 8-11 March 1994." Congresso internazionale del C.I.P.A. **422**.

This volume contains papers presented at the 13th International congress on plastics in agriculture. The papers presented cover many aspects of plastic usage in agriculture, including: irrigation and drainage systems and pipe networks; greenhouses and plastic tunnel construction technology; direct covers and mulches; and soil solarization. The optical properties of plastic films, and plastic waste management and recycling are also considered. Papers are mostly in Italian, with the remainder in English and French. Short bibliographies for each of the main conference topics are presented and a list of contributors is provided.

(1995). "Proceedings of a symposium on the improvement of vegetable industry in Taiwan held at Taichung District Agricultural Improvement Station, 25-26 May, 1994." Special Publication Taichung District Agricultural Improvement Station **37**(370).

This publication comprises the following contributions, presented at the symposium: Watermelon and muskmelon industry development and research in Taiwan; Production analysis of cucurbit vegetables for the recent ten years in Taiwan; Current situation and future prospect in production of solanaceous fruit vegetables in Taiwan; Current status and prospects of leguminous vegetables industry in Taiwan; Present situation and future development of heading leafy vegetables; Production of short-term leafy vegetables in Taiwan; Present status and perspective of flower vegetables production; Industries and researches of green onion (Allium fistulosum) and shallot (A. cepa var. aggregatum); Current status and future development of bamboo shoot industry in Taiwan; Asparagus industry and research in Taiwan; Present status on co-ba (Zizania latifolia Turcz. [Zizania caduciflora]) production; Present status and prospect of taro (Colocasia esculenta) and ginger (Zingiber officinale); Analysis of green garlic and garlic bulb production; Industry analysis on onion production; Production of radish and carrot in Taiwan; Current status and prospect of great burdock (Arctium lappa) industry in Taiwan; The relation of the nutrient of vegetable to human health; A review of disposal of agricultural plastic waste; Present status and future prospect of cultivation of native vegetables; and General discussion.

(1997). "Is there a need for new plastic resin?" BioCycle **38**(1): 6.
Reports on former East Hampton, New York recycling coordinator Peter Garnham's explanation of the properties of a new plastic resin called polyethylene napthalate (PEN) manufactured by Shell and Amoco. Federal government's approval of PEN for use in food packaging; Uncertainty concerning the resin's recyclability; PEN's potential as a beer bottle.

(2001). "Why Air Separation Works With Screen Overs But Not Compost." BioCycle **42**(9): 54.
Discusses how air separation of waste works. Challenges of air separation; Reasons for the difficulty in separating plastics from finished compost.

(2003). "Standard Classification for Standard Plastics Industry Bulk Box/Pallet Unit Size Classified By Bulk Density."
Scope: This classification covers containers used to hold plastic resins with bulk density (Test Methods D 1895) of 27 to 39 lb/ft (0.432 to 0.625 g/cm). This classification does not apply to any plastic resins with bulk density below 27 lb/ft (0.432 g/cm) or above 39lb/ft (0.625 g/cm). This standard does not apply to bulk boxes containing hazardous materials. This standard does not address box/pallet unitization requirements. This standard does not address requirements of plastic bag liners normally placed inside the corrugated bulk box before filling with plastic resin. This standard does not address tamping, shaking, or other compression methods of the resin filled bulk box to condense entrained air and increase headspace in the bulk box. This standard does not address blocking and bracing or other shipping requirements normally associated with bulk box unit deliveries. This standard does not address filled bulk box/pallet unit stack height. This standard does not address international shipping regulations of bulk box/pallet units. This standard does not address pallet opening sizes for pallet trucks. Units of MeasureThe value stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use. This classification offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgement. Not all aspects of this classification may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word "standard" in the title of this document means only that the document has been approved through the ASTM consensus process. 2003 ASTM International. All rights reserved.

(2003). "Standard Test Method for Determination of Effectiveness of Cleaning Processes for Reusable Medical Instruments Using a Microbiologic Method (Simulated Use Test)."

Scope: This test method is written principally for large medical instruments or instruments with internal channels or recesses (for example, flexible endoscopes) but may be used for any resuable medical instruments. This test method describes a procedure for testing the efficacy of a cleaning process for reusable medical instruments artificially contaminated with mixtures of microorganisms and simulated soil. The test method utilizes bacterial spores as tracers for foreign materials and quantifies their removal as a means of determining the efficacy of a cleaning process. The test method is designed for use by manufacturers of medical instruments and devices. However, it may also be employed by other individuals who have a knowledge of the instruments, techniques and access to appropriate facilities. Worst-case conditions can be represented by exaggerating a specific test parameter or otherwise intentionally simulating an extreme condition such as performing the test without cleaning solutions or utilizing instruments which are not new. The test procedure is devised to determine the efficacy of a cleaning process as applied to a particular instrument or group of instruments by simulating actual use situations. The test procedure may be performed on test instruments using a complete cleaning cycle or be limited to particular phases of the cycle such as precleaning, manual cleaning, automated cleaning, or rinsing. The test procedure is normally performed on a number of external and internal sites, but it may be restricted to one particular site on the instrument. A knowledge of microbiological and aseptic techniques and familiarity with the instruments is required to conduct these procedures. Note 1Because contamination of the surfaces of instruments may occur as a result of rinsing with tap water, bacteria-free water should be used for all rinsing when a water rinse step is part of the cleaning directions. Note 2Test methods to determine the effectiveness of cleaning medical instruments has only recently been actively debated, and research efforts are in their infancy. Because published experimental results are scarce, it is premature to dictate experimental reagents, conditions or acceptance criteria. Note 3The total elimination of the target organisms is not the goal of cleaning. Therefore, there will almost always be a number of microorganisms surviving on the test instruments unless one of the solutions or processes disinfects or sterilizes the test instrument. The results of various clinical and laboratory tests suggest that cleaning processes alone can produce a 102to 104log10reduction in bioburden. The exact reduction will depend upon the precise experimental conditions. The criteria for judging cleanliness should be determined and recorded before initiation of the test procedure. Note 4This test protocol employs target spores as indicators or tracers for foreign materials and monitors their removal by the cleaning process. It is certainly possible that other particulate target materials, such as microbeads (latex beads) could be used in place of microbes. These alternate approaches would be more practical in those circumstances where microbiological expertise is limited. This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. 2003 ASTM International. All rights reserved.

(2004). "CIVIL PROCEEDINGS." <u>National Environmental Enforcement Journal</u> **19**(9): 28-30.

The article presents information about several civil law suits in the United States. Some of the suits are: Michigan versus General Motors Corp., United States v. Chevron Phillips Chemical Co., and United States, Georgia, Illinois, Louisiana, and New Jersey v. CITGO Petroleum Corp. It informs that General Motors Corp. would pay $ 92,349 in civil fines to settle charges of air quality violations at its metal castings plant in Saginaw, Michigan. In addition, GM will spend $113,000 on two environmental projects to reduce mercury pollution and detect the release of mercury. The federal government recently filed a complaint alleging that Chevron Phillips and/or its predecessor failed to exercise sufficient care to prevent and address accidental releases of chemicals at the Pasadena, Texas, plastics complex, a plastic resin and specialty chemical manufacturing facility. Two accidental explosions occurred there in 1999 and 2000, which released 1,3 butadiene and other chemicals into the air and caused three deaths and injuries to almost one hundred workers at the facility.

(2004). "FORMER TIMES." Resource Recycling **23**(3): 9-9.
Recounts the issues and developments related to waste management in 1984 and 1994. Increase in polyethylene terephthalate bottle scrap recovery; Inauguration of an experiment for the simultaneous collection of solid waste and multi-material recyclable; Issues on recycled content products.

(2004). "In Brief." Environment **46**(6): 6-6.
Presents briefs related to science. Findings by a U.S. Geological Survey team that a godwit shore bird travelled more than 7,700 miles from Alaska to New Zealand; Development of a climate model at the Pacific Northwest National Laboratory which can predict the effects of global warming in the Sierra Nevada range; Technology used by GH Raisoni College of Engineering in India to convert plastic waste into fuel for automobiles.

(2004). "Ocean awash with plastic particles." Ecologist **34**(6): 8-8.
Reports on the clogging of the oceans with microscopic pieces of plastic according to a study in the journal "Science." Outcome of the ingestion of the plastic particles by small marine animals such as lugworms and barnacles; Possible sources of the plastic particles; Statement issued by the study author Richard Thompson regarding disposal of litter.

(2004). "Plastics Recycling Forges Ahead in Europe." Business & the Environment with ISO 14000 Updates **15**(11): 11-11.
Reports on the increase in plastics recycling in Europe between 2001 and 2002, according to statistics issued by the industry organization, PlasticsEurope. Overall increase in the amount of plastic waste recovered; Amount of plastics going to landfill between 2001 and 2003; Total post-user plastics waste.

(2005). "Farms to target plastics waste." Materials Recycling Week **186**(19): 5-5.
The article reports that farm plastics collection and recovery in England will be the focus of a £1 million scheme funded by the Business Resource Efficiency and Waste Programme. Farm packaging waste is covered by the Producer Responsibility Obligations, Packaging Waste Regulations, but little or no plastic waste is collected. The successful application for funding was made by the Agricultural Waste Stakeholders Forum in anticipation of the Agricultural Waste Regulations that will be introduced early next year.

(2005). "JAPAN'S TAX ON PLASTIC SACKS." New Scientist **186**(2504): 4-4.
The article informs that Japan, has decided that plastic shopping bags are a major environmental problem. Its Ministry of the Environment announced plans on June 13 to introduce a bill to make shoppers pay for them. Japan churns out 460 million tonnes of waste annually, and much of it is incinerated, releasing harmful dioxins. A survey by Kyoto city showed that 10 per cent of its plastic waste comes from bags. Similar levies in Ireland and Taiwan have reduced plastic bag waste by 90 per cent and 69 per cent respectively

(2005). RECYCLING'S VITAL SIGNS. **24:** 56-56.

Presents statistics on the recycling industry in the U.S. from 2004 to 2005. Paper and paperboard production in 2004; Recovered paper consumption for 2004; Steel production through February 2005; Scrap plastics exports through January 2005.

(2006). "California legislature takes next step." Resource Recycling **25**(6): 8-8.

The article reports on the passage of assembly bill 2449 in California, which requires stores with at least 40,000 square feet in retail space to establish their own recycling program. The bill was part of California's recycling campaign to reduce plastic litter and waste throughout the state. The residents use over 19 billion plastic grocery bags each year, which creates 147,038 tons of unnecessary landfill waste. Each year, litter collection for beaches, state highways, cities, and counties costs the state around $303.2 million.

(2006). "DRINK AND DRIVE." Materials Recycling Week **188**(13): 6-6.

The article reports that the company GE Plastics has launched its Valox iQ and Xenoy iQ resins for the automotive industry in Japan. In terms of both eco-responsibility and high performance, Valox iQ and Xenoy iQ resins represent one of the most significant technological breakthroughs. The resins are made with polybutylene terephthalate(PBT)-based polymers derived from 85% post-consumer plastic waste. According to the company, if all PBT was replaced with Valox iQ and Xenoy iQ resins, it would have created an outlet for 22.5 billion waste bottles. The resins are suitable for automotive applications such as connectors, lighting bezels, energy absorbers and body panels as well as in the consumer electronics and transportation industries.

(2006). "GREEN GONG." Materials Recycling Week **187**(25): 6-6.

The article announces the MBE award given to Robert Tyldesley during the celebration of the Queen's birthday. Tyldesley, a Green entrepreneur has been awarded because of his services to waste management. Tyldesley and his group have introduced a system of making roof tiles and paving slabs using ordinary household plastic waste. The system still works even if the plastic wastes are contaminated with food wastes. The system is being used in many developing countries, and it is soon to be launched in European countries.

(2006). "notes." Materials Recycling Week **188**(14): 35-35.

The article presents notes related to the "Materials Recycling Week" periodical's Materials Guide Prices. The guide provides prices in British pounds per tonne for green waste, nonhazardous waste, wood, glass containers, paper, plastic bottles, and packaging recovery notes (PRNs). Plastic bottles include clear polyethylene terephthalate, natural high-density polyethylene, colored high-density polyethylene, and mixed. Paper products include white office, mixed office, newspapers, and magazines. Prices are detailed for bagged and loose green waste.

(2006). "STATE & PROVINCE WATCH." Resource Recycling **25**(8): 12-13.

The article presents several news items related to the recycling policies and programs of the states and provinces of the U.S. House Bill 1074, a Colorado state bill, extended the states' waste tire recycling development fee till July 1, 2012. A plastic recycling law has been passed in the legislative session of New Jersey, which makes it mandatory for every rigid plastic packaging container to contain a minimum of 50 percent recycled content by January 1, 2006.

(2006). "Upturn in PET bottle recycling." Recycling International(8): 17-17.

The article reports on the 790,000 tons of post-consumer polyethylene terephthalate (PET) plastic bottles that are collected for recycling in Europe in 2005, a 15.1% increase from 2004, according to PET packaging trade association Petcore. The increase in PET collection in Europe was led by Germany with 32% increase in collection is recorded, while an increase in collection were also reported in Poland and France. An increase in the collection of PET plastic mostly in the form of mixed plastic waste is recorded in Great Britain and Ireland. Other statistics of PET recycling its provided.

(2006). "WEEE TAKER." Materials Recycling Week **188**(17): 6-6.
The article reports that recycling operations will be started at the mixed plastic waste recycling facility of Axion Recycling Ltd. in Salford by February 2007. According to the company, the facility would be among the major recycling facilities with advanced technologies in Europe. Commingled plastic waste will be recycled at the facility. Compliance schemes would be benefited by the facility. High-quality plastic polymer compounds could be formed from the facility's recycled waste. Axion claims that the facility would mainly handle electrical and electronic equipment waste.

(2007). "20 YEARS AGO." Resource Recycling **26**(10): 15-15.
The article reports the plastic waste issue in the late 1987 in the U.S. The section describes how plastics, most notably, plastic waste, as a major issue of national recycling efforts. It also reflects on how prominent manufactures in the U.S handle the issue on plastic waste. It documents the initiative done by Wellman Incorporated in Shrewsbury, New Jersey, to prove that post-consumer plastic scrap could be a useful and profitable resource. According to the report, the company utilized plastics scrap to produce a non-woven nylon resin that could be used in the production of such secondary products as carpet and tennis ball felt, as well as within automotive, electrical and industrial applications.

(2007). "China is top buyer of Australia recyclables." Plastics News **18**(46): 7-7.
The article reports that according to a new Plastics and Chemicals Industries Association recycling survey, China was Australia's top buyer of recycled plastics in 2005. The top two recycled resins were PET and high density polyethylene. Of 293 million pounds of PET consumed in Australia, 52 million pounds exported for recycling. A total 183 million pounds of unprocessed waste plastic was exported for reprocessing due to continuing China's strong demand.

(2007). "CHINESE EMPORIUM TRADING." Materials Recycling Week **190**(6): 11-11.
The article presents a discussion about Chinese Emporium Trading, an accredited exporter of plastic wastes from Great Britain to China for recycling. The company's managing director Chao Shu Au mentions that they are a typical small operator that purchases plastic waste from waste management companies which gathers it from British households and businesses. He also mentions that they inspect the plastic materials first before they agree to buy it. The materials were also said to be baled to achieve the require weight of 20 tons to be able to ship it. It was also discussed that the materials has to undergo another set of inspections once it reaches China before being processed and remanufactured.

(2007). "CHOICE WASTE MANAGEMENT." Materials Recycling Week **190**(6): 11-11.
The article presents a discussion about Choice Waste Management, the accredited exporter and winner of the 2005 to 2006 China Business Award for the UK Exporter of the Year. It was mentioned that the company sends most of British plastic wastes to China. Their chief executive

officer Raj Iqbal stated that most of the materials go to China by passing through Hong Kong, where it stays to be manufactured into new products such as garden furnitures, toys and packs for mobile phones. He also said that they only export materials which has been graded by the Basel Convention. The materials were also reported to be checked for quality by customs when it reach Hong Kong or China before being released into different factories. All the wastes were said to be properly handled.

(2007). "CLEANING TECHNOLOGY BOOST TO MIXED COLLECTIONS." Materials Recycling Week **190**(23): 6-6.

The article reports that Great Britain agent Axion Recycling exhibited a dry cleaning technology at Dusseldorf K2007 in Germany. According to an Axion spokesman, the technology attracted encouraging levels of inquiries from Great Britain-based companies interested in improving their recycling processes for the rapidly growing plastic waste stream. Technical director Keith Freegard stressed that the technology enables more effective recycling of the dirty portion of mixed plastic wastes, particularly food packaging.

(2007). "Davy Jones' litter." Earth Island Journal: 9-9.

The article reports on the results of a study by Greenpeace which indicate the detrimental effects of an artificial Sargasso Sea of discarded plastic garbage in the North Pacific on marine life. Ocean currents have collected the floating debris into a vortex between California and Hawaii which were described the Greenpeace spokespeople as the size of the State of Texas. Further, plastic pollution have been shown to have higher concentartions in the tropics and in shipping lanes, as well as in convergence zones.

(2007). "Drastic Plastic." Earth Island Journal **22**(3): 6-6.

The article reports that the Uganda government has imposed a ban on plastic bags. Ugandan Finance Minister Ezra Suruma stated that the ban has been imposed to encourage producers and consumers to minimize their use, as plastic bags cause serious environmental concerns because of their low disposal rate. Besides, enabling the spread of disease, plastic bags often pollute water supplies when they collect in wetland areas. Bags that are burned release toxic chemicals, increasing air pollution. It is stated that most cities in Uganda have the resources to properly dispose only about 10% of the trash produced. The ban states that companies will not be able to produce, import, or use plastic bags.

(2007). "Firm fined over shredder injury." Materials Recycling Week **190**(23): 6-6.

The article reports that Southampton, England-based plastics recycler Associated Polymer Resources has been prosecuted and fined for health and safety failures that could have killed employee Ken Ransom, who fell into a shredder. Health & Safety Executive (HSE) investigating inspector James Barrie noted that Ransom was lucky not to die, and suffered the loss of his right arm and part of his right shoulder, the loss of his left arm to the elbow, and damage to his scalp. Ronald Wilkinson, trading as Associated Polymer Resources, was found guilty on two health and safety charges for failing to provide safe operating systems.

(2007). "FOOD-GRADE PLASTICS GET RECYCLING PLANT." Materials Recycling Week **189**(11): 4-4.

The article announces the opening of Closed Loop London (CLL), the first food-grading plastics recycling plant, through the funding agreement of private and public sector in Great Britain. The plant offers reprocessing capacity for 35,000 tonnes of polyethylene terephthalate a year. According to CLL managing director Chris Dow, the development of the facility is the realization

of a three-year vision to end the loop on plastics recycling in the country. The country will have a world-class facility for processing its plastic waste and does not need to export the material into a low-grade application.

(2007). "FORMER TIMES." Resource Recycling **26**(9): 15-15.
The article recounts the evolution of the recycling trend in the U.S. In 1987, it has been found that plastic waste was the major issue in recycling. The economy of the domestic plastics industry was growing through the first half of 1987, and the production of plastics resins has also totaled by 23.6 billion pounds. The officials claimed that the recovery numbers will only increase if the recycling industry would integrate the high-density polyethylene in statewide recycling programs. On the other hand, in 1990s, the deinked pulp (DIP) sector has been viewed to be one of the industry's great success. However, many experts are looking on the possibilities of survival if the objectives can be realized.

(2007). "FROM THE ROAD TO THE ROOF." Recycling Today **45**(11): 31-31.
The article reports on a study which investigated the behavior of scrap plastics when blended with rubber powder derived from post-consumer tires funded by the Waste and Resources Action Programme (WRAP). Included in the trial is the creation of a new replica slate roofing tile incorporating a high percentage of recycled material. WRAP is said to be looking at supporting standard testing to provide accreditation for the use of the research's product in the marketplace.

(2007). "Microplastics pose hidden pollution risk." New Scientist **196**(2628): 20-20.
The article reports on the study by Emma Teuten and colleagues at the University of Plymouth, England indicating that microscopic grains of plastic in the sea accumulate carcinogenic pollutants which build up in the food chain. Teuten and colleagues demonstrated that grains of plastics are much better than grains of silt or sand in adsorbing pollutant phenanthrene from water. It cites that lugworms may accelerate the arrival of toxins in food by gorging themselves on grains of waste plastic.

(2007). "NO MORE PLASTIC WASTE, SAYS NZ MINISTER." Clean Air & Environmental Quality **41**(2): EI8-EI8.
The article reports on the statement of New Zealand environment minister David Benson-Pope about the recycling of all plastic packaging in the country and the government's plan to work with the local government and industry to stop the dumping of plastics into landfills. Benson-Pope visited four of the country's largest recycling facilities covering glass, plastic, paper, and metal to check whether these facilities have implemented the recycling concept and their focus on reducing the amount of waste.

(2007). "Recycle -- if you think you've got the bottle!" Sustain' Magazine **8**(4): 69-69.
The article reports on the signing of a joint private- and public-sector funding agreement that will create the first plant in Great Britain to recycle plastics into material for food packaging. The plant, located in Dagenham, London, England and operated by Closed Loop London, will transform the recycling of polyethylene terephathalate in Britain. The facility is scheduled to open in December 2007. It is reported that Marks & Spencer is the first major retailer to commit sending plastic waste from its stores in London, England to the Closed Loop London plant for recycling.

(2007). "Sharp develops plastics recycling technology." Recycling International(8): 10-10.

The article reports on the claim of consumer electronics manufacturer Sharp Corp. that it has developed a technology for separating and recovering high-purity polypropylene (PP). The company says that using the technology it will be able to separate PP from plastic components retrieved from televisions, air conditioners, refrigerators and washing machines and convert them into high-quality plastics. In 2001, Sharp succeeded in creating a technology for closed-loop material recycling which allowed the repeated reuse of scrap plastic components that have a single resin.

(2007). "Sri Lanka boosts plastic recycling." Recycling International(9): 15-15.

The article focuses on the efforts by the Sri Lankan government to encourage plastic waste recycling in the country. In an effort to prevent the piling up of plastic wastes along the road side and to curb environmental pollution, the Central Environmental Authority has launched a program called the national post-consumer plastic waste management. The government plans to impose tax on plastic imports to help fund the collection and recycling of the waste. Authorities hope that raw plastic imports could be reduced by 20% after the first year of the program.

(2008). "AERT Receives Funding to Build Plastics Recycling Facility." Recycling Today **46**(2): 18-18.

The article reports on the completion of $13.5 million in financing by AERT Inc. to fund a plastic waste mining and reclamation facility dubbed Advanced Resource Recovery Project (ARRP) near Watts, Oklahoma. The facility is aimed at reducing the company's raw material costs and assuring a stable raw materials supply. The facility is expected to be operational by the end of 2008.

(2008). "AWS plastics upgrade goes live in Lincs…." Materials Recycling Week **192**(13): 8-8.

The article reports that the 14 million pounds-worth reprocessing facility of AWS Eco Plastics at Hemswell, Lincolnshire, England, has become completely operational. This key upgrade increases its recycling capacity four-fold to 15 tons of plastic waste per hour or 100,000 tons every year. The facility is designed to produce food-grade recycled plastics.

(2008). "Citigroup invests in MBA Polymers." Recycling International(7): 11-11.

The article reports on the funding secured by MBA Polymers from investment bank Citigroup and existing investors. The money will be used for further expansion for a company. The high-performance plastic resin manufacturer recovers high-value plastics from complex waste streams, extracting plastics from items such as household appliances and business equipment. It has developed a process to recover and separate plastics from each other.

(2008). "Ethanol Coproducts Eyed as Fillers in Plastics." Resource: Engineering & Technology for a Sustainable World **15**(6): 27-27.

The article reports on a study of the production of ethanol coproducts as a non-petroleum-based filler in plastics. It is conducted by USDA Agricultural Research Service (ARS) agricultural engineer Kurt Rosentrater. It uses molded blends of DDGS and phenolic plastic resin. Its results show that 25 to 50 percent concentration of DDGS can be used as fillers in plastics. It also manifests that the development of new bio-based manufactured products is possible and may lead to less use of petroleum in plastic products.

(2008). "INFORMATION SOURCES." Resource Recycling **27**(9): 48-48.

The article presents information sources related to recycling. Mandy Haggith introduces her new book titled "Paper Trails: Travels in the Global Paper Industry," published by Virgin Books. Research and Markets released a report, "Recycling of PVC and Mixed Plastic Waste," that analyzes the production and recyclability of materials made from virgin polymers. INFORM released a five-minute film, "The Secret Life of Paper," presenting the environmental impacts of paper production and consumption.

(2008). "ISO GUIDELINES FOR RECYCLING OF PLASTICS WASTE." Journal of Plastic Film & Sheeting **24**(3/4): 166-166.

The article offers information on the issuance of guidelines for plastic waste by TC61 Plastics group of the International Organization for Standardization (ISO). The ISO 15270:2008 provides guidance for the development of standards and specifications encompassing plastics waste recovery that includes recycling. It establishes the different options for the recovery of plastics waste originating from pre-consumer and post-consumer sources and establishing the quality requirements for it.

(2008). "Marine food chain threatened by plastic waste." Oryx **42**(3): 316-316.

The article discusses the effect of plastic wastes in oceans. It mentions that tiny plastic particles might attract toxic contents that can take in by organisms living underwater. According to the author, microscopic pollution has worse consequences than what is expected to happen. The researchers likewise say that microscopic plastic fragments produce pollutants like DDT insecticide that makes water contaminated. Moreover, plastic wastes stay on shores for a long time since it is difficult to degrade.

(2008). "Non-packaging plastic gets a quality boost." Materials Recycling Week **191**(1): 7-7.

The article reports on the Quality Protocol proposal for non-packaging plastic waste launched by the Environment Agency and Waste & Resources Action Programme (WRAP) in Great Britain. According to reports, the Quality Protocol aims to free one-third of all plastic from waste regulations to encourage more recycling. It mentions that with the protocol, million tonnes of plastic could be turned away from landfill every year. It was noted that a Quality Protocol can save businesses the time and costs associated with meeting waste regulations by clearly defining the standards required to collect, transport, store, recycle and reuse non-packaging plastic without risking human health and the environment.

(2008). "Plastics." Resource Recycling **27**(1): 36-36.

The article discusses the decreasing prices of virgin resin caused by plastic buyers who resisted the demand in price increase by virgin resin producers. The author mentions that a large amount of plastic buyers resisted the attempt of virgin resin producers to increase the price of resin prices. He explains that plastic buyers were aware of large volumes of price and recycled plastics that were available even at a time of record exports. The author also explains that virgin resin prices increase during the month of December.

(2008). "Plastics industry urged to intensify efforts at recycling, reuse." Popular Plastics & Packaging **53**(1): 58-59.

The article focuses on the need for the Indian plastics industry to find solutions on the collection, recycling and reuse of plastics waste in the country. According to Union Minister of State for Chemicals and Fertilisers B. K. Handique, there has been much advancement in technology for collection and processing of used plastics. Plexconcil chairman R. C. Lohia said export of processed plastic exports had actually come down. A project in the plastic consumer goods markets includes establishing display centres and warehousing facilities.

(2008). "Recession hits paper and plastic recyclate prices." ENDS (Environmental Data Services)(406): 4-5.

This article reports on the impact of the impending recession on the price for recyclable waste in Great Britain in 2008. The recession has led to a dramatic fall in the price for recyclable waste, with paper and plastic the most affected. The Department for Environment, Food and Rural Affairs (DEFRA) held a meeting on increasing storage space for recyclables until prices recovered. Glass is the only material that has not been affected by the recession.

(2008). "Standard Classification for Standard Plastics Industry Bulk Box/Pallet Unit Size Classified By Bulk Density."

Scope: This classification covers containers used to hold plastic resins with bulk density (Test Methods D 1895) of 27 to 39 lb/ft3(0.432 to 0.625 g/cm3). This classification does not apply to any plastic resins with bulk density below 27 lb/ft3(0.432 g/cm3) or above 39lb/ft3(0.625 g/cm3). This classification does not apply to bulk boxes containing hazardous materials. This classification does not address box/pallet unitization requirements. This classification does not address requirements of plastic bag liners normally placed inside the corrugated bulk box before filling with plastic resin. This classification does not address tamping, shaking, or other compression methods of the resin filled bulk box to condense entrained air and increase headspace in the bulk box. This classification does not address blocking and bracing or other shipping requirements normally associated with bulk box unit deliveries. This classification does not address filled bulk box/pallet unit stack height. This classification does not address international shipping regulations of bulk box/pallet units. This classification does not address pallet opening sizes for pallet trucks. The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.This classification offers an organized collection of information or a series of options and does not recommend a specific course of action. This document cannot replace education or experience and should be used in conjunction with professional judgement. Not all aspects of this classification may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without consideration of a project's many unique aspects. The word standard in the title of this document means only that the document has been approved through the ASTM consensus process. 2008 ASTM International. All rights reserved.

(2008). "Standard Test Method for Determination of Effectiveness of Cleaning Processes for Reusable Medical Instruments Using a Microbiologic Method (Simulated Use Test)."

Scope: This test method is written principally for large medical instruments or instruments with internal channels or recesses (for example, flexible endoscopes) but may be used for any resuable medical instruments. This test method describes a procedure for testing the efficacy of a cleaning process for reusable medical instruments artificially contaminated with mixtures of microorganisms and simulated soil. The test method utilizes bacterial spores as tracers for foreign materials and quantifies their removal as a means of determining the efficacy of a cleaning process. The test method is designed for use by manufacturers of medical instruments and devices. However, it may also be employed by other individuals who have a knowledge of the instruments, techniques and access to appropriate facilities. Worst-case conditions can be represented by exaggerating a specific test parameter or otherwise intentionally simulating an extreme condition such as performing the test without cleaning solutions or utilizing instruments which are not new. The test procedure is devised to determine the efficacy of a cleaning process as applied to a particular instrument or group of instruments by simulating actual use situations. The test procedure may be performed on test instruments using a complete cleaning cycle or be limited to particular phases of the cycle such as precleaning, manual cleaning, automated cleaning, or rinsing. The test procedure is normally performed on a number of external and internal sites, but it may be restricted to one particular site on the instrument. A knowledge of microbiological and aseptic techniques and familiarity with the instruments is required to conduct these procedures. Note 1Because contamination of the surfaces of instruments may occur as a result of rinsing with tap water, bacteria-free water should be used for all rinsing when a water rinse step is part of the cleaning directions. Note 2Test methods to determine the effectiveness of cleaning medical instruments has only recently been actively debated, and research efforts are in their infancy. Because published experimental results are scarce, it is premature to dictate experimental reagents, conditions or acceptance criteria. Note 3The total elimination of the target organisms is not the goal of cleaning. Therefore, there will almost always be a number of microorganisms surviving on the test instruments unless one of the solutions or processes disinfects or sterilizes the test instrument. The results of various clinical and laboratory tests suggest that cleaning processes alone can produce a 102to 104log10reduction in bioburden. The exact reduction will depend upon the precise experimental conditions. The criteria for judging cleanliness should be determined and recorded before initiation of the test procedure. Note 4This test protocol employs target spores as indicators or tracers for foreign materials and monitors their removal by the cleaning process. It is certainly possible that other particulate target materials, such as microbeads (latex beads) could be used in place of microbes. These alternate approaches would be more practical in those circumstances where microbiological expertise is limited. The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. 2008 ASTM International. All rights reserved.

(2008). "Steady Does It." Recycling Today **46**(3): 40-42.

The article presents an update on the status of the plastics recycling markets. Plastics reprocessors are said to report steady progress for commodity grades of secondary plastics, such as acrylonitrile butadiene styrene (ABS) and high impact polystyrene (HIPS), in the first quarter of 2008. According to one reprocessor, domestic consumers are not interested in paying much for polyvinyl chloride (PVC). It cites the possible impact of the problems that Plastech Engineered Products Inc. is having on the market.

(2008). "WRAP sets target for mixed plastics recycling." Recycling International(5): 9-9.

The article reports on the target sets by the government-supported Waste and Resources Action Programme (WRAP) for the opening of the first mixed plastics reprocessing plant in Great Britain

by 2011. The recycling plant will have the annual capacity to recycle approximately 40,000 tons of mixed plastics into food-grade polypropylene, according to the article. Mixed plastics account for at least 7 percent by weight of the domestic waste stream in Great Britain, according to WRAP. Each household produced an estimated 86 kilogram of plastic waste annually and the vast majority ends up in landfill, according to the article.

(2009). ""Liquid Wood" Could Ease World's Dependence on Plastic." Business & the Environment **20**(9): 11-12.

The article reports on the development of a new formula by Germany-based firm Tecnaro GmbH which enables a liquid wood to be molded like plastic. It says that the said formula consists of lignin, fiber and other additives. It notes that the invention is important because it can help address the growing number of plastic waste in the world.

(2010). "Axion gives recycled plastic a caffeine kick." Recycling International(4): 13-13.

The article reports on the polymer with coffee aroma that was developed by British recycling consultancy Axion Polymers from waste electrical and electronic equipment (WEEE) and post-consumer plastics with spent coffee grounds for London, England-based industrial design and product development firm, Re-worked.

(2010). "Construction Materials Manufacturer Asks Supreme Court to Require EPA to Clarify Rule." BNA's Environmental Compliance Bulletin **17**(10): 151-151.

The article reports on the clarification asks by US Technology Corp. to the U.S. Supreme Court pertaining to the rules set by Environmental Protection Agency (EPA) on solid waste regulation. It notes that the company uses spent materials containing plastic particles and paint chips that make the materials hazardous in which according to EPA in Ohio constitutes disposal. US Technology Corp. are asking EPA to interpret the 40 CFR 266.20 to determine if the blocks used really constitutes disposal.

(2010). "Sita to build plants that will turn mixed plastic waste into diesel." ENDS (Environmental Data Services)(430): 19-19.

The article reports on British waste company Sita's partnership with Cynar PLC to develop and construct ten pyrolysis plants to convert mixed waste plastic into diesel. The plants are designed to be small in order to avoid moving bulky and light materials around. The process for turning plastic waste into diesel involves heating shredded plastic in the absence of air to form a hydrocarbon gas, which will then be condensed and fractionated to produce a low-sulfur liquid fuel.

(2010). "THE SLOW PACE OF SUMMER." Recycling Today **48**(8): 32-34.

The article provides information on the performance of the plastics industry in the U.S. from June 2009 to June 2010. According to a broker of material along the Eastern Seabord, he finds plastic scrap generation to be declining for post-consumer material. He stresses that the downsizing of containers served as a factor contributing to the decline in generation. A reprocessor based in the Midwest says that prices for commodity grade plastics are receding.

(2011). "ACC Reports Growth in Rigid Plastics Recycling." Recycling Today **49**(4): 10-10.

This article discusses a report released by the American Chemistry Council (ACC) showing the increase in the collection and recycling of post-consumer non-bottle rigid plastics in the U.S. in 2009.

(2011). "CHINA CONTINUES TO DOMINATE." Recycling Today **49**(4): 42-43.
This article discusses the growth of the recycled plastics industry in China in 2011. It highlights strong domestic demand for post-consumer high-density polyethylene (HDPE) and polyethylene terephthalate (PET). It also shows increased interest of domestic buyers in low-density polyethylene (LDPE) film. In addition, the article observes a strong export market for recycled plastics.

(2011). "EASING BACK." Recycling Today **49**(11): 34-35.
The article offers an update on the status of the plastic scrap market in the U.S. as of November 2011. There remains to be stable generation and demand for plastic scrap, but prices are declining. The importation restrictions in China play a significant role in the decline, according to a Midwest-based reprocessor. Lower-grades of plastic scrap are not allowed to enter China. Companies in the U.S. such as Revolution Bag remains committed to collecting and processing post-consumer plastics.

(2011). "Events." Resource Recycling **30**(1): 50-51.
A calendar of events for 2011 is presented which includes the IERC 10th Annual International Electronics Recycling Congress, the Tennessee Recycling Coalition Conference and Trade Show, and the Plastic Recycling Conference.

(2011). "EXPORT MARKETS SOFTEN." Recycling Today **49**(7): 34-35.
The article presents a report on the market performance of plastics as of July 2011. Although the demand for secondary plastics is strong, demands for export to China have weakened due to new import duties imposed by the Chinese government. Other factors affecting the decrease in demand include wage increases in China, and difficulty in acquiring containers for overseas shipments. Domestic demand for secondary plastics remains healthy as consumers realize the advantages of recycled materials.

(2011). "Gearing Up." Recycling Today **49**(1): 28-28.
The article focuses on an increase in demand for secondary plastics. As of mid-December 2010, buying of recycled plastics was very strong with orders coming from both Chinese and U.S. consumers. Buyers in China have been stocking up in advance of Chinese New Year-related business closures. Meanwhile, scrap generation continue to increase in the U.S. as manufacturers look to increase recycled content in their products. Among companies looking to increase the amount of recycled polyethylene terephthalate (PET) used in its bottles is Naked Juice.

(2011). "Healthcare group to push plastics recycling in hospitals." Recycling International(4): 11-11.
The article reports that the Healthcare Plastics Recycling Council (HPRC) is leading a campaign with healthcare providers, manufacturers, and waste handlers to recycle plastic products that are being used in hospitals.

(2011). "In the market for plastics." Local Authority Waste & Recycling **19**(11): 33-33.
The article discusses the findings of an assessment of the plastics recycling market in Great Britain detailed in the "Plastics Recycling Market Report - UK 2011-2015 Analysis" released by the firm AMA Research in September 2011. Investment by the private sector in plastic recycling infrastructure is increasing. Volumes of recovered post-consumer plastics are likely to increase

further. There will be a new focus on recycling plastic waste locally instead of exporting the material to China.

(2011). "PLASTIC POLLUTION COALITION: Information Recycled, Reused, and Improved." Earth Island Journal **26**(1): 20-20.
The article offers information on the online information portal known as Plastic Free Times which organized by Plastic Pollution Coalition for environmental, social and health issues associated with the global plastic pollution crisis.

(2011). "Sailing the Plastic Seas." Our Planet: Weekly Newsletter of E Magazine: 7-7.
The article offers information on the impact of plastic waste particles, on the health of humans, birds and marine wildlife. It mentions that according to the United Nations Environment Programme (UNEP), 1,000,000 seabirds and 100,000 marine mammals die every year from plastic debris. It states that 80 percent of floating plastic waste comes from land.

(2011). "The Wide World of Recycling." Resource Recycling **30**(1): 10-10.
The article reports on developments in global plastic recycling. University of Warwick researchers have developed a technique to recycle plastic waste leftover from the holidays. The Israel Ministry of Environmental Protection has allocated a fund for the construction of waste treatment and recycling facilities. The Department of Environment, Food and Rural Affairs has considered to reduce its contribution to the Waste & Resources Action Programme (WRAP).

(2012). "HPRC to Study Plastic Scrap from Health Care Facilities." Recycling Today **50**(10): 32-32.
The article reports on the finalization of an agreement between Healthcare Plastics Recycling Council (HPRC) and Stanford University Medical Center concerning a six-month pilot study of plastic waste coming from health care facilities.

(2012). "Nextlife Adds Plastics Processing Line." Recycling Today **50**(1): 16-16.
The article reports on the opening of a new film-to-film processing line by Florida-based plastics recycling company Nextlife in Frankfort, Kentucky in an effort to expand its conversion of plastic waste materials into consumer products including packaging and film-to-film applications.

(2012). "Report Projects Benefits, Costs of Plastics-to-Energy Facilities." BNA's Environmental Compliance Bulletin **19**(11): 170-170.
The article discusses the report "Environmental and Economic Analysis of Emerging Plastics Conversion Technologies," which states that new technologies that convert nonrecycled plastic waste into energy or raw materials could provide environmental benefits and cost savings compared to landfill disposal. It has been informed that the report states that waste conversion create less heat and fewer air emissions in comparison to landifil disposal.

(2013). "...as UK performs badly with 70% sent to Landfill." Materials Recycling World **202**(19): 7-7.
The article reports that Great Britain is among the worst performing European countries in terms of sending plastics to landfills because it also sent 70% post-consumer plastic waste in landfills in 2012.

(2013). "ASIA." Materials Recycling Week **201**(10): 12-13.
This section offers news briefs on recycling in Asia as of March 2013. Taiwan is building a factory to recycle waste electrical and electronic equipment (WEEE) generated by consumers and

technology firms. Pakistan's Environmental Protection Department claims that the nation's scrap plastic market has been inundated without the proper facilities, leaving millions of people exposed to hazardous plastic waste. Experts have called for more waste education programs across the United Arab Emirates.

(2013). "Defra backs campaign to encourage plastics recycling." Materials Recycling World **202**(11): 8-9.
The article reports that the British Department of Environment, Food & Rural Affairs (Defra) will put in 20,000 British pounds to a campaign launched by plastics management charity Recoup to increase collection and recycling of packaging. The charity's "Plastic Matters" initiative will provide local authorities with consumer communication support and tools to encourage recycling. Main area of concern will be pots, tubs and trays whose recycling rate remained flat year-on-year at 19%.

(2013). "Exporters shun 'Green Fence' exposure." Recycling International(5): 44-45.
The article reports on the decision of Western recovered fibre exporters to suspend shipments to China. The move is attributed to concerns over the additional custom clearance delays and higher costs associated with the country's Green Fence regime. One European supplier to the region wanted to avoid exposure to the Green Fence and the possibility of having containers rejected for what he believes are unjustifiable reasons in some instances. INSET: Nine Dragons unveils six-line expansion plan.

(2013). "First map of plastic pollution in Australian waters." Ecos(190): 1-2.
The article focuses on the study by the researchers at The University of Western Australia and CSIRO-Wealth from Oceans Flagship on Australian sea surface contamination. The study shows that plastic particles, one of type of contaminants, are a result of the breakdown of disposable packaging and fishing gear that were made of polyethylene and polypropylene. The study also provides the first map of floating marine plastics distribution in Australian waters.

(2013). "MBA Polymers Calls for UK VAT Exemptions." Recycling Today **51**(4): 24-24.
The article reports on the request of MBA Polymers for the British government to suspend the value-added tax (VAT) on recycled plastics to help stimulate consumer demand and encourage investment in the plastics recycling industry. MBA Polymers Chief Executive Officer (CEO) noted the environmental and economic benefit from recycled plastics. He proposes an audit of downstream overseas plastic waste processors and a legislation to encourage post-consumer recycled plastics content in new products.

(2013). "MRW's pick of the latest new business." Materials Recycling World(0): 11-11.
The article presents information of contracts which are available for bidding. It includes contracts such as Scotland Excel for treatment of organic waste, North Tyneside Council for processing of recyclable materials, and Bristol & Weston National Health Survey (NHS) Purchasing Consortium for supply and delivery of plastic waste bags.

(2013). "Standard Classification for Standard Plastics Industry Bulk Box/Pallet Unit Size Classified By Bulk Density."
Scope: This classification covers containers used to hold plastic resins with bulk density (Test Methods D1895) of 27 to 39 lb/ft3(0.432 to 0.625 g/cm3). This classification does not apply to any plastic resins with bulk density below 27 lb/ft3(0.432 g/cm3) or above 39lb/ft3(0.625 g/cm3). This classification does not apply to bulk boxes containing hazardous materials. This

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(2013). "Young turtles at sea more likely to swallow plastic." Ecos(186): 1-2.

The article focuses on a study conducted by Chris Wilcox and Denise Hardesty from Commonwealth Scientific and Industrial Research Organization (CSIRO) Wealth from Oceans Flagships which reveals the probability of sea turtles for debris ingestion. It notes that turtle that eats or intake debris such as plastics has tendency to be killed. It adds that coastal cleanup activities must be conducted to resolve such problem.

(2014). "2014 2nd International Conference on Food and Agricultural Sciences, Auckland, New Zealand, 12-14 November 2014." International Proceedings of Chemical, Biological and Environmental Engineering **77**: 1-65.

This special issue features 13 articles specifically discussing the following topics: magnetic treatment of irrigation water and its effect on water salinity; anti-inflammation and anti-infection applicability of Tremella flava Chen fermented soya milk (TFS) in a BALB/c mice model; effect of age on the perception of functional foods by residents of Poland; effects of different molecular weights of chitosan coatings on postharvest qualities of 'nam dok mai' mango; sustainable rice-cattle integrated farming system for small landholders in Bulacan Province, Philippines; improvement of antioxidant status in Nile tilapia Oreochromis niloticus using hot water extract of waste mushroom stalk; short-term effect of alginate-biochar microbeads in corn germination; potential of green banana as biodegradable packaging films; drying characteristics of lemongrass in solar assisted chemical heat pump dryer; development of method to produce snacks supplemented with brewer's spent cassava; small scale sustainable farming activities in the United Arab Emirates: the case of the East Coast of the UAE; effect of gamma-ray radiation on morphological development of Orthosiphon stamineus (cat whisker); and, profile of microorganisms and amylose content of white corn flours of two local varieties as affected by fermentation process.

(2014). "Briefly." Oryx **48**(4): 471-480.
The article offers world news briefs. Topics discussed include the decline of wildlife that was linked to the increase in child slavery, the impacts of deforestation to fish ecology, and the risks of diclofenac drugs to eagles. Also mentioned are the effects of climate change to reptiles, the loss of biodiversity and destabilization of grasslands because of fertilizers, and the map that reveals the degree of plastic pollution in the ocean.

(2014). "The case of the missing plastic." Recycling International(7): 71-71.
The article discusses the findings of a study conducted by researchers at the University of Cadiz in Spain which reveals that there are only about 7,000 to 40,000 tons on plastic waste on the surface of the world's ocean. Topics covered include the findings that plastics floating of surface water only accounts for one percent of plastic pollution in the oceans and the possibility that most plastic waste can be found under the oceans.

(2014). "CLOSER TO HOME." Recycling Today **52**(2): 38-38.
The article focuses on the plan of some materials recovery facility (MRF) operators to sell secondary plastics to houses due to the continuing issues of exporting materials. Topics discussed include the avoidance of low-grade materials by Chinese consumers due to the enforcement of its government to reduce shipments of hazardous materials, the decline of plastic demand in India due to the change in import/export policy of plastic scrap, and the high demand of scrap plastic in Canada and Europe.

(2014). "DIY recycling the most energy efficient." Recycling International(3): 19-19.
The article discusses a study conducted by Michigan Technological University in the U.S. which indicated that turning commonplace plastic scrap into 3D printing filament consumes less energy than conventional recycling.

(2014). "GLOBAL NEWS ROUND-UP." Materials Recycling World **203**(8): 10-11.
This section presents news briefs about key developments in waste management across the world as of March 2014. It reports that the government of Hong Kong has launched a new scheme to slash the country's total food waste by 40% within the next nine years, while the Clinton Foundation has donated 250,000 U.S. dollars to a Haitian recycling plant that seeks to clean up the city of Port-au-Prince. In addition, U.S. exports of plastic scrap to China had dropped in value terms by 18% in 2013.

(2014). "Illinois Bans Products Containing Plastic Microbeads." BNA's Environmental Compliance Bulletin **21**(13): 205-205.
The article reports that Illinois on June 8, 2014 banned the manufacture and sale of consumer products such as facial scrubs, body washes which contain synthetic plastic microbeads to control water pollution in the Great Lakes and other waterways in the U.S.

(2014). "Ocean Debris." E THIS WEEK: 4-4.
The article discusses the impact of the marine debris such as plastic into the ocean and human health. It highlights the coverage of the disappearance of Malaysian Airlines Flight 370 which contribute to the movement of harmful invasive species that suffocate coral reefs. It also notes that the U.S. Environmental Protection Agency (EPA) encourages people to stop plastic pollution

in our oceans.

(2014). "Pop stars help tackle plastic waste." Recycling International(7): 21-21.
The article reports that singer will.i.am and Coca-Cola Co. have teamed up to launch a three-dimensional printer under the EKOCYCLE brand which uses recycled polyethylene terephthalate (PET) bottles.

(2014). "Research links trace toxic metals in seabirds to plastic pollution." Ecos(192): 16-17.
The article reports on the findings of the study conducted by researchers from the University of Tasmania which examines the toxic effects of marine plastic pollution ingestion by the sea birds Flesh-footed Shearwaters. The study found an increase in the number of birds ingesting plastic over the four-year study period. It was observed that birds with high levels of ingested plastic exhibited reduced body condition and increased contaminant load.

(2014). "The science is in: the solution to pollution is not dilution." Ecos(195): 6-7.
The article discusses a study conducted by Australian Nuclear Science and Technology Organisation (ANSTO) Professor Richard Banati and Monash University ecologist Dr. Jennifer Laver about the use of radioactive tracers and seabird feathers to investigate the extent of plastic pollution in the marine food chain. Topics include the degradation process of plastics floating in the oceans and the management of marine pollution.

(2014). "Scientists and adventurers team fight microplastics." Sierra **99**(4): 1-7.
The article presents the author's views on the Plastic Tides paddle boarding expedition around the coast of Bermuda. The expedition reportedly involved a group of friends led by Jordan Holsinger which collected water samples to document microplastic pollution. Studies have shown that microplastics have negatively affected marine ecosystems worldwide.

(2014). "Standard Test Method for Determination of Effectiveness of Cleaning Processes for Reusable Medical Instruments Using a Microbiologic Method (Simulated Use Test)."
Scope: This test method is written principally for large medical instruments or instruments with internal channels or recesses (for example, flexible endoscopes) but may be used for any resuable medical instruments. This test method describes a procedure for testing the efficacy of a cleaning process for reusable medical instruments artificially contaminated with mixtures of microorganisms and simulated soil. The test method utilizes bacterial spores as tracers for foreign materials and quantifies their removal as a means of determining the efficacy of a cleaning process. The test method is designed for use by manufacturers of medical instruments and devices. However, it may also be employed by other individuals who have a knowledge of the instruments, techniques and access to appropriate facilities. Worst-case conditions can be represented by exaggerating a specific test parameter or otherwise intentionally simulating an extreme condition such as performing the test without cleaning solutions or utilizing instruments which are not new. The test procedure is devised to determine the efficacy of a cleaning process as applied to a particular instrument or group of instruments by simulating actual use situations. The test procedure may be performed on test instruments using a complete cleaning cycle or be limited to particular phases of the cycle such as precleaning, manual cleaning, automated cleaning, or rinsing. The test procedure is normally performed on a number of external and internal sites, but it may be restricted to one particular site on the instrument. A knowledge of microbiological and aseptic techniques and familiarity with the instruments is required to conduct these procedures. Note 1:Because contamination of the

surfaces of instruments may occur as a result of rinsing with tap water, bacteria-free water should be used for all rinsing when a water rinse step is part of the cleaning directions. Note 2:Test methods to determine the effectiveness of cleaning medical instruments has only recently been actively debated, and research efforts are in their infancy. Because published experimental results are scarce, it is premature to dictate experimental reagents, conditions or acceptance criteria. Note 3:The total elimination of the target organisms is not the goal of cleaning. Therefore, there will almost always be a number of microorganisms surviving on the test instruments unless one of the solutions or processes disinfects or sterilizes the test instrument. The results of various clinical and laboratory tests suggest that cleaning processes alone can produce a 102to 104log10reduction in bioburden. The exact reduction will depend upon the precise experimental conditions. The criteria for judging cleanliness should be determined and recorded before initiation of the test procedure. Note 4:This test protocol employs target spores as indicators or tracers for foreign materials and monitors their removal by the cleaning process. It is certainly possible that other particulate target materials, such as microbeads (latex beads) could be used in place of microbes. These alternate approaches would be more practical in those circumstances where microbiological expertise is limited. The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. 2014 ASTM International. All rights reserved.

(2014). Updates. **33:** 1065-1068.

The article presents news briefs related to environmental protection as of December 2014. A report in the journal "Proceedings of the National Academy of Sciences of the U.S." estimated there are between 7,000 and 35,000 tons of plastic trash floating in the world's oceans. A 2013 report from the U.S. Department of Agriculture noted that natural microbes help farmers restore soil. The 2015 Annual Conference of the U.S. National Association of Environmental Professionals will held in Hawaii.

(2015). "AMERICAS." Materials Recycling World **204**(8): 14-14.

The article offers news briefs related to waste management and recycling in the Americas in April 2015. Topics include less recycling material per household in Calgary, Alberta, a recycled food container called evercycle launched by aluminium producer Novelis Inc., and the recycling campaign in Mexico to reduce plastic waste on beaches. It also notes the decline of scrap metal theft in Broome County, New York.

(2015). "EPA Lacks Authority Over Microbead Discharges." BNA's Environmental Compliance Bulletin **22**(11): 172-172.

The article reports that the U.S. Environmental Protection Agency (EPA) lacks Clean Water Act authority to regulate consumer use of plastic microbeads that are entering wastewater discharged to treatment facilities.

(2015). "Eureka! Finding solutions to plastic pollution." Ecos(209): 1-3.

The article focuses on research activities of the marine debris team of the Commonwealth Scientific & Industrial Research Organization of Australia, which has been selected as a finalist of the 2015 Eureka Prize. It states that CSIRO Oceans and Atmosphere project used interdisciplinary research to understand the sources and distribution of marine debris, and mentions plastic pollution as a major threat to marine ecosystems.

(2015). "Law Makes Wisconsin Eighth State To Ban Microbeads From Consumer Products." BNA's Environmental Compliance Bulletin **22**(15): 237-237.

The article reports on the Senate Bill 15 signed by Wisconsin Governor Scott Walker which aims to prohibit production and sale of personal care products like facial scrubs and cosmetics that contain synthetic plastic microbeads.

(2015). "MARKETS & PRICES." Materials Recycling World **204**(6): 37-37.

This section offers news and reports across the secondary materials sector in Great Britain and abroad. The World Gold Council has reported a gold price fall to a seven-year low in 2014. Due to the weakening of the Euro against the pound, recovered plastic merchants in Great Britain have reported difficulties in export markets. A decline in the prices has been reported by recovered textiles suppliers to British collectors.

(2015). "MICROBEAD BAN SIGNED BY CALIFORNIA GOVERNOR." BioCycle **56**(9): 8-10.

The article reports that a bill is passed from California Governor, Jerry Brown which ban the sale of personal care products containing plastic microbeads. According to Assembly Member Richard Bloom, toxic microbeads are gathering in rivers and oceans at high levels resulting in increase cleanups costs to taxpayers and decrease ocean health. It states that many natural alternatives including apricot shells and cocoa beans have been used instead of plastic microbeads.

(2015). "States Begin to Ban Microbeads." Skin Deep **13**(4): 45-45.

(2015). Timely scientific opinions. **11:** 519-519.

The article summarizes studies concerning environmental assessment and management as of October 2015. Topics discussed include the need for transparency in test programs for ballast water discharge treatment, microplastics as a global pollutant and the chemical and physical effects of nanoparticle ecotoxicity.

(2016). "CALIFORNIA PASSES BAN ON PLASTIC MICROBEADS." Resurgence & Ecologist(294): 4-4.

The article reports that California State Senate had passed a bill that bans the use of plastic microbeads in cosmetic and personal hygiene products such as shampoos, soaps and toothpaste. Topics discussed include debate of environmentalists on biodegradable plastics and standard plastic beads, views of Richard Bloom California State assembly member, on effect of microplastic pollution in aquatic environments and wildlife, concerns for Great Pacific Garbage Patch in North Pacific Ocean.

(2016). "End of microbeads?" New Scientist **230**(3077): 7-7.

The article reports that the British Parliament's Environmental Audit Committee will determine whether plastic microbeads should be banned in cosmetic products as about 16 to 86 tonnes of microbeads from facial exfoliants are washed down and end up in water every year.

(2016). "Government confirms plans to ban cosmetic microbeads." ENDS (Environmental Data Services)(500): 5-5.

The article reports on the British government proposals to ban the sale and manufacture of

cosmetics and personal care products containing microbeads in 2016.

(2016). "In the Congress." Environmental Law Reporter: News & Analysis **46**(2): 10158-10162.

The article presents U.S. Congressional Record from December 1, 2015 to December 31, 2015. S. 209 would amend the Indian Tribal Energy Development and Self-Determination Act of 2005. H.R. 1321 which would prohibit the sale or distribution of cosmetics containing synthetic plastic microbeads. S. 2152 would establish a comprehensive U.S. government policy to encourage efforts of countries in sub-Saharan Africa to develop power solutions.

(2016). "INDUSTRY NEWS." Skin Deep **14**(2): 13-14.

The article offers news briefs related to the skin care industry in the U.S. as of February 2016. President Barack Obama signed a bill that bans plastic microbeads used as skin exfoliants. The Virtual Stylist Lash & Brow application (app) was launched to help lash and brow experts cater to their clients' needs. Skin Authority chief executive officer Celeste Hilling developed the My Skin Authority app to make it easier for estheticians connect with their clients.

(2016). Microplastic pollution in lakes and lake shoreline sediments – A case study on Lake Bolsena and Lake Chiusi (central Italy). **213:** 648-657.

Rivers and effluents have been identified as major pathways for microplastics of terrestrial sources. Moreover, lakes of different dimensions and even in remote locations contain microplastics in striking abundances. This study investigates concentrations of microplastic particles at two lakes in central Italy (Lake Bolsena, Lake Chiusi). A total number of six Manta Trawls have been carried out, two of them one day after heavy winds occurred on Lake Bolsena showing effects on particle distribution of fragments and fibers of varying size categories. Additionally, 36 sediment samples from lakeshores were analyzed for microplastic content. In the surface waters 2.68 to 3.36 particles/m 3 (Lake Chiusi) and 0.82 to 4.42 particles/m 3 (Lake Bolsena) were detected, respectively. Main differences between the lakes are attributed to lake characteristics such as surface and catchment area, depth and the presence of local wind patterns and tide range at Lake Bolsena. An event of heavy winds and moderate rainfall prior to one sampling led to an increase of concentrations at Lake Bolsena which is most probable related to lateral land-based and sewage effluent inputs. The abundances of microplastic particles in sediments vary from mean values of 112 (Lake Bolsena) to 234 particles/kg dry weight (Lake Chiusi). Lake Chiusi results reveal elevated fiber concentrations compared to those of Lake Bolsena what might be a result of higher organic content and a shift in grain size distribution towards the silt and clay fraction at the shallow and highly eutrophic Lake Chiusi. The distribution of particles along different beach levels revealed no significant differences. [ABSTRACT FROM AUTHOR]

(2016). "Presence of microplastics and nanoplastics in food, with particular focus on seafood." EFSA Journal **14**(6).

Following a request from the German Federal Institute for Risk Assessment (BfR), the EFSA Panel for Contaminants in the Food Chain was asked to deliver a statement on the presence of

microplastics and nanoplastics in food, with particular focus on seafood. Primary microplastics are plastics originally manufactured to be that size, while secondary microplastics originate from fragmentation. Nanoplastics can originate from engineered material or can be produced during fragmentation of microplastic debris. Microplastics range from 0.1 to 5,000 micro m and nanoplastics from approximately 1 to 100 nm (0.001-0.1 micro m). There is no legislation for microplastics and nanoplastics as contaminants in food. Methods are available for identification and quantification of microplastics in food, including seafood. Occurrence data are limited. In contrast to microplastics no methods or occurrence data in food are available for nanoplastics. Microplastics can contain on average 4% of additives and the plastics can adsorb contaminants. Both additives and contaminants can be of organic as well of inorganic nature. Based on a conservative estimate the presence of microplastics in seafood would have a small effect on the overall exposure to additives or contaminants. Toxicity and toxicokinetic data are lacking for both microplastics and nanoplastics for a human risk assessment. It is recommended that analytical methods should be further developed for microplastics and developed for nanoplastics and standardised, in order to assess their presence, identity and to quantify their amount in food. Furthermore, quality assurance should be in place and demonstrated. For microplastics and nanoplastics, occurrence data in food, including effects of food processing, in particular, for the smaller sized particles (<150 micro m) should be generated. Research on the toxicokinetics and toxicity, including studies on local effects in the gastrointestinal (GI) tract, are needed as is research on the degradation of microplastics and potential formation of nanoplastics in the human GI tract.

(2016). "Ready to start." Recycling Today **54**(9): 1-2.
The article reports on U.S. recyclers' optimistic business outlook from the manufacturing sector in fall 2016. Topics discussed include the expected increased generation of manufacturing or retail packaging waste for the holidays, the steady to increasing domestic demand for recovered plastics, and the discouraging of plastic scrap imports by China and India. Also noted is the heavy buying of plastic scraps in regions where shipping rates are competitive for export.

(2016). "Update on the global economy." Materials Recycling World **205**(14): 54-54.
The article provides updates on the international secondary materials sector as of July 2016, including a surge in the paper export markets, declines in Brent crude oil prices, and the Indian government's decision to allow importation of solid plastic waste.

(2017). "Global study finds micro-plastic in 82% samples of Delhi's tap water." TIDEE (TERI Information Digest on Energy & Environment) **16**(3): 289-290.

(2017). "A Look at London's Plastic Waste Problem." Waste360: 1-1.
The article offers update on a report conducted by the London assembly environment committee in England which revealed the city's problem with plastic bottled water and urges London Mayor Sadiq Khan to address the issue in his environmental strategy. It informs about the effort of startup Skipping Rocks Lab to reduce plastic wastes. Other details in the report include a proposed deposit return scheme and statistical data on plastic bottled water consumption in London.

(2017). "Measures needed to keep soil and water free of microplastics." ENDS (Environmental Data Services)(512): 40-40.

(2017). "Microbeads ban 'under threat' from legislation overload." ENDS (Environmental Data Services)(509): 5-5.

(2017). "Microplastics a major problem for farm soils, study shows." ENDS (Environmental Data Services)(503): 36-36.

The article focuses on a study which showed that wide-spread application of sewage sludge from wastewater treatment plants is a major source of microplastics and little is known about how it affects the soil ecosystem, crops or livestock.

(2017). "Patch of Plastic Garbage Found Floating in the Arctic Ocean." Waste360: 17-17.

The article reports on the discovery of a new garbage patch floating in the remote, frozen regions of the Arctic Ocean. Scientists have warned about the effect of the garbage patch on wildlife. They found out that the garbage patch represents about three percent of the total plastic in the world's oceans. In response, some companies are turning plastic waste found in oceans into products.

(2017). "Plastic waste in aviation fuel takes off." Materials Recycling World: 1-1.

(2017). "Procter & Gamble, TerraCycle Create Bottle from Recycled Plastic and Ocean Plastic." Waste360: 3-3.

The article offers information on the initiative of Procter & Gamble Company to partner with TerraCycle for creating the Fairy Ocean Plastic bottle which is made from post-consumer recycled plastic and ocean plastic. It mentions the initiative as an effort to divert plastic waste from landfill and the ocean. It also presents views of Tom Szaky, chief executive officer of TerraCycle, regarding the same.

(2017). "TerraCycle and P&G Reach Recycling Milestone." Waste360: 1-1.

The article informs that Procter & Gamble has partnered with TerraCycle to create the Fairy Ocean Plastic bottle, which is made from 90 percent post-consumer recycled plastic and 10 percent ocean plastic, as of November 2017. It mentions that the bottle, which will be launched in 2018, aims to raise awareness of the issue of ocean plastic and what can be done to prevent plastic waste from reaching the ocean.

(2017). "UK Initiative Uses Drones to Detect Plastic Waste on British Beaches." Waste360: 1-1.

The article offers information about the working of executives Ellie Mackay and Peter Koehler regarding teaching drones to detect plastic waste in beaches of Great Britain and to track plastic waste dumped into the ocean.

(2017). "Wales consults on details of microbead ban in cosmetics: Making and selling personal care products conraining microbeads will be banned in Wales from next summer, according to a consultation." ENDS (Environmental Data Services)(513): 12-12.

(2018). "30 DAYS." Materials Recycling World **208**(8): 6-6.

(2018). "Aquariums Up the Ante to Cut Plastic Pollution." Waste360: N.PAG-N.PAG.

The article discusses the twenty-two top aquariums across the U.S. which have already eliminated five million straws in their coordinated campaign to reduce sources of plastic pollution, the cutting back on single-use plastic starting with plastic straws by Earth Day 2019.

(2018). "BIOCYCLE WORLD." BioCycle **59**(9): 6-9.

The article offers news briefs related to recycling of wastes. Topics discussed include three bills signed by California Governor Jerry Brown to address the public health and environmental threat imposed by plastic pollution and waste, the report “What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050" from World Bank on global waste, and the report "Seeing the Forest: Nature's Solution to Climate Change" by Dogwood Alliance.

(2018). "Briefly." Oryx **52**(4): 599-608.

The article offers news briefs on topics including plastic pollution, seabirds threatened by plastic ingestion and efforts to reduce plastic pollution.

(2018). "By the billion." Recycling Today: 1-3.

(2018). "California Governor Signs First Wave of Plastic Pollution Reduction Bills." Waste360: N.PAG-N.PAG.

The article informs that three key bills have been signed by Jerry Brown, governor of California, to date on the public health and environmental threat posed by plastic pollution and waste. It is noted that he has also signed renewable natural gas Coalition-sponsored bill AB 3187 at the state capitol. Senator Ben Allen said that California has shown possibility to switch from environmentally damaging food packaging to sustainable alternatives.

(2018). "China's New Import Policies Leave Tons of Plastic Waste with No Destination." Waste360: 5-5.

The article offers information on the contamination limits put in place for its plastic imports by China and its impact of the plastic waste across the globe. Topics discussed include the potential use of landfills to deal with the plastic waste, the new policy implemented by China to limit the acceptance of plastics and scrap paper from other countries, and the plastic waste generated by the U.S. and other countries.

(2018). "Consumer Goods Industry Moves to Act on Plastic Waste." Waste360: N.PAG-N.PAG.

The article focuses on the move of the Board of Directors of the Consumer Goods Forum (CGF) to release a statement which calls for the consumer goods industry to play a leading role in eliminating plastic waste on land and sea and endorses the Ellen MacArthur Foundation's New Plastics Economy vision. Information on the Ocean Conference taking place in Bali, Indonesia is presented.

(2018). "Dow Launches #PullingOurWeight Cleanup Campaign." Waste360: N.PAG-N.PAG.

The article focuses on Cleanup Campaign "PullingOurWeight" to remove waste from water launches by the Dow Chemical. Topics include cleanups at more than 50 locations across the globe to bring attention to the issue of ocean plastic pollution; views of Diego Donoso, president of Dow that the level of commitment from employees around the world, extended Dow family; and managing the lifecycle of plastics from design to disposal will retain the many social and economic benefits of plastics.

(2018). "Environment plan: highlights and reaction." Materials Recycling World **208**(2): 1-1.

(2018). "EPA Study Shows Plastic Waste Has Doubled Over Past Decade." Waste360: N.PAG-N.PAG.

The article highlights report of Environmental Protection Agency (EPA) hike in plastic waste.

Topics discussed include industrial plastic waste doubled over from past decade; making large amount of coffee cups which also included in commercial and business waste; and mention about replacement of organic waste into plastics as primary wastes in household dustbin.

(2018). "GOVER OUTLINES ACTION TO TAKE ON GOVE’S CHALLENGE." Materials Recycling World **208**(3): 7-7.

(2018). "ISRI Execs' Observations from Several Days in China." Waste360: 1-1.
The article focuses on lessons learned by executives from the Institute of Scrap Recycling Industries (ISRI) during several days of meetings with Chinese and U.S. government officials and other industry association leaders in Beijing in January 2018. It highlights notice of adoption of new contamination standards filed by China's Ministry of Environmental Protection (MEP) with a standard of 0.5% contamination for various materials, including scrap plastics and paper.

(2018). "Johnson & Johnson Signs New Plastics Economy Commitment." Waste360: N.PAG-N.PAG.
The article reports on the move of Johnson & Johnson Consumer Inc. to join in the effort New Plastics Economy Commitment, together with the Ellen MacArthur Foundation and the U.N. Environmental Programme, which strives to address plastic waste and the importance for a reform in consumer packaging.

(2018). THE LAST WORD, New Scientist Ltd. **239:** 59-59.
Questions and answers are provided to several topics, including the method of determining the amount of toilets needed at large events, marine plastic pollution and the safety measures taken for human drinking water.

(2018). "Long Island, N.Y., Responds to Shift in Recycling Market." Waste360: N.PAG-N.PAG.
The article offers information on the changes in recycling practices in several towns in Long Island, New York, after China imposed a ban on recyclables. Topics discussed include the use of dual stream process in Brookhaven, where residents alternate between paper and cardboard one week, and plastic and metals the next; the collection sites for glass; and the need for citizens to more vigilant about contamination.

(2018). "NAVIGATING SUSTAINABILITY IN UNCERTAIN TIMES." Resurgence & Ecologist(308): 5-5.
The article discusses the impact of the transformative trends to achieve sustainable development including the use of data and robots to combat soil degradation in farming, the elimination of plastic pollution through waste management and the use of blockchain in making transactions.

(2018). "Nestlé Aims to Make 100% Recyclable or Reusable Packaging by 2025." Waste360: N.PAG-N.PAG.
The article reports that the food company Nestlé has announced its commitment to make its packaging recyclable or reusable by the year 2025. It mentions views of Mark Schneider, chief executive officer (CEO) Nestlé, on plastic waste. It states that Nestlé will focus on areas like elimination of non-recyclable plastics, encouraging the use of plastics that allow better recycling rates and eliminating or changing the complex combinations of packaging materials.

(2018). No increase in marine microplastic concentration over the last three decades – A case study from the Baltic Sea. **621:** 1272-1279.

Microplastic is considered a potential threat to marine life as it is ingested by a wide variety of species. Most studies on microplastic ingestion are short-term investigations and little is currently known about how this potential threat has developed over the last decades where global plastic production has increased exponentially. Here we present the first long-term study on microplastic in the marine environment, covering three decades from 1987 to 2015, based on a unique sample set originally collected and conserved for food web studies. We investigated the microplastic concentration in plankton samples and in digestive tracts of two economically and ecologically important planktivorous forage fish species, Atlantic herring (Clupea harengus) and European sprat (Sprattus sprattus), in the Baltic Sea, an ecosystem which is under high anthropogenic pressure and has undergone considerable changes over the past decades. Surprisingly, neither the concentration of microplastic in the plankton samples nor in the digestive tracts changed significantly over the investigated time period. Average microplastic concentration in the plankton samples was 0.21 ± 0.15 particles m^{-3} . Of 814 fish examined, 20% contained plastic particles, of which 95% were characterized as microplastic (< 5 mm) and of these 93% were fibres. There were no significant differences in the plastic content between species, locations, or time of day the fish were caught. However, fish size and microplastic in the digestive tracts were positively correlated, and the fish contained more plastic during summer than during spring, which may be explained by increased food uptake with size and seasonal differences in feeding activity. This study highlights that even though microplastic has been present in the Baltic environment and the digestive tracts of fishes for decades, the levels have not changed in this period. This underscores the need for greater understanding of how plastic is cycled through marine ecosystems. The stability of plastic concentration and contamination over time observed here indicates that the type and level of microplastic pollution may be more closely correlated to specific human activities in a region than to global plastic production and utilization as such. [ABSTRACT FROM AUTHOR]
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(2018). "NOVAMONT UNVEILS ALTERNATIVE TO MICROBEADS IN COSMETICS." Recycling International: 45-45.

(2018). PLASTIC AHOY! Environmental Engineering. R. Andy. London, Professional Engineering Publishing Ltd. **31:** 3.
Pye discusses the problem on plastic pollution in the UK and the efforts to address such problem. Studies from Plymouth University and Ghent University in Belgium that show the presence of plastic in UK-caught fish and the ingestion of tiny pieces of plastic by people who eat seafood. A United Nations (UN) resolution was created to enable collective action to reduce and prevent marine pollution, while countries such as Sri Lanka, Kenya, and Zimbabwe banned the use of plastic.

(2018). "Plastic Waste and the Flint, Mich., Water Crisis." Waste360: N.PAG-N.PAG.
The article offers information about Water Crisis in Flint, Michigan due to lead-filled, tainted drinking and bathing water. Topics discussed include accumulation of 100 million plastic water bottles in the city; talks about figure out the waste generated from water crisis and response of

the city on the issue; and fundamental initiatives taken by the public-private partnerships and public communication to clean up plastic waste.

(2018). "Quarterly Comment by Trinity Chambers: Trinity Chambers, Newcastle." Environmental Law Review **20**(2): 109-129.

This quarter has seen the government announce its 25-year plan to protect the environment, the enactment of new statutory instruments and stimulating case law. The political will to combat damage to the environment appears to exist. A much-anticipated 25-year plan was announced by Theresa May in January (Guardian, 11 January 2018). Mrs May announced that the government hopes to eliminate all 'avoidable' plastic waste within 25 years. It has been observed with some cynicism that legislation does not yet appear to be forthcoming on such lofty ambitions. The legislation itself will require careful planning, a targeted approach to the most wasteful areas of commerce and society, together with a pragmatic approach to eradicate 'avoidable' plastic waste. While some remain sceptical of the government's aspiration, it has been noted that the charge on plastic bags has been successful. The government will next seek to agree a charter for the Commonwealth aiming to reduce the amount of plastic waste in the oceans (The Guardian, 11 January 2018). The government has given new powers to tackle illegal activity at waste sites. The Waste Enforcement (England and Wales) Regulations 2018 enter into force soon. The waste regulation and collection authorities can require waste to be removed where it has been unlawfully kept or disposed of. It is important to note that this includes waste that was initially deposited lawfully. The Environment Agency and the Natural Resource Body for Wales may now give notice or seek an order of the court to restrict access and the importation of waste to particular premises. His Royal Highness Okpabi was unsuccessful in the Court of Appeal against Shell. In a case (reported below), the Nigerian claimants sought to appeal against a decision that Shell (as parent company) did not owe them a duty of care in respect of pollution and environmental damage caused by oil leaks from pipelines and associated infrastructure operated by a subsidiary. In the judgment given by Sir Geoffrey Vos and Lord Justice Simon (Lord Justice Sales dissenting), the claimants were unable to demonstrate a properly arguable case that the parent company owed a duty of care to those affected. This judgment grapples with interesting legal issues concerning a company's duty of care and jurisdiction. [ABSTRACT FROM AUTHOR]

(2018). "The Reality of the Great Pacific Garbage Patch." Waste360: N.PAG-N.PAG.

The article focuses on the a report on the epidemic of plastic in the ocean. It mentions the National Oceanographic and Atmospheric Administration's Kevin O'Brien who oversees marine debris removal in the Pacific between California and Hawaii; and also mentions plastics floating in the ocean are exposed to several environmental factors that cause them to break down into smaller fragments, making them more difficult to remove.

(2018). "Recycling Facilities Fight Contamination in the Face of New Import Policies." Waste360: 2-2.

The article reports that recycling facilities across the U.S. have been working to clean up their end products or find new buyers in the wake of increase in the standard for contamination in

plastic waste imports under China's National Sword policy. It states that a significant percent of the material that comes to the Waste Management recycling sorting facility in Denver, Colorado is trash. It notes that the sorting process has become more important.

(2018). "THE SEABIRDS THAT SHUN PLASTIC." Resurgence & Ecologist(310): 4-4.
The article reports that Australian wedge-tail shearwaters eat plastic, stating that plastic in the body of seabirds is one of the best way to measure plastic pollution.

(2018). "Stanley Black & Decker Commits to Combat Plastic Pollution." Waste360: N.PAG-N.PAG.
The article reports on the partnership between Stanley Black & Decker and government of the U.S. to sign the Plastics Economy Global Commitment, an initiative of the Ellen MacArthur Foundation and United Nations Environment Programme. The Global Commitment represents a plan to eradicate waste and pollution driven by plastic packaging. It mentions views of Deb Geyer , from Stanley Black & Decker, on plastic pollution.

(2018). "Still depressed: China's moves to ban imports of most types of plastic scrap remain the foremost factor in the health of the global plastic recycling sector." Recycling Today: 1-3.

(2018). "Study Shows Illinois Cities Struggle to Boost Recycling Rates." Waste360: N.PAG-N.PAG.
The article looks at a report titled "The State of Recycling in Illinois" compiled by the Illinois chapter of the U.S. Public Interest Research Group which shows that Chicago, as well as five other cities in Illinois, are failing to meet the nation's average recycling rates. It mentions China's import ban on plastic waste gives Illinois and other states an opportunity to expand their recycling economies by investing in better collection, sorting and reprocessing systems.

(2018). "SUNLIGHT CAN CHANGE PLASTIC WASTE INTO HYDROGEN FUEL." Recycling International: 45-45.

(2018). "U.S. Plastic Recycling Rate Projected to Drop to 4.4% in 2018." Waste360: N.PAG-N.PAG.
The article reports on the estimated drop of plastic recycling rate due to the implementation of plastic waste import bans by the U.S. Environmental Protection Agency (EPA).

(2018). "Waste Free Oceans Announces Partnership with Henkel." Waste360: 4-4.
The article reports on the partnership between Waste Free Oceans with chemical and consumer goods company Henkel. Topics discussed include goal of creating bottles for Henkel's Lovables laundry brand from recycled marine plastics; views of Bernard Merkx, co-founder of Waste Free Oceans, on the protection of oceans and rivers from plastic pollution; and commitment to promoting sustainable packaging and recycling.

(2019). "Abstracts of Current Research." TIDEE (TERI Information Digest on Energy & Environment) **18**(1): 19-100.

(2019). "Air Canada to Begin Reducing Single-use Plastics in 2019." Waste360: N.PAG-N.PAG.
The article reports that Air Canada airline company is reducing single-use plastics onboard aircrafts and its workplaces with aim of cutting down on plastic waste.

(2019). "All-consuming plastic." Chemical and Engineering News **97**(5): 28-33.
About a year ago, Philipp Schwabl, a research scientist and physician specializing in intestinal

diseases at the Medical University of Vienna, read an article about plastic pollution and started to connect the dots. About 8 million metric tons of plastic waste enters the oceans every year; eventually those bottles and bags break down into particles. Schwabl wondered whether tiny plastic particles - known as microplastics - are entering the food chain and being consumed by people and, if so, whether they could harm cells and tissue in the human gut. Schwabl could find no definitive answers, so he decided to undertake his own study. Serendipitously, he discovered that Bettina Liebmann, an analytical chemist who heads Environment Agency Austria's effort to analyze microplastics, was based a few minutes' bicycle ride away. The pair teamed up and in October 2018 released the outline of a small pilot study, now undergoing peer review, that they say is. 2019 Chemical & Engineering News.

(2019). "Atlanta's Plastic Waste Takes on New Life as Host Committee Uniforms." Waste360: N.PAG-N.PAG.

The article reports that Hartsfield-Jackson Atlanta International Airport (ATL) is promoting the importance of recycling and is also supporting a circular economy by collecting plastic bottles to be transformed into REPREVE recycled fiber for use in athletic and fashion apparel.

(2019). "Bacardi, Lonely Whale Urge Unicode to Remove all Plastic Straw Emojis." Waste360: N.PAG-N.PAG.

The article discusses a partnership between spirits company Bacardi Ltd. and the organization Lonely Whale to eliminate one billion single-use plastic straws by 2020. Topics discussed include the views of Jacob Briars, global advocacy director for Bacardi, on the impact of plastic waste on marine life, a collection of Giphy stickers released by Bacardi and Lonely Whale, and the views of Dune Ives,the executive director of Lonely Whale, on eliminating single-use plastic straws.

(2019). "BIOBOARD." Asia - Pacific Biotech News **23**(3).

ASIA-PACIFIC – Quality and quantity of sleep affects behavior, cognition and glucose levels in Asian teens.ASIA-PACIFIC – Quality of overall diet key to lowering type 2 diabetes risk.ASIA-PACIFIC – Toxic bacteria found on microplastics retrieved from tropical waters.ASIA-PACIFIC – New use of anti-parasitic drug to potentially treat cancer.ASIA-PACIFIC – Hassle free influenza vaccine close to reality.REST OF THE WORLD – Bitter rapeseed could be used as protein source for human nutrition.

(2019). "Boom Goes the Plastics Industry." Sierra: 1-3.

(2019). "Bottle-to-bottle Recycler Tackles Ocean Plastic Pollution." Waste360: N.PAG-N.PAG.

The article offers information on the challenges faced by the oceans due to the plastic pollution. Topics discussed include information on the CarbonLITE Industries, a global recycler and producer of polyethylene terephthalate plastic launching post-consumer, ocean-diverted plastic; discussions on the CarbonLITE as among the first thermoforming companies to offer food packaging from ocean-diverted plastic.

(2019). "California Senate Passes Single-use Packaging and Plastics Bill." Waste360: N.PAG-N.PAG.

The article reports that California State Senate Ben Allen on May 29, 2019 passed the California Circular Economy and Plastic Pollution Reduction Act (SB-54), which aims to set a bar for reducing single-use packaging across the U.S. It presents views of Geoff Shester, California campaign director and senior scientist at Oceana, on plastics. It presents views of Oceana Chief Policy Officer Jacqueline Savitz, on plastic pollution.

(2019). "The case for consumer battery education: Turning wishful recyclers into responsible recyclers: Battery recycling awareness and engagement varies across the country." Recycling Today: 1-2.

(2019). "Corrigendum." Environmental Toxicology & Chemistry **38**(3): 695-695.
A correction is presented to the article "Microplastics in the aquatic environment: Evidence for or against adverse impacts and major knowledge gaps" which appeared in the previous issue.

(2019). "Difficult Challenges for the UN Environment Assembly." Environmental Policy & Law **49**(2/3): 112-117.
Governance of UNEP and the UNEA, and UNEA's "linkages with various UN reform efforts" and "UNEP Agreed to support UNEP as a programme of the UN. UNEP's role as a UN Programme has not yet been 20 As described in the UNEP website, the UNEA is now "the world's highest-. [Extracted from the article]

(2019). "EU Says No to Single-Use Plastics." Earth Island Journal **34**(2): 4-4.
The article focuses on the move of the European parliament to ban single-use plastic products including food containers, cutlery, straws, and stirrers, in an effort to tackle plastic trash that is littering the beaches and polluting the oceans. The implementation of the ban into force in 2021 which means that European Union's (EU’s) 28 member states will soon join another 27 countries around the world that have imposed regulations on single-use plastic is mentioned.

(2019). "EU Votes to Ban 10 Types of Single-use Plastics by 2021." Waste360: N.PAG-N.PAG.
The article reports that European Parliament voted in favor of banning different types of plastics by the year 2021 It mentions that the banned items will comprise several items found ion the European Union (EU) beaches like plates, straws, balloon sticks, food and beverage containers made of expanded polystyrene and products made of oxo-degradable plastic. It presents information on concerns about plastic pollution.

(2019). "Ferguson to Swim Perimeter of Easter Island in Fight Against Plastic." Waste360: N.PAG-N.PAG.
The article focuses on the plastic pollution awareness campaign "Swim Against Plastic: Easter Island" which was announced by nonprofit organizations Plastic Oceans International and Breathe Conservation. The campaign will feature former South African national swimmer Sarah Ferguson and Breathe Conservation founder Sarah Ferguson who will attempt to set a world record. Education and beach cleanups on Easter Island in March 2019 will also be held.

(2019). "Florida Lawmakers Consider Ban on Plastic Straw Bans." Waste360: N.PAG-N.PAG.
The article focuses on the issue of banning the use of plastic straws by the Florida lawmakers due to the environmental concerns. Topic incudes environmental damage caused by plastic straws, growing war against the environmental impact of plastic, and the ban on municipal regulation of sunscreens that harm coral reefs.

(2019). "Groups Call on Canadian Government to Act on Plastic Pollution." Waste360: N.PAG-N.PAG.

The article discusses Canadian Government to act on plastic pollution. Topics include twelve ocean conservancy and environmental groups on requesting for Canada's environment and health ministers to take immediate action; require recycled plastics to be used in making products and packaging; views of Chloé Dubois, president of The Ocean Legacy Foundation on discarding of plastic bottles, bottle caps, and cigarette butts.

(2019). "Invisible, but ubiquitous." New Scientist **244**(3259): 3-3.

Microplastics are in our air, food and water. Are there health implications?

(2019). "Iowa, Tennessee Pass Bills Supporting Advanced Plastics Recycling." Waste360: N.PAG-N.PAG.

The article reports on legislative bills supporting advanced recycling facilities to convert plastic waste into raw material, passed by Iowa and Tennessee.

(2019). "Keep New Hanover Beautiful, TerraCycle Hit Cigarette Recycling Milestone." Waste360: N.PAG-N.PAG.

The article reports that the firm TerraCycle Inc. in 2017 joined forces with North Carolina-based Keep New Hanover Beautiful (KNHB), a Keep America Beautiful affiliate, to collect and recycle cigarette butts outside of county buildings, local bars, restaurants, Wilmington International Airport and along Wrightsville Beach. It is noted that the aim of the KNHB is to minimize waste and reduce hazardous plastic waste.

(2019). "Keurig Dr Pepper Launches New Corporate Responsibility Strategy." Waste360: N.PAG-N.PAG.

The article highlights the announcement of unified corporate responsibility (CR) commitments by the Keurig Dr Pepper (KDP) company for improvement and increase in recycling. Topics include focusing of CR platform on environment, supply Chain, health & wellbeing and communities; views of KDP chairman Bob Gamgort on the issue of plastic waste in the environment; and new packaging goals of company that use of post-consumer recycled content & recyclable or compostable packaging by 2025.

(2019). "L'Occitane, Loop Industries Agree to Transition to 100% Sustainable PET Plastic." Waste360: N.PAG-N.PAG.

The article reports the signing of a supply agreement by natural cosmetics manufacturer L'Occitane Group with sustainable plastic company Loop Industries for obtaining Loop-branded sustainable polyethylene terephthalate (PET) plastic so as to implement it into its product packaging by 2022. Topics discussed include growth in demand for sustainable packaging solutions and the efforts of L'Occitane Group to reduce plastic pollution.

(2019). "Looking for solutions for safe food contact materials." DMZ, Lebensmittelindustrie und Milchwirtschaft **140**(21): 18-19.

This paper presents the International Conference of the Fresenius Academy discussions on EU food contact materials (FCM) legislation and new initiatives. Issues on mineral oil, petroleum hydrocarbon and microplastic residues in food, and the potential of packaging made from bio-based polymers as an environment-friendly plastic alternative are discussed.

(2019). "MALAYSIA CLOSES ILLEGAL PLASTIC RECYCLING FACILITIES." Recycling Today: 1-3.

(2019). "Maryland Becomes Second State to Ban Plastic Foam Containers." Waste360: N.PAG-N.PAG.

The article reports that Maryland has put ban on polystyrene foam cups and containers. It mentions views of Maryland resident and Oceana Chief Policy Officer Jacqueline Savitz, on plastics crisis, and consumer goods. It informs that Maryland has been a leader when it comes to addressing plastic pollution crisis. It informs that the U.S. Public Interest Research Group's Zero Waste Director Alex Truelove issued.

(2019). "New Global Alliance to End Plastic Waste Has Launched." Waste360: N.PAG-N.PAG.

The article reports the launch of Alliance to End Plastic Waste (AEPW), which include companies from the plastics and consumer goods value chain, to develop solutions to eliminate plastic waste in the environment, especially from land to the ocean.

(2019). "Oceanic Society, SC Johnson to Drive Engagement on Ocean Conservation." Waste360: N.PAG-N.PAG.

The article highlights about a campaign named "Five for 50" organized by Oceanic Society in 2019 to build public awareness around Oceanic Society's conservation goals centered on plastic pollution, climate change and, fisheries management.. Topic includes five expeditions of the "Five for 50" campaign exploring marine habitats and critical conservation issues; sponsored and support of oceanic society by SC Johnson; and expeditions' destinations.

(2019). "P&G: 2020 Olympic Medals Podiums Created from Recycled Plastic." Waste360: N.PAG-N.PAG.

The article focuses on the fast-moving consumer goods (FMCG) company Procter & Gamble (P&G) creating medals with recycled materials. It discusses the medals created for the Olympic games in partnership with Tokyo 2020 Organizing Committee, the Tokyo 2020 Podium Project in host-country Japan, and sustainability for positive impact on environment.

(2019). PATHWATER Introduces Reusable Water Bottle Packaging**:** N.PAG-N.PAG.

The article reports that PathWater has introduced its first reusable bottled water to help end single-use plastic pollution.

(2019). "Pennsylvania Lawmakers Introduce "Zero Waste PA" Legislative Package." Waste360: N.PAG-N.PAG.

The article focuses on Zero Waste PA, a package of 13 legislative bills announced by Democratic state lawmakers in Pennsylvania to tackle environmental and health problems caused by Styrofoam waste and single-use plastics

(2019). "People, Projects, and Programs News from the field." Sustainability: The Journal of Record **12**(5): 239-247.

Coal-driven air pollution in China has become so bad that solar panels are unable to function at maximum efficiency because not enough sunlight can break through. U.S. cities are ramping up their clean energy efforts, notably with stricter energy-saving rules for buildings, but only a few cities appear to be on track to meet their community-wide climate goals, according to the American Council for an Energy-Efficient Economy (ACEEE). The City Clean Energy Scorecard tracks policy efforts by 75 cities to advance renewable energy and energy efficiency, and is the most-comprehensive national report that tracks city progress toward climate goals, Ribeiro adds. InterContinental Hotels Group (IHG), which owns Holiday Inn, Crowne Plaza, and Kimpton hotel chains, among others, is eliminating the travel-sized tubes from its 843,000 rooms worldwide. [Extracted from the article]

(2019). "Piling on the pressures to ecosystems." Science **366**(6467): 801.

A multitude of anthropogenic pressures and perturbations now assault the world's ecosystems. The air is enriched with carbon dioxide (CO2), temperature extremes and droughts happen with increasing frequency, and a wide range of pollutants accumulate in the soil and water, including pesticides, microplastics, and excess fertilizer. What is the overall impact of these changes—so-called global environmental change drivers (or factors)—on ecosystems and their functioning? Although a broad scope of scientific approaches is used, including observational studies and modeling, experiments remain key. On page 886 of this issue Rillig et al. (1) present an exciting new methodological approach to investigate how these multiple pressures affect ecosystems.

(2019). "Plastic hitches a ride with the wind." New Scientist **242**(3226): 18-18.

The article covers researching suggesting that microplastics can travel far distances through the air.

(2019). "Quick Studies." Nutrition Action Health Letter **46**(10): 7-7.

The article highlights several health-related studies. The American Heart Association and American College of Cardiology published its 2019 guidelines on what foods can cut the risk of having a heart attack or stroke. A study found that women assigned to exercise for 45 to 60 minutes at least three times a week all month experienced lesser menstrual pain. Canadian researchers found that some tea bags are made of microplastic and nanoplastic particles which can increase the risk of cancer.

(2019). "Red Lobster, Ocean Conservancy Partnership Highlights Ocean Preservation." Waste360: N.PAG-N.PAG.

The article reports on the partnership between Red Lobster and Ocean Conservancy, in order to support the protection and preservation of the oceans. It mentions information on focus of the partnership over the Global Ghost Gear Initiative, which focuses on driving solutions to the problem of lost and the Trash Free Seas Alliance, which unites leaders to mitigate plastic waste entering the oceans. It presents views of Kim Lopdrup, from Red Lobster, on seafood sustainability.

(2019). "Report: "Communities on the Frontlines of the Global Plastic Crisis"." Waste360: N.PAG-N.PAG.

The article highlights a report from the Global Alliance for Incinerator Alternatives who takes a look at how countries in southeast Asia are struggling to manage higher volumes of plastic waste as a result of China's ban on imports of mixed recyclable plastics. Topics discussed include that despite of efforts to recycle, consumers and municipal waste managers do not know where their recycling is going, or if it is being recycled at all.

(2019). "Second Ocean Heroes Bootcamp Empowers Youth to Beat Plastic Pollution." Waste360: N.PAG-N.PAG.

(2019). "SUEZ to Build Plastics Recycling Plant in Thailand." Waste360: N.PAG-N.PAG.

The article discusses Suez, utilities company on building of plastics recycling plant in Thailand. Topics include plant which aims for turning plastic waste into circular polymers in the Bang Phli district near Bangkok, Thailand; plant which convert 30,000 tons of collected polyethylene film waste into high quality post-consumer recycled plastic (PCR); and development in regional countries by improving drinking water, sanitation and waste management services.

(2019). "Tupperware Unveils Vision to Reduce Plastic, Food Waste by 2025." Waste360: N.PAG-N.PAG.

The article discusses Tupperware Brands on announcing of reduce plastic and food waste by 2025. Topics include company on introducing reusable, long-lasting plastic for the home; views of Tricia Stitzel, chairman and chief executive officer of Tupperware Brands on having business to change lives; and views of Mark Shamley, vice president of global social impact at Tupperware Brands on integrating sustainable practices by products, operations and supply chain.

(2019). "UP TO DATE: What's happened in recycling recently ... and what's on the horizon." Resource Recycling **38**(2): 7-7.

The article offers recycling news briefs in Canada and the U.S. The topics discussed include the 2019 Plastics Recycling Conference & Trade Show to be held at the Gaylord National Resort and Convention Center in National Harbor, Maryland on March 11-13, 2019, the creation of the Alliance to End Plastic Waste by top virgin plastic companies like LyondellBasell and Dow, and the estimated number of deaths in the solid waste industry of Canada and the U.S. from January to March 2019.

(2019). "Vermont to Ban Food Scraps from Trash Disposal by 2020." Waste360: N.PAG-N.PAG.

(2019). "Walmart Launches New Reusable Bag Campaign, Sustainability Goals." Waste360: N.PAG-N.PAG.

The article reports on an announcement by Walmart regarding its offering of reusable bags at its U.S. stores to customers for purchase to increase customer convenience. It states that the recent announcement by Walmart on a series of plastic waste reduction goals has led to the launch of the new reusable bag initiative.

(2019). "WALMART MAKES PLASTIC PACKAGING WASTE REDUCTION COMMITMENTS." Recycling Today: 3-3.

(2019). "Westlake Chemical Joins Global Alliance to End Plastic Waste." Waste360: N.PAG-N.PAG.

The article focuses on the announcement from Westlake Chemical Corporation regarding joining the Alliance to End Plastic Waste (AEPW), that was launched in January 2019. It aims to eliminate plastic waste in the environment, but delivers products that benefit lives every day from polyethylene that is used daily in food packaging, to vinyl pipe that is used to deliver clean drinking water.

(2019). "Windex Highlights World Oceans Day 2019 with Interactive Experience." Waste360: N.PAG-N.PAG.

The article discusses Windex, multi surface cleaner with vinegar which announced for launching of 100 percent ocean plastic bottle. Topics include receiving of Windex multi surface cleaner with vinegar ocean plastic bottle; making a donation to Swim Drink Fish, a nonprofit organization to create a swimmable, drinkable and fishable future; and sharing an experience on social channels of feeling to swim in ocean which polluted with solid waste.

(2019). "Working together to challenge plastic pollution." Resurgence & Ecologist(316): 66-66.
We're delighted to have joined Plastic Free North Devon (PFND) - a consortium set up to combat the global problem of plastic pollution through local action. The consortium includes charities, voluntary groups organisations working together across communities, tourism and business to make the biggest and most immediate impacts on the plastic problem in North Devon. PFND aims to Raise awareness of how the environment is affected by plastic Reduce the consumption of single-use plastics Remove plastic that has entered the natural environment Recycle or dispose of used plastic appropriately. [Extracted from the article]

(2019). "WWF Launches Activation Hub to Help Prevent Global Plastic Waste." Waste360: N.PAG-N.PAG.
The article reports that according to the World Wildlife Fund (WWF), global plastic pollution crisis is impacting oceans, communities, wildlife and people at an unprecedented rate. It presents views of Nik Sekhran, chief conservation officer of WWF, on plastic pollution. It mentions views of Francesca DeBiase, McDonald's executive vice president, on plastic pollution.

(2020). "Plastic pollution in the environment." Environmental Toxicology & Pharmacology **73**: N.PAG-N.PAG.

(2020). "A Weighty Issue." Earth Island Journal **34**(4): 5-5.
New research indicates that worms in microplastic-polluted soils don't do as well as their non-plastic-ingesting relatives. Specifically, scientists found that worms in soil contaminated with high density polyethylene (HDPE), which is commonly used to make bags and bottles, lost 3 percent of their body weight over 30 days, while worms in HDPE-free soil gained 5 percent of their body weight over the same amount of time. Given worms' role in soil ecosystems, the findings, published in the journal Environmental Science and Technology, raise some alarm for the health of soils across the world that are the foundation for our agricultural lands, forests, and grasslands. [Extracted from the article]

A, G. K., et al. (2020). "Review on plastic wastes in marine environment - Biodegradation and biotechnological solutions." Marine Pollution Bulletin **150**: 110733.
The marine plastic pollution has drastic effect on marine species. The importance in environmental issues increases the demand to develop a significant technology which does not burden the marine environment or marine life forms. To mitigate the foreseen problems of

micro and nanoplastic contamination, different biotechnological solutions has to be considered. Microbial communities exposed to plastic contaminated sites can adapt and form dense biofilms on the plastic surface and produce active catalytic enzymes. These enzymes can be able to degrade the synthetic polymers. In view of their high catalytic activity, microbial enzymes can be applicable for the degradation of synthetic polymers. This review highlights the toxicity of micro and nanoplastics on marine organisms, biodegradation of plastics and futuristic research needs to solve the issues of plastic pollution in marine environment.

Aandahl, E. M., et al. (2012). "Heterogeneity in the suppressive activity of human regulatory T cells-relevance for solid organ transplantation?" Transplantation **10S)**: 438.

Introduction: Human CD4+CD25+FOXP3+ regulatory T cells (Tregs) are crucial for maintaining peripheral tolerance. Depletion of Tregs precipitate widespread autoimmune disease whereas adoptive transfer of Tregs cells resolves autoimmunity and may foster immune tolerance after solid organ allotransplantation (SOT) in rodent models. In humans, the level and specificity of Treg immunosuppressive activity may have important implications for the propensity to organ rejection and level of immunosuppresison needed to avoid rejection reactions after SOT. Method(s): Peripheral blood mononuclear cells (PBMC) were isolated from buffycoats from healthy blood donors (n=64), and conventional T cells and Tregs were isolated by antibody-coated microbeads or by flow cytometry based cell sorting. The suppressive activity of Tregs was assessed in add-back experiments in co-cultures with anti-CD3/CD3/ CD28 stimulated effector T cells. Result(s): In add-back experiments, the immunosuppressive activity of untreated human Tregs varied widely. In order to specifically assess the contact-dependent immunosuppressive activity and exclude the contribution of secreted cytokines, Tregs were fixed in paraformaldehyde prior to add-back and co-culture. Tregs from 54% of the donors were fully active without the need of stimulation, whereas Tregs from the remainder were completely inactive prior to stimulation, but acquired full suppressive actitivity after 6 hours of anti-CD3/CD2/CD28 stimulation prior to fixation and add-back. In time-course experiments, inactive Tregs acquired immunosuppressive capacity incrementally during stimulation, and effector T cells were sensitive to inhibition of effector functions up to 24 hours after stimulation. Conclusion(s): Our results reveal great heterogeneity in the suppressive activity of Tregs that may have important implications for the disposition to immune related disease. The level of Treg activity may determine the risk for rejection after SOT, and guide the level of immunosuppressive treatment needed.

Abay, I., et al. (2005). "Removal and pre-concentration of phenolic species onto beta-cyclodextrin modified poly(hydroxyethylmethacrylate-ethyleneglycoldimethacrylate) microbeads." Chemosphere **61**(9): 1263-1272.

Poly(Hydroxyethylmethacrylate-Ethyleneglycoldimethacrylate), poly(HEMA-EGDMA), microbeads with 150-200 microm in size, was prepared by suspension polymerization. Beta-cyclodextrin was modified onto the polymeric microbeads using glutaraldahyde activation in an acidic medium at pH=2.5. FT-IR and TGA were used for the characterization of modified polymers and the determination of the nature of the interaction between phenolic compounds and the modified polymeric microbeads. Plain and beta-cyclodextrin modified microbeads were used in adsorption-desorption studies of phenolic species in single solution. Adsorption capacities of the phenolic species onto the plain microbeads were found to be 28.2, 17.0, 14.3, 9.8, and 1.92 mg/g polymer for o-chloro phenol, p-nitro phenol, p-chloro phenol, o-nitro phenol, and phenol, respectively. However, for beta-cyclodextrin modified microbeads, adsorption capacity of phenolic species was determined as 274, 365, 128, 182, and 87 mg/g for phenol, o-nitro phenol, p-nitro phenol, o-chloro phenol, and p-chloro phenol, respectively. Desorption ratio for the phenolic species was more than 90%, except for o-nitro phenol. Detection limits of the phenolic species were improved at least 500-fold for UV-Vis spectrophotometric detection, after the pre-concentration of all phenolic species used in this study. Adsorption time for the phenolic species onto beta-cyclodextrin-modified poly(HEMA-EGDMA) microbeads was found to be reasonable short (10-60 min) and suitable for the applications. Also, synthesized microbeads were useful for the repeated use for the removal and pre-concentration of phenolic species.

Abay, İ., et al. (2005). "Removal and pre-concentration of phenolic species onto β-cyclodextrin modified poly(hydroxyethylmethacrylate–ethyleneglycoldimethacrylate) microbeads." Chemosphere **61**(9): 1263-1272.

Abstract: Poly(Hydroxyethylmethacrylate–Ethyleneglycoldimethacrylate), poly(HEMA–EGDMA), microbeads with 150–200μm in size, was prepared by suspension polymerization. β-cyclodextrin was modified onto the polymeric microbeads using glutaraldahyde activation in an acidic medium at pH=2.5. FT-IR and TGA were used for the characterization of modified polymers and the determination of the nature of the interaction between phenolic compounds and the modified polymeric microbeads. Plain and β-cyclodextrin modified microbeads were used in adsorption–desorption studies of phenolic species in single solution. Adsorption capacities of the phenolic species onto the plain microbeads were found to be 28.2, 17.0, 14.3, 9.8, and 1.92mg/g polymer for o-chloro phenol, p-nitro phenol, p-chloro phenol, o-nitro phenol, and phenol, respectively. However, for β-cyclodextrin modified microbeads, adsorption capacity of phenolic species was determined as 274, 365, 128, 182, and 87mg/g for phenol, o-nitro phenol, p-nitro phenol, o-chloro phenol, and p-chloro phenol, respectively. Desorption ratio for the phenolic species was more than 90%, except for o-nitro phenol. Detection limits of the phenolic species were improved at least 500-fold for UV–Vis spectrophotometric detection, after the pre-concentration of all phenolic species used in this study. Adsorption time for the phenolic species onto β-cyclodextrin-modified poly(HEMA–EGDMA) microbeads was found to be reasonable short (10–60min) and suitable for the applications. Also, synthesized microbeads were useful for the repeated use for the removal and pre-concentration of phenolic species. [Copyright &y& Elsevier]

Abayomi, O. A., et al. (2017). "Microplastics in coastal environments of the Arabian Gulf." Marine Pollution Bulletin **124**(1): 181-188.

Eight sandy beaches along the coastline of Qatar and four sea surface stations on the eastern coast, adjacent to Doha Bay, were surveyed between December 2014 and March 2015. Microplastics, mainly low density polyethylene and polypropylene, were found in all samples of sediments and seawater. Blue fibers, ranging between 1 and 5mm, were the dominant type of particle present. Abundances on the sea surface varied between 4.38x10⁴ and 1.46x10⁶particles.km⁻², with the highest values being consistently found 10km offshore, suggesting the presence of a convergence zone. No significant temporal variability was detected for sea surface samples. The concentration of microplastics in intertidal sediments varied between 36 and 228particlesm⁻², with no significant differences

among the 8 beaches examined. These results show the pervasiveness of microplastic pollution in coastal environments of the Arabian Gulf. Potential local sources and sinks for microplastics are discussed.

Abbasi, S., et al. (2017). "Investigation of microrubbers, microplastics and heavy metals in street dust: a study in Bushehr city, Iran." Environmental Earth Sciences **76**(23): 1-19.

This study aimed to (1) investigate microrubbers (MRs) for the first time and identify microplastics (MPs) in street dust, (2) determine the physicochemical and mineralogical characteristics and morphology of dust particles, (3) understand the concentration and the possible source(s) of heavy metals/metalloids, (4) identify the chemical speciation and mobility potential of trace metals in urban street dusts, and (5) determine adverse health effects of street dust on children and adults living in the city of Bushehr in southwestern Iran. Generally, twenty four street dust samples were collected and analyzed. Calculated enrichment factors indicate high levels of contamination. Statistical analysis reveals that the two main sources of trace elements include road traffic emissions (Cu, Zn, Sb, Hg, Pb, Mo) and re-suspended soil particles (Al, Mn, Ni, Ti, Cd, Co). BCR sequential extraction results indicated that As, Zn, Cu, and Pb mainly occur in the exchangeable fraction and hence are highly bioavailable. X-ray powder diffraction analysis revealed the presence of calcite, dolomite, quartz, and magnetite. The size distribution of dust particles was also investigated using a scanning electron microscope (SEM), while elemental distribution was analyzed using an attached energy dispersive X-ray spectrometer (SEM–EDS) unit. Dust particles from heavy traffic areas are much finer compared with other investigated areas. MPs and MRs, mostly fibers and fragments, were detected in all samples [ranging from 210 to 1658 (MPs) and 44 to 782 (MRs) items/10 g dust] using fluorescence microscopy. The hazard index for As is higher than 10−4 for children and adults indicative of high risk. According to the calculated potential ecological risk index, Hg indicated moderate ecological risk in the street dust of the study area.

Abbasi, S., et al. (2019). "Geochemistry and environmental effects of potentially toxic elements, polycyclic aromatic hydrocarbons and microplastics in coastal sediments of the Persian Gulf." Environmental Earth Sciences **78**(15): 1-15.

Coastal areas are critical parts of the Persian Gulf with regard to high populations and economically driven activity. They pose major concerns because of the presence of toxic chemicals, and hence harmful effects on marine ecosystems. In this study, 14, 15 and 12 coastal sediment samples were collected in Bushehr province and analyzed, respectively, for potentially toxic elements (PTEs), polycyclic aromatic hydrocarbons (PAHs) and microplastics (MPs). The results showed that almost all PTEs were not significantly enriched. Most elements exhibited their highest levels at stations close to urban areas and along the pathway of ships and boats. Based on enrichment factor and statistical evaluations, two main sources of trace elements were identified: anthropogenic (Mo, Cu, Pb, As and Sb) and geogenic (Zn, Ni, Co, Mn, Fe, Cd, Cr and Al). Regarding MPs, a total of 577 pieces were observed with sizes ranging between 500 and 1000 µm. The dominant shape of the MPs was fibrous with the dominant colors being white and black. The concentration of total PAHs were fairly low in the sediments, with their source determined to be pyrogenic in origin.

Abbasi, S., et al. (2019). "Distribution and potential health impacts of microplastics and microrubbers in air and street dusts from Asaluyeh County, Iran." Environmental Pollution **244**: 153-164.

While the distribution and effects of microplastics (MPs) have been extensively studied in aquatic systems, there exits little information on their occurrence in the terrestrial environment and their potential impacts on human health. In the present study, street dust and suspended dust were collected from the city and county of Asaluyeh, Iran. Samples were characterized by various microscopic techniques (fluorescence, polarized light, SEM) in order to quantify and classify MPs and microrubbers (MRs) in the urban and industrial environments that are potentially ingestible or inhalable by humans. In < 5-mm street dust retrieved from 15 sites, there were an average of 900MPs and 250MRs per 15g of sample, with MPs exhibiting a range of colours and sizes (<100 to >1000mum). Most street dust samples were dominated by spherical and film-like particles and MRs largely made up of different sizes of black fragments and fibrous particulates. Airborne dust collected daily over an eight-day period at two locations revealed the ubiquity of fibrous MPs of sizes ranging from about 2mum to 100mum and an abundance of about 1 per m⁻³. These samples contained small MR fragments whose precise characteristics were more difficult to define. Based on the median concentrations in street dust, estimates of acute exposure through ingestion are about 5 and 15MPd⁻¹ and 2 and 7MRd⁻¹ for construction workers and young children, respectively. Quantities of inhalable particulates were more difficult to define but the potential toxicity of MPs and MRs taken in by this route was evaluated from assays performed using particulates isolated from street dusts in the presence of an artificial lung fluid. Both types of particle exhibited oxidative potential, with MPs displaying consumptions of different antioxidants that were comparable with corresponding values for a reference urban particulate dust but lower than those for London ambient particulate matter. Thus, MPs and MRs contribute towards the health impacts of urban and industrial dusts but their precise roles remain unclear and warrant further study.

Abbasi, S., et al. (2018). "Microplastics in different tissues of fish and prawn from the Musa Estuary, Persian Gulf." Chemosphere **205**: 80-87.

Commercially-important species of fish and a crustacean from four sites in the Musa estuary and a site in the Persian Gulf have been analysed for the presence and location of microplastics (MPs). A total of 828 MPs were detected in the guts (gastrointestinal tracts), skin, muscle, gills and liver of demersal and pelagic fish (Platycephalus indicus, Saurida tumbil, Sillago sihama, Cynoglossus abbreviatus) from all five sites and in the exoskeleton and muscle of the tiger prawn, Penaeus semisulcatus, from three sites. On an individual basis, MPs were most abundant in P. indicus (mean=21.8) and least frequently encountered in P. semisulcatus (mean=7.8), but when normalized on a mass basis, MPs ranged from 0.16 g⁻¹ for C. abbreviatus to 1.5 g⁻¹ for P. semisulcatus. Microscopic analyses (polarized light, fluorescence, SEM/EDS) revealed that MPs were mainly fibrous fragments (with a few angular fragments) of various colour and size (<100 micro m to >1000 micro m) and with strong C and O signatures. Additional particles detected that were distinctly different in colour, morphology, brittleness and elemental composition (part-metallic, and containing Cu) were suspected of being fragments of antifouling paint. The means of entry of MPs into tissues not involved in digestion are unclear but could be related to translocation or adherence. Regardless of the mode of accumulation, the presence of MPs in heavily fished species of fish and crustacean raises concerns about the potential transfer of synthetic materials into humans.

Abbodi, M. A. (2013). "Virotherapy targeting breast cancer stems cells by using Oncolytic Herps Simplex Virus." International Journal of Pharma and Bio Sciences **4**(4): B1143-B1147.

In the present study I isolated breast cancer stem cells from cell line MDA-MB231 by used CD44 MicroBeads separator. Cancer stem cells (CSCs) were identified by used PCR machine; here specific primers were designed for CD44 and CD24 genes, whereas CD44 positive for breast CSCs

and CD24 negative CSCs. MDA-MB231 cells and breast CSCs treated with G47DELTA vector. G47DELTA showed highly effect on both kinds of cells by killing over 90% of MDA-MB231 and over 80% of the CSCs in vitro. Virus used as therapy demonstrated that pathogenic microorganisms can be modify genetically and use for targeting diseases and oHSV can be used for treatment breast CSCs that are still not understood. This study demonstrates that oHVS effective against breast cancer stem cells and could be a beneficial method for treating cancer stem cells expressed in breast cancer.

Abbott, J. K. and U. R. Sumaila (2019). "Reducing Marine Plastic Pollution: Policy Insights from Economics." Review of Environmental Economics & Policy **13**(2): 327-336.

Marine plastic pollution is heavily driven by escaped plastic waste from land. Effectively reducing flows of plastic pollution into the oceans requires incentivizing efficient disposal decisions, discouraging production and consumption of products with low recyclability and reuse potential, and encouraging lower-impact, easily recyclable product and packaging designs. We examine the economic literature on waste management and integrated environmental policy to assess how particular policies target these individual pathways and can efficiently reduce flows of plastics into waterways. These policies include production/retail bans and standards, extended producer responsibility, price-based policies such as advance disposal fees and two-part instruments, and interventions grounded in behavioral economics and psychology. We also consider the applicability of these policies in coastal developing nations that often rely upon the informal sector for waste management services. We conclude by identifying important issues for future research. [ABSTRACT FROM AUTHOR]

Abdolahpur Monikh, F., et al. (2019). "Development of methods for extraction and analytical characterization of carbon-based nanomaterials (nanoplastics and carbon nanotubes) in biological and environmental matrices by asymmetrical flow field-flow fractionation." Environmental Pollution **255**: N.PAG-N.PAG.

Suitable methods and fit-for-purpose techniques are required to allow characterization of carbon-based nanomaterials (CB-NMs) in complex matrices. In this study, two methods were developed; a method for extraction and characterization of CB-NMs in biological media and a method for fractionation of natural organic matter (NOM) coated CB-NMs in environmental matrices. The former method was developed by extracting carbon nanotubes (CNTs: sized 0.75 × 3000 nm) and nanoplastics (sized 60, 200 and 600 nm) from eggshells and characterizing the extracted CB-NMs in terms of particle size distribution using asymmetrical flow field-flow fractionation (AF4) coupled with multi-angle light scattering (MALS). The latter method was developed using AF4-MALS to fraction NOM-coated CNT (sized 0.75 × 3000 nm) and nanoplastics (sized 60, 200 and 300 nm) in a simulated natural surface water and provide information about the size distribution of the CB-NM-NOM complexes. The developed AF4-MALS method successfully fractioned the CB-NM-NOM complexes based on hydrodynamic size and provided the size distribution of the complexes. The NOM corona did not shift significantly the median size of the CB-NMs. It influenced however the size distribution of the nanoplastics and CNTs. The sample preparation method failed to extract the CNTs (recovery <

20%) from the matrices of the eggshells while being successful for extracting the nanoplastics (recoveries > 60%). The AF4-MALS fractogram showed that the extraction method did not significantly influence the size distribution of the nanoplastics of 60 and 200 nm size, whereas the peak of 600 nm nanoplastics shifted towards a smaller hydrodynamic size. In conclusion, the developed sample preparation method followed by the developed AF4-MALS method can be applied for extraction, separation and characterization of CB-NMs in biological and environmental matrices. Thus, the methods have a high potential to be methods of choice to investigate CB-NMs in future studies. Image 1 • A method was developed to extract, separate and characterize CB-NMs and CB-NM-NOM complexes in environmental and biological media using AF4-MALS. • We extracted nanoplastics from simulated biological and environmental media. • The AF4-MALS method successfully separated CB-NMs from environmental samples. • The method characterized the CB-NMs in terms of size and size distribution. • NOM corona influences the size distribution of CNTs and nanoplastics. [ABSTRACT FROM AUTHOR]

Abdul Hasan Sathali, A. and J. Varun (2012). "Formulation, development and in vitro evaluation of Candesartan cilexetil mucoadhesive microbeads." International Journal of Current Pharmaceutical Research **4**(3): 109-118.

Mucoadhesive microbeads of candesartan cilexetil was designed in order to obtain a unique drug delivery system which would remain in the small intestine and prolong the residence time at the absorption site by intimate contact with the mucus layer thereby increase bioavailability, reduce the frequency of dose administration and also to prolong the drug release. The mucoadhesive microbeads were prepared by ionotrophic gelation method using sodium alginate, xanthan gum, pectin in combination with 1% chitosan using different crosslinking agents including calcium chloride (ca2+), zinc chloride (zn2+), barium chloride (ba2+) and lead nitrate (pb2+) ions in different ratios. The microbeads were evaluated for percentage yield, bead size, entrapment efficiency, swelling index, entrapment efficiency, mucoadhesion study by in vitro wash off test and scanning electron microscopy (SEM) analysis were investigated. Infrared spectroscopy studies (IR) confirmed the absence of any drug interaction with polymers. DSC analysis revealed that the drug was uniformly distributed in the beads. The mean particle size increases with increasing the polymer concentration. SEM photomicrograph showed microbeads with rough surface and spherical shape. The entrapment efficiency of all formulations was in the range between 70% and 90%. The swelling index decreased with increase in sodium alginate and divalent ions concentration. The results of in vitro mucoadhesive showed that the microbeads were remained adhered to mucus membrane for longer period of time. In vitro drug release studies were performed in simulated gastric fluid [SGF, pH 1.2] for 2 hours and phosphate buffer [pH 6.5] for 10 hours at 37+/-20C. In vitro drug release followed zero order kinetics, Korse Meyer & Peppas model. The diffusional exponent, n, (0.43 and 0.85) specified anomalous transport or non fickian type and controlled by diffusion through swollen matrix. The above observations suggested that the candesartan cilexetil can be developed as mucoadhesive drug delivery system with sodium alginate using calcium chloride as cross linking agent and 1% chitosan as mucoadhesive polymer.

Abdullah, J. J. and J. J. S. Mohammed (2015). "Control of soil pollution at dumping site by polytar mix formation within Erbil Province-Iraq." International Proceedings of Chemical, Biological and Environmental Engineering **83**: 1-6.

Over the past few years, the Erbil-Iraq city has produced 100 tons of solid waste daily yet there is no sanitary land fill for ultimate disposal of solid waste. For a long time, it has been a common practice to dispose of soil waste in open low-lying areas. Recently, the government commissioned a new process to separate solid wastes in to organic and inorganic fractions. In the present study, particular interest are plastics, because plastics are not eco-friendly as they are non-biodegradable or degrade very slowly, and could secrete pollutants including heavy metals into the soil. The binding property of plastics in its molten state has helped in discovering a method of safe disposal of plastic waste, which is their use in road laying. This study determines some common heavy metals in soil at depths of 0-15 cm the concentration of heavy metals including Co, Cr, Cu, Fe, Mn, Ni, Pb and Zn were determined, and Fe recorded highest value comparing with other metals. While, the main aim is to use the plastic waste to mix with bitumen. This mix has high Marshall Value, low penetration value and resistance to water penetration.

Abe, M., et al. (2010). "Microbial degradation of poly(butylene succinate) by Fusarium solani in soil environments." Polymer Degradation and Stability **95**(2): 138-143.

The use of mulch made of biodegradable plastic in agriculture is expected to help solve the problem of the enormous amount of plastic waste emission, and to save the labor of removing the mulch after harvesting crops. In this study, we isolated a microorganism possessing the ability to degrade one of the promising biodegradable plastics, poly(butylene succinate) (PBS), and investigated the degradation characteristics of the microorganism in soil environments. Fungal strain WF-6, belonging to Fusarium solani, that had not been reported could be isolated from farmland as the PBS-degrading microorganism. Strain WF-6 degraded 2.8 percent of the PBS in a 14-day experimental run in a sterile soil environment, as determined by measuring CO₂ evolution. Furthermore, we ascertained that the degradability of strain WF-6 was enhanced by co-culturing with the newly isolated bacterial strain Stenotrophomonas maltophilia YB-6, which itself does not show PBS-degrading activity. We then investigated the effects of cell density of the indigenous microorganisms in the soil environments on the degradability of the co-culture of strains WF-6 and YB-6 by inoculating these strains into non-sterilized and partially sterilized soils, which contained 10⁸, 10⁶, and 10³ CFU/g-dry solid of soil of indigenous microorganisms. The degradability strongly depended on the cell density level of the indigenous microorganisms and was remarkably diminished when the cell concentration level was the highest, 10⁸ CFU/g-dry solid. Quantitative PCR analysis revealed that the growth of strains WF-6 and YB-6 was inhibited in the non-sterile soil environment with the highest cell density level of the indigenous microorganisms.

Abedi, D., et al. (2012). "Optimization of the Expression of Genes Encoding Poly (3-hydroxyalkanoate) Synthase from Pseudomonas aeruginosa PTCC 1310 in Escherichia coli." Avicenna Journal of Medical Biotechnology **4**(1): 47-51.

Over the years, the use of plastics has complicated the problem of disposal of solid wastes. One strategy to reduce plastic waste is the use of biodegradable plastics. A group of these plastics are polyhydroxyalkanoates (PHAs). To date more than 250 different microorganisms are known to synthesize and accumulate PHA. Most Pseudomonas strains are able to accumulate mcl-PHA. In previous studies, the phaC1 and phaC2 genes were identified in Pseudomonas aeruginosa

(P.aeruginosa) PTCC 1310 and were cloned. The aim of this study was to express these genes and optimize the conditions for their expression. The inserts obtained from vectors pTZPHAC1 and pTZPHAC2 were subcloned into pET15b expression vector. After transformation of competent Escherichia coli (E.coli) BL21 (DE3) cells with recombinant plasmids, expression was induced using IPTG. By changing expression conditions such as IPTG concentration, time and temperature of incubation with IPTG, the expression conditions for these enzymes were optimized, and the obtained results were compared using proper statistical analysis. The PHA synthase genes were induced with IPTG and the expressed 62 kDa protein was observed and purified. By changing expression conditions, 1 mM IPTG, 37 degreeC and a 2 hr incubation provided the highest level of protein production in E.coli cells. These results suggest that induction condition of PhaC genes can influence expression of PHA synthase enzymes.

Abidli, S., et al. (2019). "Microplastics in commercial molluscs from the lagoon of Bizerte (Northern Tunisia)." Marine Pollution Bulletin **142**: 243-252.

Microplastic (MP) pollution was investigated, for the first time, in six commercial molluscs collected from the lagoon of Bizerte during March 2018. The objective of this study was to determine the bioavailability of MPs to marine organisms and their risk for consumers of seafood. MP concentrations varied from 703.95+/-109.80 to 1482.82+/-19.20 items kg⁻¹ wet weight. Three types of coloured MPs, including fibres, fragments and films were recovered. Fibres were the most common MP type isolated in each species. The most common size class was 0.1-1mm. The FTIR-ATR analysis confirmed the presence of two polymer types polyethylene and polypropylene. Our results suggest that MP pollution was widespread and exhibited a relatively high level in commercial molluscs collected from Bizerte lagoon, suggesting trophic transfer in the food web and human exposure risks by diet. More investigations on MPs should be conducted in seafood and other marine organisms.

Abidli, S., et al. (2017). "The first evaluation of microplastics in sediments from the complex lagoon-channel of Bizerte (Northern Tunisia)." Water, Air, and Soil Pollution **228**(7).

Microplastics (MPs) in sediments from the complex lagoon-channel of Bizerte were investigated, for the first time, to evaluate the occurrence and abundance of MPs in Tunisia. After density separation in saline solution, MPs were counted by a stereomicroscope. The number of MPs was at the range of 3-18 items/g sediment (3000-18,000 items/kg dry sediment) and the most contaminated site was of Menzel Abderrahmane (MA) followed by Carrier Bay (CB), Menzel Jemil (MJ) and Channel of Bizerte (C). The MPs gathered during the survey varied in size from 0.3 to 5 mm, and appear in a variety of shapes and colours. The dominant shape was fibre (88.88% in MA, 91.00% in CB, 82.35% in C and 21.05% in MJ). The rest of MPs are fragments whilst no micro beads were found. Colours are clear, white, blue, green, red and black. Cities discharges, fishing activity and industrial production sites are the most likely sources of MPs. This first work provides original data on the presence of MPs that determines their bioavailability to organisms as seafood, and then possibly transfers of to human. The high MP concentrations registered in the complex lagoon-channel of Bizerte suggest that this site is a hotspot for MP pollution and there is an urgency to understand their origins and effects on marine life. The results will provide useful background information for further investigations.

Abou-Hany, R. A., et al. (2015). "Tailoring molecularly imprinted polymer beads for alternariol recognition and analysis by a screening with mycotoxin surrogates." Journal of Chromatography. A **1425**: 231-239.

Molecularly imprinted porous polymer microspheres have been prepared for selective binding of alternariol (AOH), a phenolic mycotoxin produced by Alternaria fungi. In order to lead the synthesis of recognition materials, four original AOH surrogates have been designed, prepared and characterized. They bear different number of phenol groups in various positions and different degree of O-methylation on the dibenzo[b,d]pyran-6-one skeleton. A comprehensive library of mixtures of basic, acidic or neutral monomers, with divinylbenzene or ethyleneglycol dimethacrylate as cross-linkers, were polymerized at a small scale in the presence of the four molecular mimics of the toxin molecule. This polymer screening has allowed selection of the optimal composition of the microbeads (N-(2-aminoethyl)methacrylamide, EAMA, and ethylene glycol dimethacrylate). The latter are able to bind AOH in water-acetonitrile (80:20, v/v) with an affinity constant of 109+/-10mM(-1) and a total number of binding sites of 35+/-2mumolg(-1), being alternariol monomethylether the only competitor species. Moreover, (1)H NMR titrations have unveiled a 1:2 surrogate-to-EAMA stoichiometry, the exact interaction sites and a binding constant of 1.5x10(4)M(-2). A molecularly imprinted solid phase extraction (MISPE) method has been optimized for selective isolation of the mycotoxin from aqueous samples upon a discriminating wash with 3mL of acetonitrile/water (20:80, v/v) followed by determination by HPLC with fluorescence detection. The method has been applied, in combination to ultrasound-assisted extraction, to the analysis of AOH in tomato samples fortified with the mycotoxin at five concentration levels (33-110mugkg(-1)), with recoveries in the range of 81-103% (RSD n=6). To the best of our knowledge, this is the first imprinted material capable of molecularly recognizing this widespread food contaminant.

Abraham, A. and P. Chakraborty (2019). "A review on sources and health impacts of bisphenol A." Reviews on Environmental Health **19**: 19.

Bisphenol-A (BPA) is a synthetic chemical used in the manufacturing of polycarbonates and epoxy resins. This paper is a review of studies reporting the occurrences and concentrations of BPA in the environment and associated impact on human health. Studies have found that at high temperature conditions such as open burning of dumped waste in developing nations can relocate BPA from plastic waste into the environment. BPA is a proven endocrine disruptor capable of mimicking or blocking the receptors and altering hormone concentrations and its metabolism. Even though it is consumed in a low dose, it can stimulate cellular responses and affect body functions. Biomonitoring studies show that human and animal exposure to BPA is rapid and continuous. In-depth studies are needed to understand the fate of these compounds particularly in the developing nations and the associated adverse health impacts of BPA due to prolonged exposure.

Abreo, N. A. S., et al. (2015). "Nutrient Enrichment, Sedimentation, Heavy Metals and Plastic Pollution in the Marine Environment and its Implications on Philippine Marine Biodiversity: A Review." IAMURE. International Journal of Ecology and Conservation **15**: 111.

The authors conducted a review using opensourced journals on the effects of nutrient enrichment, sedimentation, heavy metals and plastic pollution in the marine environment and its implications on marine biodiversity. Lethal and sub-lethal effects were observed in different organisms that could affect marine biodiversity directly or indirectly. Human land use change, coastal construction activities, untreated sewage discharges, pesticides, mine tailings, uncollected, unsegregated and improperly dumped garbages and unabated garbage dumping at sea have been found to negatively influence marine biodiversity. In the Philippines, very few studies have been conducted with regards to marine pollution, especially on marine plastic debris, and even fewer studies have been made that tackles the effect of these stressors at an ecosystem level. Furthermore, this review has identified direct and indirect effects of pollution

stressors on marine organisms which include: mortality and reduced fitness, vulnerability to disease or sickness, habitat degradation, and food web simplification.

Absher, T. M., et al. (2019). "Incidence and identification of microfibers in ocean waters in Admiralty Bay, Antarctica." Environmental Science & Pollution Research **26**(1): 292-298.

Antarctic pristine environment is threatened by the presence of microplastics that occur in a variety of shapes and sizes, from fibers to irregular fragments. The aim of this study is to assess the abundance, distribution, and the characterization of the microfibers in zooplankton samples found in ocean waters in Admiralty Bay, Antarctica. The samples were collected at five points in Admiralty Bay during the XXIX Brazilian Antarctic Expedition in the austral summer of 2010-2011. A total of 603 microfibers were collected in 60 samples, with an average abundance of 2.40 (+/- 4.57) microfibers 100 m⁻³. Microfiber size ranging from ca. 10 to 22 mum in diameter of various lengths and colors (blue, red, black, and clear) was collected and characterized by scanning electron microscopy (SEM) and Raman spectroscopy. Most of these microfibers were entangled in various different zooplankton species and were identified as polymers composed mostly by polyethyleneglycols, polyurethanes, polyethylene terephthalates, and polyamides. The presence of such microfibers may cause the loss of biodiversity in the Antarctic continent, and the results presented herein can contribute to a better understanding of the impact caused by them within the food chain and human health. Graphical Abstract .

Abuid, N. J., et al. (2019). "Layer-by-Layer Cerium Oxide Nanoparticle Coating for Antioxidant Protection of Encapsulated Beta Cells." Advanced Healthcare Materials **8**(12): e1801493.

In type 1 diabetes, the replacement of the destroyed beta cells could restore physiological glucose regulation and eliminate the need for exogenous insulin. Immunoisolation of these foreign cellular transplants via biomaterial encapsulation is widely used to prevent graft rejection. While highly effective in blocking direct cell-to-cell contact, nonspecific inflammatory reactions to the implant lead to the overproduction of reactive oxygen species, which contribute to foreign body reaction and encapsulated cell loss. For antioxidant protection, cerium oxide nanoparticles (CONPs) are a self-renewable, ubiquitous, free radical scavenger currently explored in several biomedical applications. Herein, 2-12 alternating layers of CONP/alginate are assembled onto alginate microbeads containing beta cells using a layer-by-layer (LbL) technique. The resulting nanocomposite coatings demonstrate robust antioxidant activity. The degree of cytoprotection correlates with layer number, indicating tunable antioxidant protection. Coating of alginate beads with 12 layers of CONP/alginate provides complete protection to the entrapped beta cells from exposure to 100 x 10⁻⁶ m H₂ O₂ , with no significant changes in cellular metabolic activity, oxidant capacity, or insulin secretion dynamics, when compared to untreated controls. The flexibility of this LbL method, as well as its nanoscale profile, provides a versatile approach for imparting antioxidant protection to numerous biomedical implants, including beta cell transplantation.

Abuid, N. J., et al. (2019). "Layer-by-Layer Cerium Oxide Nanoparticle Coating for Antioxidant Protection of Encapsulated Beta Cells." Advanced Healthcare Materials **8**(12).

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nanoparticles (CONPs) are a self-renewable, ubiquitous, free radical scavenger currently explored in several biomedical applications. Herein, 2–12 alternating layers of CONP/alginate are assembled onto alginate microbeads containing beta cells using a layer-by-layer (LbL) technique. The resulting nanocomposite coatings demonstrate robust antioxidant activity. The degree of cytoprotection correlates with layer number, indicating tunable antioxidant protection. Coating of alginate beads with 12 layers of CONP/alginate provides complete protection to the entrapped beta cells from exposure to 100 × 10−6 m H2O2, with no significant changes in cellular metabolic activity, oxidant capacity, or insulin secretion dynamics, when compared to untreated controls. The flexibility of this LbL method, as well as its nanoscale profile, provides a versatile approach for imparting antioxidant protection to numerous biomedical implants, including beta cell transplantation.

Acampora, H., et al. (2017). "Presence of plastic litter in pellets from Great Cormorant (Phalacrocorax carbo) in Ireland." Marine Pollution Bulletin **117**(1/2): 512-514.

Plastic pollution has been the subject of much research in the last decade. Seabirds can mistake plastic fragments for prey, which can perforate or block the digestive tract and cause ulcers. Most commonly, seabirds accumulate this indigestible matter in their stomachs, obtaining no nutrition and may die from starvation. Certain species of seabirds however, have the ability of regurgitating indigestible matter in the form of pellets. This study aimed to investigate the ingestion of plastics by live seabirds through the examination of regurgitated pellets (n=92) from a Great Cormorant (Phalacrocorax carbo) breeding colony and a winter roost in Ireland. Plastic prevalence was consistently 3.2% at both sites. The presence of plastic litter highlights the fact that all species of seabird are susceptible to interact with marine litter regardless of feeding habits, although at different rates. More research is needed to understand the driving factors involved in plastic ingestion among different species.

Acampora, H., et al. (2017). "Opportunistic sampling to quantify plastics in the diet of unfledged Black Legged Kittiwakes (Rissa tridactyla), Northern Fulmars (Fulmarus glacialis) and Great Cormorants (Phalacrocorax carbo)." Marine Pollution Bulletin **119**(2): 171-174.

Seabirds can interact with marine litter, mainly by entanglement or ingestion. The ingestion of plastics can lead to starvation or physical damage to the digestive tract. For chicks, it could additionally lead to reduced growth, affecting survival and fledging. This study quantified the ingestion of plastics by seabird chicks via an opportunistic sampling strategy. When ringing is carried out at colonies, birds may spontaneously regurgitate their stomach contents due to the stress or as a defence mechanism. Regurgitates were collected from nestlings of three different species: Black-legged Kittiwake (Rissa tridactyla, n=38), Northern Fulmar (Fulmarus glacialis, n=14) and Great Cormorant (Phalacrocorax carbo, n=28). Plastic was present in all species, with the highest frequency of occurrence (FO) in Northern Fulmar chicks (28.6%), followed by Black-legged Kittiwakes (7.9%) and Great Cormorants (7.1%). The observed load of plastics on chicks, which have not yet left the nest, highlights the pervasive nature of plastic pollution.

Accinelli, C., et al. (2019). "Degradation of microplastic seed film-coating fragments in soil." Chemosphere **226**: 645-650.

Encapsulating fungicides and/or insecticides in film-coatings applied to agronomic seeds has become a widely accepted method for enhancing seed germination and overall seedling health by protecting against many diseases and early-season insect pests. Despite advancements in seed film-coating technologies, abrasion of the seed coating can occur during handling and mechanical planting operations, resulting in variable amounts of detached fragments entering

the soil. The present study investigated the degradation in soil of these plastic-like, small-sized fragments, referred to here as microplastic coating fragments. Degradation of microplastic coating fragments in soil was found to be highly variable. The lowest degradation rate (<=48 days) was observed in fragments detached from seeds coated with a commercial polymer mixture, while fragments from a biodegradable plastic formulation degraded completely within 32 days. When spores of the plant growth-promoting bacterium, Bacillus subtilis, were incorporated into the bioplastic, degradation was even more rapid (<=24 days). The fragment degradation rate was unaffected by incorporating two commonly used neonicotinoid insecticides, imidacloprid or thiacloprid, into either coating formulations, but insecticide dissipation rates in soil were more rapid when added associated with seed coating fragments than when spiked in directly. Half-lives of these two insecticides were reduced by up to 27% in fragments from bioplastic-coated seeds. These results are consistent with variable and not easily predicted soil degradation rates for seed coating fragments, with enhanced dissipation of coating-entrapped pesticides and with a higher degradation rate for biodegradable seed coating incorporating selected microbial strains.

Accomando, W. P., et al. (2012). "A novel method for the detection of circulating NK cells in archived blood reveals a decrease in NK cells in head and neck squamous cell carcinoma." Cancer Research. Conference: 103rd Annual Meeting of the American Association for Cancer Research, AACR **72**(8 SUPPL. 1).

Patients with head and neck squamous cell carcinoma (HNSCC) frequently exhibit abnormal immune cell levels and activities, leading many to believe that progression of the disease is linked to evasion of immune surveillance. A more complete understanding of immune cell alterations could be obtained from analysis of archival samples, but this type of study is not possible using current immunodiagnostic methods. Combining information on cell lineage specific differentially methylated regions (DMRs) with methylation specific quantitative PCR (MS-qPCR) enables highly sensitive and accurate counts of individual cell types in archival blood and tissues. DNA methylation and mRNA expression in magnetic microbead (MACS) isolated, flow cytometry (FACS) validated normal human peripheral blood leukocytes were assessed using the Infinium HumanMethylation27 and Whole-Genome DASL HT (Illumina) microarrays. Cell-specific DMRs were identified by comparative analysis of DNA methylation and mRNA expression patterns between different cell lineages, and validated by MS-qPCR and pyrosequencing. Analysis of the microarray data revealed CpG loci significantly demethylated in NK cells compared to all other leukocyte lineages ($q < 0.1$) within genes exhibiting significantly increased mRNA expression in NK cells ($q < 0.1$). Pyrosequencing and MS-qPCR assays confirmed a NK cell specific demethylated region. The MS-qPCR assay was calibrated using known quantities of NK cell DNA to facilitate quantification of these cells in biological samples, and was then applied to archival peripheral blood DNA samples from 122 control donors and 122 HNSCC patients. Demethylation of the candidate region was significantly lower in HNSCC patient bloods compared with control bloods ($p < 0.001$), but was not significantly associated with age, gender, HPV16 (E6 and/or E7) serology, cigarette smoking, alcohol consumption, BMI, or disease treatment. Measurements from control samples were used to establish normal demethylation tertiles. Proportion of total HNSCC cases decreased significantly with increasing tertile ($p < 0.001$). Multivariate logistic regression controlling for age, gender, cigarette smoking, alcohol consumption, BMI, and HPV16 serology confirmed increased HNSCC risk for individuals in the lowest tertile (OR = 5.6, 95% CI: 2.0, 17.4) and second lowest tertile (OR = 4.9, 95% CI: 1.8, 16.1). The advent of DNA methylation based immunodiagnostic methods will make assessment of immune cell profiles in archived samples that have not undergone rigorous special handling

requirements possible. Using a novel NK cell specific demethylated region to detect and quantify NK cells in the blood, we have detected a HNSCC associated decrease in circulating NK cells that is independent of disease treatments, known exposures and other putative risk factors.

Acosta-Coley, I., et al. (2019). "Trace elements in microplastics in Cartagena: A hotspot for plastic pollution at the Caribbean." Marine Pollution Bulletin **139**: 402.

Microplastics are new pollutants considered a source of concern for the oceans worldwide. This research reports the concentrations of trace metals on microplastics collected on beaches from Cartagena, an industrialized city in the Caribbean. Mercury (Hg) was quantified using a Hg analyzer and forty-seven trace elements were assessed by ICP/MS. Most abundant microplastics in beaches were those with the lower degree of surface degradation features (SDF), categorized as white-new polyethylene pellets, followed by secondary microplastics (SM). Greater Hg levels were found in SM, white-degraded (WDP) and black pellets. Trace elements concentrations were linked to the degree of SDF registered in examined pellets, with larger concentrations in WDP. Compared to white-new pellets, Ba, Cr, Rb, Sr, Ce, Zr, Ni, Pb were the most accumulated elements in WDP, as their surface enhance the sorption processes. Microplastic pollution represents a toxicological hazard because its ability to accumulate and transport toxic elements.

Acosta-Coley, I. and J. Olivero-Verbel (2015). "Microplastic resin pellets on an urban tropical beach in Colombia." Environmental Monitoring and Assessment **187 (7) (no pagination)**(435).

Microplastics are a problem in oceans worldwide. The current situation in Latin America is not well known. This paper reports, for the first time, the presence of microplastics on an urban Caribbean beach in Cartagena, Colombia. Pellet samples were collected from a tourist beach over a 5-month period covering both dry and rainy seasons. Pellets were classified by color and their surface analyzed by stereomicroscopy, and some were characterized by infrared spectroscopy. The most abundant pellets were white, presenting virgin surfaces, with few signs of oxidation. This is congruent with a short residence time in the marine environment and primary sources possibly located nearby. The frequency of white pellets did not change with sampling period. Surface features identified in the pellets included cracks, material loss, erosion, adhesion, granulation, color change, and glazed surfaces. Reticulated granular pellets exhibited the greatest degradation, easily generating submicroplastics. Sample composition was mostly polyethylene, followed by polypropylene. This pollution problem must be addressed by responsible authorities to avoid pellet deposition in oceans and on beaches around the world. [Figure not available: see fulltext.] Copyright © 2015, Springer International Publishing Switzerland.

Adam, V., et al. (2019). "Toward an ecotoxicological risk assessment of microplastics: Comparison of available hazard and exposure data in freshwaters." Environmental Toxicology & Chemistry **38**(2): 436-447.

Microplastics have been detected in freshwaters all over the world in almost all samples, and ecotoxicological studies have shown adverse effects of microplastics on organisms. However, no risk assessment of microplastics has been performed specifically in freshwater so far. The aim of the present study was therefore to review all exposure and ecotoxicity data available for microplastics in freshwaters and to perform a preliminary probabilistic risk assessment. The exposure probability distribution was based on 391 concentrations measured in Asia, Europe, and North America. Because exposure data are mainly available in particle number-based metrics but results from hazard studies are mostly mass-based, the hazard results were converted into particle number concentrations. A statistical analysis of the hazard data showed that there was no significant influence of particle shape or type of polymer on the no-observed-effect concentration. The predicted-no-effect concentration (PNEC) was calculated as the fifth percentile of the probabilistic species sensitivity distribution, based on 53 values from 14 freshwater species, to have a mode of 7.4 x 10⁵ particles . m⁻³ (25th and 75th quantiles of 6.1 x 10⁵ and 1.3 x 10⁶ particles . m⁻³ , respectively). The exposure probability distribution was divided by the PNEC probability distribution to calculate risk characterization ratios (RCRs), with modes of 1.3 x 10⁻⁶ in North America, 3.3 x 10⁻⁶ in Europe, and 4.6 x 10⁻³ in Asia. Probability distributions associated with the RCRs showed that ecological risks cannot be entirely excluded in Asia, where 0.4% of the RCR values were above 1. Environ Toxicol Chem 2019;38:436-447. © 2018 SETAC.

Adamcova, M. and F. Simko (2018). "Multiplex biomarker approach to cardiovascular diseases." Acta Pharmacologica Sinica **39**(7): 1068-1072.

Personalized medicine is partly based on biomarker-guided diagnostics, therapy and prognosis, which is becoming an unavoidable concept in modern cardiology. However, the clinical significance of single biomarker studies is rather limited. A promising novel approach involves combining multiple markers into a multiplex panel, which could refine the management of a particular patient with cardiovascular pathology. Two principally different assay formats have been developed to facilitate simultaneous quantification of multiple antigens: planar array assays and microbead assays. These approaches may help to better evaluate the complexity and dynamic nature of pathologic processes and offer substantial cost and sample savings compared with traditional enzyme-linked immunosorbent assay (ELISA) measurements. However, a multiplex multimarker approach cannot become a generally disseminated method until analytical problems are solved and further studies confirming improved clinical outcomes are accomplished. These drawbacks underlie the fact that a limited number of systematic studies are available regarding the use of a multiplex biomarker approach in cardiovascular medicine to date. Our perspective underscores the significant potential of the use of the multiplex approach in a wider conceptual framework under the close cooperation of clinical and experimental cardiologists, pathophysiologists and biochemists so that the personalized approach based on standardized multimarker testing may improve the management of various cardiovascular pathologies and become a ubiquitous partner of population-derived evidence-based medicine.

Adebiyi-Abiola, B. B., et al. (2019). "Cleaning up plastic pollution in Africa." Science **365**(6459): 1249-1251.

Aderoju, O. M., et al. (2019). "PLASTIC WASTE FOR ELECTRICAL POWER GENERATION: A CASE STUDY IN NIGERIA." Revista de Gestão Ambiental e Sustentabilidade **8**(3): 538-553.

Nigerian is currently threatened by the quantity of waste plastics in its major cities. However, waste plastics has been a menace to the Nigerian environs (land and water) majorly and contributed to flood disasters and other environmental degradation events which has led to severe health risk. In view of this, the study aims to assess the waste plastics in Nigeria for electric power generation. The study devised two strategies (incentive-based approach, and the Extended Producer's Responsibility (EPR)) for the collection of waste plastics from the environment. This study is focused on the incineration of waste plastics with energy recovery; hence the proximate and ultimate analyses were carried out to determine the Higher Heat Value (HHV) and the Lower Heat Value (LHV) as well as to estimate the Power Generation Potential (PGP). The empirical results show that the HHV was evaluated as 568.96 kcal/kg and, the LHV

was evaluated as 561.55 kcal/kg. Again, the power generation potential (PGP) was enumerated using 100 tons of waste plastics and 4.83 million tons (81% of inadequately managed plastics) to arrive at about 0.6MW and 29,000MW respectively. This study contributes to the literature on the problems of waste plastics in Nigeria. Furthermore, it is likely to be a sustainable solution to the backlog of waste plastics in the environment and a supplementary solution to the erratic electric power supply. The results show that the quantity of waste plastics in Nigeria is likely to generate enough electricity to complement the existing source of power supply.Alternate abstract:Um dos grandes problemas da Nigéria, na atualidade, é a grande quantidade de residuos plásticos que sao produzidos nas suas principais cidades. Os residuos plásticos těm sido uma ameaça para os arredores daquelas cidades (em particular sobre o solo e sobre a água) e contribuem para desastres de inundaçao e outros eventos de degradaçao ambiental que conduzem a sérios riscos para a saúde humana. Assim, este estudo tem como objetivo avaliar o potencial dos residuos plásticos produzidos na Nigéria para a geraçao de energia elétrica. O estudo desenvolvido baseia-se em duas estratégias (uma abordagem baseada em incentivos e no principio da Responsabilidade Estendida do Produtor (REP)) para a coleta de residuos plásticos no meio ambiente. O foco deste trabalho está na incineraçao de residuos plásticos com recuperaçao da energia produzida. Assim, foram realizadas análises imediata e elementar para determinar o Poder Calorifico Superior (PCS) e o Poder Calorifico Inferior (PCI), bem como estimar o Potencial de Geraçao de Energia (PGE). Os resultados empíricos mostram que o PCS foi avaliado em 568.96 kcal/ kg e o PCI foi avaliado em 561.55 kcal/kg. Adicionalmente, foi determinado o Potencial de Geraçao de Energia (PGE) usando 100 toneladas de residuos plásticos e 4.83 milhöes de toneladas (81% de plásticos manuseados inadequadamente) obtendo-se, respetivamente, 0.6 MW e 29.0 MW. Este estudo contribui para a literatura como uma visao geral de gestao de residuos na Nigéria, focando-se nos problemas relacionados com os residuos plásticos. Além disso, o conceito proporciona uma soluçao sustentável para esta tipologia de residuos que afeta particularmente a envolvente das grandes cidades. Além disso, é provável que seja uma soluçao sustentável para a acumulaçao de residuos plásticos no meio ambiente e uma soluçao suplementar para a produçao de energia elétrica. Os resultados mostram que a quantidade de residuos plásticos produzidos na Nigéria, provavelmente, gerará eletricidade suficiente para complementar as fontes tradicionais de produçao de eletricidade.Alternate abstract:Uno de los principales problemas de Nigeria hoy en dia es la gran cantidad de residuos plásticos que se producen en sus principales ciudades. Los residuos plásticos han sido una amenaza para las afueras de esas ciudades (particularmente en el suelo y el agua) y contribuyen a los desastres de inundaciones y otros eventos de degradación ambient l que conducen a serios riesgos para la salud humana. Por lo tanto, este estudio tiene como objetivo evaluar el potencial de los residuos plásticos producidos en Nigeria para la generación de electricidad. El estudio desarrollado se basa en dos estrategias (un enfoque basado en incentivos y el principio de Responsabilidad Extendida del Productor (REP)) para la recolección de desechos plásticos en el medio ambiente. El objetivo de este trabajo es la incineración de residuos plásticos con la recuperación de la energia producida. Por lo tanto, se realizaron análisis inmediato y elemental para determinar el poder calorifico superior (PCS) y el poder calorifico inferior (PCI), asi como para estimar el potencial de generación de energia (PGE). Los resultados empiricos muestran que el PCS se calificó a 568.96 kcal/kg y el PCI se calificó a 561.55 kcal/kg. Además, el potencial de generación de energía (PGE) se determinó utilizando 100 toneladas de residuos plásticos y 4,83 millones de toneladas (81% de plásticos manejados incorrectamente), produciendo respectivamente 0.6 MW y 29.0 MW. Este estudio contribuye a la literatura como una visión general de la gestión de residuos en Nigeria, centrándose en cuestiones relacionadas con los residuos plásticos. Además, el concepto proporciona una

solución sostenible para esta tipologia de residuos que afecta particularmente a los alrededores de las grandes ciudades. Los resultados muestran que la cantidad de residuos plásticos producidos en Nigeria probablemente generará electricidad suficiente para complementar las fuentes tradicionales de producción de electricidad.

Adeyemi, O. and B. Ajayi (2018). "Investigation of properties of paper-plastic composite made from kraft paper and plastic wastes." Pro Ligno **14**(2): 53-58.
In this study, we investigated the compatibility of kraft paper and plastic wastes. Also, the physical and mechanical properties of the paper-plastic composite were determined. Pulverized kraft paper wastes and fine sachet water particles were weighed and mixed together using different mixing ratios (50% of paper & 50% of plastic (1:1), 33% of paper & 67% of plastic (1:2) and 25% of paper & 75% of plastic (1:3)). The method of composite production employed was extrusion method. The results of water absorption (WA) conducted on the paper-plastic composite material ranged between 0.03%-0.16% and 0.03%-0.20% for 2 and 24 hours respectively. The average values obtained for thickness swell (TS) ranged between 0.00%-0.23% and 0.00%-0.33% for 2 and 24 hours respectively. The average values obtained for tensile modulus ranged between 0.11 GPa to 0.33 GPa and the average values obtained for tensile strength ranged between 9.99 MPa to 15.12 MPa. The result obtained from this study shows that kraft paper wastes and water sachet wastes can be utilized as a composite material as they were compatible. In addition, 25% of paper & 75% of plastic waste (1:3) gives the best mixing ratio as indicated by the result with the most dimensionally stable and high strength properties.

Adrados, A., et al. (2013). "Pyrolysis behavior of different type of materials contained in the rejects of packaging waste sorting plants." Waste Management **33**(1): 52-59.
In this paper rejected streams coming from a waste packaging material recovery facility have been characterized and separated into families of products of similar nature in order to determine the influence of different types of ingredients in the products obtained in the pyrolysis process. The pyrolysis experiments have been carried out in a non-stirred batch 3.5 dm3 reactor, swept with 1 L min−1 N2, at 500 °C for 30min. Pyrolysis liquids are composed of an organic phase and an aqueous phase. The aqueous phase is greater as higher is the cellulosic material content in the sample. The organic phase contains valuable chemicals as styrene, ethylbenzene and toluene, and has high heating value (HHV) (33–40 MJ kg−1). Therefore they could be used as alternative fuels for heat and power generation and as a source of valuable chemicals. Pyrolysis gases are mainly composed of hydrocarbons but contain high amounts of CO and CO2; their HHV is in the range of 18–46 MJ kg−1. The amount of COCO2 increases, and consequently HHV decreases as higher is the cellulosic content of the waste. Pyrolysis solids are mainly composed of inorganics and char formed in the process. The cellulosic materials lower the quality of the pyrolysis liquids and gases, and increase the production of char. [Copyright &y& Elsevier]

Agamuthu, P. (2018). "Marine debris, plastics, microplastics and nano-plastics: What next?" Waste Management and Research **36**(10): 869-871.

Agamuthu, P. and P. N. Faizura (2005). "Biodegradability of degradable plastic waste." Waste Management & Research **23**(2): 95-100.

Plastic waste constitutes the third largest waste volume in Malaysian municipal solid waste (MSW), next to putrescible waste and paper. The plastic component in MSW from Kuala Lumpur averages 24% (by weight), whereas the national mean is about 15%. The 144 waste dumps in the country receive about 95% of the MSW, including plastic waste. The useful life of the landfills is fast diminishing as the plastic waste stays un-degraded for more than 50 years. In this study the compostability of polyethylene and pro-oxidant additive-based environmentally degradable plastics (EDP) was investigated. Linear low-density polyethylene (LLDPE) samples exposed hydrolytically or oxidatively at 60 degrees C showed that the abiotic degradation path was oxidative rather than hydrolytic. There was a weight loss of 8% and the plastic has been oxidized as shown by the additional carbonyl group exhibited in the Fourier transform infra red (FTIR) Spectrum. Oxidation rate seemed to be influenced by the amount of pro-oxidant additive, the chemical structure and morphology of the plastic samples, and the surface area. Composting studies during a 45-day experiment showed that the percentage elongation (reduction) was 20% for McD samples [high-density polyethylene, (HDPE) with 3% additive] and LL samples (LLDPE with 7% additive) and 18% reduction for totally degradable plastic (TDP) samples (HDPE with 3% additive). Lastly, microbial experiments using Pseudomonas aeroginosa on carbon-free media with degradable plastic samples as the sole carbon source, showed confirmatory results. A positive bacterial growth and a weight loss of 2.2% for degraded polyethylene samples were evident to show that the degradable plastic is biodegradable.

Agamuthu, P., et al. (2019). "Marine debris: A review of impacts and global initiatives." Waste Management & Research **37**(10): 987-1002.

Marine debris, defined as any persistent manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment, has been highlighted as a contaminant of global environmental and economic concern. The five main categories of marine debris comprise of plastic, paper, metal, textile, glass and rubber. Plastics is recognised as the major constituent of marine debris, representing between 50% and 90% of the total marine debris found globally. Between 4.8 and 12.7 million metric tonnes of consumer plastics end up in the world oceans annually, resulting in the presence of more than 100 million particles of macroplastics in only 12 regional seas worldwide, and with 51 trillion particles of microplastic floating on the ocean surface globally. The impacts of marine debris can be branched out into three categories; injury to or death of marine organisms, harm to marine environment and effects on human health and economy. Marine mammals often accidentally ingest marine debris because of its appearance that can easily be mistaken as food. Moreover, floating plastics may act as vehicles for chemicals and/or environmental contaminants, which may be absorbed on to their surface during their use and permanence into the environment. Additionally, floating plastics is a potential vector for the introduction of invasive species that get attached to it, into the marine environment. In addition, human beings are not excluded from the impact of marine debris as they become exposed to microplastics through seafood consumption. Moreover, landscape degradation owing to debris accumulation is an eyesore and aesthetically unpleasant, thus resulting in decreased tourism and subsequent income loss. There are a wide range of initiatives that have been taken to tackle the issue of marine debris. They may involve manual removal of marine debris from coastal and aquatic environment in form of programmes and projects organised, such as beach clean-ups by scientific communities, non-governmental organizations and the removal of marine litter from Europe's four regional seas, respectively.

Other initiatives focus on assessment, reduction, prevention and management of marine debris under the umbrella of international (the United Nations Environment Programme/Mediterranean Action Plan, the Oslo/Paris Convention) and regional organisations - that is, the Helsinki Commission. There are also a number of international conventions and national regulations that encourage mitigation and management of marine debris. However, it is argued that these initiatives are short-term unsustainable solutions and the long-term sustainable solution would be adoption of circular economy. Similarly, four of the sustainable developmental goals have targets that promote mitigation of marine debris by efficient waste management and practice of 3R. As evident by the Ad Hoc Expert Group on Marine Litter and Microplastics meeting, tackling the marine debris crisis is not a straightforward, one-size-fits-all solution, but rather an integrated and continuous effort required at local, regional and global level.

Agar, J., et al. (2018). "Dialysis plastic waste recycled as a concrete incorporative." Nephrology **23 (Supplement 3)**: 39.

Background: A global annual estimate of >900,000 tonnes of post-dialysis plastic waste (pdPW) is either incinerated or chemically disinfected for landfill - both at vast financial and environmental cost. But, as novel waste management systems [eg: A SteriMed 700] can shred then sterilize pdPW, we have explored incorporating pdPW into concrete as a potential re-use end product. Method(s): All p-dPW [lines, dialysers, saline bags, syringes, bi-bags etc.] were shredded and sterilized to a polypropylene plastic fiber 'shreddate' (PPfs). This was added as 0.5% and 1% by weight to concrete slurries. Pre-separated hard, soft, and all-mixed PPfs were separately tested in a 1% concentration for compressive strength (CS), tensile strength (TS), and water absorption (WA). Result(s): The mixed PPfs additive increased TS (0.5% mix = 0.8% increase: 1% mix = 8% increase). 1% PPfs modestly decreased CS (hard 9.9%: Soft 16.9%: Mixed 11.5% respectively). Added 1% PPfs did not immediately alter the rate of WA, but the mean delayed rate decreased by 30% across all three PPfs-concrete mixes. Discussion(s): The % mix, shape and size of PPfs fibers significantly influenced final concrete characteristics. The small reduction in CS is unlikely to have significant impact, but the increase in TS and the 30% reduction in WA are likely significant factors in reducing water penetration and corrosion. Conclusion(s): Concrete sequestration of pdPW may: (1) help solve the financial/environmental costs of pdPW disposal; and (2) significantly improve specific concrete characteristics. Improved long-term concrete behavior, water resistance, durability, and steel reinforcement corrosion protection may prove valuable, especially for coastal construction/building, or in marine structures (piers/retaining walls) that contact seawater. The potentially far-reaching implications of this research have prompted further testing.

Agar, J. W. (2012). "Personal viewpoint: hemodialysis--water, power, and waste disposal: rethinking our environmental responsibilities." Hemodialysis International **16**(1): 6-10.

While medical health professionals are trained to detect, treat, and comfort, they are not trained to consider the environmental impact of the services they provide. Dialysis practitioners seem particularly careless in the use of natural resources-especially water and power-and seem broadly ignorant of the profound medical waste issues created by single use dialysis equipment. If the data we have collected is an indication, then extrapolation of this data to a dialysis population currently estimated at ~2 million patients worldwide, a "world dialysis service" would use ~156 billion liters of water and discard ~2/3 of that during reverse osmosis. This waste occurs, despite the discarded water being high-grade "gray water" of potable standard. The same world dialysis service would consume 1.62 billion kWh of power-mostly generated from coal and other environmentally damaging sources. Our world dialysis service, based on ~2 kg of waste from each dialysis treatment, would generate ~625,000 tonnes of plastic waste-waste that would be potentially reusable if simple sterilizing techniques were applied to it at the point of generation. Dialysis services must begin to explore eco-dialysis potentials. The continued plundering of resources without considering reuse or recycling, exploration of renewable energy options, or the reduction of the carbon footprint of the dialysis process . . . is unsustainable. Sustainable dialysis practices should be a global goal in the coming decade.

Agar, J. W. M. "Personal viewpoint: Hemodialysis-Water, power, and waste disposal: Rethinking our environmental responsibilities." Hemodialysis International.

While medical health professionals are trained to detect, treat, and comfort, they are not trained to consider the environmental impact of the services they provide. Dialysis practitioners seem particularly careless in the use of natural resources-especially water and power-and seem broadly ignorant of the profound medical waste issues created by single use dialysis equipment. If the data we have collected is an indication, then extrapolation of this data to a dialysis population currently estimated at ~2million patients worldwide, a "world dialysis service" would use ~156billion liters of water and discard ~2/3 of that during reverse osmosis. This waste occurs, despite the discarded water being high-grade "gray water" of potable standard. The same world dialysis service would consume 1.62billion kWh of power-mostly generated from coal and other environmentally damaging sources. Our world dialysis service, based on ~2kg of waste from each dialysis treatment, would generate ~625,000tonnes of plastic waste-waste that would be potentially reusable if simple sterilizing techniques were applied to it at the point of generation. Dialysis services must begin to explore eco-dialysis potentials. The continued plundering of resources without considering reuse or recycling, exploration of renewable energy options, or the reduction of the carbon footprint of the dialysis process ... is unsustainable. Sustainable dialysis practices should be a global goal in the coming decade. Hemodialysis International © 2011 International Society for Hemodialysis.

Agar, J. W. M. (2011). "Eco-dialysis: Planning dialysis facilities for the future." Nephrology **1)**: 70.

Haemodialysis (HD) is a wasteful medical therapy. It places huge demands on water and power resources, utilizes poorly designed and badly insulated buildings, generates a vast per/patient carbon footprint, and creates extraordinary stresses on medical waste disposal. Yet, these environmental burdens can all be markedly reduced. In our HD facilities, simple, inexpensive and permanent systems now re-cycle our reverse osmosis reject water - up to 2/3rd of all HD-directed feed water. Capital investment costs have been rapidly recouped by institutional reductions in recurrent expenditure on water, while re-use has provided practical solutions to other institutional water uses: instrument sterilization, toilet flushing, laundry uses and landscape maintenance. Permanent, simple alternative power options are also effective. The power generated by a single 24 m2 solar array (total cost = $16, 219) at our 4 chair home HD training and respite unit exceeds all HD-process power consumption with grid reimbursements effectively subsidizing power costs out for >25 years. Minimization of the HD carbon footprint through improved recycling of packaging waste is commonly neglected by facilities. As infectious medical plastic waste, often still discarded into landfill, can now be effectively re-processed and incorporated into, for example, road surfacing, new paradigms of waste recycling must be explored. As European eco-architects now routinely use rooftop soil and vegetation to insulate buildings against both heat and cold, future HD unit design might also consider combining rooftop soil-insulation with HD reject-water (ed) vegetable horticulture to provide low-cost, facility-grown produce for dialysis staff and patient use. Clever design is not fanciful: rather, it is possible, practical and essential in the 21st century. All Australian HD services should unite to explore eco-dialysis potentials. An Australian 'green nephrology' program, similar to the NHS cooperative now spanning the UK, should be a defined ANZSN intent for the next decade.

Agar, J. W. M. (2012). "Personal viewpoint: hemodialysis - water, power, and waste disposal: rethinking our environmental responsibilities." Hemodialysis International **16**(1): 6-10.

While medical health professionals are trained to detect, treat, and comfort, they are not trained to consider the environmental impact of the services they provide. Dialysis practitioners seem particularly careless in the use of natural resources - especially water and power - and seem broadly ignorant of the profound medical waste issues created by single use dialysis equipment. If the data we have collected is an indication, then extrapolation of this data to a dialysis population currently estimated at ~2 million patients worldwide, a "world dialysis service" would use ~156 billion liters of water and discard ~2/3 of that during reverse osmosis. This waste occurs, despite the discarded water being high-grade "gray water" of potable standard. The same world dialysis service would consume 1.62 billion kWh of power - mostly generated from coal and other environmentally damaging sources. Our world dialysis service, based on ~2 kg of waste from each dialysis treatment, would generate ~625,000 tonnes of plastic waste - waste that would be potentially reusable if simple sterilizing techniques were applied to it at the point of generation. Dialysis services must begin to explore eco-dialysis potentials. The continued plundering of resources without considering reuse or recycling, exploration of renewable energy options, or the reduction of the carbon footprint of the dialysis process ... is unsustainable. Sustainable dialysis practices should be a global goal in the coming decade.

Agar, J. W. M. (2019). "Dialysis and the environment: Seeking a more sustainable future." Artificial Organs **43**(12): 1123-1129.

Agarwal, R., et al. (2016). "A novel technique to study arteriovenous malformations in left ventricular assist device patients with gastrointestinal bleeding." Journal of Heart and Lung Transplantation **1)**: S247.

Purpose: Gastrointestinal bleeding (GIB) associated with arteriovenous malformations (AVMs) is the leading cause of morbidity in LVAD patients. Postulated mechanisms for AVM development exist however the distinct vascular biology of in-situ lesions has not been intimately studied. We present a novel method for isolating endothelial cells and performing proteomic profiling of AVMs. Method(s): We applied vigorous soft-bristle brushings to surface AVMs and adjacent non-bleeding mucosa (control) in 12 LVAD patients during routine endoscopy. No additional bleeding was provoked by this method. Brushing samples were washed and enriched using anti-human CD146 microbeads to isolate endothelial cells. Intracellular protein was extracted from AVMs and control and labeled fluoroscopically for differential in-gel analysis of protein expression. Patients with recurrent GIB were able to be serially sampled using this technique. Result(s): The results of our method in a patient with diffuse gastric AVMs are shown in Figures 1 and 2. We detected 2642 protein spots: 214 (8.1%) spots decreased, 281 (10.6%) spots increased, and 2147 (81.3%) spots were unchanged in control vs. AVMs. Conclusion(s): This study highlights a unique and safe methodologic approach for the study of AVM lesions in LVAD patients. We successfully isolated endothelial cells at time of endoscopy and explored proteomic profiling to detect differences in protein expression between pathologic AVM lesions and normal appearing GI tissue. Further study is needed to characterize specific protein markers and predictors for AVM-related GIB. (Figure Presented).

Agbo, I. A. and D. Abaye (2016). "Levels of Polychlorinated Biphenyls in Plastic Resin Pellets from Six Beaches on the Accra-Tema Coastline, Ghana." Journal of Health & Pollution **6**(11): 9-17.

Background: Polychlorinated biphenyls (PCBs) are organic compounds, known to be carcinogenic and banned by the Stockholm Convention. PCBs are hydrophobic substances able to accumulate in organic materials, including plastic pellets. Plastic resin pellets are industrial raw materials that are remolded finished products for industrial and domestic use, commonly used for packaging. Plastic resin pellets were chosen as the medium for monitoring hydrophobic contaminants because they are able to adsorb PCB contaminants. Pellets can be unintentionally washed into the ocean where hydrophobic contaminants such as PCBs are also deposited.

Objectives: We aimed to identify PCB congeners and quantify PCB pollution levels in the marine environment using resin plastic pellets collected from six beaches along the Accra-Tema coastline in Ghana.

Methods: Plastic resin pellets (5 g) were extracted with 200 mL of n-hexane for 16 hours by Soxhlet extraction. Concentrations of PCBs from the extracts were determined using gas chromatography with an electron capture detector.

Results: The individual PCB congeners detected were PCB 28, 52, 101, 105, 138, 153, 156 and 180. PCB 28 was detected at all six beaches, with a total concentration of 43.5 ng/g pellet (mean/beach 7.25 +/- 2.47 ng/g pellet; CV = 34%), while PCB 138 was only detected on one beach (Castle Beach) at a total concentration of 0.8 ng/g pellet. The concentration of PCBs ranged from 7.4 ng/g (Sunset Beach) to 47.5 ng/g (Castle Beach) (mean 16.4+/-15.4 ng/g per beach; CV=94%).

Discussion: PCB concentrations at Castle Beach have been studied previously, showing an increase from 39 ng/g to 47.5 ng/g, whereas levels decreased significantly from 28 ng/g to 14.2 ng/g in Sakumono Beach over the span of three years.

Conclusions: The concentrations of four detected PCB congeners (28, 52, 101 and 156) were significantly higher than the World Health Organization (WHO) allowable daily intake of 6 ng/g food per day for PCBs. A more efficient industrial and domestic waste disposal system is advocated for Ghana.

Aghababaei, A. and R. Kasaai (2013). "Studies on different properties of composite thin films made from waxy starch-citric acid and starch-methyl cellulose." Iranian Food Science & Technology Research Journal **9**(1): e68-Pe80.

Pollution arising from plastic waste materials caused a great worry for researchers who are interested in protection of environment. This problem shifts their subject to bio-polymers for applications in packaging industries. However, their low water barrier properties are a critical problem. The effects of citric acid and methyl cellulose on water vapor and oxygen permeabilities and mechanical properties of starch composite thin films have been studied. Water vapor permeability (WVP) has been measured using a vial coated by a film. Oxygen transmission rate (OTR) of a film was determined from measurement of peroxide value for a definite amount of oil that is placed in a vial and coated by the film. Mechanical properties were measured using a tensile machine. Increase in citric acid concentration up to 5% citric acid (w/w), resulted in a decrease in water vapor and oxygen permeabilities. A film containing 5% of citric acid exhibited a minimum value for WVP, whereas the value of WVP and elongation at the break increased and tensile strength decreased for a film containing 20% of citric acid (w/w). Increase in methyl cellulose up to 30% resulted in decrease in WVP and OTR.

Agorku, D., et al. (2014). "Depletion of mouse cells from human tumor xenografts significantly reduces bias in molecular analysis and improves culture of target cells." Cancer Research. Conference: 105th

Annual Meeting of the American Association for Cancer Research, AACR **74**(19 SUPPL. 1).

Human tumor xenografts represent the gold standard method for research areas like drug discovery, cancer stem cell biology, and metastasis prediction. They can be derived from primary human tumor material, serially transplanted tumor tissue, or cultured cells. When compared to in vitro cell culture models, human tumor xenografts show a higher validity for most assays (Rubio-Viqueira et al., 2009). During the growth phase in vivo, xenografted tissue is vascularized and infiltrated by cells of murine origin including heterogeneous lymphocyte subpopulations, fibroblasts, and endothelial cells. The level of infiltration is highly dependent on multiple factors like tumor subtype, growth rate, and region of transplantation. However, even when these factors are kept constant, the amount and composition of infiltrating mouse cells is highly variable. Due to this, some molecular downstream analyses are challenged. The contaminating mouse cells lead to cross hybridization of mouse derived molecules to human probes on microarrays and a significant reduction of sensitivity caused by measuring mouse signals during next-generation sequencing or proteome analysis. In addition, the culture of human tumor cells is frequently hampered by murine fibroblasts efficiently plating and overgrowing the target cells. To overcome these limitations, we have developed a fast and easy method allowing for the comprehensive depletion of all cells of murine origin. We have dissociated human tumor xenografts as well as normal murine tissue of multiple origins including skin, brain, kidney and lung followed by screening panels of cell surface markers to define an optimized combination of antibodies capable of binding all cells from all murine origins. Subsequently, we generated conjugates of suitable antibodies with paramagnetic nanoparticles (MicroBeads) and titrated all reagents to optimize the depletion efficiency by using magnetic cell sorting (MACS). Even tumors that contain high numbers of mouse cells (> 60%) can be cleaned up to purities of human tumor cells higher than 96% in less than 25 minutes. This depletion step substantially increased sensitivity during empiric cell surface marker screenings as well as during the isolation of tumor cell subpopulations. Finally, we show that downstream molecular analysis and culture of human tumor cells is significantly standardized upon removal of mouse contamination. Taken together, this novel method prevents inaccurate human tumor xenograft analysis caused by contamination with cells of murine origin. As antibodies specific only for mouse cells are used, the target cells stay "untouched" and the procedure can be used for all kinds of xenografted material without the need for a positive marker expressed on the human cells.

Agorku, D., et al. (2014). "A novel monoclonal antibody allowing for the isolation and analysis of Lgr5 positive cells from cell lines and primary human tissue." European Journal of Cancer **5)**: S30.

Introduction: Cancer stem cells (CSCs), also called tumor initiating cells, have gained substantial interest in the research field over the past few years. CSCs have been isolated from multiple tumor entities and were shown to play a crucial role during tumor growth and metastasis. However, there is still a major debate about specific cell surface markers capable of identifying CSCs in most tumor entities. The leucine-rich repeat-containing G-protein-coupled receptor (LGR) Lgr5 and its close homologues Lgr4 and Lgr6 associate with Wnt-receptors and act as R-spondin receptors thereby playing a central role in the modulation of Wnt/b-catenin signaling in normal and neoplastic stem cells (de Lau et al., 2011, Carmon et al., 2011). Initially described as a highly specific marker for stem cells in the small intestine, colon, hair follicle, stomach, and during kidney development (Barker et al., 2007, Jaks et al., 2008, Barker et al., 2010, Barker et al., 2012), Lgr5 positive cells were also shown to be crucial during the development and progression of cancer. It was shown that Lgr5 positive crypt stem cells are the cells-of-origin in intestinal cancer and that CSCs in human colorectal cancer can be identified and isolated based on Lgr5 expression (Barker et al., 2009, Kemper et al., 2012). However, the analysis of Lgr5

expressing cells is hampered by the lack of highly specific monoclonal antibodies. Material(s) and Method(s): We have developed a novel rat monoclonal antibody specifically binding to the extracellular domain of human Lgr5. Fluorochrome conjugates were generated allowing for the direct detection, enumeration, and analysis of Lgr5 expressing cells in cell lines and primary tissues. Furthermore, the antibody was evaluated for use in immunohistochemistry and western blot based detection of Lgr5. Subsequently, we generated conjugates of the novel antibody with superparamagnetic nanoparticles (MicroBeads) and titrated it to optimize the separation efficiency by using magnetic cell sorting (MACS). Result(s): Using stable transfectants for Lgr4 and Lgr6, we could prove that the antibody is not cross reactive with the close homologues of Lgr5. This is of particular importance for Lgr4, as this protein is also expressed on more differentiated progenitor cells. It was possible to detect cells expressing Lgr5 even at low levels in cell lines as well as in primary tissues using flow cytometry, immunohistochemistry, and western blot analysis. In addition, we generated a new magnetic cell separation (MACS) protocol that can be used as an easy and fast method to isolate Lgr5 positive cells from cell lines and primary human tissue. Using this method Lgr5 positive colon carcinoma cells as well as human skin stem cells were isolated at purities >95% and >75%, respectively. Conclusion(s): Taken together, we have developed a highly specific monoclonal antibody allowing for the analysis and isolation of Lgr5 positive cells from cell lines and primary tissues.

Agrawal, R., et al. (2015). "Assessment of red blood cell deformability by Optical tweezers in diabetic retinopathy." Investigative Ophthalmology and Visual Science **56 (7)**: 5183.

Purpose Haemorheological disturbances observed in diabetics have been postulated to play a role in the pathogenesis of diabetic microangiopathy. The present study was conducted to investigate the role of red blood cell (RBC) deformability and factors affecting RBC deformability in patients with diabetic retinopathy (DR) using modified optical tweezers method. Methods A pilot project was conducted as per declaration of tenets of Helsinki with ethics board approval (14/WM/1038). Bloods from age matched control and patients was collected for standard biochemical and hematological tests and for RBC deformability index (DI) assessment using Optical tweezers. A dual optical tweezers (two trapping beams) was made by splitting and recombining a single laser beam. RBCs were trapped directly (i.e. without microbead handles) in the dual optical tweezers where they adopt a "side-on" image. Results Blood from 8 healthy controls with mean age of 52.37yrs and 4 diabetic patients with mean age of 52.00yrs was analysed. Unstretched RBC length for control group was 6.847mum (+/-0.29, 95CI: 6.83-6.86) and 7.001 mum (+/-0.27, 95CI: 6.97-7.02) for diabetic RBCs (p<0.0001). Maximal stretched length for RBCs using two laser beams of optical tweezers was 7.362mum (+/-0.24, 95CI: 7.35-7.37) for control group and 7.401mum (+/- 0.262, 95CI: 7.37-7.42) for diabetic group (p=0.0021). DI was calculated by subtracting unstretched length of RBCs from maximal stretched length of RBCs. The DI for control group was 0.57 (+/-0.22, 95CI: 0.55-0.59) and that for diabetic RBCs was 0.39 (+/-0.26, 95CI: 0.37-0.42) (p<0.0001). With DI as dependent variable, we did bivariate analysis for age (yrs), hemoglobin, hematocrit, red blood cell count, mean corpuscular volume, red blood cell distribution width, platelet concentration, mean platelet volume, erythrocyte sedimentation rate, serum creatinine, total proteins, C-reactive protein, random blood glucose, HbA1C, total cholesterol and fibrinogen. None of the factors were found to be significantly correlated with DI on bivariate analysis. Conclusions DI of RBC from DR was significantly lower in comparison with normal healthy controls. None of the biochemical and hematological factors in the blood were found to a ect DI for RBCs.

Agrawal, R., et al. (2016). "Synthesis and molecular docking of terephthalic dihydrazide from poly(ethylene terepthalate) for antimicrobial activity and biochemical changes." Der Pharma Chemica **8**(1): 137-145.

The increasing use and generation of solid plastic wastes have imposed challenges of their disposal for the society. Thereby, the recycling and treatment of solid plastic waste to ecofriendly compound may help in sustaining and integrating the wastes for useful purpose. Herein, this paper the aminolysis of poly(ethylene terphthalate) (PET) is being carried out in presence of excess of hydrazine monohydrate to form terphthalic dihydrazide (TDH). The characterization and structural confirmation was done by FTIR, NMR, UV and thermal analysis. The derivatives of amide are related with broad spectrum biological activities including antimicrobial activities. This aromatic amide was further analysed for antifungal property by well diffusion method viz., MIC (minimum inhibitory concentration), zone of inhibition and biochemical changes. The synthesized aromatic amide showed broad spectrum antifungal property. The amide derivative was proposed as an inhibitor of Cytochrome P450- 14DM14, a-demethylase from Aspergillus niger and S12 protein of ribosomal subunit from Escherichia coli. Drug-likeness and hidden potential of compound and descriptors related to ADMET were deliberated to foresee pharmacokinetic properties of the molecule. Thereby molecular docking data study helped in evaluating probable mode of action of molecules in active site of receptor.

Aguado, A., et al. (2014). "Chemical depolymerisation of PET complex waste: hydrolysis vs. glycolysis." Journal of Material Cycles and Waste Management **16**(2): 201-210.

The huge increase in the generation of post-consumer plastic waste has produced a growing interest in eco-efficient strategies and technologies for their appropriate management and recycling. In response to this, PROQUIPOL Project is focused on developing, optimizing and adapting feedstock recycling technologies as an alternative for management for the treatment of complex plastic waste. Among the different plastic wastes studied, PROQUIPOL Project is working on providing a suitable treatment to the highly colored and complex multilayered post-consumer waste fractions of polyethylene terephthalate (PET) by chemical depolymerisation methods. Glycolysis and alkali hydrolysis processes have been studied with the aim of promoting the transformation of PET into the bis(2-hydroxyethyl) terephthalate monomer and terephthalic acid, respectively. In both cases operational conditions such as temperature, reaction time, catalyst to PET rate and solvent to PET rate have been considered to optimize product yield, achieving values near to 90 % and monomer purities over 95 % in both processes. This paper presents results obtained for each treatment as well as a simplified comparison of technical, economic and environmental issues.

Agyapong, D. and K. N. A. Arthur (2018). Sustainable business practices among MSMEs: Evidence from four Metropolitan Areas in Ghana. 13th European Conference on Innovation and Entrepreneurship, ECIE 2018, September 20, 2018 - September 21, 2018, Aveiro, Portugal, Academic Conferences and Publishing International Limited.

Pollution poses major health risks to man and other living creatures, especially in developing countries. Its sources include industrial emissions and improper waste by households and organisations. However, large firms have often been accused as the main actors of polluting water bodies, land and air. Despite this, some studies argue it is difficult to identify culprits for air and water pollution; hence, the need to analyse the business practices of MSMEs to determine their sustainability, since they contribute over 90% of businesses in developing countries. The study, therefore, looked at plastic pollutant, a major waste concern in Ghana. This is because, despite several government interventions in cleaning cities and towns of plastic waste; the problem still persists. Statistics indicate about 501,875 tons of plastic waste are generated annually, and it has created serious health and environmental risks such as the blocking of drains leading to flooding, the breeding of mosquitoes that spread malaria and the causing of severe aesthetic nuisance in terms of smell and appearance in communities. Using a mixed method, 500 MSMEs engaged in the production of Sachet Water in the Accra and Kumasi metropolis were sampled. Questionnaires and interviews were used to collect data. Data was analysed using descriptive and inferential statistics. The results showed that though MSMEs contribute significantly to plastic waste, they do not have any strategy for managing the waste generated. Furthermore, there is a map of complex network of actors in the plastic packaging chain, and therefore, it was concluded that the idea of plastic management policy should not target only sachet water producers. This study recommends that policy formulation aimed at dealing with this menace should target all actors in the plastic value chain including suppliers of plastic raw material, consumers of plastic packaged products, collectors of plastic waste as well as processors. 2018 Proceedings of the European Conference on Innovation and Entrepreneurship, ECIE. All rights reserved.

Ahmad, E., et al. (2015). "Fibrin matrices: The versatile therapeutic delivery systems." International Journal of Biological Macromolecules **81**: 121-136.

Fibrin sealants, that have been employed for over a century by surgeons to stop post surgery bleeding, are finding novel applications in the controlled delivery of antibiotics and several other therapeutics. Fibrinogen can be easily purified from blood plasma and converted by thrombolysis to fibrin that undergoes spontaneous aggregation to form insoluble clot. During the gelling, fibrin can be formulated into films, clots, threads, microbeads, nanoconstructs and nanoparticles. Whole plasma clots in the form of beads and microparticles can also be prepared by activating endogenous thrombin, for possible drug delivery. Fibrin formulations offer remarkable scope for controlling the porosity as well as in vivo degradability and hence the release of the associated therapeutics. Binding/covalent-linking of therapeutics to the fibrin matrix, crosslinking of the matrix with bifunctional reagents and coentrapment of protease inhibitors have been successful in regulating both in vitro and in vivo release of the therapeutics. The release rates can also be remarkably lowered by preentrapment of therapeutics in insoluble particles like liposomes or by anchoring them to the matrix via molecules that bind them as well as fibrin. Copyright © 2015 Elsevier B.V.

Ahmadi, A., et al. (2014). "Synbiotic yogurt-ice cream produced via incorporation of microencapsulated lactobacillus acidophilus (la-5) and fructooligosaccharide." Journal of Food Science & Technology-Mysore **51**(8): 1568-1574.

Yogurt-ice cream is a nutritious product with a refreshing taste and durability profoundly longer than that of yogurt. The probiotic Lactobacillus acidophilus (La-5) cells either in free or encapsulated form were incorporated into yog-ice cream and their survivability were studied. Fructooligosaccharide (FOS) as a prebiotic compound at three levels (0, 4 & 8 % w/w) was added to yogurt-ice cream mix and its effects on some chemical properties, overrun and firmness of product were evaluated. The higher the incorporated FOS concentration, the lower were the pH value and higher the total solid content of treatments. FOS incorporation (8 %) significantly increased the overrun of treatments and reduced their firmness. The viable counts of free probiotics decreased from ~9.55 to ~7.3 log cfu/g after 60 days of frozen storage while that of encapsulated cells merely decreased less than 1 log cycle. Encapsulation with alginate microbeads protected the probiotic cells against injuries in the freezing stage as well as, during frozen storage.

Ahmed, T., et al. (2018). "Biodegradation of plastics: current scenario and future prospects for environmental safety." Environmental Science & Pollution Research **25**(8): 7287-7298.

Plastic is a general term used for a wide range of high molecular weight organic polymers obtained mostly from the various hydrocarbon and petroleum derivatives. There is an ever-increasing trend towards the production and consumption of plastics due to their extensive industrial and domestic applications. However, a wide spectrum of these polymers is non-biodegradable with few exceptions. The extensive use of plastics, lack of waste management, and casual community behavior towards their proper disposal pose a significant threat to the environment. This has raised growing concerns among various stakeholders to devise policies and innovative strategies for plastic waste management, use of biodegradable polymers especially in packaging, and educating people for their proper disposal. Current polymer degradation strategies rely on chemical, thermal, photo, and biological procedures. In the presence of proper waste management strategies coupled with industrially controlled biodegradation facilities, the use of biodegradable plastics for some applications such as packaging or health industry is a promising and attractive option for economic, environmental, and health benefits. This review highlights the classification of plastics with special emphasis on biodegradable plastics and their rational use, the identified mechanisms of plastic biodegradation, the microorganisms involved in biodegradation, and the current insights into the research on biodegradable plastics. The review has also identified the research gaps in plastic biodegradation followed by future research directions.

Ahmed, T. A., et al. (2008). "Fibrin: a versatile scaffold for tissue engineering applications." Tissue Engineering Part B-Reviews **14**(2): 199-215.

Tissue engineering combines cell and molecular biology with materials and mechanical engineering to replace damaged or diseased organs and tissues. Fibrin is a critical blood component responsible for hemostasis, which has been used extensively as a biopolymer scaffold in tissue engineering. In this review we summarize the latest developments in organ and tissue regeneration using fibrin as the scaffold material. Commercially available fibrinogen and thrombin are combined to form a fibrin hydrogel. The incorporation of bioactive peptides and growth factors via a heparin-binding delivery system improves the functionality of fibrin as a scaffold. New technologies such as inkjet printing and magnetically influenced self-assembly can alter the geometry of the fibrin structure into appropriate and predictable forms. Fibrin can be prepared from autologous plasma, and is available as glue or as engineered microbeads. Fibrin alone or in combination with other materials has been used as a biological scaffold for stem or primary cells to regenerate adipose tissue, bone, cardiac tissue, cartilage, liver, nervous tissue, ocular tissue, skin, tendons, and ligaments. Thus, fibrin is a versatile biopolymer, which shows a great potential in tissue regeneration and wound healing. [References: 198]

Ahn, H. R., et al. (2019). "The Intraocular Pressure-Lowering Effect of Persimmon leaves (Diospyros kaki) in a Mouse Model of Glaucoma." International Journal of Molecular Sciences **20**(21): 23.

The aim of this study was to evaluate the pharmacological efficacy of persimmon leaves in two glaucoma models, microbeads-induced ocular hypertension (OHT) and DBA/2 mouse. Thus, we demonstrated that Ethanol Extract of Diospyros kaki (EEDK) reduced elevated intraocular pressure (IOP) in both mouse models of glaucoma by measurements with a tonometer. In particular, we revealed that retinal ganglion cell loss and optic nerve damage caused by IOP elevation were markedly diminished as assessed by TUNEL assay, H&E staining, and fluorescent staining, while the expression of soluble guanylate cyclase (sGCalpha-1) increased, when EEDK was administered, as revealed by western blot. Moreover, the b-wave magnitude indicating

functional scotopic vision was significantly improved in EEDK-administered DBA/2 mice during the 10-week follow-up study, as observed with electroretinography. Collectively, our results suggested that EEDK could be an effective therapeutic and IOP-lowering agent for preventing and treating retinal degenerative diseases such as glaucoma.

Ahn, J., et al. (2015). "Human alpha-fetal protein immunoassay using fluorescence suppression with fluorescent-bead/antibody conjugate and enzymatic reaction." Biosensors and Bioelectronics **71**: 115-120.

The aim of the study was to develop a simple and rapid immunoassay using fluorescent microbeads and enzyme-substrate reactions to measure alpha-fetal protein (AFP) concentrations. We demonstrated the functionality of the fluorescent immunosensor using antibody-conjugated fluorescent latex beads (AB-FLBs) and horseradish peroxidase (HRP) to catalyze a reaction, where the products would precipitate and suppress the fluorescence of AB-FLBs. First, the AB-FLBs were incubated with antigen, biotinylated antibodies (bABs), and streptavidin-HRP (SAv-HRP) to form a sandwich-type immunoreaction. The mixture was then filtered through a membrane to concentrate the beads on a small area. After washing to remove unbound bABs and SAv-HRP, a chromogenic HRP substrate and H<inf>2</inf>O<inf>2</inf> were added to form precipitates on the FLB surface. The suppression of the fluorescence was measured with a fluorescent image analyzer system. Under optimized conditions, AFP could be measured at concentrations as low as 1 pg mL⁻¹ with a dynamic range up to 100 ng mL⁻¹. Copyright © 2015 Elsevier B.V.

Ahrendt, C., et al. (2019). "Microplastic ingestion cause intestinal lesions in the intertidal fish Girella laevifrons." Marine Pollution Bulletin **(no pagination)**(110795).

We exposed juvenile intertidal fish to different amounts of Poly(styrene-co-divinylbenzene) microplastics in their diet. We fed ten individuals with pellets containing 0.01 g, another ten fish with pellets containing 0.1 g of PS, and ten fish without plastic as control. After 45 days of treatment, the whole intestine was removed, and the histological evaluation started immediately. We evaluated inflammation due to leukocyte infiltration (Lk), circulatory disorders like Hypermeia (Hyp), and regressive changes in the intestinal tissue, assessing Crypt cell loss (Ccl) and Villi cell loss (Vcl). The severity of the lesions increased according to the microplastic concentration. In the fish group feeding on microplastics, we found that leukocyte infiltration and hyperemia were more severe in the higher exposure group compared to the lower exposure; and crypt cell loss and villi cell loss increased significantly due to Poly(styrene-co-divinylbenzene) microplastic physical abrasion. Copyright © 2019 Elsevier Ltd

Ahuja, M., et al. (2016). "Sodium alginate-arabinoxylan composite microbeads: preparation and characterization." Journal of Pharmaceutical Investigation **46**(7): 645-653.

The objective of present study was to prepare composite microbeads of psyllium arabinoxylan and sodium alginate by ionotropic gelation method using calcium chloride as a cross linker and was further evaluated for release study. The effect of concentration of sodium alginate/arabinoxylan and concentration of calcium chloride on the entrapment efficiency and on % release were studied employing 2-factor, 3-level central composite experimental design. The results of the study revealed that interaction effect of the concentration of sodium alginate/arabinoxylan and calcium chloride influenced the entrapment efficiency and release of diclofenac sodium significantly. The optimal calculated parameters were found to be concentration of sodium alginate/arabinoxylan-5 and concentration of calcium chloride-0.75 M, that provided microbeads with entrapment efficiency-64.4 % and release of 28.5 % of the drug

over 8 h period of study. Further, arabinoxylan-sodium alginate mucoadhesive microbeads were found to sustain the release of diclofenac sodium over a period of 8 h following zero order kinetics with the mechanism of release being diffusion. Copyright © 2016, The Korean Society of Pharmaceutical Sciences and Technology.

Ahuja, P., et al. (2015). "Functional Imaging of Chemically Active Surfaces with Optical Reporter Microbeads." PLoS ONE [Electronic Resource] **10**(9): e0136970.

We have developed a novel approach to allow for continuous imaging of concentration fields that evolve at surfaces due to release, uptake, and mass transport of molecules, without significant interference of the concentration fields by the chemical imaging itself. The technique utilizes optical "reporter" microbeads immobilized in a thin layer of transparent and inert hydrogel on top of the surface. The hydrogel has minimal density and therefore diffusion in and across it is like in water. Imaging the immobilized microbeads over time provides quantitative concentration measurements at each location where an optical reporter resides. Using image analysis in post-processing these spatially discrete measurements can be transformed into contiguous maps of the dynamic concentration field across the entire surface. If the microbeads are small enough relative to the dimensions of the region of interest and sparsely applied then chemical imaging will not noticeably affect the evolution of concentration fields. In this work colorimetric optode microbeads a few micrometers in diameter were used to image surface concentration distributions on the millimeter scale.

Ai, X., et al. (2013). "Multiplex DNA sensor for BRAF and BRCA detection." Analytical Biochemistry **438**(1): 22-28.

In this article, a kind of simple, sensitive, and rapid quantum dots (QDs)-based multiplex DNA sensor is developed for the simultaneous detection of BRAF and BRCA DNA based on the "nano-on-micro" technique. In our strategy, capture DNA(BRCA) and DNA(BRAF) are simultaneously immobilized on the surface of amino-modified silica microbeads. After blocking with bovine serum albumin (BSA), different concentrations of target DNA(BRCA) and DNA(BRAF) are introduced to hybrid with complementary capture DNA(BRCA) and DNA(BRAF). After hybridization, QDs546-labeled probe DNA(BRAF) and QDs657-labeled probe DNA(BRCA) were added into the above solution so that the unreacted capture DNA(BRCA) and DNA(BRAF) could be detected by QDs657-labeled probe DNA(BRCA) and QDs546-labeled probe DNA(BRAF) simultaneously. We demonstrate that the proposed method is effective for detecting BRAF and BRCA DNA with high sensitivity. The sensor has great potential to expand its application to the early diagnosis of cancers such as breast cancer, ovarian cancer, and papillary thyroid carcinoma.

Aida Isma, M. I., et al. (2015). "Mixed Plastic Wastes Pyrolysis in a Fluidized Bed Reactor for Potential Diesel Production." International Journal of Environmental Science and Development **6**(8): 606-609.

Disposing of waste to landfill has becoming undesirable to the legislation pressures, rising costs and the poor biodegradable quality of polymer used. Feasible study on converting mixed plastic wastes by applying catalytic pyrolysis into valuable products had been carried out. Thermogravimetric analysis under various heating rates and particle sizes were determined. A 15 g/h of fluidized bed lab scale of fast pyrolysis unit was used. The pyrolysis processes were carried out at temperature of 400 super(o)C for 2 hours in non-catalytic and catalytic conditions with ratio catalyst to mixed plastic waste of 10:90. The properties of liquid products were analysed and compared using Fourier Transform Infrared Spectroscopy (FTIR) and High-Pressure Liquid Chromatography (HPLC). Under the experimental conditions, the maximum liquid yields with and without catalyst were 20 and 35 ml, respectively. FTIR results revealed that those functional groups detected are similar with commercial diesel together with HPLC results indicating diesel concentration.

Aizenshtein, E., et al. (2013). "Immunological complex for enhancement of innate immune response in passive vaccination." Vaccine **31**(4): 626-631.

Passive vaccination is used to treat a wide range of infections and cancer. However, this approach has some limitations. An immune complex termed Y-complex was developed to intensify the effect of the passive vaccine. The complex is composed of a microbead that carries specific antibodies and an inducer. It enables targeting of pathogen or abnormal cells, and stimulation of a desired response by innate immune cells, depending on the inducer. The production and efficacy of Y-complex as a passive immune prophylaxis is demonstrated in this study by its use in treating cow mastitis. In an in vitro assay, Y-complex inhibited propagation and induced phagocytosis of bacteria. In challenge experiments, cows were inoculated through the udder with Escherichia coli or Streptococcus dysgalactiae. Following treatment with Y-complex, no bacteria were isolated in the milk and N-acetyl- beta -D-glucosaminidase activity had returned to normal levels. Thus the Y-complex approach can be used as an effective treatment for mastitis. Due to its modularity, this approach may serve as a treatment for a variety of disease agents.

Akarsu, C., et al. (2017). "Microplastic threat to aquatic ecosystems of the municipal wastewater treatment plant." Turk Hijyen ve Deneysel Biyoloji Dergisi **74**(Suppl. 1): 73-78.

Objective: The effluent of domestic wastewater treatment plants are considered to be the greatest source of microplastics from cosmetic products and clothing fibers to the aquatic ecosystem. The aim of this study is to collect microplastic studies and to take a closer look at state of microplastic pollution. Method: For this purpose, Studies on the effect of the point where the effluent from the wastewater treatment plants are discharged, are determined. And the findings of these studies were put together. The compilation text included work done in the Americas, Europe, Australia and Asia.

Akdogan, Z. and B. Guven (2019). "Microplastics in the environment: A critical review of current understanding and identification of future research needs." Environmental Pollution **254**(Pt A): 113011.

Microplastics (plastic particles <5mm) are a contaminant of increasing ecotoxicological concern in aquatic environments, as well as for human health. Although microplastic pollution is widespread across the land, water, and air, these environments are commonly considered independently; however, in reality are closely linked. This study aims to review the scientific literature related microplastic research in different environmental compartments and to identify the research gaps for the assessment of future research priorities. Over 200 papers involving microplastic pollution, published between 2006 and 2018, are identified in the Web of Science database. The original research articles in 'Environmental Sciences', 'Marine/Freshwater Biology', 'Toxicology', 'Multidisciplinary Sciences', 'Environmental Studies', 'Oceanography', 'Limnology' and 'Ecology' categories of Web of Science are selected to investigate microplastic research in seas, estuaries, rivers, lakes, soil and atmosphere. The papers identified for seas, estuaries, rivers and lakes are further classified according to (i) occurrence and characterization (ii) uptake by and effects in organisms, and (iii) fate and transport issues. The results reveal that whilst marine microplastics have received substantial scientific research, the extent of microplastic pollution in continental environments, such as rivers, lakes, soil and air, and environmental interactions, remains poorly understood.

Akei, H., et al. (2006). "Surface tension influences cell shape and phagocytosis in alveolar macrophages." American Journal of Physiology **291**(4): 7.

The effect of surface tension on alveolar macrophage shape and phagocytosis was assessed in vivo and in vitro. Surface tension was regulated in vivo by conditionally expressing surfactant protein (SP)-B in Sftpb^sup -/-^ mice. Increased surface tension and respiratory distress were produced by depletion of SP-B and were readily reversed by repletion of SP-B in vivo. Electron microscopy was used to demonstrate that alveolar macrophages were usually located beneath the surfactant film on the alveolar surfaces. Reduction of SP-B increased surface tension and resulted in flattening of alveolar macrophages on epithelial surfaces in vivo. Phagocytosis of intratracheally injected fluorescent microbeads by alveolar macrophages was decreased during SP-B deficiency and was restored by repletion of SP-B in vivo. Incubation of MH-S cells, a mouse macrophage cell line, with inactive surfactant caused cell flattening and decreased phagocytosis in vitro, findings that were reversed by the addition of sheep surfactant or phospholipid containing SP-B. SP-B controls surface tension by forming a surfactant phospholipid film that regulates shape and nonspecific phagocytic activity of alveolar macrophages on the alveolar surface. [PUBLICATION ABSTRACT]

Akgol, S., et al. (2004). "Cu(II)-incorporated, histidine-containing, magnetic-metal-complexing beads as specific sorbents for the metal chelate affinity of albumin." Journal of Applied Polymer Science **93**(6): 2669-2677.

N-Methacryloyl-(L)-histidine methyl ester (MAH) was synthesized from metharyloyl chloride and histidine. Spherical beads with an average size of 150-250 m were obtained by the suspension polymerization of ethylene glycol dimethacrylate and MAH in an aqueous dispersion medium. Magnetic poly(ethylene glycol dimethacrylate-co-N-Methacryloyl-(L)-histidine methyl ester) [m-p(EGDMA-co-MAH)] microbeads were characterized with swelling tests, electron spin resonance, elemental analysis, and scanning electron microscopy. The specific surface area of the beads was 80.1 m2/g. m-p(EGDMA-co-MAH) microbeads with a swelling ratio of 40.2% and 43.9 mol of MAH/g were used for the adsorption of bovine serum albumin (BSA) in a batch system. The Cu(II) concentration was 4.1 mol/g. The adsorption capacity of BSA on the Cu(II)-incorporated beads was 19.2 mg of BSA/g. The BSA adsorption first increased with the BSA concentration and then reached a plateau, which was about 19.2 mg of BSA/g. The maximum adsorption was observed at pH 5.0, which was the isoelectric point of BSA. The BSA adsorption increased with decreasing temperature, and the maximum adsorption was achieved at 4°C. High desorption ratios (>90% of the adsorbed BSA) were achieved with 1.0M NaSCN (pH 8.0) in 30 min. The nonspecific adsorption of BSA onto the m-p(EGDMA-co-MAH) beads was negligible.

Akgul, S. U., et al. (2017). "Association Between HLA Antibodies and Different Sensitization Events in Renal Transplant Candidates." Transplantation Proceedings **49**(3): 425-429.

Background Human leukocyte antigen (HLA) allo-immunization is caused by various events such as blood transfusions, pregnancies, or organ transplantations, which can lead to sensitization. In this retrospective study, we evaluated different sensitization models and their effects on panel-reactive antibody (PRA) profiles of renal transplantation candidates. Methods Anti-HLA class I/II antibody screening tests were performed in 906 renal transplantation candidates with the use of a microbead-based assay (Luminex). Results Two hundred ninety-seven (32.8%) of the patients were determined as positive in terms of PRA, and 609 (67.2%) were negative. Sensitized and non-sensitized patients were compared separately in terms of each sensitization type. The

anti-HLA class I, II, and I+II positivity rates in patients sensitized only by blood transfusion were 13.1%, 6.3%, and 14.1%, the rates with pregnancy sensitization were 35.5%, 29%, and 45.2%, and rates with previous transplantation sensitization were 15.6%, 34.4%, and 38.9%, respectively. Prevalence of PRA positivity was significantly higher in patients with previous pregnancy than with transplantation and transfusion (odds ratio, 1.003; 95% confidence interval, 0.441-2.281; P =.031). The risk of developing HLA class I antibodies was higher in pregnancies (P <.001), and the risk of developing anti-HLA class II antibodies was higher in patients who had undergone a previous transplantation (P <.001). The rate of developing HLA-B antibodies in patients sensitized by pregnancy were significantly higher compared with sensitization after transfusion (P = .015), as was the rate of developing HLA-DQ antibodies in patients sensitized by previous transplantation compared with sensitization through pregnancy (P =.042). Conclusions In patients who are waiting for kidney transplantation, sensitization by pregnancy and transplantation have a significant impact on development of HLA class I and class II antibodies. Copyright © 2017 Elsevier Inc.

Akhbarizadeh, R., et al. (2018). "Investigating a probable relationship between microplastics and potentially toxic elements in fish muscles from northeast of Persian Gulf." Environmental Pollution **232**: 154-163.

Although weekly consumption of fish is recommended, the presence of contaminants in seafood has raised many concerns regarding the benefits of fish intake. In the present study microplastics (MPs) and metals' concentration in muscles of both benthic and pelagic fish species from northeast of Persian Gulf were investigated and the risk/benefit of their consumption was assessed. The results demonstrated that MPs and Hg in all species and Se in benthic species increase with size, while relationship between other metals, and fish size is not consistent. Consumption of a meal ration of 300 and < 100 g/week for adults and children, respectively, is recommended since it would provide the required essential elements with no human health risk. On the other hand, the estimated intake of MPs from fish muscles revealed that the mean intake of MPs for P. indicus, E. coioides, A. djedaba, and S. jello consumption is 555, 240, 233, and 169 items/300 g-week, respectively. Moreover, the relationship between MPs and metals in fish muscles were positive for A. djedaba, and negative for E. coioides. Considering the chemical toxicity of MPs and metals, and their good linear relationships in some species, consumption of high doses of the studied fish may pose a health threat to the consumers.

Akhbarizadeh, R., et al. (2019). "Investigating microplastics bioaccumulation and biomagnification in seafood from the Persian Gulf: a threat to human health?" Food Additives & Contaminants. Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment **36**(11): 1696-1708.

High bioavailability of microplastics (MPs) in the marine environment has raised serious concern during the last few decades. Nevertheless, the trophic transfer of MPs within edible parts of the marine food webs remain unknown. In this study, bioaccumulation, biomagnification, and potential human intake of MPs in muscles and gills of five popular commercial species (3 fish, 1 crab, and 1 prawn) from the Persian Gulf were investigated. The surface structure characteristics of the material and elemental composition signatures were used to screen for likely MPs and rule out non-plastics. Among the studied species, Penaeus semisulcatus and Epinephelus coioides displayed the highest (mean 0.360 items/g muscle) and lowest (mean 0.158 items/g muscle) MPs level in their muscles, respectively. The number of extracted MPs from the gills was higher than the muscle of the analyzed species, especially when it comes to scavengers and filter feeders such as (Liza klunzingeri, Portunus armatus, and P. semisulcatus).The results of the

trophic magnification factor (TMF) and biomagnification factor (BMF) calculation indicated that MPs were not biomagnified in edible parts of the marine food web of the Persian Gulf. Hence, contrary to previous belief, MPs trophic dilution occurs rather than magnification in edible parts of seafood. The assessment of human intake of MPs highlights the possible risks posed by seafood consumption to the the human population depending to a great extent on a seafood diet. Considering possible physical and chemical toxicity of MPs and their associated contaminants, routine consumption of high doses of the studied seafood should be controlled for vulnerable groups such as pregnant/lactating women and their children to ensure their safety.

Akhbarizadeh, R., et al. (2017). "Microplastics and potentially toxic elements in coastal sediments of Iran's main oil terminal (Khark Island)." Environmental Pollution **220**(Pt A): 720-731.

Marine pollutants are becoming a growing concern due to their ecological consequences. This study investigates the potential risk posed by microplastics and toxic elements in coastal sediments of Khark Island, the main oil export hub of Iran. Principal component biplots exhibited a significant positive correlation between microplastic quantities (ranging in shape and color) and concentration of heavy metals with industrial activity. Source identification of the heavy metals indicated both natural and anthropogenic origin. Quality and risk assessment of the sediments revealed low to moderate pollution of Zn, Mo, Pb, Cu, Cd and As in some stations.

Akin-Ajani, O. D., et al. (2019). "Date mucilage as co-polymer in metformin-loaded microbeads for controlled release." Journal of Excipients and Food Chemicals **10**(1): 3-12.

Mucilage from the fruit of the date palm (Phoenix dactylifera) was characterized and evaluated for the use as a polymer in controlled release metformin-loaded microbeads. Metformin-loaded (1%^w/<inf>w</inf>) microbeads were formed by the ionotropic gelation method using blends (2%^w/<inf>v</inf>) of date mucilage: sodium alginate in varying concentrations (20:80 C4, 25:75 C3, 33:67 C2, 50:50 C1) using zinc chloride (10%^w/<inf>v</inf>) as a crosslinking agent. Bead size and morphology, swelling index, entrapment efficiency and release properties were then measured. The dissolution profiles were fitted to kinetic equations to determine the kinetics and mechanisms of drug release while the similarity factor, f<inf>2</inf> was used to determine formulations with similar drug release patterns. The results showed that the date mucilage had crude fat content of 2.5%. The microbeads formed were spherical with bead sizes ranging from 0.44 to 1.99 mm except for the one prepared using blend C4 which was ellipsoidal. Drug entrapment efficiency ranged between 25.0 and 91.1%^w/<inf>w</inf> with alginate alone giving the least entrapment. Microbeads formulated with blends C2 and C3 had the slowest dissolution rates at t<inf>15</inf> < 9% in 240 hours. C3, however, had a higher entrapment efficiency and was considered the optimum formulation. All microbead formulations fitted the Korsmeyer-Peppas model with super case II transport mechanism except for the one made of sodium alginate alone, which had an anomalous (non-Fickian) diffusion. Secondary parameters of the Korsmeyer-Peppas' model showed that microbead formulations C2 and C3 provided controlled release for longer than 24 hours. Similarity factor, f<inf>2</inf> showed comparable release profiles between C2 and C3 (f<inf>2</inf>=94.2). This study shows that mucilage from the date fruit could potentially be used as a polymer in the formulation of controlled release metformin-loaded microbeads. Copyright © IPEC-Americas.

Akinfieva, O., et al. (2013). "New directions in quantum dot-based cytometry detection of cancer serum markers and tumor cells." Critical Reviews in Oncology-Hematology **86**(1): 1-14.

The use of fluorescent quantum dots (QDs) incorporated in or tagged with polymeric microbeads allows multiplexed coding of biomolecules. Compared to organic dyes, QDs are characterized by improved imaging capabilities, brightness, and photostability and may be used for simultaneous detection of multiple biomarkers. Development of QD conjugates and QD-encoded suspension arrays has given rise to new promising approaches to cell labeling, in vivo visualization, and diagnostic assay techniques. QDs have proved to be efficient donors for Forster resonance energy transfer (FRET) and are characterized by high multiphoton absorption coefficients. Implication of QD-based suspension arrays for identification of autoantibodies, tumor-specific T cells, and detection of circulating cancer cells by means of flow cytometry, holds considerable promise for earliest diagnosis of human abnormalities and effective monitoring of the therapeutic effects. This review summarizes recent advances in QD-based suspension arrays application to cancer diagnosis and attempts to predict their diagnostic potential in a future.

Akolade, J. O., et al. (2018). "Influence of formulation parameters on encapsulation and release characteristics of curcumin loaded in chitosan-based drug delivery carriers." Journal of Drug Delivery Science and Technology **45**: 11-19.

Drugs derived from plants with excellent chemotherapeutic effectiveness and relatively low toxicity may fail to scale through the phyto-drug discovery channel due to lack of appropriate drug delivery systems. These phytoceuticals need compatible carriers that will improve their stability, bioavailability and enhance their effectiveness. In this study, chitosan-based drug delivery carriers (DDCs) containing curcumin as phyto-drug model were prepared either via ionotropic gelation with tripolyphosphate or polyelectrolyte complexation with alginate. Influence of formulation parameters was evaluated using encapsulation and release characteristics as response indices. Crosslinking time, pH of chitosan solution and concentration of curcumin, alginate or tripolyphosphate significantly influenced the encapsulation efficiency, rate of curcumin release and mean release time (MRT) in simulated gastric fluid (SGF). Roughly spherical chitosan-based micro-beads with copious pores within the matrix and of improved encapsulation efficiency (82-93%) were prepared using optimized set of formulation parameters. Incorporation of alginate into the chitosan DDC reduced erosion of curcumin by 30% and extended MRT by 180 min in SGF without net delineating change in release profiles of curcumin in simulated physiological saline and intestinal fluids. Time-dependent in vitro study showed that radical scavenging activity ratio of curcumin was enhanced via encapsulation in chitosan-based DDCs. Copyright © 2018 Elsevier B.V.

Alabi, O. A., et al. (2019). "In vitro mutagenicity and genotoxicity of raw and simulated leachates from plastic waste dumpsite." Toxicology Mechanisms & Methods **29**(6): 403-410.

Increase in production of different types of plastics has led to increase in the amount of plastic waste generation worldwide. The chemical constituents of these plastic wastes have made their disposal an important economic and environmental health problem globally. This study assessed the mutagenic and genotoxic potential of plastic waste dumpsite raw and simulated leachates using the Ames Salmonella fluctuation test with Salmonella typhimurium strains TA98 and TA100, and the SOS chromotest with Escherichia coli PQ37. Physico-chemical parameters and organic constituents of the leachates were also analyzed. The result of the Ames test showed that the leachates are mutagenic even at low concentration. Also, the TA100 strain was the more responsive strain in terms of mutagenic index in the absence of metabolic activation. The SOS chromotest results complimented the Ames Salmonella fluctuation test results. Nevertheless, the E. coli PQ37 system was slightly more sensitive than the Salmonella assay for detecting mutagens and genotoxins in the tested leachates. Generally, simulated leachate showed a higher mutagenicity and genotoxicity than the raw leachate. Pb, Cd, Cr, Ni, Cu, As, PBDEs, PAHs, PCBs, and Bisphenol A contents analyzed in the leachates were believed to play significant role in the observed mutagenicity and genotoxicity in the microbial assays. These data showed that plastic waste constituents are capable of inducing DNA damage in exposed organisms and might induce similar damage in plants, animals and humans exposed to it, hence, great care should be taken to eliminate indiscriminate disposal of plastics in the environment.

Alam, F. C., et al. (2019). "Microplastic distribution in surface water and sediment river around slum and industrial area (case study: Ciwalengke River, Majalaya district, Indonesia)." Chemosphere **224**: 637-645.

Microplastic research in urban and industrial areas, including remote areas, have been conducted recently. However, there is still a lack of research about microplastic abundances in slum area. Ciwalengke River is located in Majalaya, Indonesia, which is dominated by slum and industrial areas that probably generate microplastics. This research was conducted to investigate the distribution of microplastic around the slum area for the first time. Surface water and sediment samples of the river were obtained at ten locations and grouped into six segments location based on different land use at the riverbank. Microplastic particles were identified using binocular microscope and categorized by shape and size. The average microplastic concentration were 5.85+/-3.28 particles per liter of surface water and 3.03+/-1.59 microplastic particles per 100g of dry sediments. Microplastic concentration in the sediment samples were found to have significant differences in location segment (Kruskal Wallis test, p-value=0.01165<0.05), but no significant differences were found in the water samples (Kruskal Wallis test; p-value=0.654>0.05). In addition, microplastic distribution was dominated by fiber particle. More fiber shape might be derived from the direct clothing of residents in the river and fabric washing process in the textile industries. This was also revealed by Raman spectroscopy test of several microplastic particles indicating that the type of microplastic were polyester and nylon.

Alam, R., et al. (2008). "Generation, storage, collection and transportation of municipal solid waste--a case study in the city of Kathmandu, capital of Nepal." Waste Management **28**(6): 1088-1097.

Solid waste management (SWM) services have consistently failed to keep up with the vast amount of solid waste produced in urban areas. There is not currently an efficient system in place for the management, storage, collection, and transportation of solid waste. Kathmandu City, an important urban center of South Asia, is no exception. In Kathmandu Metropolitan City, solid waste generation is predicted to be 1091 m(3)/d (245 tons/day) and 1155 m(3)/d (260 tons/day) for the years 2005 and 2006, respectively. The majority (89%) of households in Kathmandu Metropolitan City are willing to segregate the organic and non-organic portions of their waste. Overall collection efficiency was 94% in 2003. An increase in waste collection occurred due to private sector involvement, the shutdown of the second transfer station near the airport due to local protest, a lack of funding to maintain trucks/equipment, a huge increase in plastic waste, and the willingness of people to separate their waste into separate bins. Despite a substantial increase in total expenditure, no additional investments were made to the existing development plan to introduce a modern disposal system due to insufficient funding. Due to the lack of a proper lining, raw solid waste from the existing dumping site comes in contact with river water directly, causing severe river contamination and deteriorating the quality of the water.

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Alassali, A., et al. (2019). "Classification of plastic waste originated from waste electric and electronic equipment based on the concentration of antimony." Journal of Hazardous Materials **380**: 120874.

The aim of this research is a preliminary assessment of antimony concentration in plastic fractions deriving from different e-waste. We considered microwave ovens, desktop computers, laptops, mobile phones, a TV case, a PC monitor and LED lamps (63 items in total). The plastic fraction ranged from 8%-wt in computers and microwave ovens, up to 40%-wt in cell phones and 59%-wt in LED lamps. Specific polymers were identified through Near Infrared spectroscopy. The samples followed three parallel procedures: acid digestion with aqua regia; conversion into ashes at 600degreeC then acid digestion with aqua regia; leaching according to UNI10802 reference procedure. Plastic components with significant amounts of antimony were the ones derived from desktop computers (25-1900mg/kg) and from microwave ovens (830mg/kg), yet their relative amount compared to the total weight of the item was limited. Items with larger plastic fractions showed lower concentrations of antimony (1-6mg/kg in mobile phones cases and 160-640mg/kg in plastic components of LED lamps). Leaching tests revealed that the analyzed plastic fractions could be mostly admitted in non-hazardous waste landfills. The analysis of ashed samples highlighted the need to further improve the acidic extraction procedure.

Alassali, A., et al. (2018). "Assessment of plastic waste materials degradation through near infrared spectroscopy." Waste Management **82**: 71-81.

Plastic waste is a relevant challenge for waste management sector and further technological means have to be urgently researched. The evaluation of plastic waste quality through non-destructive, cost-effective and mature technologies could be without any doubt a key issue. This study is aimed at the assessment of Near Infrared (NIR) spectroscopy for the generation of global degradation-prediction models able to forecast plastic ageing. The degradation of Polyethylene terephthalate (PET), Acrylonitrile Butadiene Styrene (ABS), Polypropylene (PP) and Polyethylene (PE) was achieved by thermal ageing (at 85 degreeC, 105 degreeC and 120degreeC and durations ranging from 4 to 504h), to simulate environmental outdoor conditions. Experimental data obtained for each plastic material were elaborated through partial least square (PLS) regression to obtain empirical models. For all inspected plastic materials, a good

correspondence between the variation in absorbance units and the change in chemical bonds vibrations was observed. The PLS models were afterwards calibrated (taking into account the different ageing conditions; first separately then including the ageing factors combined). A high accuracy (R² equal to 0.85-1.00) was observed in predicting ageing for PET and ABS, while the correspondence showed a 30% decrease for PE and PP. This study proves that NIR spectroscopy can be recommended as an effective tool to investigate plastics degradation, with some limitations for specific polymers that need further investigations.

Albano, C., et al. (2009). "Influence of content and particle size of waste pet bottles on concrete behavior at different w/c ratios." <u>Waste Management</u> **29**(10): 2707-2716.

Abstract: The goal of this work was to study the mechanical behavior of concrete with recycled Polyethylene Therephtalate (PET), varying the water/cement ratio (0.50 and 0.60), PET content (10 and 20vol%) and the particle size. Also, the influence of the thermal degradation of PET in the concrete was studied, when the blends were exposed to different temperatures (200, 400, 600°C). Results indicate that PET-filled concrete, when volume proportion and particle size of PET increased, showed a decrease in compressive strength, splitting tensile strength, modulus of elasticity and ultrasonic pulse velocity; however, the water absorption increased. On the other hand, the flexural strength of concrete-PET when exposed to a heat source was strongly dependent on the temperature, water/cement ratio, as well as on the PET content and particle size. Moreover, the activation energy was affected by the temperature, PET particles location on the slabs and water/cement ratio. [Copyright &y& Elsevier]

Al-Bihani, J., et al. (2012). <u>Durability Characteristics of Sustainable Pervious Pavement Materials</u>.

This study focused on the durability characteristics and moisture susceptibility of a porous plastic-based cementitious material (P-PBC) that is manufactured from plastic waste (PET), soil and aggregates. Use of this material will reduce storm water runoff and provide a pavement structure suitable for walkways, parking lots, recreational courts and other applications. It will also play a crucial role in current recycling programs by diverting large quantities of plastic from landfills and incinerators. P-PBC specimens were prepared in a two step procedure: (1) melting the PET flakes and mixing them with the soil at the melting temperature of plastic until a uniform mixture was attained and (2) thoroughly mixing the PET-soil mixture with the aggregates until uniformity was obtained. Specimens had a plastic to soil ratio (PSR), by weight of 0.75 and a plastic to aggregate ratio (PAR), by weight of 0.175. After compaction, prismatic specimens were cured for 24 hours and tested for freezethaw durability in accordance with the ASTM C666 test method. Results showed that the dynamic modulus of elasticity and modulus of rupture of the specimens decreased as the number of freeze-thaw cycles increased; in addition, moisture susceptibility tests were run according to the AASHTO T-283-89 test method. Results showed that the average tensile strength ratio of P-PBC specimens was greater than 70%, which indicated that P-PBC specimens were not susceptible to moisture.

Alcantara-Concepciona, V., et al. (2016). "Environmental impacts at the end of life of computers and their management alternatives in Mexico." <u>Journal of Cleaner Production</u> **131**: 615-628.

A Life Cycle Analysis of End-of-Life Computers was developed for management of computers discarded in Mexico for the year 2014 through LCA methodology (ISO 14044) and using specialized software named Umberto super(registered) version 5.5.4 with database Ecoinvent 2.2. The modeling consisted in the current scenario in Mexico (10% recycling) versus four alternative scenarios: 0% recycling, 25% recycling, 35% recycling and elimination of open dump disposal considering experience in other countries and real possibilities of medium-term management. All practices of management and recycling are considered in the model with changes in the recycling rates and installed infrastructure for different alternatives proposals. On the other hand, the model included that dismantling operations are done mostly with manual labor; transportation, extraction and processing of printed wiring boards, including local process of transforming, heating and melting of materials and considering recycling in Asian countries with all the environmental burdens processes involving transoceanic transportation and metallurgy. The majority of non-precious metals recycling was considered to take place locally. A substantial benefit was identified for all recycling scenarios, particularly in the elimination of open dump disposal and the recycling of 35% of the stream and was found that there was a high impact on climate change and adverse toxic effects to health and natural environments for the practice of accumulating waste in sanitary landfills and dumpsites as well as by burning of materials (plastics and others) in open areas. The use of recycled materials versus virgin materials was also beneficial up to 10 times for reduction in global warming potential impact and up to 3 times reduction for human toxic potential. Public policies might be recommended in order to protect health and environment. As public policy recommendations, it is proposed reinforcement the national infrastructure to collect EoL computers- and transformation of materials into new commercial products, and as a starting point for the recycling of all generated materials, including plastics and printed wiring boards, but should also include the promotion of research for the transformation of plastic waste and the implementation of new technologies that can be adopted by the national recycling industry and create new regulations that result in the production or import of EoL computers and other electronics with low levels of toxic substances as their main components. Other public policies should include the legal prohibition of use of landfills and dumps for containment of EoL computers and other electrical and electronic equipment.

Alchab, S., et al. (2011). "Blood-borne cancer cells in pulmonary veins in surgical non-small cell lung cancer (NSCLC)." Journal of Thoracic Oncology **2)**: S370-S371.

Background: Patients with NSCLC have a high risk of relapse even after complete surgical resection. The presence of cancer cells in the pulmonary venous blood draining the tumour may be a potential primary source of haematogenous dissemination even at the time of surgery. Method(s): A consecutive series of 16 patients with completely resected primary NSCLC, was studied. Blood samples were collected on EDTA from the pulmonary vein draining the tumor after vessel ligation. Within 2 hours, blood mononuclear cells were collected after Ficoll gradient centrifugation and cancer cells were selected after incubation with anti-CD326EpCAM microBeads and magnetic isolation [MACS Cell isolation Technology (Milteny Biotec France)]. Cytospins of the cells obtained either without (n:10) or after (n:6) magnetic isolation were immunolabelled with anti CK antibody [Pan-Cytokeratin Mouse Monoclonal Antibody NovocastraTM] for epithelial characterization. Preliminary experiments have been done using A549 cell line and peripheral blood mononuclear cells from donors. Result(s): Pulmonary venous blood sampling then isolation by Ficoll-Hypaque allowed to collect (20 +/- 10) ml of blood and (37 +/-10) x106 mononuclear cells or (1.8 x106) cells/ml. Using the magnetic isolation technique, it was possible to recover an average of 10 cytokeratinplus cancer cells per 20 x106 mononuclear cells or per 15 ml of blood. Cytokeratinplus cells were detected in respectively 7/10 and 6/6 patients without or after magnetic isolation. Detection of cancer cells without magnetic isolation which was a laborious and tedious method was obtained in 70% of the patients, while after isolation 100% of the samples contained cancer cells. This last method provided the necessary sensitivity for the detection and isolation of very small numbers of circulating tumor cells. Conclusion(s): This work has enabled us to develop a method for collecting tumor cells in the pulmonary venous blood draining NSCLC at time of surgery. The results show that it is an important phenomenon found in 81.25% of patients. This method allows to study more thoroughly the characteristics of circulating cancer cells in NSCLC.

Alcocer-Varela, J., et al. (2013). "Analysis of the expression of interferon regulatory factors on myeloid dendritic cells from systemic lupus erythematosus patients." Lupus **22 (1)**: 115.

Background: Dendritic cells (DC) are a key element between the innate and the adaptive immune response, they are considered professional antigen presenting cells, and the main source of type-I interferon (IFNI). Elevated levels of IFN- I have been detected in many autoimmune diseases in humans. The genomic and proteomic studies have shown that elevated serum levels of IFN-I and the interferon related genes overexpression are the molecular signature of systemic lupus erythematosus (SLE). The interferon regulatory factors (IRF) are among these upregulated genes. These transcription factors are induced by many different receptors, mainly toll-like receptors and interferon receptors. Diverse genetic association studies have found relationship between many IRF-5 polymorphisms and increased susceptibility to SLE in different ethnic groups. However these studies have been done with total mononuclear cells, which may not reflect specific DC alterations. The aim of this study was to evaluate the expression of IRF-3, 5 and 7 on myeloid DC (mDC) from SLE patients. Method(s): We included 34 patients with SLE diagnosis (17 with SLEDAI=0, 17 with SLEDAI>6) as well as 34 healthy controls. Peripheral blood mononuclear cells were isolated by Ficoll-Hypaque centrifugation. Monocytes were purified by positive selection with anti- CD14 mAb coated microbeads. mDC were generated by culturing monocytes for 6 days in presence of GM-CSF, IL-4 and for 2 additional days in presence of LPS to induce maturation. In vitro generated mDC were analyzed for HLA-DR, CD11c, CD40, CD80, IRF3 and IRF5 expression by flow cytometry. We also analyzed the expression of IRF3 IRF5 and IRF7 by Western Blot and real time PCR (RTPCR). Data were analyzed by the Mann-Whitney U test. Result(s): We found no differences between the expression of surface molecules (HLA-DR, CD11c, CD80 and CD40) on mature mDC from SLE compared with controls. Neither we found differences on IRF3 IRF5 and IRF7 expression analyzed by flow cytometry (IRF3: 24.85% vs 28% and MIF 31 vs 23.5; IRF5: 30.8% vs 32.5% and MIF 35.5 vs 28), Western Blot (IRF3: 0.77 vs 0.62, IRF5: 1.39 vs 1.42 and IRF7: 0.72 vs 0.96) and RT-PCR (IRF3: 1765.9 vs 1141.3 copies/ microliter; IRF5: 2975 vs 1970 copies/microliter and IRF7: 1163 vs 1772 copies/microliter). No differences were found between active and inactive SLE patients. Conclusion(s): mDC from SLE patients do not display abnormalities in the expression of IRF3, 5 and 7.

Aldana, A. A., et al. (2015). "The Cooperative Effect in Dendronized Chitosan Microbeads." Australian Journal of Chemistry **68**(12): 1918-1925.

The present study evaluates the cooperative effects of dendronized chitosan microbeads with tris- and hexa-functionalized dendrons for capturing copper and for further use as catalysts. The dendronized microbeads were characterized by infrared spectroscopy, scanning electron microscopy, thermogravimetry, swelling capacity analysis, and atomic absorption spectroscopy. A correlation between the number and type of functional groups at the dendritic surface of the

dendronized microbeads and the retention of copper highlights structural features of the cooperative effect. It is demonstrated that covalently bound dendrons can modulate the properties of chitosan, which has shown potential as a catalyst for the development of a novel materials.

Aldo, M., et al. (2011). "Carfilzomib-dependent selective inhibition of chymotrypsin-like activity of the proteasome leads to in vitro and in vivo anti-tumor effect in waldenstrom macroglobulinemia." Haematologica **2)**: 161-162.

Background. Selective inhibition of chymotrypsin-like (CT-L) activity of constitutive-(c20S) and immuno-(i20S) proteasome leads to a significant anti-neoplastic effect in a wide spectrum of hematologic tumors. Preclinical evaluation of new proteasome inhibitors with a more targeted inhibition of clonal cells is needed in order to increase efficacy and improve patient outcome. We evaluated the anti-tumor activity of Carfilzomib, a novel selective, irreversible peptide epoxyketone inhibitor of the CT-L activity of i20S and c20S, in WM.selective chymotrypsin- like (CT-L) proteasome inhibitor in WM, both in vitro and in vivo. Aims. 1) To evaluate the distribution of i20s and c20S in WM primary cells as compared to the related normal cellular counterpart. 2) To evaluate the anti-tumor properties of Carfilzomib in WM, both in vitro and in vivo. Methods. Primary WM cells were obtained from bone marrow (BM) of WM patients (CD19+ microbead selection). WM and IgM secreting low-grade lymphoma cell lines were used. Level of imunoproteasome (i20S) and constitutive proteasome (c20S) subunits were detected by an ELISA-based assay. Cytotoxicity, DNA synthesis were measured by MTT and thymidine uptake, respectively. Cell signaling and apoptotic pathways were determined by Western Blot. Effect of Carfilzomib on paracrine WM cell growth in the BM has been evaluated by looking at adhesion, migration and co-colture of WM cells with primary BM stromal cells (BMSCs). Drug synergism was calculated using CalcuSyn software. In vivo studies were perfomed using BCWM.1-GFP+/Luc+ cells injected into SCID mice, treated intra-venously with either Carfilzomib or vehicle. Detection of Carfilzomib-induced apoptosis has been validated ex vivo using WM cells isolated from BM of SCID mice treated with either vehicle or Carfilzomib. Measurement of human IgM has been performed on serum obtained from treated mice. Results. Primary WM cells which are characterized by higher expression of the i20S subunits as compared to c20S subunits, and they contain a higher i20S content as compared to normal CD19+ B-cells. Carfilzomib inhibited the CT-L activity of both i20S (LMP7) and c20S (beta5) in primary WM cells, leading to inhibition of proliferation and induction of cytotoxicity; supported by increased PARP-, caspase-9-, -8 and -3-cleavage, as well as induced activation of c-jun- N-terminal kinase and ER-stress in a dose-dependent manner. Carfilzomib targeted WM cells even in the context of BM milieu, where inhibition of adhesion and migration were observed, together with inhibition of WM growth even in presence of BMSCs. Combination of carfilzomib and bortezomib induced synergistic cytotoxicity in WM cells, as shown by enhanced PARP-, caspase-9- and -3-cleavage; and synergy in inhibiting the CT-L activity of the i20S and c20S. Antitumor activity of Carfilzomib has been validated in vivo, where carfilzomib- treated mice presented with a significant lower number of tumor cells (P<.05); increased percentage of apoptotic WM cells (P<.05); and reduced serum IgM levels (P<.05), as compared to control mice. Summary. These findings demonstrate for the first time that Carfilzomib targets WM cells both in vitro and in vivo, due to its anti- CT-L activity of both i20S and c20S proteasome, providing the framework for testing this compound in this disease.

Alessandri, I., et al. (2016). "Cavitands Endow All-Dielectric Beads With Selectivity for Plasmon-Free Enhanced Raman Detection of Nepsilon-Methylated Lysine." Acs Applied Materials & Interfaces **8**(24):

14944-14951.

SiO2/TiO2 microbeads (T-rex) are promising materials for plasmon-free surface-enhanced Raman scattering (SERS), offering several key advantages in biodiagnostics. In this paper we report the combination of T-rex beads with tetraphosphonate cavitands (Tiiii), which imparts selectivity toward Nepsilon-methylated lysine. SERS experiments demonstrated the efficiency and selectivity of the T-rex-Tiiii assays in detecting methylated lysine hydrochloride (Nepsilon-Me-Lys-Fmoc) from aqueous solutions, even in the presence of the parent Lys-Fmoc hydrochloride as interferent. The negative results obtained in control experiments using TSiiii ruled out any other form of surface recognition or preferential physisorption. MALDI-TOF analyses on the beads exposed to Nepsilon-Me-Lys-Fmoc revealed the presence of the Tiiii*Nepsilon-Me-Lys-Fmoc complex. Raman analyses based on the intensity ratio of Nepsilon-Me-Lys-Fmoc and cavitand-specific modes resulted in a dose-response plot, which allowed for estimating the concentration of Nepsilon-methylated lysine from initial solutions in the 1 x 10(-3) to 1 x 10(-5) M range. These results can set the basis for the development of new Raman assays for epigenetic diagnostics.

Alevizopoulos, K. (2015). "Hypertonic seawater solutions exhibit anti-inflammatory actions and improve nasal cell function in epithelial cell cultures isolated from an allergic human donor." Allergy: European Journal of Allergy and Clinical Immunology **101)**: 563.

Background: Hypertonic saline sprays are frequently used as adjunct agents providing symptomatic relief and/or reducing the need for prescribed medication in allergic rhinitis patients. Despite reported mechanisms of action including induction of osmotic gradients or mechanical removal of mucus in nasal epithelia, direct and conclusive evidence linking hypertonic saline solutions to inflammation reduction and improvement of nasal function are still lacking. Method(s): Airway epithelial cells isolated from an allergic human donor were cultured as 3-dimensional, fully differentiated cultures in the presence of HCPt (ammonium hexachloroplatinate IV), a wellknown respiratory allergen capable of inducing potent inflammatory responses in cells. To assess potential benefits of a hypertonic seawater solution comprising 2.3% NaCl (HSS), its effects on the secretion of HCPt-induced inflammatory mediators IL-8 and IL-6 were measured by ELISA over a time-course of 3 days. Cilia Beating Frequencies (CBF) of the nasal epithelia were also determined by digital high-speed video imaging at day 3 post HCPt challenge. Finally, effects of HSS on the mucociliary clearance of allergic cells were analyzed by measuring the speed of clearance of micro-beads added to the apical surface of cells by video imaging. Result(s): HCPt induced a potent inflammatory response as measured by strong IL-8 secretion in the supernatant of allergic epithelial cells (25-fold increase in Day 3). HSS (2.3% NaCl) was capable of blocking the HCPt-induced increase of IL-8. Similar effects were observed for IL-6 although the action of HSS was less profound in comparison to IL-8. Furthermore, treatment with HSS resulted in increased CBF of the nasal epithelia at day 3 post HCPt challenge. Directly proving the beneficial effects of the solution, measurements in naive allergic epithelia not treated with HCPt showed increased mucociliary clearance speed in response to seawater treatment. Of note, similar anti-inflammatory effects on IL-8 and IL-6 and increased CBF were observed in epithelia from normal human donors treated with bacterial lipopolysaccharide in the presence of HSS. Conclusion(s): Hypertonic seawater solutions comprising 2.3% NaCl have direct anti-inflammatory effects and improve nasal cell function in physiological cultures of epithelial cells isolated from an allergic donor. These results may help explain the beneficial effects observed with hypertonic solutions in allergic patients.

Alexiadou, P., et al. (2019). "Ingestion of macroplastics by odontocetes of the Greek Seas, Eastern Mediterranean: Often deadly!" Marine Pollution Bulletin **146**: 67-75.

Plastic pollution is an omnipresent problem that threatens marine animals through ingestion and entanglement. Marine mammals are no exception to this rule but their interaction with plastic remains understudied in the Mediterranean Sea. Here we highlight this problem by analyzing the stomach contents of 34 individuals from seven odontocete species stranded in Greece. Macroplastic (>5 mm) were found in the stomachs of nine individuals from four species (harbour porpoise Phocoena phocoena, Risso's dolphin Grampus griseus, Cuvier's beaked whale Ziphius cavirostris and sperm whale Physeter macrocephalus) with the highest frequency of occurrence in sperm whales (60%). Gastric blockage from plastic was presumably lethal in three cases, with plastic bags being the most common finding (46%). Plastic ingestion is of particular conservation concern for the endangered Mediterranean sperm whales. A regular examination of stranded cetaceans with a standardised protocol is critical for allowing spatiotemporal comparisons within and across species. Copyright © 2019 Elsevier Ltd

Alexy, P., et al. (2020). "Managing the analytical challenges related to micro- and nanoplastics in the environment and food: filling the knowledge gaps." Food Additives & Contaminants. Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment **37**(1): 1-10.

This paper identifies knowledge gaps on the sustainability and impacts of plastics and presents some recommendations from an expert group that met at a special seminar organised by the European Commission at the end of 2018. The benefits of plastics in society are unquestionable, but there is an urgent need to better manage their value chain. The recently adopted European Strategy for Plastics stressed the need to tackle the challenges related to plastics with a focus on plastic litter including microplastics. Microplastics have been detected mainly in the marine environment, but also in freshwater, soil and air. Based on today's knowledge they may also be present in food products. Although nanoplastics have not yet been detected, it can be assumed that they are also present in the environment. This emerging issue presents challenges to better understand future research needs and the appropriate immediate actions to be taken to support the necessary societal and policy initiatives. It has become increasingly apparent that a broad and systematic approach is required to achieve sustainable actions and solutions along the entire supply chain. It is recognised that there is a pressing need for the monitoring of the environment and food globally. However, despite the number of research projects increasing, there is still a lack of suitable and validated analytical methods for detection and quantification of micro- and nanoplastics. There is also a lack of hazard and fate data which would allow for their risk assessment. Some priorities are identified in this paper to bridge the knowledge gaps for appropriate management of these challenges. At the same time it is acknowledged that there is a great complexity in the challenges that need to be tackled before a really comprehensive environmental assessment of plastics, covering their entire life cycle, will be possible.

Alfonso, M. B., et al. (2020). "Microplastics integrating the zooplanktonic fraction in a saline lake of Argentina: influence of water management." Environmental Monitoring & Assessment **192**(2): 117.

This study address for the first time in Argentina and the South American continent the effect of water management on the presence of microplastics (MPs) in a shallow lake, assessing their contribution to the zooplankton fraction. Water samples were collected in the lake and its principal affluent, an irrigation channel, from winter 2018 to summer 2019 with a zooplankton net (47 mum). MPs were present in all analyzed samples, with a dominance of fibers, black color, and <= 1000 mum range size. MPs concentration was maximum during summer at the lake (180 MPs m⁻³) while during spring (140 MPs m⁻³) at the channel. Rotifers and cyclopoids dominated the zooplanktonic fraction at both sites which range sizes (< 200 to 600 mum) included most of the size range found for MPs (50-950 mum). According to our results, the MPs found represents a potential risk for the first levels of the food web. In the lake, the concentration of MPs concerning total zooplankton abundance was higher when the channel was closed. Nevertheless, when the channel was open, the higher concentration in summer matches with the increase of tourism and an extraordinary rainfall. Our results suggest that while the runoff of agro-industrial waste regulates the MPs concentration in the channel, its water management, the touristic activities, and the runoff of MPs from nearby urban settlements regulate the concentration of MPs in the lake. These findings emphasize the need for better treatment of urban and agro-industrial waste that develops near continental aquatic systems, mainly in those where tourism activities are frequent and treatment facilities scarce.

Al-Harbi, M., et al. (2013). "Kinetic analysis and modelling of thermal degradation of perspex (PMMA) and perspex blend plastic waste." Canadian Journal of Chemical Engineering **91**(7): 1281-1288.

The thermal decomposition of pure perspex and a mixture of 50% perspex and 50% poly(ethylene terephthalate; PET) was carried out between 295 and 325 degree C using a thermogravimetric analyser (TGA) in air and nitrogen (N sub(2)) atmosphere. The weight losses of decomposition products were measured during these experiments. The thermal degradation process is slower in inert atmosphere than air, where oxidation reaction expedites the decomposition process. Kinetic rate constants (k), pre-exponential factor (A) and activation energy (E) for both pure prespex and a blend of perspex/PET were calculated for both air and N sub(2) conditions. The thermal degradation process followed a third-order reaction in air and second-order in N sub(2). A second-order (n=2) model for the pyrolytic process based on simultaneous reactions was developed using experimental data for pure and blend. The pyrolytic products are gases, liquids, waxes, aromatics and char, which can be ultimately used as raw material and fuel in various applications. It is important to note that the addition of PET to perspex was found to suppress/inhibit the decomposition of perspex compared with pure perspex. Pre-exponential factor (A) and activation energy (E) values support such an observation. copyright 2012 Canadian Society for Chemical Engineering

Alharbi, M., et al. (2017). "Label-free selective plane illumination microscopy of tissue samples." Journal of the Saudi Heart Association **29 (4)**: 326.

Introduction: There is an increasing demand for non-invasive, label-free, three-dimensional imaging techniques for characterisation of optically turbid samples such as tissue engineered constructs, used in Regenerative Medicine, and native tissue for medical diagnosis. Selective plane provide both high temporal and spatial information, deliver rapid results, are capable of assessing quality control criteria of engineered products and are applicable to a clinical environment. Many existing optical imaging techniques are not suitable for imaging samples that are non-transparent and turbid. In this project a unique technique which is Label-free Selective Plane Microscopy will be demonstrated. The imaging capabilities of this new method will be compared with existing techniques including bright field microscopy, fluorescence microscopy and confocal microscopy. Methodology: Test samples of polystyrene microbeads were prepared to simulate tissue. Red (6 micron in diameter) and clear microbeads (8 micron in diameter) were used to represent tissues that are and are not highly perfused with blood. For comparison with fluorescence imaging techniques, samples containing fluorescent beads were also prepared. The samples were imaged using bright field microscopy, Label-free Selective Plane Microscopy, fluorescence microscopy and confocal microscopy. Native tissue samples

were also studied and as above samples with different optical absorption and scattering properties. Chicken tendon and sheep kidney were used. Result(s): Label-free Selective Plane Microscopy have the capability to image highly scattering and absorbing tissue in 3D. Label-free Selective Plane Microscopy (SPIM) is a fast method for imaging tissue samples with high lateral and axial resolution and good depth penetration. Conclusion(s): Overall this method meets the demands of the current needs for 3D imaging tissue samples in a label-free manner. Label-free Selective Plane Microscopy directly provides excellent information about the structure of the tissue samples. This work has highlighted the superiority of Label-free Selective Plane Microscopy to current approaches to label-free 3D imaging of tissue.

Ali, K., et al. (2018). "Microplastic and mesoplastic contamination in canned sardines and sprats." Science of the Total Environment **612**: 1380-1386.

No report was found on the occurrence of microplastics in processed seafood products that are manufactured for direct human consumption. This study investigates the potential presence of micro- and mesoplastics in 20 brands of canned sardines and sprats originating from 13 countries over 4 continents followed by their chemical composition determination using micro-Raman spectroscopy. The particles were further inspected for their inorganic composition through energy-dispersive X-ray spectroscopy (EDX). Plastic particles were absent in 16 brands while between 1 and 3 plastic particles per brand were found in the other 4 brands. The most abundant plastic polymers were polypropylene (PP) and polyethylene terephthalate (PET). The presence of micro- and mesoplastics in the canned sardines and sprats might be due to the translocation of these particles into the edible tissues, improper gutting, or the result of contamination from the canneries. The low prevalence of micro- and mesoplastics sized >149 micro m, and the absence of potentially hazardous inorganic elements on them, might indicate the limited health risks associated with their presence in canned sardines and sprats. Due to the possible increase in micro- and mesoplastic loads in seafood products over time, the findings of this study suggest their quantification to be included as one of the components of food safety management systems.

Ali, K., et al. (2017). "Microplastics in eviscerated flesh and excised organs of dried fish." Scientific Reports **7**(1).

There is a paucity of information about the occurrence of microplastics (MPs) in edible fish tissues. Here, we investigated the potential presence of MPs in the excised organs (viscera and gills) and eviscerated flesh (whole fish excluding the viscera and gills) of four commonly consumed dried fish species (n=30 per species). The MP chemical composition was then determined using micro-Raman spectroscopy and elemental analysis with energy-dispersive X-ray spectroscopy (EDX). Out of 61 isolated particles, 59.0% were plastic polymers, 21.3% were pigment particles, 6.55% were non-plastic items (i.e. cellulose or actinolite), while 13.1% remained unidentified. The level of heavy metals on MPs or pigment particles were below the detection limit. Surprisingly, in two species, the eviscerated flesh contained higher MP loads than the excised organs, which highlights that evisceration does not necessarily eliminate the risk of MP intake by consumers. Future studies are encouraged to quantify anthropogenic particle loads in edible fish tissues.

Ali, K., et al. (2017). "Biomarker responses in zebrafish (Danio rerio) larvae exposed to pristine low-density polyethylene fragments." Environmental Pollution **223**: 466-475.

There are serious concerns over the adverse impacts of microplastics (MPs) on living organisms. The main objective of this study was to test the effects of MPs on the total length, weight, condition factor (CF), transcriptional level of antioxidant, anti and pro-apoptotic, and neurotransmitter genes, and the histopathology of the gill, liver, brain, kidney, and intestine in the larvae of zebrafish (Danio rerio). Fish were exposed to one of three levels of pristine low-density polyethylene (LDPE) fragments (5, 50, or 500 micro g/L) for 10 or 20 days. No significant changes were observed in any of the selected biomarkers across MP concentrations at days 10 or 20. The expression of casp9 (caspase 9, apoptosis-related cysteine protease), casp3a (caspase 3, apoptosis-related cysteine protease a) and cat (catalase), however, were significantly lower in the larvae sampled at day 20 than day 10. We provide evidence that virgin short-term exposure to LDPE fragments has minimal impact on biomarker responses in D. rerio larvae.

Ali, K., et al. (2016). "Virgin microplastics cause toxicity and modulate the impacts of phenanthrene on biomarker responses in African catfish (Clarias gariepinus)." Environmental Research **151**: 58-70.

Despite the ubiquity of microplastics (MPs) in aquatic environments and their proven ability to carry a wide variety of chemicals, very little is known about the impacts of virgin or contaminant-loaded MPs on organisms. The primary aim of this study was to investigate the impacts of virgin or phenanthrene (Phe)-loaded low-density polyethylene (LDPE) fragments on a suite of biomarker responses in juvenile African catfish (Clarias gariepinus). Virgin LDPE (50 or 500 micro g/L) were preloaded with one of two nominal Phe concentrations (10 or 100 micro g/L) and were exposed to the fish for 96 h. Our findings showed one or both Phe treatments significantly increased the degree of tissue change (DTC) in the liver while decreased the transcription levels of forkhead box L2 (foxl2) and tryptophan hydroxylase2 (tph2) in the brain of C. gariepinus. Exposure to either levels of virgin MPs increased the DTC in the liver and plasma albumin: globulin ratio while decreased the transcription levels of tph2. Moreover, MPs modulated (interacted with) the impact of Phe on the DTC in the gill, plasma concentrations of cholesterol, high-density lipoprotein (HDL), total protein (TP), albumin, and globulin, and the transcription levels of fushi tarazu-factor 1 (ftz-f1), gonadotropin-releasing hormone (GnRH), 11 beta -hydroxysteroid dehydrogenase type 2 (11 beta -hsd2), and liver glycogen stores. Results of this study highlight the ability of virgin LDPE fragments to cause toxicity and to modulate the adverse impacts of Phe in C. gariepinus. Due to the wide distribution of MPs and other classes of contaminants in aquatic environments, further studies are urgently needed to elucidate the toxicity of virgin or contaminant-loaded MPs on organisms.

Ali, M. F. (2006). The development of a microbead array for the detection and amplification of nucleic acids.

The focus of this doctoral thesis is on the development of a chip-based sensor array, composed of individually addressable agarose micro-beads, that is suitable for the real-time detection of DNA oligonucleotides. This research is consistent with recent trends in disease diagnostics following the miniaturization and integration of sample preparation and measurement steps towards portable devices capable of point of care analysis. Thus, the power and utility of this microbead array methodology for DNA detection is demonstrated here for the analysis of fluids containing a variety of similar short oligonucleotides. Hybridization times on the order of minutes with point mutation selectivity factors greater than 10,000 and limit of detection values of similar to 10 super(-13) M are obtained readily with this microbead array system. These analytical characteristics, here exhibited are competitive with some of the best direct DNA detection methodologies before reported. As an extension of this work, an integrated self quenching based sensing system within the bead format has shown clear efficacy for the detection of HIV gag isolates and Bacillus anthracis (Sterne) purified strains and allows for the rapid detection of 100bp sequences with sensitivities in the subnanomolar range. Additionally, due to the tailored immobilization of specific sequences on each sensor element, the multiplexed detection of various sequences utilizing diverse strategies has been demonstrated. Use of the micro-bead array in tandem with the hybridization capabilities of molecular beacons, constitutes a powerful tool for the heterogeneous elucidation of specific sequences. Concomitantly, successful collaboration with the Chen group on the development of a miniaturized enzyme based nucleic acid amplification device has been reported. Purified strains of Bacillus anthracis (Sterne) have been successfully amplified by the miniaturized polymerase chain reaction (PCR) chip as seen by gel electrophoresis. One of the long term aims of this general area of research will be to couple the glass micro chip-based PCR amplification of oligonucleotides with the real-time detection capabilities of a bead based array. These efforts serve to establish some precedent for the bead-based microfluidics approach to be implemented in the context of genomics testing for the next generation of health care.

Ali, M. I., et al. (2014). "Biodegradation of starch blended polyvinyl chloride films by isolated Phanerochaete chrysosporium PV1." International Journal of Environmental Science and Technology **11**(2): 339-348.

The accumulation of plastics in the environment is raising great concerns with respect to long-term environmental, economic and waste management problems. The aim of the present research was to investigate the biodegradability of starch blended polyvinyl chloride films in soil burial and controlled laboratory experiments using selective fungal isolates. Clear surface aberrations as color change and minor disintegration in polyvinyl chloride films were observed after 90 days and later confirmed through scanning electron microscopy. The fungal strains showing prominent growth and adherence on plastic films were isolated. One of the strains showing maximum activity was selected and identified as Phanerochaete chrysosporium PV1 by rDNA sequencing. Fourier transform infrared spectroscopy and nuclear magnetic resonance analyses indicated considerable structural changes and transformation in films in terms of appearance of new peaks at 3,077 cm⁻¹ (corresponding to alkenes) and decrease in intensity of peaks at 2,911 cm⁻¹ (C-H stretching). It was supported with a significant decrease in the molecular weight of polymer film from 80,275 to 78,866 Da (treated) through Gel permeation chromatography in shake flask experiment. Moreover, the biodegradation of starch blended polyvinyl chloride films was confirmed through release of higher CO₂ (7.85 g/l) compared to control (2.32 g/l) in respirometric method. So fungal strain P. chrysosporium PV1 has great potential for use in bioremediation of plastic waste.

Ali, W. H., et al. (2010). "Solid-phase extraction using molecularly imprinted polymers for selective extraction of a mycotoxin in cereals." Journal of Chromatography. A **1217**(43): 6668-6673.

The aim of this work was to develop a method for the clean-up of a mycotoxin, i.e. Ochratoxin A (OTA), from cereal extracts employing a new molecularly imprinted polymer (MIP) as selective sorbent for solid-phase extraction (SPE) and to compare with an immunoaffinity column. A first series of experiments was carried out in pure solvents to estimate the potential of the imprinted sorbent in terms of selectivity studying the retention of OTA on the MIP and on a non-imprinted polymer using conventional crushed monolith. The selectivity of the MIP was also checked by its application to wheat extracts. Then, after this feasibility study, two different formats of MIP: crushed monolith and micro-beads were evaluated and compared. Therefore an optimization procedure was applied to the selective extraction from wheat using the MIP beads. The whole procedure was validated by applying it to wheat extract spiked by OTA at different concentration levels and then to a certified contaminated wheat sample. Recoveries close to

100% were obtained. The high selectivity brought by the MIP was compared to the selectivity by an immunoaffinity cartridge for the clean-up of the same wheat sample. The study of capacity of both showed a significant higher capacity of the MIP.

Ali, Z. H., et al. (2019). "Environmental impact assessment of medical wastes shredding machine in Al-Hila teaching hospital-Babylon province, IRAQ." Indian Journal of Public Health Research and Development **10**(6): 963-967.

This study was carried out to assess the environmental impact of medical wastes shredding machine in Al- Hila Teaching Hospital- Babylon Province, IRAQ and samples of medical wastes received from various local health premises were identified and the percentage of each component in wet and dried forms were assessed. Several heavy metal ions were determined while air variables such as CO, NO<inf>2</inf> and SO<inf>2</inf> were measured in shredding machine location and surrounding environment. Regarding waste heavy metal content, current work has found that the highest mean concentration (1.473 +/- 0.786 micro g/kg) was recorded for cadmium ion which was within standard limit (1 - 3 micro g/kg) while both copper and ferrous ions gave mean value of 0.0163 +/- 0.005 micro g/kg and 0.679 +/- 0.431 micro g/kg respectively. In case of air gases, it was found that there were no significant differences between all measured gases in all measured siteswithin shredding room and surrounding environment where NO<inf>2</inf> mean values were 0.0194 +/- 0.006 ppm and 0.019 +/- 0.002 ppm respectively while SO<inf>2</inf> gave mean values of 0.033 +/- 0.002 ppm and 0.049 +/- 0.003 ppm respectively and CO mean concentrations have been found to be 0.026 +/- 0.023 ppm and 0.05 +/- 0.007 ppm respectively. Copyright © 2019, Indian Journal of Public Health Research and Development. All rights reserved.

Aliabad, M. K., et al. (2019). "Microplastics in the surface seawaters of Chabahar Bay, Gulf of Oman (Makran Coasts)." Marine Pollution Bulletin **143**: 125-133.

Current study aimed to evaluate the microplastics abundance in the surface waters of Chabahar Bay for the first time. 21 neuston net water samples were collected from 7 stations. Microplastics were visually counted by stereomicroscope, sorted into 4 size categories, 4 shape categories, and identified by ATR-FTIR spectroscopy. Density of microplastics varied from 0.07+/-0.03 to 1.14+/-0.27 with an average density of 0.49+/-0.43particle.m⁻³. Microplastics were mostly found in the shape of fibers. 69% of analyzed particles were polyethylene and polypropylene. Main colors of the collected microplastics were white, blue and red. The results showed that the largest number of microplastics was found at station near populated area. Therefore, it can be concluded that, there is a pressing-need to investigate the distribution of microplastics in sediments and biota of this Bay as well as their effects on marine life and human health.

Alimba, C. G. and C. Faggio (2019). "Microplastics in the marine environment: Current trends in environmental pollution and mechanisms of toxicological profile." Environmental Toxicology & Pharmacology **68**: 61-74.

The global plastics production has increased from 1.5 million tons in the 1950s to 335 million tons in 2016, with plastics discharged into virtually all components of the environment. Plastics rarely biodegrade but through different processes they fragment into microplastics and nanoplastics, which have been reported as ubiquitous pollutants in all marine environments worldwide. This study is a review of trend in marine plastic pollution with focus on the current toxicological consequences. Microplastics are capable of absorbing organic contaminants, metals and pathogens from the environment into organisms. This exacerbates its toxicological

profile as they interact to induced greater toxic effects. Early studies focused on the accumulation of plastics in the marine environment, entanglement of and ingestions by marine vertebrates, with seabirds used as bioindicators. Entanglement in plastic debris increases asphyxiation through drowning, restrict feeding but increases starvation, skin abrasions and skeletal injuries. Plastic ingestion causes blockage of the guts which may cause injury of the gut lining, morbidity and mortality. Small sizes of the microplastics enhance their translocation across the gastro-intestinal membranes via endocytosis-like mechanisms and distribution into tissues and organs. While in biological systems, microplastics increase dysregulation of gene expression required for the control of oxidative stress and activating the expression of nuclear factor E2-related factor (Nrf) signaling pathway in marine vertebrates and invertebrates. These alterations are responsible for microplastics induction of oxidative stress, immunological responses, genomic instability, disruption of endocrine system, neurotoxicity, reproductive abnormities, embryotoxicity and trans-generational toxicity. It is possible that the toxicological effects of microplastics will continue beyond 2020 the timeline for its ending by world environmental groups. Considering that most countries in African and Asia (major contributors of global plastic pollutions) are yet to come to terms with the enormity of microplastic pollution. Hence, majority of countries from these regions are yet to reduce, re-use or re-circle plastic materials to enhance its abatement. [ABSTRACT FROM AUTHOR]

Alimi, O. S., et al. (2018). "Microplastics and Nanoplastics in Aquatic Environments: Aggregation, Deposition, and Enhanced Contaminant Transport." Environmental Science & Technology **52**(4): 1704-1724.

Plastic litter is widely acknowledged as a global environmental threat, and poor management and disposal lead to increasing levels in the environment. Of recent concern is the degradation of plastics from macro- to micro- and even to nanosized particles smaller than 100 nm in size. At the nanoscale, plastics are difficult to detect and can be transported in air, soil, and water compartments. While the impact of plastic debris on marine and fresh waters and organisms has been studied, the loads, transformations, transport, and fate of plastics in terrestrial and subsurface environments are largely overlooked. In this Critical Review, we first present estimated loads of plastics in different environmental compartments. We also provide a critical review of the current knowledge vis-a-vis nanoplastic (NP) and microplastic (MP) aggregation, deposition, and contaminant cotransport in the environment. Important factors that affect aggregation and deposition in natural subsurface environments are identified and critically analyzed. Factors affecting contaminant sorption onto plastic debris are discussed, and we show how polyethylene generally exhibits a greater sorption capacity than other plastic types. Finally, we highlight key knowledge gaps that need to be addressed to improve our ability to predict the risks associated with these ubiquitous contaminants in the environment by understanding their mobility, aggregation behavior and their potential to enhance the transport of other pollutants.

Alivernini, S., et al. (2015). "Micro-RNA-34A and micro-RNA-155 unbalance is associated to IL-6/IL-6R pathway in CD14 cells and skin compartment of systemic sclerosis patients." Annals of the Rheumatic Diseases **1)**: A32.

Background and objectives MicroRNAs (miRs) are post-transcriptional regulators implicated in Systemic sclerosis (SSc). MiR- 34a and miR-155 are related to endothelial senescence and inflammation. The aim of the study is to investigate the expression of miR-34a and miR-155 in peripheral blood (PB) CD14 cells and in clinically involved and uninvolved skin paired samples in SSc. Materials and methods Twenty-seven patients with Raynaud phenomenon (RP) were enrolled, divided into 3 groups: long standing SSc (lsSSc) fulfilling the 1987 ACR criteria (n = 10), early SSc (eSSc) reaching 9 points using the Very Early Diagnosis of Systemic Sclerosis criteria (n = 9) and primary RP (n = 8) respectively. Matched healthy controls (HC) (n = 7) were enrolled. Immunostaining for CD68 was performed on paired skin tissues from SSc patients. miR-34a and miR-155 expression was evaluated by qPCR on CD14 cells isolated by CD14 specific microbeads from PB and on clinically involved and uninvolved skin paired samples. Using HumanTargetScan cross-referenced methodology, IL-6 receptor (IL6-R) was selected as target of miR-34a and miR-155 and experimentally confirmed by qPCR. IL-6 and IL-6R plasma levels were determined by ELISA. CD14 cells from PB of HC (n = 4) were cultured in RPMI, stimulated with IL-6 (30ng/ml) or LPS (100ng/ml) and collected after 48 h to assess miR-34a and miR-155 expression by qPCR. Results MiR-155 is over-expressed either in eSSc (p = 0.0002) and lsSSc (p = 0.04) compared to HC. MiR-34a expression is increased only in lsSSc compared to HC (p = 0.01). Primary RP patients did not differ for miR-155 and miR-34a expression from HC (p = 0.71). CD68 cells are over-represented in clinically involved skin compared to uninvolved skin paired samples (p = 0.02). MiR-34a is over-expressed in clinically involved skin samples compared to uninvolved skin (p = 0.04). IL-6R expression is significantly lower in lsSSc and eSSc patients compared to primary RP (p = 0.03 and p = 0.03). IL-6 plasma levels were higher in lsSSc (p = 0.01) as well as in eSSc (p = 0.003) compared to HC whereas no significant difference was found in IL-6R plasma levels. MiR-34a expression directly correlates with the skin score value (R = 0.52, p = 0.03) in SSc patients and with IL-6 plasma levels (R = 0.42; p = 0.01). SSc patients with digital ulcers have higher miR-34a expression than SSc patients without ulcers (p = 0.01). Finally, miR-34a and miR-155 are induced in CD14 cells by IL-6 and LPS in vitro stimulation. Conclusions MiR-34a and miR-155 expression is unbalanced in CD14 cells and paired skin samples of SSc patients linked to the IL-6/IL-6R pathway. MiRNA expression profile could help to differentiate patients with primary and SSc associated RP.

Alivernini, S., et al. (2011). "The role of microrna-34 and microrna-22 in dendritic cells and monocyte activation in rheumatoid arthritis." Arthritis and Rheumatism. Conference: Annual Scientific Meeting of the American College of Rheumatology and Association of Rheumatology Health Professionals **63**(10 SUPPL. 1).

Background/Purpose: MicroRNAs (miRs) are a novel class of post-transcriptional regulators that have been implicated in the pathogenesis of distinct human diseases, including Rheumatoid Arthritis (RA). We have previously shown that miR-34 family members and miR-22 are overexpressed in synovial fluid (SF) monocytes compared to matched peripheral blood (PB) monocytes in RA patients. The aim of this study was to investigate the functional role of miR-34 and miR-22 in the biology of monocytes and monocyte-derived DCs in the context of their abnormal activation in RA. Method(s): Expression of miR-34a and miR-22 in RA and osteoarthritis (OA) synovial tissues were evaluated by in situ hybridization. To characterize miR-34a positive cells, fluorescent in situ hybridization and immunostaining for CD68 were performed on RA tissues. Expression of miR-34a and miR-22 was evaluated by qPCR on DCs isolated by CD1c and CD304 specific microbeads from matched PB and SF of RA patients (n=3). Monocytes from PB of healthy donors (n=5) were isolated by CD14+ microbeads (AutoMACS) and transfected with miR-34a, miR-22 or control mimics. Cells were subsequently stimulated with LPS (10 ng/ml) or CL097 (1 mg/ml). DCs were generated from PB CD14+ cells stimulated with GM-CSF (100 ng/ml) and IL-4 (20 ng/ml) for 7 days. Once generated, CD14+ derived DCs (n=4) were transfected with miR mimics and stimulated as described above. After 18h of stimulation, supernatants were collected and evaluated for chemokine and cytokines levels (Luminex assay). To identify miR-34/22 targets HumanTargetScan cross-referenced with transcriptomic profile of SF CD14+ cells was employed. Identified targets were experimentally verified by miR luciferase assay and qPCR. Result(s): miR-34a and miR-22 are overexpressed in SF DCs compared to matched PB DCs in RA patients. In situ hybridisation showed that miR-34a and miR-22 are widely expressed in RA synovium compared to OA. Double immunofluorescence staining revealed that miR-34a is present in RA synovial tissue myeloid cells. Enforced overexpression of miR-34a but not miR-22 in PB monocytes increased TLR7/8 triggered TNF-alpha production. Overexpression of miR-34a and miR-22 in monocytes-derived DCs increased spontaneous, TLR4 and TLR7/8 triggered TNF-alpha production. In addition, miR-22 but not miR-34a induced production of chemokines and interferon alpha by DCs. Computational target ranking system cross-referenced with transcriptomic profile of RA SF CD14+ cells identified Axl and Tyro3, receptor tyrosine kinases involved in negative feedback mechanism limiting TLRs-induced myeloid cells activation, as potential direct targets for miR-34a and miR-22. Experimental validation confirmed that miR-34a and miR-22 target 3' UTR of Axl and Tyro3 mRNAs, respectively. Consistently, Axl and Tyro3 levels are downregulated in myeloid cells overexpressing miR-34a and miR-22, respectively. Conclusion(s): This study indicates that overexpression of miR-34a and miR-22 in myeloid cells can lead to the disregulation of their self-regulatory mechanism. Thus, high levels of miR-34a and miR-22 in synovial myeloid cells of RA patients may be responsible for an excessive pro-inflammatory activation of these cells.

Alivernini, S., et al. (2014). "microRNA-155 as an epigenetic regulator of B-cell activation in rheumatoid arthritis: In vivo and in vitro evidences." Arthritis and Rheumatology **10)**: S443.

Background/Purpose: MicroRNAs (miRs) are a novel class of posttranscriptional regulators. miR-155 was shown to be a regulator of B cell biology in haematological diseases as well as in myeloid cells in Rheumatoid Arthritis (RA). The regulation of the transcription factor PU.1 by miR-155 is required for the production of high-affinity IgG1 antibodies. The aim of this study was to investigate the expression of miR-155 in B cells of RA patients and its association with synovial inflammation. Method(s): 31 RA patients underwent ultrasound guided synovial tissue (ST) biopsy. ST samples were categorized through Hematoxiline and Eosine staining as diffuse or aggregate pattern. B cells from peripheral blood (PB) and matched synovial fluid (SF) of RA patients (n=19) and PB of healthy controls (HC) (n=10) were isolated by CD19+ microbeads (Mylteni). B-cell subsets were determined by Flow-Cytometry using IgD/CD27 classification and ZAP70 intracellular expression was assessed. IL-6 and BAFF levels in PB and SF were measured by ELISA. miR-155 expression was determined by qPCR on B cells from PB and SF and on ST of osteoarthritis (OA) (n=3), diffuse RA (n=5) and aggregate RA (n=5) patients. Finally, B cells from PB of HC (n=5) were isolated by CD19+ microbeads and cultured in RPMI with or without IL-6 (30 ng/ml), BAFF (20 ng/ml), IL-6+BAFF. Cells were collected after 24h, 48h and 72h to assess miR-155 and PU.1 expression by qPCR. Result(s): 14(45,2%) RA patients showed an aggregate synovial pattern in ST. RA patients with an aggregate synovial pattern were more likely anti-CCP positive compared to RA patients with diffuse pattern (p=0.05). Moreover, anti-CCP plasma levels directly correlates with the synovial aggregate grade (r=0.38; p=0.01). IL-6 and BAFF levels were higher in SF than in PB of RA patients regardless to the synovial pattern (p=0.001 for both). CD19+/IgD-CD27- and CD19+/ZAP70+ cells were overrepresented in PB of RA patients with an aggregate pattern (p=0.05 and p=0.04) compared to RA patients with a diffuse pattern.

Moreover, anti- CCP+ RA patients showed higher percentages of CD19+/IgD-CD27- and CD19+/ZAP70+ in the PB (p=0.01 for both) compared to anti-CCP- RA patients. miR-155 was over-expressed in PB B-cells compared to HC (p=0.0002). miR-155 was over-expressed in SF B-cells compared to matched PB B-cells (p=0.05) in RA patients. Moreover, anti-CCP+ RA showed higher miR-155 expression in PB B-cells compared to anti-CCP- RA patients (p=0.02) and HC (p=0.001). miR-155 was over-expressed in ST of aggregate RA compared to diffuse RA (p=0.03) and OA (p=0.03) patients respectively. Finally, IL-6 and BAFF in vitro stimulation of healthy B-cells induced an overexpression of miR-155 after 72h of incubation (p=0.04 and p=0.03). Consistently PU.1 was down-regulated after in vitro stimulation (p=0.01 and p=0.03). Conclusion(s): This study indicates that miR-155 is over-expressed in B-cells of RA patients and is associated to anti-CCP positivity and to an aggregate synovial pattern. IL-6 and BAFF, that are over-expressed in the SF environment, induce in vitro an over-expression of miR-155 in B-cells. Thus, miR-155 may represent a key regulator of B-cells in RA patients with an activated memory phenotype.

Alivernini, S., et al. (2018). "Interleukin-6 receptor inhibition, as first-line B-DMARD, affects b cell subpopulations distribution through epigenetic modifications in rheumatoid arthritispatients." Annals of the Rheumatic Diseases **77 (Supplement 2)**: 242.

Background: Despite IL-6R inhibition was found to influence B cell subpopulations distribution in Rheumatoid Arthritis (RA), no data are available on the effect on epigenetic signature of RA B cells by this treatment. It is well known that B cell maturation is under control of the microRNA-155 (miR-155)/PU.1 axis significantly influenced by IL-6 stimulation1. Objective(s): To investigate the effect of IL-6R inhibition on the epigenetic signature of B cells (miR-155/PU.1 axis) in RA patients. Method(s): Twenty-nine RA patients [18 (62.1%) female; 57.2+/-14.9 years old; disease duration 1.3+/-0.7 years] starting IL-6R inhibitor treatment as first b-DMARD, have been enrolled. At study entry and after 3-6-12-18 months follow-up, CD19⁺ cells were isolated from peripheral blood (PB) by magnetic microbeads (Miltenyi) and B cells subpopulations were assessed through FACS according to the IgD/ CD27 classification. MiR-155 and PU.1 endogenous expression was determined in PB-derived CD19⁺ cells by RT-PCR at baseline and after 3-6-12-18 months follow-up. IL-6 plasma level was assessed by ELISA at study entry for each patient. ACR/EULAR criteria were used to assess the response rate to IL-6R inhibitor treatment for each RA patient. PB-derived CD19⁺ cells of healthy individuals (HC) were used as comparison group. Result(s): At study entry, RA patients showed higher percentage of IgD⁻/CD27⁻ CD19⁺ cells (p<0.05) and IgD⁺/CD27⁺ CD19⁺ cells (p<0.05) than HC. Moreover, IgD⁻/CD27⁻ CD19⁺ cells percentage directly correlated with Disease Activity Score (p=0.04) and IL-6 plasma levels (p=0.06) in RA patients. IL-6R inhibition lead to DAS and SDAI remission achievement in 73.9% and 52.2% of RA patients after 18 months follow-up, respectively, and significantly reduced IgD⁻/CD27⁻ CD19⁺ cells percentage after 18 months follow-up (p<0.02). Stratifying RA patients based on the remission achievement during the follow-up, RA patients who achieved DAS remission under IL-6R inhibition showed a significant decreased of IgD⁻/ CD27⁻ CD19⁺ cells percentage compared to patients not achieving this outcome (p<0.05), reaching IgD⁻/CD27⁻ CD19⁺ cells percentage comparable to HC (p>0.05). Analysing the epigenetic profile in B cells of RA patients, at baseline, PB-derived CD19⁺ cells of RA patients showed significantly higher endogenous expression of miR-155 (p=0.04) than HC. Moreover, RT-PCR showed that IL-6R inhibition significantly

represses endogenous miR-155 expression in PB-derived RA B cells already after 3 months of treatment (p<0.05) and restores PU.1 expression in PB-derived B cells after 6 months (p<0.05) only in RA patients achieving disease remission. Conclusion(s): IL-6R inhibitor, used as first b-DMARD treatment, acts restoring B cells homeostasis through epigenetic modulation in RA. In particular, IL6-R inhibition significantly represses endogenous expression of miR-155 in PB-derived CD19⁺ cells conversely restoring PU.1 expression mirrored by the decrease of IgD⁻/CD27⁻ B cell rate in RA patients achieving disease remission.

Alivernini, S., et al. (2019). "STAT3/STAT5 balance as a biomarker in RA: CTLA4-Ig and T cell differentiation through STAT signaling." Annals of the Rheumatic Diseases **78 (Supplement 2)**: 1100.

Background: Regulatory T cells (Treg) play suppressive functions and are modulated by Abatacept (CTLA4-Ig). Limited data are available on CTLA4-Ig effect on Treg population in Rheumatoid Arthritis (RA). Objective(s): The aim of the study was to analyze if STAT3/STAT5 expression in CD4+ T cells in peripheral blood (PB) of RA patients at baseline predicts response to Abatacept treatment (after 12 months follow-up). Method(s): Early RA (ERA) and long-standing RA (LS-RA) patients with conventional DMARDs insufficient response were enrolled in this observational, investigative, monocentric, non-randomized, no profit study, and treated with CTLA4-Ig in combination with methotrexate. Each enrolled RA patients underwent peripheral blood sampling and CD4+ cells isolation using magnetic micro-beads at baseline and after 6-12 months follow-up. Flow cytometric analysis (FACS) for CD4 positive cells phenotype was performed to assess T-regulatory cells (Treg) as CD4+/CD25+/CD127- and CD4+/CD25+/Foxp3+, respectively. STAT3/STAT5 gene expression on CD4+ cells was performed by RT-PCR for each enrolled patient at every time-point follow-up. Low disease activity (LDA) and disease remission (DAS) achievement were assessed at 6 and 12 months follow-up (FU), respectively. Result(s): A total of 35 patients were enrolled in the study (16 ERA and 19 LS-RA, respectively). At baseline, ERA and LS-RA did not differ based on clinical parameters. Eight (22.9%) withdrew from the study because of treatment failure (n=6), severe infection (n=1) and death (n=1). LDA or DAS remission within twelve months follow-up were achieved in 28/34 (82.4%) and 16/34 (47.1%) patients, respectively, without any significant difference among ERA and LS-RA. There were no significant differences in the demographic and clinical characteristics of RA patients at study based on LDA or DAS remission status achievement within 12 months FU, even stratifying patients based on disease duration. FACS analysis showed CD4+/CD25+/CD127- and CD4+/CD25+/Foxp3+ cells decrease during CTLA4-Ig treatment (p=0.01 and p=0.02, respectively after 12 months FU), despite disease duration. RT-PCR revealed that PB CD4+ cells of RA patients achieving LDA, but not DAS remission, after CTLA4-Ig treatment have significantly lower endogenous expression of STAT3 and STAT5 compared to RA patients not achieving this outcome (p=0.03 and p<0.001, respectively). Moreover, baseline STAT3/STAT5 ratio in PB CD4+ cells of RA patients directly correlates with Treg cells percentages (CD4+/CD25+/CD127-cells (%): R=0.518, p=0.03; CD4+/CD25+/Foxp3+ cells (%): R=0.549, p=0.02, respectively). Finally, baseline STAT3/STAT5 expression ratio on CD4+ cells > 0.93 (obtained by ROC analysis: AUC:0.754+/-0.100; Sensitivity 75.0%, Specificity: 80.0%) arose as baseline predictor factor of LDA achievement in RA patients treated with CTLA4-Ig [OR(95%CIs): 12.0 (1.98-72.89)]. Conclusion(s): STAT3/STAT5 expression ratio in T cells at baseline identify RA patients better responding to CTLA4-Ig, which decreases Treg cells.

Alivernini, S., et al. (2015). "MicroRNA-155/PU.1 axis as an epigenetic regulator of b-cells in rheumatoid arthritis." Arthritis and Rheumatology. Conference: American College of Rheumatology/Association of

Rheumatology Health Professionals Annual Scientific Meeting, ACR/ARHP **67**(SUPPL. 10).

Background/Purpose: MicroRNA-155(miR-155) has been shown to be a key regulator of B cell biology by PU.1 regulation. However, the role of miR-155 in the activation of B cells in Rheumatoid Arthritis(RA) has not been explored. This study aimed to investigate miR-155 expression in RA B cells and its association with B cell driven pathologies such as levels of antibodies against citrullinated peptides(ACPA) and follicular structures in the synovial tissues(ST). Method(s): 60 RA patients underwent ST biopsy. Based on immunostaining for CD68, CD21, CD3 and CD20 cells, ST samples were categorized as diffuse or with follicular pattern. MiR-155 expression in RA ST and synovial B cells was evaluated by in situ hybridization(ISH). B cells from peripheral blood(PB) and matched synovial fluid(SF) of RA and PB of healthy controls(HC) were isolated by CD19+micro-beads. IL-6 and BAFF levels in PB and SF were measured by ELISA. MiR-155 and PU.1 expression in B cells from PB and SF of RA; and in ST samples of osteoarthritis(OA) and RA patients was determined by qPCR. Finally, PB-derived B cells were cultured with or without IL-6(30ng/ml) or BAFF(20ng/ml) and miR-155 and PU.1 expression was assessed by qPCR. Result(s): 29 out of 60 RA patients(49.2%) had follicular pattern in the ST biopsy. These patients were more likely ACPA positive compared to RA with a diffuse pattern(p=0.04). Moreover, ACPA plasma levels directly correlated with the synovial aggregate grade(r=0.39;p=0.01). IL -6 and BAFF levels were higher in SF than in PB of RA regardless of the synovial infiltrate pattern(p=0.001 for both). PB B-cells from ACPA positive RA showed higher miR-155 expression compared to ACPA negative RA(p=0.02) and HC(p=0.001). Furthermore, ISH showed that miR-155 was highly expressed in ST of follicular RA compared to diffuse RA(p=0.03). Double staining revealed that the majority of B cells within synovial follicular structures were miR-155 positive. qPCR further confirmed that miR-155 was significantly increased in ST of follicular RA compared to diffuse RA(p=0.03) and OA(p=0.03), respectively. Consistently, the expression of miR-155 target in B cells, PU.1 was found to be lower within synovial aggregates in RA. At the cellular level, miR-155 was highly expressed in PB-derived B-cells of RA compared to HC(p=0.0002). In addition, miR-155 was over-expressed in SF B-cells compared to matched PB B-cells(p=0.05) in RA. This was associated with reciprocal lower expression of PU.1 in SF-derived B-cells and within ST follicular structures compared to matched PB Bcells(p=0.001) and ST with a diffuse pattern, respectively. Finally, in vitrostimulation of HC B-cells with IL-6 and BAFF induced miR- 155(p=0.04 and p=0.03) and decreased PU.1(p=0.01 and p=0.03) expression. Conclusion(s): B-cells of RA show high expression of miR-155 that is associated with ACPA positivity, follicular synovial pattern and low expression of PU.1. IL-6 and BAFF that are significantly increased in the SF environment and induce miR-155 expression in B-cells in vitro are likely candidates for maintaining high levels of miR-155 in the synovial B cells. Thus, miR-155 may represent a key regulator of B-cells in RA patients.

Alivernini, S., et al. (2015). "MicroRNA-155/PU.1 axis as an epigenetic regulator of B-cell activation in rheumatoid arthritis." Annals of the Rheumatic Diseases **2)**: 195.

Background: MicroRNA-155 (miR-155) has been shown to be a key regulator of B cell biology. The regulation of the transcription factor PU.1 by miR-155 is required for high-affinity IgG1 production and B cell maturation. However, the role of miR-155 in the activation of B in Rheumatoid Arthritis (RA) has not been explored. Objective(s): To investigate miR-155 expression in RA B cells and its association with B cell activation and synovial inflammation. Method(s): 53 RA patients underwent synovial (ST) biopsy. ST samples were categorized on a basis of immunostaining for CD68, CD21, CD3 and CD20 cells as diffuse or aggregate pattern. MiR-155 expression in RA ST was evaluated by in situ hybridization (ISH)(n=15). B cells from peripheral blood (PB) and matched synovial fluid (SF) of RA (n=19) and PB of healthy controls

(HC)(n=10) were isolated by CD19+ microbeads. B-cell subsets were determined through Flow-Cytometry. IL-6 and BAFF levels in PB and SF were measured by ELISA. MiR-155 and PU.1 expression was determined by qPCR in B cells from PB and SF of RA (n=10) and on ST samples of osteoarthritis (OA)(n=3), RA diffuse (n=8) and RA aggregate (n=8) patients. Finally, HC PB B cells (n=5) were cultured with or without IL-6 (30ng/ml) or BAFF (20ng/ml) and miR-155 and PU.1 expression was assessed by qPCR. Result(s): 23 (43,4%) RA patients had an aggregate pattern of ST biopsy. RA with an aggregate pattern were more likely anti-CCP+ compared to RA with diffuse pattern (p=0.04).Moreover, anti-CCP plasma levels directly correlated with the synovial aggregate grade (r=0.39; p=0.01). IL-6 and BAFF levels were higher in SF than in PB of RA regardless of the synovial infiltrate pattern (p=0.001 for both). ISH showed that miR-155 was expressed at significantly higher levels in ST of aggregate RA compared to diffuse RA (p=0.03). qPCR further confirmed that miR-155 was significantly increased in ST of aggregate RA compared to diffuse RA (p=0.03) and OA (p=0.03) respectively. Consistently, PU.1 staining was found to be lower within synovial lymphoid aggregates in RA patients. On the single cell level, miR-155 was expressed significantly higher in RA PB B-cells compared to HC (p=0.0002). In addition, miR-155 was over-expressed in SF B-cells compared to matched PB B-cells (p=0.05) in RA. Consistently, PU.1 expression was lower in SF B-cells compared to matched PB B-cells (p=0.001). Moreover, anti-CCP+ RA showed higher miR-155 expression in PB B-cells compared to anti-CCPRA (p=0.02) and HC (p=0.001). CD19+/IgD-CD27- cells were significantly overrepresented in PB of aggregate compared to diffuse RA (p=0.04). Finally, IL-6 and BAFF in vitro stimulation of HC B-cells induced miR-155 overexpression (p=0.04 and p=0.03) whereas PU.1 was significantly down-regulated (p=0.01 and p=0.03). Conclusion(s): MiR-155 is over-expressed in B-cells of RA and is associated to anti-CCP positivity, an aggregate synovial pattern and a PU.1 lower expression. IL-6 and BAFF are significantly increased in the SF environment and induce in vitro miR-155 expression in B-cells. Thus, miR-155 may represent a key regulator of B-cells in RA patients with a memory phenotype.

Aljaibachi, R. and A. Callaghan (2018). "Impact of polystyrene microplastics on Daphnia magna mortality and reproduction in relation to food availability." PeerJ **6**: e4601.

Microplastics (MPs) in the environment continue to be a growing area of concern in terms of acute and chronic impacts on aquatic life. Whilst increasing numbers of studies are providing important insights into microparticle behaviour and impacts in the marine environment, a paucity of information exists regarding the freshwater environment. This study focusses on the uptake, retention and the impact of 2 micro m polystyrene MPs in the freshwater cladoceran Daphnia magna in relation to food intake (algae Chlorella vulgaris), with MP size chosen to approximately match the cell size of the algae. Daphnia were exposed to varied concentrations of MPs and algae. When exposed to a single concentration of MPs Daphnia almost immediately ate them in large quantities. However, the presence of algae, even at low concentrations, had a significant negative impact on MP uptake that was not in proportion to relative availability. As MP concentrations increased, intake did not if algae were present, even at higher concentrations of MPs. This suggests that Daphnia are selectively avoiding eating plastics. Adult Daphnia exposed to MPs for 21 days showed mortality after seven days of exposure in all treatments compared to the control. However significant differences were all related to algal concentration rather than to MP concentration. This suggests that where ample food is present, MPs have little effect on adults. There was also no impact on their reproduction. The neonate toxicity test confirmed previous results that mortality and reproduction was linked to availability of food rather than MP concentrations. This would make sense in light of our suggestion that Daphnia are selectively avoiding eating microplastics.

Al-Jaibachi, R., et al. (2019). "Examining effects of ontogenic microplastic transference on Culex mosquito mortality and adult weight." Science of the Total Environment **651**(Part 1): 871-876.

Microplastics (MPs) continue to proliferate and pollute aquatic and terrestrial environments globally. The impacts of MP pollution on ecosystems and their functioning remain poorly quantified, with most research hitherto focusing on marine ecosystems. There is a paucity of information on the impacts of MPs in freshwater ecosystems, despite the broad range of pathways through which MPs can proliferate and the extensive range of species which actively ingest MPs in these systems. Of particular interest are organisms that bridge aquatic and terrestrial habitats. The present study thus examines the uptake, ontogenic transference and effect of different concentrations (0, 50, 100 and 200 MPs mL⁻¹) and sizes (2 and 15 micro m) of polystyrene MPs between aquatic and terrestrial life stages of Culex pipiens complex mosquitoes. Both 2 and 15 micro m MPs transferred from the aquatic larval to terrestrial adult stage of Culex mosquitoes, and uptake correlated tightly with initial exposure concentration. However, neither concentration nor size of MPs significantly influenced mortality rates between the aquatic larval and terrestrial adult stage. There was also no impact of MPs on the weight of emerging mosquito adults. We thus demonstrate that MPs can be transferred ontogenically through organisms with complex life histories, presenting a potential pathway for dispersal of MPs into terrestrial environments. We also show that MPs exposure does not affect mortality rates between life stages of freshwater Culex populations. This suggests that MPs do not impact nutritional uptakes, with unhampered development to adulthood facilitating subsequent dispersal of MPs aerially and between freshwater and terrestrial habitats.

Al-Katib, A., et al. (2019). "Isolation and characterization of a CD34⁺ sub-clone in B-cell lymphoma." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Non-Hodgkin's lymphoma (NHL) is the most common hematological malignancy in the US. Many types remain incurable despite response to initial therapy and achievement of complete remission (CR). Advanced laboratory techniques like multicolor flow cytometry (MCF) and polymerase chain reaction (PCR) have demonstrated persistence of rare malignant cell population post therapy referred to as minimal residual disease (MRD). However, the functional and biological characteristics of this population have not been fully elucidated. Established B-lymphoma cell lines (B-NHL) and patient-derived samples (PDS) were analyzed using 8-color FCM of leukemia and lymphoma antibody panels (28 antibodies). The CD34⁺ sub-population was enriched using in vitro exposure to 2-chlorodeoxyadenosine (2-CdA), and a CD34-coated magnetic beads isolation procedure (Miltenyi Biotech). Genetic analysis of CD34⁺ and CD34-/parent cell fractions was done by karyotyping, and by chromosomal microarray (CMA) using the oligonucleotide-single nucleotide polymorphism (Oligo-SNP), whole genome Agilent 180K GGXChip⁺SNP (Agilent Technologies, Inc). Sensitivity to chemotherapy was assayed by short-term in vitro exposure to drugs. Clonogenicity was determined by soft agar colony formation assay, and proliferation was determined using DNA staining with propidium iodide and flow cytometry. The side population was determined using the fluorescent vital dye Hoechst 33342 and flow cytometry. Analysis of three B-NHL cell lines revealed the presence of a minute sub-clone (<1%) of monotypic B-cells that expresses CD34. This sub-population enriched several folds in response to exposure of the cells to 2-CdA. Enrichment was highest in the follicular lymphoma cell line, WSU-FSCCL reaching more than 50 folds compared with control (13.2% vs 0.26%), followed by WSU-WM, 10-fold (2.36% vs 0.23%), and least in WSU-DLCL2 (1.25% vs 0.71%). Using a CD34 microbead positive selection technique, we were able to enrich the CD34⁺ population up to 80% purity. Western blots confirmed higher expression of CD34 protein in the enriched population compared with parent cells. Using StemPro media (Gibco by Life Technologies), CD34⁺ cell fraction of WSU-WM showed more sustained growth and viability in culture over 9-day period compared with parent cells. This technique allowed the generation of large number of CD34⁺ cells for further characterization. Except for CD34 expression, this cell fraction expressed identical phenotype, karyotype, SNP and MCA profile to parent cells. However, the CD34⁺ fraction was more proliferative with an increase in S-phase cells (~60% vs 20% in control cells) and Hoechst 33342-positive cells (~40%). These cells were clonogenic even in presence of the cytotoxic agents Doxorubicin and 2-CdA that completely inhibited colony formation in parent cells. Resistance to chemotherapy was also noticed in liquid culture. A CD34⁺ population within clonal B-cells was also detected in 8 of 8 PDS. The lowest number of CD34⁺ cells was detected in chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL) and the highest (5.35%) was seen in Richter's transformation of CLL. The isolated CD34⁺ cells in this study show many features of what is known as Lymphoma Stem Cells implicated in resistance to therapy and disease recurrence. Its relatedness to MRD cells is uncertain, however, since CD34 is not routinely included in MRD antibody panel. The observation that CD34⁺ cells are genetically identical to parent cells suggests an epigenetic modification. This conclusion is supported by our finding that Ehd3 expression is dramatically reduced in the CD34⁺ cell population of WSU-DLCL2 compared with parent cells. Ehd3 was recently identified as an epigenetically-silenced gene in solid tumors and in hematological malignancies including leukemia and lymphoma. The Ehd3-encoded protein belongs to the family of C-terminal Eps15 homology domain-containing (EHD) prot ins, implicated in intracellular trafficking of tubular recycling endosomes (TRE), apoptosis, and cell cycle arrest. Further studies are underway to determine the contribution of Ehd3 to the biological and functional characteristics of the CD34⁺ cells in B-NHL. Utilizing the CD34⁺ monotypic B-cells in B-NHL as a model for screening new therapeutic agents and to identify potential new therapeutic strategies may lead to a more effective treatment of B-NHL.

Alkayyali, T., et al. (2019). "Microfluidic and cross-linking methods for encapsulation of living cells and bacteria - A review." Analytica Chimica Acta **1053**: 1-21.

Microencapsulation of living cells is a field that has been heavily investigated by many researchers over the past two decades. Numerous experimental setups have been developed to encapsulate living cells in microbeads using different microfluidic devices and materials. Previous studies have investigated different microfluidic devices and materials for use in cancer treatment, drug delivery, environmental remediation, food production, and cell culture contexts. Some of the current challenges to these setups are maintaining reasonable levels of cell viability, cell leaching, nutrient and oxygen diffusion, and ensuring uniform microbead shape and size distribution. Addressing these issues and identifying the most reproducible and convenient setup enables researchers to efficiently encapsulate living cells and further advance the biomedical field. The efficiency of microencapsulation in terms of cell viability and uniform microbead shape and size distribution are directly related to the type of device used and the cross-linking method applied. Hence, the focus of this review is to assess the effects of using T-junction, flow-focusing, and co-flow microfluidic devices as well as thermal, ionic, and photo cross-linking methods for the microencapsulation of living cells. Recent applications of bacteria microencapsulation using microfluidic systems since 2017 are presented.

Allam, A. N. and M. M. Mehanna (2016). "Formulation, physicochemical characterization and in-vivo evaluation of ion-sensitive metformin loaded-biopolymeric beads." Drug Development and Industrial Pharmacy **42**(3): 497-505.

The demand on the controlled release of short acting antidiabetic drug, metformin (MT), has been increased dramatically. Thus, boosting the development of new sustained release formulations with contents of multi-micro-scaled particles. This paved the way for the preparation of MT-loaded Gellan gum (GG) microbeads through inotropic gelation technique. The prepared beads were characterized for the following parameters; yield and loading efficiency particle size, particles morphology and topography, swelling behavior, and in-vitro release studies. In view of any possible interactions, differential scanning calorimetry and infrared spectroscopy were performed. As an ultimate evaluation, the relative bioavailability of the sustained release beads was studied in healthy volunteers after oral administration in a fasted state compared to commercially available immediate and extended release tablets using a new validated HPTLC method for MT assay in urine. Results obtained revealed that the formulated Gellan beads were spherical in shape with less smooth surface in the micron range with high yield and entrapment efficiency. In-vitro release studies of the prepared beads were achieved up to 8 h. The prolonged release of MT can be explained through various factors among them; the swelling of the biopolymer and the ionic interaction between the drug and the GG. After oral administration, the AUC<inf>0-24</inf>, t<inf>1/2</inf> and t<inf>max</inf> of the prepared beads were of 246.74 +/- 26.81 mg, 11.84 +/- 2.79 and 7.17 +/- 1.75 h, respectively, demonstrating its bioequivalence to the marketed products. In conclusion, the formulated GG microbeads exhibit potentials as an oral sustained release MT system. Copyright © 2015 Taylor & Francis.

Allen, A. S., et al. (2017). "Chemoreception drives plastic consumption in a hard coral." Marine Pollution Bulletin **124**(1): 198-205.

The drivers behind microplastic (up to 5 mm in diameter) consumption by animals are uncertain and impacts on foundational species are poorly understood. We investigated consumption of weathered, unfouled, biofouled, pre-production and microbe-free National Institute of Standards plastic by a scleractinian coral that relies on chemosensory cues for feeding. Experiment one found that corals ingested many plastic types while mostly ignoring organic-free sand, suggesting that plastic contains phagostimulents. Experiment two found that corals ingested more plastic that wasn't covered in a microbial biofilm than plastics that were biofilmed. Additionally, corals retained ~ 8% of ingested plastic for 24 h or more and retained particles appeared stuck in corals, with consequences for energetics, pollutant toxicity and trophic transfer. The potential for chemoreception to drive plastic consumption in marine taxa has implications for conservation. Copyright © 2017 Elsevier Ltd

Allen, B., et al. (2019). "Microplastic freshwater contamination: an issue advanced by science with public engagement." Environmental Science & Pollution Research **26**(17): 16904-16905.

Allen, S., et al. (2019). "Atmospheric transport and deposition of microplastics in a remote mountain catchment." Nature Geoscience **12**(5): 339-344.

Plastic litter is an ever-increasing global issue and one of this generation's key environmental challenges. Microplastics have reached oceans via river transport on a global scale. With the exception of two megacities, Paris (France) and Dongguan (China), there is a lack of information on atmospheric microplastic deposition or transport. Here we present the observations of

atmospheric microplastic deposition in a remote, pristine mountain catchment (French Pyrenees). We analysed samples, taken over five months, that represent atmospheric wet and dry deposition and identified fibres up to ~750 µm long and fragments ≤300 µm as microplastics. We document relative daily counts of 249 fragments, 73 films and 44 fibres per square metre that deposited on the catchment. An air mass trajectory analysis shows microplastic transport through the atmosphere over a distance of up to 95 km. We suggest that microplastics can reach and affect remote, sparsely inhabited areas through atmospheric transport.

Allione, A., et al. (2016). "Anticoagulants used in plasma collection affect adipokine multiplexed measurements." Cytokine **80**: 43-47.

Obesity is an important health problem worldwide. Adipose tissue acts as an endocrine organ that secretes various bioactive substances, called adipokines, including pro-inflammatory biomarkers such as TNF-alpha, IL-6, leptin and C-reactive protein (CRP) and anti-inflammatory molecules such as adiponectin. The deregulated production of adipokines in obesity is linked to the pathogenesis of various disease processes and monitoring their variation is critical to understand metabolic diseases. The aim of this study was to determine the plasma concentration of adipokines in healthy subjects by multiplexed measurements and the effect of anticoagulants on their levels. Plasma samples from 10 healthy donors were collected in two different anticoagulants (sodium citrate or heparin). All markers, excluding TNF-alpha, showed significantly higher concentrations in heparinized compared to citrate plasma. However, levels of adipokines in different plasma samples were highly correlated for most of these markers. We reported that different anticoagulants used in the preparation of the plasma samples affected the measurements of some adipokines. The importance of the present results in epidemiology is relevant when comparing different studies in which blood samples were collected with different anticoagulants.

Alloush, J., et al. (2014). "Contribution of tripartite motif proteins modulating membrane repair to the pathogenesis of autoimmune-mediated myositis." Arthritis and Rheumatology **10)**: S966-S967.

Background/Purpose: The idiopathic inflammatory myopathies are a heterogeneous group of diseases that result in autoimmunity toward muscles and lead to tissue destruction, but the pathogenesis remains largely unknown. Synaptotagmin VII-knockout (Syt VII^{-/-}) mice display mild myositis and we have previously demonstrated that combining this genetic defect with regulatory T-cell deficiency (FoxP3^{-/Y}) results in a robust inflammatory myositis when adoptively transferred into immunodeficient (RAG1^{-/-}) recipients. Interestingly, Syt VII^{-/-} mice have impaired sarcolemmal membrane resealing capacity, which allows exposure of intracellular antigens. Tripartite motif (TRIM) proteins have also been linked to membrane repair capacity and are associated with myopathy in human patients. Here, we examined protein expression levels and subcellular localization of several novel TRIM proteins linked to membrane repair capacity in muscle tissue from mice using the Syt VII^{-/-}/FoxP3^{-/Y} model of myositis. Method(s): Membrane repair was monitored in vitro in cells using an established assay where the membrane of cultured cells is physically disrupted by glass microbeads. Mouse skeletal muscle was collected from wild type mice exercised on a treadmill or RAG1^{-/-} mice adoptively transferred with lymph node preparations from Syt VII^{-/-}/FoxP3^{-/Y} mice. Tissue was analyzed by standard Western immunoblotting and by immunohistochemistry. Result(s): We identified multiple TRIM family proteins that can modulate membrane repair capacity in cultured cells. Our results show that TRIM27 translocates to the membrane of injured muscle cells in vivo, as shown by immunohistochemistry. Similarly, when mice were exposed to membrane disruption due to eccentric contractions during treadmill running, there was translocation of TRIM27 from a diffuse pattern to the damaged membrane. In skeletal muscle of RAG1^{-/-} mice, expression of several TRIM proteins, including TRIM27, was altered and displayed differential subcellular localization. Conclusion(s): We have identified altered expression and localization of TRIM proteins in muscle in this mouse model of myositis. These results highlight an association of decreased sarcolemmal membrane integrity in the development of myositis and suggest a mechanism that could be targeted for diagnostics and therapeutics in these diseases. (Figure Presented).

Al-Maaded, M., et al. (2012). "An Overview of Solid Waste Management and Plastic Recycling in Qatar." Journal of Polymers & the Environment **20**(1): 186-194.

Municipal solid waste management (MSWM) constitutes one of the most crucial health and environmental problems facing authorities in the Arabian Gulf. Recent literature on current solid waste management (SWM) in Qatar has been reviewed in this paper, and a focused study has been carried out to provide a review on the total amount of municipal solid waste generated, stored, collected, disposed as well as the constituents of the waste. The analysis showed that Qatar produced around 2,000,000 tons of solid municipal waste annually, corresponding to a daily generation rate per capita of about 2.5 kg. About 60% of MSW is organic material and about 300 kg is composed daily. Landfill and composting is considered the most appropriate waste disposal techniques in Qatar. Um-Al-Afai landfill has nearly 80% of MSW. Because of the increased migration in Qatar, there is a sharp rise in the volume and also in the variety of solid waste. It is important to alleviate societal concerns over the increased rate of resource consumption and waste production; thus, policy makers have encouraged recycling and reuse strategies to reduce the demand for raw materials and to decrease the quantity of waste going to landfill. An example of the benefit of mechanical recycling of plastics compared to land filling and composting was conducted by GaBi 4 life cycle analysis tool which showed the benefits to the global warming and human toxicity. Recycling is the favored solution for plastic waste management, because it has a lower environmental impact on the defined impact categories, from Global Warming Potential (GWP) and Human Toxicity Potentials (HTP) indicators. [ABSTRACT FROM AUTHOR]

Almari, B., et al. (2019). "Fabrication of Amyloid-beta-Secreting Alginate Microbeads for Use in Modelling Alzheimer's Disease." Journal of Visualized Experiments **149**: 06.

According to the amyloid cascade hypothesis, the earliest trigger in the development of Alzheimer's disease (AD) is the accumulation of toxic amyloid-beta (Abeta) fragments, eventually leading to the classical features of the disease: amyloid plaques, neurofibrillary tangles and synaptic and neuronal loss. The lack of relevant non-transgenic preclinical models reflective of disease progression is one of the main factors hindering the discovery of effective drug treatments. To this end, we have developed a protocol for the fabrication of alginate microbeads containing amyloid-secreting cells useful for the study of the effects of chronic Abeta production. Chinese hamster ovary cells previously transfected with a human APP gene, secreting Abeta (i.e., 7PA2 cells), were used in this study. A three-dimensional (3D) in vitro model for the sustained release of Abeta was fabricated by encapsulation of 7PA2 cells in alginate. The process was optimized to target a bead diameter of 500-600 mum for further in vivo studies. Optimization of 7PA2 cell encapsulation in alginate was performed altering fabrication parameters, e.g., alginate concentration, gel flow rate, electrostatic potential, head vibration frequency, gelling solution. Levels of secreted Abeta were analyzed over time and compared between alginate beads and standard cell culture methods (up to 96 h). A concentration of 1.5 x 10⁶ 7PA2 cells/mL and an alginate concentration of 2% (w/v) buffered with HEPES and subsequent gelation in 0.5 M calcium chloride for 5 min were found to fabricate the most stable microbeads. Fabricated microbeads were 1) of uniform size, 2) with an average diameter of 550 mum, 3) containing about 100-150 cells per microbead and 4) able to secrete Abeta. In conclusion, our optimized method for the production of stable alginate microbeads containing amyloid-producing 7PA2 cells might enable the modeling of important aspects of AD both in vitro and in vivo.

Almeida, C. M. R., et al. (2019). "Adsorption of Cd and Cu to different types of microplastics in estuarine salt marsh medium." Marine Pollution Bulletin **(no pagination)**(110797).

This study aimed to investigate if microplastics (MPs) type (polyethylene microspheres (mPE), fishing line fibers, film plastic bags MPs and bottle cap particles) and aging affect MPs capacity to sorb Cd or Cu in estuarine salt marsh medium. Tests were carried out in elutriate solution, a simple medium obtained by mixing rhizosediment (sediment in contact with plants roots) with the respective estuarine water, that can be used to simulate water-sediment exchanges in estuarine salt marsh environments. After 7 days of exposure, metals adsorption was only detected for film MPs. No differences were observed between virgin and aged MPs. Salinity also did not influence metal adsorption to mPE. Present results indicate that in estuarine salt marsh areas some types of MPs might adsorb metals, which could affect metals availability. Copyright © 2019 Elsevier Ltd

Almeida, E. L., et al. (2019). "In silico Screening and Heterologous Expression of a Polyethylene Terephthalate Hydrolase (PETase)-Like Enzyme (SM14est) With Polycaprolactone (PCL)-Degrading Activity, From the Marine Sponge-Derived Strain Streptomyces sp. SM14." Frontiers in Microbiology **10**: 2187.

Plastics, such as the polyethylene terephthalate (PET), are widely used for various industrial applications, due to their physicochemical properties which are particularly useful in the packaging industry. However, due to improper plastic waste management and difficulties in recycling, post-consumer plastic waste has become a pressing issue for both the environment and for human health. Hence, novel technologies and methods of processing plastic waste are required to address these issues. Enzymatic-assisted hydrolysis of synthetic polymers has been proposed as a potentially more efficient and environment-friendly alternative to the currently employed methods. Recently, a number of PET hydrolases have been described, and in particular a PETase derived from Ideonella sakaiensis 201-F6 (IsPETase), which appears to be the most efficient and substrate-specific bacterial PET hydrolase enzyme discovered to date. In order to further investigate this class of PETase-like enzymes, we employed an in silico-based screening approach on the biotechnologically relevant genus Streptomyces, including terrestrial and marine isolates; in a search for potential PETase homologs. From a total of 52 genomes analyzed, we were able to identify three potential PETase-like enzymes, all of which were derived from marine-sponge associated Streptomyces isolates. A candidate PETase-like gene (SM14est) was identified in Streptomyces sp. SM14. Further in silico characterization of the SM14est protein sequence and its predicted three-dimensional structure were performed and

compared to the well-characterized IsPETase. Both the serine hydrolase motif Gly-x1-Ser-x2-Gly and the catalytic triad Ser, Asp, His are conserved in both sequences. Molecular docking experiments indicated that the SM14est enzyme possessed the capacity to bind plastics as substrates. Finally, polyesterase activity was confirmed using a polycaprolactone (PCL) plate clearing assay which is a model substrate for the degradation of plastics; following heterologous expression of SM14est in Escherichia coli, with secretion being facilitated by the native Streptomyces signal peptide. These findings provide further insights into this important class of PETase-like enzymes.

Almeida, M., et al. (2019). "Polystyrene nanoplastics alter the cytotoxicity of human pharmaceuticals on marine fish cell lines." Environmental Toxicology & Pharmacology **69**: 57-65.

There is an increasing concern on the consequences of the presence of micro(nano)plastics to marine organisms. The present study aimed to provide information on the effects of polystyrene nanoplastics (PSNPs) to fish cells alone and combined with human pharmaceuticals, other emerging contaminants, using as biological models marine fish cell lines SAF-1 and DLB-1. Cells were exposed for 24 h to 100 nm PSNPs, starting at 0.001 up to 10 mg/L, to assess effects on viability and activity of catalase (antioxidant defense) and glutathione S-transferases (phase II biotransformation and antioxidant defense). The viability of cells was also evaluated after exposure to human pharmaceuticals alone and combined with PSNPs. Overall, PSNPs failed to be cytotoxic but data proved their ability to alter the toxicity of human pharmaceuticals. DLB-1 was the most sensitive cell line to PSNPs. Data support the use of marine fish cell lines in the study of the effects of micro(nano)plastics.

Almodovar, J., et al. (2013). "Gradients of physical and biochemical cues on polyelectrolyte multilayer films generated via microfluidics." Lab on a Chip **13**(8): 1562-1570.

The cell microenvironment is a complex and anisotropic matrix composed of a number of physical and biochemical cues that control cellular processes. A current challenge in biomaterials is the engineering of biomimetic materials which present spatially controlled physical and biochemical cues. The layer-by-layer assembly of polyelectrolyte multilayers (PEM) has been demonstrated to be a promising candidate for a biomaterial mimicking the native extracellular matrix. In this work, gradients of biochemical and physical cues were generated on PEM films composed of hyaluronan (HA) and poly(l-lysine) (PLL) using a microfluidic device. As a proof of concept, four different types of surface concentration gradients adsorbed onto the films were generated. These included surface concentration gradients of fluorescent PLL, fluorescent microbeads, a cross-linker, and one consisting of a polyelectrolyte grafted with a cell adhesive peptide. In all cases, reproducible centimeter-long linear gradients were obtained. Fluorescence microscopy, Fourier transform infrared spectroscopy and atomic force microscopy were used to characterize these gradients. Cell responses to the stiffness gradient and to the peptide gradient were studied. Pre-osteoblastic cells were found to adhere and spread more along the stiffness gradient, which varied linearly from 200 kPa-600 kPa. Myoblast cell spreading also increased throughout the length of the increasing RGD-peptide gradient. This work demonstrates a simple method to modify PEM films with concentration gradients of non-covalently bound biomolecules and with gradients in stiffness. These results highlight the potential of this technique to efficiently and quickly determine the optimal biochemical and mechanical cues necessary for specific cellular processes. © 2013 The Royal Society of Chemistry.

Almroth, B. C. and H. Eggert (2019). "Marine Plastic Pollution: Sources, Impacts, and Policy Issues."

Review of Environmental Economics & Policy **13**(2): 317-326.

Plastics have been instrumental in providing access to clean drinking water, medical applications, and improved hygiene and food safety. However, plastics also cause problems. More than 10 million tons of plastic enter the oceans annually. Marine plastic pollution has documented impacts on marine organisms and ecosystem services. The use of chemical additives in plastics also poses a potential threat to human health. While desirable, recycling of plastics is currently constrained by material and chemical complexity, limitations in available technologies, and market demands. This article provides a brief introduction to plastic materials, marine plastic pollution, and its potential effects on marine ecosystems and human health. We also discuss some of the policy and technical issues and suggest priorities for further research. [ABSTRACT FROM AUTHOR]

Almustapha, M. N., et al. (2019). "Modification of acidic and textural properties of a sulphated zirconia catalyst for efficient conversion of high-density polyethylene into liquid fuel." Environmental Science & Pollution Research **10**: 10.

Consumption of plastic has a rapid increase of about 8% per annum and reached to 400 million per tonnes approximately, where about 50% of plastic was disposed after using only once. Different techniques for treating this increased waste faced a number of issues related to cost and environmental and sustainable development. Catalytic conversion has been found as one of the most viable solutions to solve this problem. Sulphated zirconia (SZ) catalyst modified with calcium carbide (CC) was found to improve high-density polyethylene (HDPE) conversion into liquid fuel. The liquid content was improved from 39.0wt% to 66.0wt% at 410 degreeC. HDPE was converted 100% by weight using, SZ/CC with 66wt% liquid yield as compared to the conversion of approximately 98wt% with about 40wt% only liquid yield for the pure SZ. The composition of hydrocarbon liquid product was significantly changed from paraffin (16%) and aromatic (58%) to olefin (74%) and naphthenic (23%) compounds. This significant increase in liquid was related to changes in the acidic and textural characteristics of the new hybrid catalyst, SZ/CC where the total ammonia desorption of 337.0 mum NH₃/g for the SZ was modified to 23.4 mum NH₃/g for the SZ/CC. Both SZ and SZ/CC catalysts showed characteristics of mesoporous material, where the internal pore volume of SZ had reduced from 0.21 mL/g for SZ to 0.04 mL/g for SZ/CC. Furthermore, XRD analysis indicated the presence of a new compound, CaZrO₃ in the SZ/CC, which confirmed a chemical interaction between the SZ and CC through sintering of ZrO₂ and CaO. Therefore, the SZ/CC catalyst improves the liquid yield significantly and the selectivity towards olefinic and naphthenic compounds.

Alomar, C. and S. Deudero (2017). "Evidence of microplastic ingestion in the shark Galeus melastomus Rafinesque, 1810 in the continental shelf off the western Mediterranean Sea." Environmental Pollution **223**: 223-229.

Microplastic (<5 mm) ingestion has been recorded in Galeus melastomus, the blackmouth catshark, around the Balearic Islands. In total 125 individuals were analyzed for microplastic ingestion. Results have shown that 16.80% of the specimens had ingested a mean value of 0.34

+/- 0.07 microplastics/individual. Stomach fullness index ranged from 0.86 to 38.89% and regression analyses showed that fuller stomachs contained more microplastics. A higher quantity of filament type microplastics were identified compared to granular or hard plastic type. No significant differences were given between ingestion values of two locations over the continental shelf providing further evidence of the ubiquitous distribution of microplastics. The findings in this study reflect the availability of this man made contaminant to marine species in seafloor habitats. Based on results from this study, data on microplastic ingestion could be used to study trends in the amount and composition of litter ingested by marine animals in accordance with descriptor 10 of the Marine Strategy Framework Directive. Copyright © 2017 Elsevier Ltd

Alomar, C., et al. (2016). "Microplastics in the Mediterranean Sea: Deposition in coastal shallow sediments, spatial variation and preferential grain size." Marine Environmental Research **115**: 1-10.
Marine litter loads in sea compartments are an emergent issue due to their ecological and biological consequences. This study addresses microplastic quantification and morphological description to test spatial differences along an anthropogenic gradient of coastal shallow sediments and further on to evaluate the preferential deposition of microplastics in a given sediment grain fraction. Sediments from Marine Protected Areas (MPAs) contained the highest concentrations of microplastics (MPs): up to 0.90 +/- 0.10 MPs/g suggesting the transfer of microplastics from source areas to endpoint areas. In addition, a high proportion of microplastic filaments were found close to populated areas whereas fragment type microplastics were more common in MPAs. There was no clear trend between sediment grain size and microplastic deposition in sediments, although microplastics were always present in two grain size fractions: 2 mm > x > 1 mm and 1 mm > x 0.5 mm.

Alomar, C., et al. (2017). "Microplastic ingestion by Mullus surmuletus Linnaeus, 1758 fish and its potential for causing oxidative stress." Environmental Research **159**: 135-142.
A total of 417 striped red mullet, Mullus surmuletus, were analyzed to study microplastic ingestion and livers of fish were assessed to study effects of microplastics. Nearly one third (27.30%) of the individuals were quantified to ingest microplastics although there was no evidence of oxidative stress or cellular damage in the liver of fish which had ingested microplastics. A small increase in the activity of glutathione S-transferase (GST) of M. surmuletus was detected which could be suggesting an induction of the detoxification systems but these findings should be tested in laboratory conditions under a controlled diet and known concentration of microplastics. Fish from trammel fisheries, operating closer to land and targeting larger individuals, showed higher mean ingestion values than fish from trawling fisheries, and were related to body size, as microplastics ingested increased with total fish length. Consequently, ingestion values of microplastics were not related to sampling distance from land giving further evidence of the ubiquity of microplastics in the marine environment. Finally, Fourier Transform Infrared Spectroscopy (FTIR) analysis showed that the vast majority of microplastics were filament type and polyethylene terephthalate (PET) was the main identified component.

Al-Salem, S. M. (2019). "Influential parameters on natural weathering under harsh climatic conditions of mechanically recycled plastic film specimens." Journal of Environmental Management **230**: 355-365.
In this work, real life reclaimed plastic solid waste (PSW) secured from the municipal sector was mechanically recycled and compounded with virgin linear low density polyethylene (LLDPE). The compounding of the plastic film samples utilised the means of extrusion and blown filming to

produce various formulations of the blends containing up to 100% (by weight) of the PSW in the examined specimens. The film samples were compared to market products used in the State of Kuwait where PSW accumulation presents a major obstacle. Natural weathering under arid and harsh climatic conditions was also performed to determine the degradation extent of the film samples. Haze (%), light transmission (%) and the total change in colour (DELTAE) were measured as indicators to the degradation profile of the polymeric materials, in addition to tensile pull mechanical properties. Properties were noted to deteriorate as a function of weathering time and waste content. Statistical analysis was also performed on the properties measured and climatic conditions including airborne pollutants levels. The abundance of the secondary airborne pollutant (ozone) was determined to be a significant variable on the studied properties. This can be attributed to induced photo-oxidation the polymeric matrix is subjected to under such climatic conditions which increases oxygen diffusion throughout the polymeric matrix. Future development of the recycled blends studied in this work can be a route for the decrease of associated environmental stressors with virgin plastic resin conversion.

Al-Salem, S. M., et al. (2017). "A review on thermal and catalytic pyrolysis of plastic solid waste (PSW)." Journal of Environmental Management **197**: 177-198.

Plastic plays an important role in our daily lives due to its versatility, light weight and low production cost. Plastics became essential in many sectors such as construction, medical, engineering applications, automotive, aerospace, etc. In addition, economic growth and development also increased our demand and dependency on plastics which leads to its accumulation in landfills imposing risk on human health, animals and cause environmental pollution problems such as ground water contamination, sanitary related issues, etc. Hence, a sustainable and an efficient plastic waste treatment is essential to avoid such issues. Pyrolysis is a thermo-chemical plastic waste treatment technique which can solve such pollution problems, as well as, recover valuable energy and products such as oil and gas. Pyrolysis of plastic solid waste (PSW) has gained importance due to having better advantages towards environmental pollution and reduction of carbon footprint of plastic products by minimizing the emissions of carbon monoxide and carbon dioxide compared to combustion and gasification. This paper presents the existing techniques of pyrolysis, the parameters which affect the products yield and selectivity and identify major research gaps in this technology. The influence of different catalysts on the process as well as review and comparative assessment of pyrolysis with other thermal and catalytic plastic treatment methods, is also presented.

Al-Salem, S. M., et al. (2019). "Study of the degradation profile for virgin linear low-density polyethylene (LLDPE) and polyolefin (PO) plastic waste blends." The Journal of Material Cycles and Waste Management **21**(5): 1106-1122.

In this study, the properties of virgin linear low-density polyethylene (LLDPE) and its blends with reclaimed plastic solid waste (PSW) are investigated by thermogravimetry, differential scanning calorimetry (DSC), infrared spectroscopy and scanning electron microscopy (SEM). The PSW constituted polyolefin (PO) polymers recycled mechanically via extrusion/blown-film and exposed to accelerated weathering tests to determine the change in their degradation behaviour. The oxidation products determined using the FTIR analysis and thermal stability studies points toward the blend constituting 25% of waste by weight as the most stable. Changes in crystallinity of the polymers were attributed to the crystal size change as a consequence of the weathering mechanism. The DSC results revealed that both oxidation induction temperature (OIT) and crystallinity were affected by the PO waste content. This points towards the impact of polymers immiscibility and polydispersity within the matrix of the blends due to chain scission reaction and oxidation with the UV exposure.

Al-Salem, S. M., et al. (2019). "On the Kinetics of Degradation Reaction Determined Post Accelerated Weathering of Polyolefin Plastic Waste Blends." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(3): 30.

Polyolefin (PO) polymers constitute the majority of consumer plastic commodities. The reliance on such materials make it near imposable to avoid touching one in any given day. Therefore, the accumulation of plastic solid waste (PSW) in developed and developing societies alike requires immediate attention to manage and valorize this type of waste. In this work, PSW originating from real life sources and virgin linear low-density polyethylene (LLDPE) films were compounded in a mechanical recycling effort. The recycled blends constituted up to 100% (by weight) of the waste material. Accelerated weathering (aging) was conducted on the blends, reaching threshold limit of exposure to study the major changes occurring on the recycled blends. Thermogravimetry and differential scanning calorimetry (DSC) were used to determine their characteristics and applicability for future recycling using thermo-chemical treatment (TCT) methods. Analytical solution methods following the international committee of thermal analysis and calorimetry (ICTAC) were followed in conducting the measurements and kinetic calculations alike. A novel analytical mathematical solution model is also introduced to determine both the pre-exponential factor (A_o) and apparent activation energy (E_a) of the degradation reaction. The model proved to be a more accurate analysis tool, and the work in whole enabled the determination of future plans for using such waste components as a feedstock to thermal units.

Alshawafi, A., et al. (2017). "Assessment of marine debris on the coastal wetland of Martil in the North-East of Morocco." Marine Pollution Bulletin **117**(1-2): 302-310.

Plastic waste at the coastal wetland in Martil beach in the North-East of Morocco is one of the problems that have appeared recently. This study aims to characterize the marine debris in the coast of Martil during the year 2015. The sampling is seasonally by type and size. The result shows, for the macro debris, the abundance of plastic (57%), lumber and paper (21.93%), cloth and fabric (7.8%), glass (5.42%), metal (4.40%), and rubber (3.4%). Micro debris is also present in the area in several forms such as wood, plants, and others by 75,63%. This was followed by the foam (26,95%), line (7,8%), and the film (1,23%). The seasonal variation (S1: January-March and S3: July to September) are the most polluted months of the year. The sources of marine debris are mainly tourism (beach users), land (run off), and commercial fishing in the four seasons of the year. Copyright © 2017 Elsevier Ltd

Al-Sid-Cheikh, M., et al. (2018). "Uptake, Whole-Body Distribution, and Depuration of Nanoplastics by the Scallop Pecten maximus at Environmentally Realistic Concentrations." Environmental Science & Technology **52**(24): 14480.

Previous studies of uptake and effects of nanoplastics by marine organisms have been conducted at what may be unrealistically high concentrations. This is a consequence of the analytical challenges in tracking plastic particles in organisms at environmentally relevant concentrations and highlights the need for new approaches. Here, we present pulse exposures of 14C-radiolabeled nanopolystyrene to a commercially important mollusk, Pecten maximus, at what have been predicted to be environmentally relevant concentrations (<15 μg L–1). Uptake was rapid and was greater for 24 nm than for 250 nm particles. After 6 h, autoradiography showed accumulation of 250 nm nanoplastics in the intestine, while 24 nm particles were dispersed throughout the whole-body, possibly indicating some translocation across epithelial

membranes. However, depuration was also relatively rapid for both sizes; 24 nm particles were no longer detectable after 14 days, although some 250 nm particles were still detectable after 48 days. Particle size thus apparently influenced the biokinetics and suggests a need for chronic exposure studies. Modeling extrapolations indicated that it could take 300 days of continued environmental exposure for uptake to reach equilibrium in scallop body tissues although the concentrations would still below 2.7 mg g–1. Comparison with previous work in which scallops were exposed to nonplastic (silver) nanomaterials of similar size (20 nm), suggests that nanoparticle composition may also influence the uptake tissue distributions somewhat.

Altinok, H., et al. (2008). "COVALENT IMMOBILIZATION OF INVERTASE ON CHEMICALLY ACTIVATED POLY (STYRENE-2-HYDROXYETHYL METHACRYLATE) MICROBEADS." Journal of Food Biochemistry **32**(3): 299-315.

ABSTRACTA carrier for invertase enzyme was synthesized from styrene (S) and 2- hydroxyethyl methacrylate (HEMA) in the form of microbeads. These poly (styrene-2-hydroxyethyl methacrylate), P(S-HEMA) microbeads were activated by epichlorohydrin (ECH) treatment for covalent immobilization. The free and immobilized invertase were assayed in the hydrolysis of sucrose to glucose, and the obtained results were compared. The optimum pH was 4.5 for free and 5.5 for immobilized invertase. The optimum temperature of invertase shifted from 45C to 55C upon immobilization. For free and immobilized enzymes, kinetic parameters were calculated as 4.1 10-3molL-1and 9.210-3molL-1fo r Km, and 6.610-2molL-1&# x2003; min-1and 4.110-1molL-1&# x2003; min-1for Vmax, respectively. After 1 month of storage at 4C, free enzyme retained 36% of its initial activity, while for the ECH-activated P(S-HEMA) immobilized enzyme, P(S-HEMA)-E, this value was observed as 67%. In repeated batch use, i.e., 20 times in 3 days, 78% retention of the initial activity was observed for P(S-HEMA)-E system.PRACTICAL APPLICATIONSImmobilization of enzymes are very important for many industrial applications, e.g., food, medicine, pharmacology, etc. Invertase converts sucrose to glucose and fructose, which have wide applications in food industry especially as sweeteners. Glucose-fructose mixture has much lower crystallinity compared to sucrose and therefore used in the production of noncrystallizing jams and creams. They are also used as liquid sweeteners. Immobilization enables repeated use, provides significant reduction in the operation costs, facilitates easy separation and speeds up recovery of enzyme and extends the stability of enzyme by protecting the active material from deactivation. Industrial application of immobilized invertase may decrease the production cost of glucose-fructose mixture because it could be used repeatedly for long periods. Although invertase is not a very expensive enzyme, the technique can also be applied to expensive ones for biotechnological productions.

Altomare, D. F., et al. (2008). "Carbon-coated microbeads anal injection in outpatient treatment of minor fecal incontinence." Diseases of the Colon & Rectum **51**(4): 432-435.

PURPOSE: Anal bulking agents are injected to pose a stronger obstacle to the involuntary passage of feces and gas. This prospective, multicenter study was designed to evaluate the safety and efficacy of Durasphere anal injection for the treatment of fecal incontinence.

PATIENTS AND METHODS: Thirty-three unselected patients with incontinence (24 females; mean age, 61.5 +/- 14 (range, 22-83) years) underwent anal bulking agent submucosal injection with carbon-coated microbeads (Durasphere) in the outpatient regimen. The causes of incontinence were obstetric lesions in 18.2 percent, iatrogenic in 36.4 percent, rectal surgery in 12.1 percent, and idiopathic in 33.3 percent. Previous unsuccessful treatments for fecal incontinence included diet and drugs in 16 patients, biofeedback training in 7 patients, sacral nerve modulation in 6 patients, sphincteroplasty in 2 patients, artificial bowel sphincter in 1 patient, and PTQ

macroplastique bulking agent in 1 patient. Under local anesthesia and antibiotic prophylaxis, a mean of 8.8 (range, 2-19) ml of Durasphere were injected into the submucosa by using a 1.5-inch, angled, 18-gauge needle.

RESULTS: After a median follow-up of 20.8 (range, 10-22) months, the median Cleveland Clinic continence score decreased significantly from 12 to 8 (P < 0.001) and the median American Medical System score from 89 to 73 (P = 0.0074), but the Fecal Incontinence Quality of Life did not change significantly (74 to 76, P = not significant). Anal manometry significantly improved (resting pressure increasing from 34 to 42 mmHg; P = 0.008) and squeezing pressure from 66 to 79 mmHg (P = 0.04). Two patients complained of moderate anal pain for a few days after the implant, one patient had asymptomatic leakage of the injected material through a mucosa perforation, and two had distal migration of the Durasphere along the dentate line.

CONCLUSIONS: Anal bulking agent injection is a safe treatment and can mitigate the severity of fecal incontinence by increasing anal pressure but does not significantly improve the quality of life.

Alvarez, G., et al. (2018). "The use of European shag pellets as indicators of microplastic fibers in the marine environment." Marine Pollution Bulletin **137**: 444-448.

Microplastic particles are abundant marine pollutants that are ingested by many seabirds. Some seabirds regurgitate non-digestible materials in the form of pellets and their analysis may be useful to study the abundance of plastic debris at the local scale. Here, we aimed to provide baseline data for the presence of microplastics in pellets regurgitated by European shags (Phalacrocorax aristotelis) (n=41) in the Iberia peninsula (NW Spain). We found microplastic fibers in 63% of pellets, suggesting that this type of plastic pollution is prevalent in the study area. According to Fourier Transform Infrared spectrometry, nylon fibers were the most abundant, followed by polyester. We also found that the presence of microplastics was higher in pellets containing remains of benthic fishes. Our results suggest that shag pellets may be useful to monitor microplastic pollution in coastal waters.

Alvarez-Hernandez, C., et al. (2019). "Microplastic debris in beaches of Tenerife (Canary Islands, Spain)." Marine Pollution Bulletin **146**: 26-32.

The occurrence and composition of microplastics (1-5 mm) was evaluated in six beaches of the island of Tenerife (Canary Islands, Spain). Two of them were located at the North coast (El Socorro and San Marcos) and the rest in the South littoral (Leocadio Machado, El Poris, Los Abriguitos and Playa Grande). Sampling was developed during the months of October, November and December 2018 (depending on the beach) above the high tide line. Isolated microplastics were identified by attenuated total reflection infrared spectroscopy. All the beaches showed a relatively low content of microplastics, below 3.5 g/m², which is also below 0.069 g/L of sand, except for Playa Grande, which showed an average content of 99 g/m² or 2.0 g/L of sand. Tar pollution (around 18%) was also found in Playa Grande. The major polymers found were polyethylene, polypropylene and polystyrene, accounting for 69%, 18% and 4%, respectively. Copyright © 2019 Elsevier Ltd

Alves, V. E., et al. (2016). "Do different degrees of human activity affect the diet of Brazilian silverside Atherinella brasiliensis?" Journal of Fish Biology **89**(2): 1239-1257.

The aim of the present study was to test whether different degrees of human activity affect the diet of the Brazilian silverside Atherinella brasiliensis in two tropical estuaries. Fish were collected along the salinity gradient of two Brazilian estuaries, the heavily impacted Paraiba Estuary and the less impacted Mamanguape Estuary, in the dry and wet seasons. The findings confirm that A. brasiliensis has generalist feeding habits and is able to change its diet under different environmental conditions. The results indicate clear spatial (i.e. along the estuarine gradient) changes in diet composition in both estuaries, but diet was also influenced by the degree of anthropogenic disturbance. During the wet season in the nutrient enriched Paraiba Estuary, when human activity was higher, the diet of A. brasiliensis was poorer and dominated by few dietary items, reflecting the potential impoverishment of prey items in this heavily disturbed system. The specimens collected in the most affected estuary also had a greater frequency of micro-plastics and parasites in their stomachs, reflecting the greater degree of human disturbance in the estuary. The present findings suggest that the diet of A. brasiliensis could be a useful indicator of changes in the ecological quality of these and other tropical estuaries of the western Atlantic Ocean.

Alves, V. E. N. and G. M. Figueiredo (2019). "Microplastic in the sediments of a highly eutrophic tropical estuary." Marine Pollution Bulletin **146**: 326-335.

Given the implications of microplastics contamination in aquatic ecosystems and information scarcity about microplastic abundances in estuarine sediments, this study aimed to quantify and describe the microplastics in the sublittoral sediments from Guanabara Bay. Sediment samples were collected at four sites and three months, microplastics were separated and classified according to type, color, size, and polymer composition. High abundances of microplastic (160 to 1000 items kg⁻¹ or 4367 to 25,794 items m⁻²) occurred independent of area or period, indicating microplastics are widely spread in Guanabara Bay. The dominant microplastic in the sediment was the translucent polyester microfiber of <1 mm size; which is a secondary microplastic, possibly coming from washing machines wastes. The extremely high availability of microplastics in Guanabara Bay, compared to the majority of studies around the world, suggests high risk of contamination to benthic organisms and demersal fish, as they may be ingesting microplastics.

Amamiya, K., et al. (2019). "Evidence of transport of styrene oligomers originated from polystyrene plastic to oceans by runoff." Science of the Total Environment **667**: 57-63.

This study demonstrates for the first time that styrene oligomers (SOs), which are indicators of polystyrene (PS) plastic contamination in the environment, are transported from land to the ocean. Samples of sand and seawater were taken from the coastline of the Tokyo Bay over the past four years, and all samples of both sand and seawater were found to contain SOs such as styrene monomer (SM), styrene dimers (SD), and styrene trimers (ST), with the concentration distributions of these being in the order of ST>SD>SM. The concentrations of these SOs are linearly proportional to monthly precipitation. These results indicate that various land-based SOs sources are connected with the estuary, a substantial amount of which are transported into Tokyo Bay through runoff as overland flow. As a result, runoff by precipitation is a potential transport pathway of land-based SOs sources. This finding is of interest in terms of both the extent of PS plastic pollution and the transport of SOs to the ocean. CAPSULE ABSTRACT: The assessment of the transport of styrene oligomers (SOs) in the coastal environment is performed.

Amand, L. E. and H. Kassman (2013). "Decreased PCDD/F formation when co-firing a waste fuel and biomass in a CFB boiler by addition of sulphates or municipal sewage sludge." Waste Management **33**(8): 1729-1739.

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) are formed during waste incineration and in waste-to-energy boilers. Incomplete combustion, too short residence times at low combustion temperatures (<700degreeC), incineration of electronic waste and plastic waste containing chlorine are all factors influencing the formation of PCDD/Fs

in boilers. The impact of chlorine and catalysing metals (such as copper and iron) in the fuel on PCDD/F formation was studied in a 12MW<inf>th</inf> circulating fluidised bed (CFB) boiler. The PCDD/F concentrations in the raw gas after the convection pass of the boiler and in the fly ashes were compared. The fuel types were a so-called clean biomass with low content of chlorine, biomass with enhanced content of chlorine from supply of PVC, and solid recovered fuel (SRF) which is a waste fuel containing higher concentrations of both chlorine, and catalysing metals. The PCDD/F formation increased for the biomass with enhanced chlorine content and it was significantly reduced in the raw gas as well as in the fly ashes by injection of ammonium sulphate. A link, the alkali chloride track, is demonstrated between the level of alkali chlorides in the gas phase, the chlorine content in the deposits in the convection pass and finally the PCDD/F formation. The formation of PCDD/Fs was also significantly reduced during co-combustion of SRF with municipal sewage sludge (MSS) compared to when SRF was fired without MSS as additional fuel. © 2013 Elsevier Ltd.

Amaya-Delgado, L., et al. (2006). "Hydrolysis of sucrose by invertase immobilized on nylon-6 microbeads." Food Chemistry **99**(2): 299-304.

A commercial extracellular invertase (EC 3.2.1.26) from Saccharomyces cerevisiae has been inmobilized by covalent bonding on novel microbeads of nylon-6 using glutaraldehyde. The enzyme was strongly bound on the support, immobilized with an efficiency factor of 0.93. The biocatalyst showed a maximum enzyme activity when immobilized at pH 5.0, but optimum pH activity for both immobilized and free invertases was 5.5. The optimum temperatures for immobilized and free enzymes were 60 and 65 degreeC, respectively. Kinetic parameters were determined for immobilized and free invertases: V<inf>max</inf> values were 1.37 and 1.06 mmol min⁻¹ mg⁻¹, respectively. The K<inf>m</inf> and K<inf>i</inf> values were 0.029 and 0.71 M for immobilized invertase and 0.024 and 0.69 M for free invertase. It was found that the thermal stability of the immobilized invertase with regard to the free one increased by 25% at 50 degreeC, 38% at 60 degreeC and 750% at 70 degreeC. The immobilized biocatalyst was tested in a tubular fixed-bed reactor to investigate its possible application for continuous sucrose hydrolysis. The effects of two different sugar concentrations and three flow rates on the productivity of the reactor and on the specific productivity of the biocatalyst were studied. The system demonstrated a very good productivity up to 2.0 M sugar concentration, with conversion factors of 0.95 and 0.97, depending on sucrose concentration in the feeding. This approach may serve as a simple technique and can be a feasible alternative to continuous sucrose hydrolysis in a fixed bed reactor for the preparation of fructose-rich syrup. © 2005 Elsevier Ltd. All rights reserved.

Ambrose, C. A., et al. (2002). "Diversion from landfill: Quality products from valuable plastics." Resources, Conservation and Recycling **36**(4): 309-318.

Mechanical recycling of 100% post-consumer plastic waste into high-quality products has been performed. The chemical and physical properties of these recycled materials have been compared with similar products manufactured from virgin resins. The properties of a blow-moulded bottle prepared from 100% post-consumer high-density polyethylene (HDPE) showed that this recycled polymer exceeded the materials specifications for virgin plastic designs. Similarly, a sample of thermoplastic polyolefin (TPO, 100% polypropylene), obtained entirely from shredder residue (SR) displayed sufficient material strength for future separation and reprocessing. © 2002 Elsevier Science B.V. All rights reserved.

Ambrose, K. K., et al. (2019). "Spatial trends and drivers of marine debris accumulation on shorelines in

South Eleuthera, The Bahamas using citizen science." Marine Pollution Bulletin **142**: 145-154.

This study measured spatial distribution of marine debris stranded on beaches in South Eleuthera, The Bahamas. Citizen science, fetch modeling, relative exposure index and predictive mapping were used to determine marine debris source and abundance. Citizen scientists quantified debris type and abundance on 16 beaches within three coastal exposures (The Atlantic Ocean, Great Bahama Bank and The Exuma Sound) in South Eleuthera. Marine debris, (~2.5cm or larger) on each beach was monitored twice between March-May and September-November 2013 at the same locations using GPS. Approximately, 93% of all debris items were plastic with plastic fragments (<=2.5cm) being the most common. There were spatial differences (p<=0.0001) in plastic debris abundance between coastal exposures. Atlantic Ocean beaches had larger quantities of plastic debris by weight and by meter (m) of shoreline. Stranded plastic may be associated with Atlantic Ocean currents associated with leakage from the North Atlantic sub-tropical gyre.

Ambrosini, R., et al. (2019). "First evidence of microplastic contamination in the supraglacial debris of an alpine glacier." Environmental Pollution **253**: 297-301.

Contamination by plastic debris has been documented in most regions of the world, but their occurrence in high mountain areas has not been investigated to date. Here we present the first report of the occurrence and amount of microplastic in any terrestrial glacier environment. In the supraglacial debris of the Forni Glacier (Italian Alps), we observed the occurrence of (mean+/-standard error) 74.4+/-28.3 items kg⁻¹ of sediment (dry weight). This amount is within the range of variability of microplastic contamination observed in marine and coastal sediments in Europe. Most plastic items were made by polyesters, followed by polyamide, polyethylene and polypropylene. We estimated that the whole ablation area of Forni Glacier should host 131-162 million plastic items. Microplastic can be released directly into high elevation areas by human activities in the mountain or be transported by wind to high altitude. The occurrence of microplastic on Forni Glacier may be due to the gathering of debris coming from the large accumulation area into the relatively smaller ablation area of the glacier, as a consequence of its flow and melting.

Amelineau, F., et al. (2016). "Microplastic pollution in the Greenland Sea: background levels and selective contamination of planktivorous diving seabirds." Environmental Pollution **219**: 1131-1139.

Microplastics have been reported everywhere around the globe. With very limited human activities, the Arctic is distant from major sources of microplastics. However, microplastic ingestions have been found in several Arctic marine predators, confirming their presence in this region. Nonetheless, existing information for this area remains scarce, thus there is an urgent need to quantify the contamination of Arctic marine waters. In this context, we studied microplastic abundance and composition within the zooplankton community off East Greenland. For the same area, we concurrently evaluated microplastic contamination of little auks (Alle alle), an Arctic seabird feeding on zooplankton while diving between 0 and 50 m. The study took place off East Greenland in July 2005 and 2014, under strongly contrasted sea-ice conditions. Among all samples, 97.2% of the debris found were filaments. Despite the remoteness of our study area, microplastic abundances were comparable to those of other oceans, with 0.99+or-0.62 m⁻³ in the presence of sea-ice (2005), and 2.38+or-1.11 m⁻³ in the nearby absence of sea-ice (2014). Microplastic rise between 2005 and 2014 might be linked to an increase in plastic production worldwide or to lower sea-ice extents in 2014, as sea-ice can represent a sink for microplastic particles, which are subsequently released to the water column upon melting. Crucially, all birds had eaten plastic filaments, and

they collected high levels of microplastics compared to background levels with 9.99 and 8.99 pieces per chick meal in 2005 and 2014, respectively. Importantly, we also demonstrated that little auks took more often light colored microplastics, rather than darker ones, strongly suggesting an active contamination with birds mistaking microplastics for their natural prey. Overall, our study stresses the great vulnerability of Arctic marine species to microplastic pollution in a warming Arctic, where sea-ice melting is expected to release vast volumes of trapped debris.

Amengual, O., et al. (2009). "Up-regulated expression of phospholipid scramblase 1 on monocytes in patients with antiphospholipid syndrome." Arthritis and Rheumatism **10)**: 2046.

Purpose: It is worldwide accepted that the interaction between phospholipid (PL)-binding proteins and antiphospholipid antibodies (aPL) triggers tissue factor expression, leading to thrombotic events in patients with antiphospholipid syndrome (APS), but the precise mechanisms underlying thrombosis in APS are not yet clarified. Normal circulating cells show an asymmetric distribution of PL in the membranes with amino-PL, such as phosphatidylserine (PS), restricted to the cytoplasmic leaflets. Externalization of PS occurs in activated cells and is crucial for the activation of the coagulation cascade, as PS serves as an assembly site for coagulation factors. Moreover, PS exposure is essential for the binding of PL-binding protein-aPL complexes to pro-coagulant cells, favoring aPL-mediated cell activation and thrombosis. One of the key molecules involved in the regulation of PS externalization is phospholipid scramblase 1 (PLSCR1) which catalyzes rapid transbilayer movement of PL between membrane leaflets. PLSCR1 was reported to be up-regulated by interferon alpha, but its role in APS pathogenesis is unknown. In this study, we examined the expression of PLSCR1 on pro-coagulant cells in patients with APS. Method(s): The study includes 40 patients with APS (35 women, mean age 50 yrs, [range 26-76 yrs]). 17 patients had primary APS and 23 were diagnosis as having systemic lupus erythematosus (SLE). Forty-three healthy individuals were included as a control group. Heparinized venous blood was collected from all the subjects. PBMC were isolated and monocytes purified using CD14 micro beads (Miltenyi Biotec). Total RNA was isolated and reverse- transcribed using SuperScriptTM First-Strand Synthesis System (Invitrogen). Quantitative Real-Time PCR was performed using gene-specific PLSCR1 Taq Man MGB Probe and the ABI PRISM 7000 Sequence Detection System. PS exposure on monocyte surface was evaluated by flow-cytometry using the Annexin-V Fluos labeling kit (Roche). Result(s): Monocytes from APS patients had higher levels of PLSCR1 mRNA expression than those from healthy controls (mean +/- SD; 2.4 +/- 1.2 vs. 1.3 +/- 0.4, p < 0.00001). Levels of PLSCR1 mRNA were significantly elevated in both group of APS patients compared to controls (2.2 +/- 0.9, 2.6 +/- 1.4, p= 0.001, p= 0.0003, primary APS and APS/SLE, respectively). However, the increased PS expression in patients with APS was minor compared to controls (20.6 +/- 8.2 vs. 17.8 +/- 5.8). Conclusion(s): Patients with APS have enhanced expression of PLSCR1 on monocytes. Even though the presence of PS on monocytes may be related not only to PLSCR1 expression but to several mechanisms, the up-regulation of PLSCR1 expression in APS might represent a contributing factor in the hypercoagulability in APS.

Amereh, F., et al. (2019). "Thyroid endocrine status and biochemical stress responses in adult male Wistar rats chronically exposed to pristine polystyrene nanoplastics (Electronic supplementary information (ESI) available. See DOI: 10.1039/c9tx00147f)." Toxicology Research **8**(6): 953-963.

Toxicity evaluations of micro- or nano-sized plastics in rodent species commonly employed for toxicity analyses based on which risk assessment for humans could be performed are still largely lacking. Given this knowledge gap, the present work was aimed at determining the potential

impact of chronic exposure to polystyrene nanoplastics (PS NPs) on the thyroid endocrine status and biochemical stress in a rat model. Young adult male rats were orally administered with PS NPs (1, 3, 6 and 10 mg kg−1 day−1) for five weeks. Thyroid hormones (THs) l-thyroxine (T4), l-triiodothyronine (T3), l-free triiodothyronine (FT3), and l-free thyroxine (FT4) as well as thyroid stimulating hormone (TSH) serum levels of normal rats and those exposed to PS NPs were compared. Serum levels of high-density lipoprotein (HDL), low-density lipoprotein (LDL), cholesterol, and creatinine, as well as glutamic oxaloacetic transaminase (GOT) and glutamic pyruvic transaminase (GPT) enzymes were also measured. Exposure to PS NPs suppressed the serum levels of T3 and circulating levels of THs, whereas TSH increased significantly. Though exposure to PS NPs did not affect the molar ratios of T3/T4, it induced a slight, but significant, increase in FT3/FT4. In addition, exposure to plastic nanoparticles showed signs of nephrotoxicity induction and kidney injury in exposed organisms as can be inferred from the significantly higher serum levels of creatinine in exposed groups. Our results provide clear evidence of an association between exposure to plastic NPs and thyroid endocrine disruption as well as metabolic deficit, and generate new leads for future research efforts.

Amine, K. M., et al. (2014). "Effect of palmitoylated alginate microencapsulation on viability of Bifidobacterium longum during freeze-drying." LWT Food Science and Technology **56**(1): 111-117.

In the present research the viability of microencapsulated Bifidobacterium longum 15708 by extrusion and spray technique was investigated. Native (NA) and O-palmitoylated (PA) alginate were used as matrix for immobilization. Beads obtained by extrusion were characterized to assess the encapsulation yield (EY). Higher EY (67%) was found for bacteria immobilized in 3% PA. The effects of freeze drying on viability of entrapped B. longum were evaluated. Results indicated that microbeads obtained by spray were the most effective in preserving bacterial viability with a loss of viability of 2 log after 24 h as compared to extrusion beads and free cells where a loss of 2.9 and 2.75 log were respectively observed. No significant difference (P>0.05) between NA and PA was observed. Scanning electron microscopy (SEM) analysis of beads showed globular structures and confirmed differences between the NA and PA alginates as to their appearance (porosity, fatty acid content), while the use of spray contributes to reduce the size of beads by 1/10. Present results showed that several alternatives such as beads size, alginate concentration, as well as polymer functionalization can be managed to allow probiotic viability.

Amiri, S., et al. (2017). "Enhancing purification efficiency of affinity functionalized composite agarose micro beads using Fe₃O₄ nanoparticles." Journal of Chromatography B: Analytical Technologies in the Biomedical & Life Sciences **1041-1042**: 27-36.

In this work, a series of magnetic and nonmagnetic agarose matrices were fabricated for protein purification. Certain amounts of Fe₃O₄ nanoparticles were encapsulated in agarose beads to form composite magnetic matrices with enhanced purification efficiency. Structure and morphology of prepared matrices were studied by optical and scanning electron microscopes, FT-IR, and BET-BJH analysis. The prepared matrices had regular spherical shape, followed by a uniform size distribution. By nanoparticles addition, the number of mesopores decreased while population of pores with radius <=10nm increased; thus, higher specific area achieved. According to VSM results, magnetization degree was one of the characteristics affected by agarose content of the beads. A dye ligand, Cibacron Blue F3GA (CB), was covalently bound to beads to adsorb Bovine serum albumin. CB concentration was determined by elemental analysis. It was shown that magnetic beads hold higher CB concentrations than nonmagnetic ones due to higher specific area. As a result, magnetic

8%-agarose beads had the highest affinity adsorption capacity in static experiments. Moreover, breakthrough curves were monitored to calculate dynamic binding capacity. And, it was shown that magnetic 4%-agarose had the highest adsorbing amount (6.00mg/mL). It was implied that pore diffusion in magnetic 4%-agarose may be the reason for higher dynamic capacity. Plus, column efficiency was evaluated. It was revealed that all magnetic beads had lower HETP (0.11, 0.12 and 0.11cm for magnetic 4, 6, and 8%-agarose beads) than nonmagnetic ones (P-value<0.05).

Amoatey, P. and M. S. Baawain (2019). "Effects of pollution on freshwater aquatic organisms." Water Environment Research **91**(10): 1272-1287.

This paper presents the reviews of scientific papers published in 2018 issues on the effects of anthropogenic pollution on the aquatic organisms dwelling in freshwater ecosystem at global scale. The first part of the study provides the summary of relevant literature reviews followed by field and survey based studies. The second part is based on categories of different classes/sources of pollutants which affect freshwater organism. This is composed of several sections including metals and metalloids, wastewater and effluents, sediments, nutrients, pharmaceuticals, polycyclic aromatic hydrocarbons, flame retardants, persistent organic pollutants, pharmaceuticals and illicit drugs, emerging contaminants, pesticides, herbicides, and endocrine disruptors. The final part of the study highlights the reviews of published research work on new pollutants such as microplastics and engineered nanoparticles which affect the freshwater organisms. PRACTITIONER POINTS: Heavy metals concentrations should be assessed at nano-scale in aquatic environment. Air pollutants could have long-term effects on freshwater ecosystem. Future studies should focus on bioremediations of freshwater pollution.

Amorim, M. J. B., et al. (2018). "Environmental impacts by fragments released from nanoenabled products: a multiassay, multimaterial exploration by the SUN approach." Environmental Science & Technology **52**(3): 1514-1524.

Nanoenabled products (NEPs) have numerous outdoor uses in construction, transportation or consumer scenarios, and there is evidence that their fragments are released in the environment at low rates. We hypothesized that the lower surface availability of NEPs fragment reduced their environmental effects with respect to pristine nanomaterials. This hypothesis was explored by testing fragments generated by intentional micronisation ("the SUN approach"; Nowack et al. Meeting the Needs for Released Nanomaterials Required for Further Testing: The SUN Approach. Environmental Science & Technology, 2016 (50), 2747). The NEPs were composed of four matrices (epoxy, polyolefin, polyoxymethylene, and cement) with up to 5% content of three nanomaterials (carbon nanotubes, iron oxide, and organic pigment). Regardless of the type of nanomaterial or matrix used, it was observed that nanomaterials were only partially exposed at the NEP fragment surface, indicating that mostly the intrinsic and extrinsic properties of the matrix drove the NEP fragment toxicity. Ecotoxicity in multiple assays was done covering relevant media from terrestrial to aquatic, including sewage treatment plant (biological activity), soil worms (Enchytraeus crypticus), and fish (zebrafish embryo and larvae and trout cell lines). We designed the studies to explore the possible modulation of ecotoxicity by nanomaterial additives in plastics/polymer/cement, finding none. The results support NEPs grouping by the matrix material regarding ecotoxicological effect during the use phase. Furthermore, control results on nanomaterial-free polymer fragments representing microplastic had no significant adverse effects up to the highest concentration tested.

Amrullah, A. (2016). "Gasoline and Synthetic Fuel from Plastic Waste: Study for Engine Performance."

International Journal of Manufacturing, Materials, and Mechanical Engineering **6**(2): 41-50.

Currently the use of motor gasoline from year to year increase. In 2010 the number of vehicles in Indonesia about 26,706,705 vehicles, in 2011 amounted to 30,769,093 vehicles and 2012 amounted to 38,156,278 vehicles. This resulted in the consumption of petroleum fuels and exhaust emissions in motor vehicles is increasing. To overcome these problems, conducted research on synthetic fuel which is one of the alternative fuel sources. This research was conducted at gasoline engine. Variations in fuel mixture gasoline and synthetic fuel. This research will be able to generate and determine the effect of fuel mixture gasoline-synthetic fuel on levels of exhaust emissions, to determine the effect of fuel mixture gasoline-synthetic fuel for engine performance. Based on the analysis of performance and exhaust emissions test on a gasoline engine, for most engine performance is good and efficient set at first to mix synthetic fuel.

Amyot, F., et al. (2002). "A new experimental method for the evaluation of the release profiles of drug-loaded microbeads designed for embolisation." Itbm-Rbm **23**(5): 285-289.

The development of a galenical form must take into account the drug's physico-chemical properties as well as the external conditions that govern its performances. In the case of loaded microbeads designed for embolisation, the drug-release kinetics strongly depends on the local hydrodynamic conditions. Currently the apparatuses recommended by the European Pharmacopoeia allow the measurement in vitro of these kinetics; but the measured kinetics are very different from those met in the in vivo embolisation procedures. A new methodology is presented for evaluating the controlled release of a drug from ion exchange resins for embolisation. Experimental and numerical data are reported on the release kinetics of two closely related galenical formulations (DEAE Trisacryl LS and QAE Trisacryl LS). © 2002 Editions scientifiques et medicales Elsevier SAS.

An, S. S., et al. (2004). "Role of heat shock protein 27 in cytoskeletal remodeling of the airway smooth muscle cell." Journal of applied physiology (Bethesda, Md. : 1985) **96**(5): 1701-1713.

Remodeling of the airway smooth muscle (ASM) cell has been proposed to play an important role in airway hyperresponsiveness. Using a functional assay, we have assessed remodeling of the cultured rat ASM cell and the role of heat shock protein (HSP) 27 in that process. To probe remodeling dynamics, we measured spontaneous motions of an individual Arg-Gly-Asp-coated microbead that was anchored to the cytoskeleton. We reasoned that the bead could not move unless the microstructure to which it is attached rearranged; if so, then its mean square displacement (MSD) would report ongoing internal reorganizations over time. Each bead displayed a random, superdiffusive motion; MSD increased with time as approximately t(1.7), whereas an exponent of unity would be expected for a simple passive diffusion. Increasing concentrations of cytochalasin-D or latrunculin-A caused marked increases in the MSD, whereas colchicine did not. Treatments with PDGF or IL-1beta, but not transforming growth factor-beta, caused decreases in the MSD, the extent of which rank-ordered with the relative potency of these agents in eliciting the phosphorylation of HSP27. The chemical stressors anisomycin and arsenite each increased the levels of HSP27 phosphorylation and, at the same time, decreased bead motions. In particular, arsenite prevented and even reversed the effects of cytochalasin-D on bead motions. Finally, ASM cells overexpressing phospho-mimicking human HSP27, but not wild-type or phosphorylation-deficient HSP27, exhibited decreases in bead motions that were comparable to the arsenite response. Taken together, these results show that phosphorylated HSP27 favors reduced bead motions that are probably due to stabilization of the actin cytoskeleton.

Anarte, C., et al. (2013). "What is the real effect of the annexin v columns on human sperm?" Fertility and Sterility **1)**: S447-S448.

OBJECTIVE: To know whether or not the AnnexinV columns reduce the percentage of apoptosis in human sperm. To assess the effect of the AnnexinV columns on the quality of the sperm samples. DESIGN: Retrospective observational trial. MATERIALS AND METHODS: We analyzed the proportion of apoptotic spermatozoa in 25 patients during the first four months of 2013. All subjects were involved in assisted reproduction treatments at Quiron Bilbao. We studied apoptotic spermatozoa in fresh samples, after capacitation and after sperm was filtered by MACS with AnnexinV microbeads (Annexin negative fraction) by using AnnexinV-FITC/ PI assay with flow cytometry. All patients had >15% of apoptotic spermatozoa in capacitated samples (which is our clinical practice cutoff point). Sperm parameters were measured according to the WHO 2010 criteria. RESULT(S): The average percentage of apoptosis in fresh samples is 31.88+/-22.46, 29,23+/-12.67 in capacitated samples and 13.4+/-7.53 after MACS. A high decrease was observed in concentration from fresh (30.45+/-31.09) and capacitated samples (10.14+/-8.55) comparing to the ones analyzed after MACS (1.42 +/-1.39). The percentage of progressive sperm was (47.93+/-23.87 in fresh 64.16+/-17.67 in capacitated samples and 52.64+/-27.33% after MACS) and the percentage of non-progressive spermatozoa (45.73+/-25.4%, 27.91+/-17.32 to 39.57+/-27.81%). CONCLUSION(S): The percentage of apoptosis in fresh samples is higher, since the seminal plasma has anticapacitating substances and therefore after capacitation this percentage of apoptosis is reduced. Different behaviours were observed in sperm quality parameters. Concentration decreases because apoptotic sperm remains in the filters. A slight increase is observed in the percentage of progressive sperm. Filtering the samples using MACS reduces the percentage of apoptosis but does not make it disappear completely, sowe still need to choose the best spermatozoa to try to get better fertilization rates and better quality embryos.

Anayo, J. M., et al. (2018). "Impact of ultra violet radiation on polyethylene packaged water exposed at varying conditions: Are we drinking micro-plastics?" American Journal of Biochemistry and Biotechnology **14**(1): 20-28.

The public is worried about how their health is impacted by microplastics in sachet water. This awareness has repercussion for water producing factories and public health organization in managing health hazard associated with microplastic ingestion. Many countries in Africa, with concern to Nigeria, the act of packaging water in polyethylene materials by water producing factories has become accustomed. These packaged products are popularly called pure water or sachets water. The packaged materials are made of antioxidants, stabilizers, plasticizers, lubricants, antimicrobials, anti-static and anti-blocking agents. Heat hindrance agents are usually incorporated to improve functionality of polyethylene. It was conceived that the polyethylene material if exposed to sun light radiation over a period of time, its components may leach into the potable water due to photolytic, photo-oxidative and thermo-oxidative reactions caused by fragmentation of the polyethylene material. This research was designed to evaluate the water quality/safety of polyethylene sachet-packaged exposed to direct sunlight at different days. Eighteen polyethylene packaged water were sampled from three different factories - Lion water, Galaxy and Ashor water in Nsukka area of Enugu State. They were exposed to sunlight at 31 to 33degreeC for (24, 48, 72, 96 and 120 h), respectively. Agilent gas chromatography tandem mass spectroscopy was used to analyze the exposed and unexposed (control) packaged water. Organic compounds such as low molecular weight substituted hydrocarbons, polycyclic aromatic hydrocarbons, trichloromethane, benzene, limonene, xylene, toluene and 2-hexanone were detected in all the exposed samples. These micoplastics which leached into water has been listed by the Agency for Toxic Substances and Disease Registry as potential human carcinogens. The concern now is whether we are drinking micoplastics. The only way out of this perceived health risk is to change the packaging material to prevent ingestion of microplastics in water. Copyright © 2018 James Matthew Anayo, Victor Eshu Okpashi and Ikechukwu N.E. Onwurah.

Anbumani, S. and P. Kakkar (2018). "Ecotoxicological effects of microplastics on biota: a review." Environmental Science & Pollution Research **25**(15): 14373-14396.

The ubiquitous presence of microplastics in the environment has drawn the attention of ecotoxicologists on its safety and toxicity. Sources of microplastics in the environment include disintegration of larger plastic items (secondary microplastics), personal care products like liquid soap, exfoliating scrubbers, and cleaning supplies etc. Indiscriminate usage of plastics and its poor waste disposal management pose serious concern on ecosystem quality at global level. The present review focused on the ecological impact of microplastics on biota at different trophic levels, its uptake, accumulation, and excretion etc., and its plausible mechanistic toxicity with risk assessment approaches. Existing scientific evidence shows that microplastics exposure triggers a wide variety of toxic insult from feeding disruption to reproductive performance, physical ingestion, disturbances in energy metabolism, changes in liver physiology, synergistic and/ or antagonistic action of other hydrophobic organic contaminants etc. from lower to higher trophics. Thus, microplastic accumulation and its associated adverse effects make it mandatory to go in for risk assessment and legislative action. Subsequent research priorities, agenda, and key issues to be addressed are also acknowledged in the present review.

Anda, K. S. D., et al. (2011). "Analysis of the expression of interferon regulatory factors on dendritic cells from systemic lupus erythematosus patients." Arthritis and Rheumatism. Conference: Annual Scientific Meeting of the American College of Rheumatology and Association of Rheumatology Health Professionals **63**(10 SUPPL. 1).

Background/Purpose: Dendritic cells (DC) are a key element between the innate and the adaptative immune responses, they are considered professional antigen presenting cells, and the main source (plasmacytoid DC) of type-I interferon (IFN-I). Elevated levels of IFN- I have been detected in many autoinmune diseases in humans. The genomic and proteomic studies have shown that elevated serum levels of IFN-I and the interferon related genes overexpression are the molecular signature of systemic lupus erythematosus (SLE). The interferon regulatory factors (IRF) are among these upregulated genes. These transcription factors are induced by many different receptors, mainly toll-like receptors and interferon receptors. Diverse genetic association studies have found relationship between many IRF-5 polymorphisms and increased susceptibility to SLE in different ethnic groups. However these studies have been done with total mononuclear cells, which may not reflect specific DC alterations. It is not known if there are alterations in the expression of IRF on DC from SLE patients. The aim of this study was to evaluate the expression of IRF-3 and IRF-5 on DC from SLE patients. Method(s): We included 10 SLE patients (4 with SLEDAI=0, 6 with SLEDAI>6) as well as 10 healthy controls. Peripheral blood mononuclear cells were isolated by Ficoll-Hypaque centrifugation. Monocytes were purified by positive selection with anti-CD14 mAb coated microbeads. DC were generated by culturing monocytes for 6 days in presence of GM-CSF, IL-4 and for 2 additional days in presence of LPS to induce maturation. In vitro generated DC as well as peripheral blood DC defined by the following phenotype, Lin-HLA-DR+CD11c-BDCA-4+, were analyzed for HLA-DR, CD40, IRF3, and IRF5 expression by flow cytometry and Western Blot. Result(s): We found that immature DC from SLE patients shown significantly diminished levels of the CD40 molecule (percentage of CD40+ DC:

control median= 48.8, SLE median= 28, p=0.03). In addition, we observed that expression of IRF-3 and IRF-5 on mature DC from SLE tended to be higher compared with controls (IRF3 MFI mean= 17.7 in controls versus 32.5 in SLE; IRF5 MFI mean=22.1 in controls versus 30.01 in SLE). Furthermore, we found that the expression of these molecules was increased in peripheral blood Lin-HLA-DR+CD11c-BDCA-4+ DC from SLE patients compared with healthy controls (percentage of IRF3 positive cells= 29 in controls versus 76 in SLE; percentage of IRF5 positive cells= 3.6 in controls versus 34.6 in SLE). We found no differences on IRF expression on DC from active SLE and those with inactive disease. Conclusion(s): Our results suggest that the previously reported elevated levels of IFN-I observed in SLE might be explained by the altered expression of IRF on DC from SLE patients. Furthermore, the impaired expression of these factors might be considered as an intrinsic defect in SLE.

Anderson, A. G., et al. (2016). "Microplastics in personal care products: Exploring perceptions of environmentalists, beauticians and students." Marine Pollution Bulletin **113**(1-2): 454-460.

Microplastics enter the environment as a result of larger plastic items breaking down ('secondary') and from particles originally manufactured at that size ('primary'). Personal care products are an important contributor of secondary microplastics (typically referred to as 'microbeads'), for example in toothpaste, facial scrubs and soaps. Consumers play an important role in influencing the demand for these products and therefore any associated environmental consequences. Hence we need to understand public perceptions in order to help reduce emissions of microplastics. This study explored awareness of plastic microbeads in personal care products in three groups: environmental activists, trainee beauticians and university students in South West England. Focus groups were run, where participants were shown the quantity of microbeads found in individual high-street personal care products. Qualitative analysis showed that while the environmentalists were originally aware of the issue, it lacked visibility and immediacy for the beauticians and students. Yet when shown the amount of plastic in a range of familiar everyday personal care products, all participants expressed considerable surprise and concern at the quantities and potential impact. Regardless of any perceived level of harm in the environment, the consensus was that their use was unnatural and unnecessary. This research could inform future communications with the public and industry as well as policy initiatives to phase out the use of microbeads.

Anderson, E. C., et al. (2010). "Investigations of Redox Magnetohydrodynamic Fluid Flow At Microelectrode Arrays Using Microbeads." Analytical Chemistry **82**(7): 2643.

Microbeads are used to track fluid flow over microband electrode arrays to investigate fundamentals of redox magnetohydrodynamics (redox-MHD) in a confined solution. The results may lead toward the design of micro total analysis systems with microfluidics based on the redox-MHD concept. Ion flux was generated by reduction and oxidation of electroactive potassium ferri- and ferrocyanide at selected individually addressable microelectrodes in the array. An external magnetic field was produced by a small, permanent magnet (0.38 T) placed directly below the array with its field perpendicular to the plane of the array. The cross product of ion flux and magnetic field produces a magnetic force (a portion of the Lorentz force equation) that causes the fluid to rotate around the active electrodes. Velocities up to 1.4 mm/s are demonstrated here. The effects on velocities were obtained for different concentrations of redox species, widths of electrodes, gaps between electrodes, and combinations of anodically- and cathodically polarized electrodes. The microbeads allowed mapping of flow patterns and velocities, both parallel and perpendicular to the array chip. The influence of counteracting shear forces, drag along the walls, and reinforcing flow are discussed. A significant result is the

fairly flat flow profile across 650 ...m, attained between electrodes that are oppositely biased. (ProQuest: ... denotes formulae/symbols omitted.)

Anderson, J. A. and A. B. Alford (2014). "Ghost fishing activity in derelict blue crab traps in Louisiana." Marine Pollution Bulletin **79**(1-2): 261-267.

Derelict crab traps impact the coastal ecosystem through continued catch of target species and species of conservation, economic, or recreational importance. During volunteer-supported crab trap cleanups in 2012 and 2013, we quantified ghost fishing activity in derelict crab traps in coastal Louisiana through a citizen scientist program. Volunteers removed 3607 derelict traps during these events, and over 65% of traps analyzed by citizen scientists were actively ghost fishing. Additionally, volunteers identified 19 species enmeshed in derelict traps, including a combination of fresh and saltwater species. We also detected a significant difference in the number of blue crab in actively ghost fishing derelict traps across removal locations with estimated catches varying between 2.4 and 3.5 crabs/trap. Our instantaneous estimates of ghost fishing activity are greater than those previously thought in Louisiana, further justifying current derelict crab trap prevention and removal extension and outreach programs in Louisiana and throughout the Gulf of Mexico. © 2013 Elsevier Ltd.

Anderson, J. C., et al. (2016). "Microplastics in aquatic environments: Implications for Canadian ecosystems." Environmental Pollution **218**: 269-280.

Microplastics have been increasingly detected and quantified in marine and freshwater environments, and there are growing concerns about potential effects in biota. A literature review was conducted to summarize the current state of knowledge of microplastics in Canadian aquatic environments; specifically, the sources, environmental fate, behaviour, abundance, and toxicological effects in aquatic organisms. While we found that research and publications on these topics have increased dramatically since 2010, relatively few studies have assessed the presence, fate, and effects of microplastics in Canadian water bodies. We suggest that efforts to determine aquatic receptors at greatest risk of detrimental effects due to microplastic exposure, and their associated contaminants, are particularly warranted. There is also a need to address the gaps identified, with a particular focus on the species and conditions found in Canadian aquatic systems. These gaps include characterization of the presence of microplastics in Canadian freshwater ecosystems, identifying key sources of microplastics to these systems, and evaluating the presence of microplastics in Arctic waters and biota.

Anderson, P. J., et al. (2017). "Microplastic contamination in Lake Winnipeg, Canada." Environmental Pollution **225**: 223-231.

Microplastics are an emerging contaminant of concern in aquatic ecosystems. To better understand microplastic contamination in North American surface waters, we report for the first time densities of microplastics in Lake Winnipeg, the 11th largest freshwater body in the world. Samples taken 2014 to 2016 revealed similar or significantly greater microplastic densities in Lake Winnipeg compared with those reported in the Laurentian Great Lakes. Plastics in the lake were largely of secondary origin, overwhelmingly identified as fibres. We detected significantly greater densities of microplastics in the north basin compared to the south basin of the lake in 2014, but not in 2015 or 2016. Mean lake-wide densities across all years were comparable and not statistically different. Scanning electron microscopy with energy dispersive X-ray spectroscopy indicated that 23% of isolated particles on average were not plastic. While the ecological impact of microplastics on aquatic ecosystems is still largely unknown, our study contributes to the growing evidence that microplastic contamination is widespread even around sparsely-populated freshwater ecosystems, and provides a baseline for future study and risk assessments.

Anderson, R. V. and D. C. Coleman (1977). "The use of glass microbeads in ecological experiments with bacteriophagic nematodes." Journal of Nematology **9**(4): 319-322.
A system that uses microbeads for the culture of bacteriophgic nematodes is described. Glass-bead culture was found to simulate a soil microcosm more closely than did agar culture i n terms of CO production , number of nematodes produced, and nematode size.

Anderson, T. N. and A. Zarrinpar (2018). "Hepatocyte transplantation: past efforts, current technology, and future expansion of therapeutic potential." Journal of Surgical Research **226**: 48-55.
Hepatic cell transplantation (HCT) continues to garner interest as an alternative to orthotopic liver transplantation and the attendant donor shortage. When compared with solid organ transplantation, advantages of cell transplantation include the potential to treat more patients with a considerably less invasive procedure, the ability to utilize organs otherwise unsuitable for transplant, and leaving the native organ in situ with the potential for regeneration. While studies date back to the early 1960s, advancement of clinical application has been slow due in part to limitations of suitable tissue supplies and reproducible robust techniques. Compared with orthotopic liver transplantation, there are fewer absolute contraindications for donor selection. And, current techniques used to harvest, isolate, store, and even transfuse cells vary little between institutions. Significant variation is seen due to a lack of consensus with maintenance therapy. Although the ideal recipient has not been clearly identified, the most significant results have been demonstrated with correction of congenital metabolic liver disorders, with a few trials examining its utility in cirrhotics and more recently acute liver failure. The most exciting new topic of discussion examines techniques to improve engraftment, with many such as ischemic preconditioning and nonselective partial embolization (microbead therapy), while not yet used in HCT study, showing promise in solid organ research. Advancements in HCT, although slow in progress, have great potential in the ability to alleviate the burden faced in solid organ transplantation and possibly become a long-term viable option, beyond that of a bridge or salvage therapy.

Anderson, Z. T., et al. (2018). "A rapid method for assessing the accumulation of microplastics in the sea surface microlayer (SML) of estuarine systems." Scientific Reports **8**(1): 9428.
Microplastics are an increasingly important contaminant in the marine environment. Depending on their composition and degree of biofouling, many common microplastics are less dense than seawater and so tend to float at or near the ocean surface. As such, they may exhibit high concentrations in the sea surface microlayer (SML - the upper 1-1000 mum of the ocean) relative to deeper water. This paper examines the accumulation of microplastics, in particular microfibres, in the SML in two contrasting estuarine systems - the Hamble estuary and the Beaulieu estuary, southern U.K., via a novel and rapid SML-selective sampling method using a dipped glass plate. Microplastic concentrations (for identified fibres, of 0.05 to 4.5 mm length) were highest in the SML-selective samples (with a mean concentration of 43 +/- 36 fibres/L), compared to <5 fibres/L for surface and sub-surface bulk water samples. Data collected show the usefulness of the dipped glass plate method as a rapid and inexpensive tool for sampling SML-associated microplastics in estuaries, and indicate that microplastics preferentially accumulate at the SML in estuarine conditions (providing a potential transfer mechanism for incorporation into upper intertidal sinks). Fibres are present (and readily sampled) in both developed and more pristine estuarine systems.

Andersson, T. P. M., et al. (2005). "Frog melanophores cultured on fluorescent microbeads: Biomimic-based biosensing." Biosensors and Bioelectronics **21**(1): 111-120.

Melanophores are pigmented cells in lower vertebrates capable of quick color changes and thereby suitable as whole cell biosensors. In the frog dermis skin layer, the large and dark pigmented melanophore surrounds a core of other pigmented cells. Upon hormonal stimulation the black-brown pigment organelles will redistribute within the melanophore, and thereby cover or uncover the core, making complex color changes possible in the dermis. Previously, melanophores have only been cultured on flat surfaces. Here we mimic the three dimensional biological geometry in the frog dermis by culturing melanophores on fluorescent plastic microbeads. To demonstrate biosensing we use the hormones melatonin and alpha-melanocyte stimulating hormone (alpha-MSH) as lightening or darkening stimuli, respectively. Cellular responses were successfully demonstrated on single cell level by fluorescence microscopy, and in cell suspension by a fluorescence microplate reader and a previously demonstrated computer screen photo-assisted technique. The demonstrated principle is the first step towards "single well/multiple read-out" biosensor arrays based on suspensions of different selective-responding melanophores, each cultured on microbeads with distinctive spectral characteristics. By applying small amount of a clinical sample, or a candidate substance in early drug screening, to a single well containing combinations of melanophores on beads, multiple parameter read-outs will be possible. © 2004 Elsevier B.V. All rights reserved.

Andrade, C. S., et al. (2014). "Biodegradable mulch films performance for autumn-winter strawberry production." Journal of Berry Research **4**(4): 193-202.

An enormous amount of plastic waste resulting from the agricultural activities is produced every year. Part of this plastic remains in the fields, while the other part is sent to recycling or landfill. The use of biodegradable (BD) mulch films can play a key role towards a sustainable development in agricultural sector because they can be plugged in the soil, after its use, together with the crop residues. The aim of this study was to evaluate the performance of white-on-black biodegradable mulch films in contrast to the conventional polyethylene (PE) mulch film in autumn-winter cycle strawberry production, monitoring the variation on soil warming, lifetime of the films in the field as well as the effects on fruit yield. Soil temperatures showed differences among treatments during summer period under open field conditions and autumn-winter season under tunnel. Although the degradation rate of BD mulch films varied along the crop cycle, they provided adequate bed cover and weed suppression until crop end. Plants had similar monthly crop yield distribution, and percentage of commercial and uncommercial fruits between mulch treatments. From the overall results obtained, biodegradable mulch films may be a promising alternative to PE mulching but there should be economic incentives for growers to implement this sustainable practical as its price at present are not yet competitive.

Andrade, J., et al. (2019). "A low-cost system to simulate environmental microplastic weathering." Marine Pollution Bulletin **149 (no pagination)**(110663).

Society concerns about the potential thread of microplastics into the environment call for detailed laboratory and field studies to assess their fate, in particular, their weathering. This can hardly be done in natural conditions and, so, a low-cost system (<EUR 1000) to accelerate photooxidative and hydrolytic weathering is presented in a way that standardizes major marine experimental conditions: incident radiation range, light intensity, temperature and mechanical stress. The system can be valid for many European countries, most US states, and other

intermediate-latitude-countries; otherwise it can be scaled up easily. Validation was done by studying three different polymeric structures: polyamide 6.6, polystyrene and polypropylene. The results agreed nicely with previous reports derived from different working conditions. Therefore, this low-cost system would likely contribute to the standardization of microplastic marine weathering studies by, e.g., improving their intercomparability. Copyright © 2019 Elsevier Ltd

Andrade, M. C., et al. (2019). "First account of plastic pollution impacting freshwater fishes in the Amazon: ingestion of plastic debris by piranhas and other serrasalmids with diverse feeding habits." Environmental Pollution **244**: 766-773.

Reported here is the first evidence of plastic ingestion by freshwater fishes in the Amazon. Plastic bags, bottles, fishing gear, and other products are entering Amazonian water bodies and degrade into meso- and micro-plastic particles that may be ingested, either directly or indirectly via food chains, by fishes. Examination of stomach contents from 172 specimens of 16 serrasalmid species from lower Xingu River Basin revealed consumption of plastic particles by fishes in each of three trophic guilds (herbivores, omnivores, carnivores). Overall, about one quarter of specimens and 80% of species analyzed had ingested plastic particles ranging from 1 to 15 mm in length. Fourier transform infrared spectroscopy indicated 12 polymer types, including 27% identified as polyethylene, 13% polyvinyl chloride, 13% polyamide, 13% polypropylene, 7% poly(methyl methacrylate), 7% rayon, 7% polyethylene terephtalate, and 13% a blend of polyamide and polyethylene terephtalate. Dimensions of ingested plastic particles varied among trophic guilds, even though the frequency and mass of ingested particles were not significantly different among fishes with different feeding habits.

Andrades, R., et al. (2019). "Scavenging as a pathway for plastic ingestion by marine animals." Environmental Pollution **248**: 159-165.

Plastic pollution is prevalent worldwide and affects marine wildlife from urbanized beaches to pristine oceanic islands. However, the ecological basis and mechanisms that result in marine animal ingestion of plastic debris are still relatively unknown, despite recent advances. We investigated the relationship between scavenging behavior and plastic ingestion using green turtles, Chelonia mydas, as a model. Diet analysis of C. mydas showed that sea turtles engaging in scavenging behavior ingested significantly more plastic debris than individuals that did not engage in this foraging strategy. We argue that opportunistic scavenging behavior, an adaptive behavior in most marine ecosystems, may now pose a threat to a variety of marine animals due to the current widespread plastic pollution found in oceans. Scavenging behavior in sea turtles led to high rates and loads of plastic ingestion and may be an important pathway for plastic debris ingestion by marine animals. Copyright © 2019 Elsevier Ltd

Andrades, R., et al. (2016). "Origin of marine debris is related to disposable packs of ultra-processed food." Marine Pollution Bulletin **109**(1): 192-195.

Marine debris is currently distributed worldwide, and the discard and contamination pose hazards to human and wildlife health. One of the gaps in debris science is tracking the source of debris to better evaluate and avoid the pathway of debris from the source to marine environment. For this, we evaluated three beaches of different urbanization levels and environmental influences; a low urbanized beach, a highly urbanized beach and a non-urbanized estuary-associated beach, in order to determine the sources and original use of debris. Plastic was the major material found on beaches, and the urbanized beach recorded the highest debris densities. Marine debris was primarily from land-based sources, and the debris recorded in all beaches was mainly assigned as food-related items. Our results highlight the major presence of disposable and short-lived products comprising the majority of debris that enters the ocean and draw attention to the unsustainable lifestyle of current society.

Andrades, R., et al. (2018). "Marine debris in Trindade Island, a remote island of the South Atlantic." Marine Pollution Bulletin **137**: 180-184.

Marine debris is widespread in oceans worldwide, including the most remote locations. Here, for the first time, we report macro-debris accumulation on beaches of Trindade Island, a remote island 1160km from mainland Brazil. High debris density was recorded on windward, east-coast beaches, which are exposed to wind-driven currents. Small-sized plastic fragments were the most abundant debris. Polyethylene (67%), polypropylene (30%) and polyamide (3%) were the most prevalent polymeric materials identified by ATR-FTIR. Identified debris show that interaction with Trindade fauna, mainly with seabirds and endangered terrestrial crabs, exists and already has some impact. This study provides baseline information on Trindade macro-debris demonstrating that the island, located on the edge of the South Atlantic Gyre, acts as a sink for gyre debris, exposing the island fauna to the threats related to plastic contamination.

Andrady, A. L. (2011). "Microplastics in the marine environment." Marine Pollution Bulletin **62**(8): 1596-1605.

This review discusses the mechanisms of generation and potential impacts of microplastics in the ocean environment. Weathering degradation of plastics on the beaches results in their surface embrittlement and microcracking, yielding microparticles that are carried into water by wind or wave action. Unlike inorganic fines present in sea water, microplastics concentrate persistent organic pollutants (POPs) by partition. The relevant distribution coefficients for common POPs are several orders of magnitude in favour of the plastic medium. Consequently, the microparticles laden with high levels of POPs can be ingested by marine biota. Bioavailability and the efficiency of transfer of the ingested POPs across trophic levels are not known and the potential damage posed by these to the marine ecosystem has yet to be quantified and modelled. Given the increasing levels of plastic pollution of the oceans it is important to better understand the impact of microplastics in the ocean food web. © 2011 Elsevier Ltd.

Andrady, A. L., et al. (2019). "Interactive effects of solar UV radiation and climate change on material damage." Photochemical & Photobiological Sciences **18**(3): 804-825.

Solar UV radiation adversely affects the properties of organic materials used in construction, such as plastics and wood. The outdoor service lifetimes of these materials are influenced by their rates of degradation under solar UV radiation as well as by other climate factors such as temperature, moisture, and atmospheric pollutants. While recovery of the stratospheric ozone layer is expected, local increases in UV radiation are still likely to occur, especially in the tropics, but also elsewhere because of climate change effects. Such increases, when taken together with an increased ambient temperature due to climate change, can significantly shorten the service lifetimes of organic building materials. Several proven technologies, including the use of UV stabilisers, surface treatments or coatings have been developed over the years to mitigate these adverse effects. While these technologies should be able to compensate for any realistic future UV radiation and climate change scenarios, they will also add significantly to the lifetime cost of material in relevant products. Shorter outdoor lifetime of the plastic components in photovoltaic (PV) modules is a serious concern in the solar energy industry. To ensure module durability over the full service-lifetime (of about ~20 years) of the light-harvesting PV components, better stabilisation technologies are being investigated. The present trend towards more environmentally sustainable materials in building, and environmental impact of additives such as stabilisers, need to be considered in addition to their engineering performance. This may require the phasing out of some conventional additives used in plastics as well as substituting wood or other materials in place of plastics in buildings. Depending on the relative costs of mitigation, substituting more UV-stable materials for conventional ones in outdoor products may also be a viable option with some categories of products. Neither the global cost of mitigation of the effects of climate change on materials nor the long-term sustainability of the technologies available for the purpose, have been estimated. Plastic waste and litter exposed outdoors to solar UV radiation over extended periods undergo cracking and fragmentation into small pieces (of micro- and nano-scale size). Release of these fragments into the environment, particularly in the aquatic environment, poses a potential threat to marine biota. Already several hundred of species are known to ingest these fragments that can potentially accumulate additives and pollutants from water. This is a potential threat to humans because 25% of fish marketed for human consumption have been reported to contain microplastics in their digestive systems. The focus of this assessment is on recent advances in understanding the mechanisms of UV-radiation-induced degradation in materials and in assessing emerging technologies for their stabilisation against outdoor UV-degradation. A better understanding of the mechanisms of degradation will allow for innovative stabilisation approaches to be developed. Also assessed is information on the sustainability of the available and emerging UV stabilisation technologies.

Angadi, S. C., et al. (2012). "Novel composite blend microbeads of sodium alginate coated with chitosan for controlled release of amoxicillin." International Journal of Biological Macromolecules **51**(1-2): 45-55.

Composite blend microbeads of sodium alginate (NaAlg) with sodium carboxymethyl cellulose (NaCMC) containing magnesium aluminum silicate (MAS) particles and enteric coated with chitosan have been prepared to achieve controlled release (CR) of amoxicillin in stomach environment. The composite beads have been characterized by X-ray diffraction (XRD) to study drug distribution, DSC for understanding thermal stability and Fourier transform infrared (FTIR) spectroscopy to investigate chemical interactions as well as to assess the structure of the drug-loaded formulations. Surface morphology of the beads was investigated by scanning electron microscopy (SEM). The size distribution of beads loaded with drug as studied by particle size analyzer was in the range of 745-889 mum. The beads exhibited quite widely varying encapsulation efficiencies from 52 to 92%. Equilibrium swelling of the beads measured in water and in vitro release of amoxicillin in pH 1.2 medium suggests that drug release depends on polymer blend composition, concentration of MAS and extent of enteric coating.

Anger, P. M., et al. (2018). "Raman microspectroscopy as a tool for microplastic particle analysis." TrAC - Trends in Analytical Chemistry **109**: 214-226.

This review discusses the identification and quantification of microplastic (MP) using Raman microspectroscopy (RM). It addresses scientists investigating MP in environmental and food samples. We show the benefits and limitations of RM from a technical point of view (sensitivity, smallest particle sizes, speed optimizations, analysis artefacts and background effects) and provide an assessment of the relevance of lab analyses and their interpretation (sample sizes for the analysis, uncertainty of the analysis). All parts are complimented by extensive literature data and a theoretical derivation of the concepts. We conclude with suggestions for a feasible and meaningful RM analysis of MP samples. Copyright © 2018 Elsevier B.V.

Angin, M., et al. (2010). "Successful expansion of functional human regulatory T-cells from individuals

with HIV-1 infection." AIDS Research and Human Retroviruses **26 (10)**: A162.

Background: In the context of HIV-1 infection, the exact impact of regulatory T cells (Tregs) on HIV pathogenesis remains poorly understood. Natural CD4+CD25 +Foxp3+Tregs represent 5-7% of CD4+T cells in healthy donors, however in untreated HIV-1 seropositive individuals absolute CD4 +Treg numbers decrease during disease progression with the overall loss of CD4 T cells, making this population remarkably hard to study. In the present study, we describe an approach to expand functional regulatory T cells from HIV-1 positive individuals. Method(s): Peripheral CD4+CD25+ CD127lo natural Tregs and CD4+CD25-CD127+conventional T cells were isolated from the peripheral blood of individuals with chronic untreated HIV-1 infection, Elite controllers and healthy donors using a FacsAria cell sorter. The Tregs were stimulated with anti-CD3/CD28 microbe-ads and cultured in the presence of IL-2. Frequency and phenotype of the expanded Tregs and conventional T cells were measured by flow cytometry. The suppressive function was assessed by standard flow-based proliferation assays using CFSE dilution of microbead-activated PBMCs in the presence or absence of expanded Tregs. Result(s): Our data show that sorted CD4+CD25 + CD127lo Tregs from HIV-1 negative and positive donors can be expanded, with a mean fold change of 43+/- 11.8 at day 7. The expanded Tregs expressed high levels of Foxp3 compared to the conventional T cells. More importantly, the expanded Tregs were able to suppress activated PBMCs in vitro. Detailed analyses on phenotype, HIV-1 infectability and the functional profile of these expanded Tregs are ongoing. Conclusion(s): Our data show that CD4+CD25 + CD127lo Tregs isolated from HIV-1 positive individuals can be successfully isolated and expanded ex vivo, while maintaning high expression of Foxp3 and their suppressive function. This approach holds great potential for more detailed studies on the role of regulatory T cells in the setting of HIV-1 infection, especially in situations where specimen are scarce (e.g infants, tissues).

Angus, S. V., et al. (2012). "Field-deployable and near-real-time optical microfluidic biosensors for single-oocyst-level detection of Cryptosporidium parvum from field water samples." Journal of Environmental Monitoring **14**(12): 3295-3304.

Cryptosporidium spp. is an obligate, parasitic protozoan that is difficult to detect and causes diarrhea in healthy adults while potentially causing death in the immunocompromised and children. Its treatment options are few and treat the symptoms, not the actual parasite. Current methods of detection are inefficient and rely too heavily upon laboratory sample preparations and technician skill, including differential staining, negative staining, and immunofluorescence methods [especially U.S. Environmental Protection Agency (EPA) Method 1623]. These assays can take from hours to days and require a laboratory environment. In this work, we demonstrated the microbead immunoagglutination assay combined with Mie scatter detection in a microfluidic device to provide a field-deployable and near-real-time alternative to the laboratory-based method (especially EPA Method 1623). Two main challenges were the relatively big diameter of Cryptosporidium oocysts (5-6 mum) and the contaminants in field water samples that negatively affected the immunoagglutination and its scatter detection. We used 4 min sonication to liberate Cryptosporidium oocyst wall proteins (COWP), which was previously used to inactivate Cryptosporidium oocysts. As for the contaminants, we optimized the microbead diameter (920 nm) and the wavelength of incident light (375 nm) to find the angle of scatter detection (45degree) where the Mie scatter from immunoagglutinated microbeads was maximum and the background scatter from contaminants was minimum. This enabled the sub-single-oocyst-level detection despite the fact that only a very small volume of water sample (15 muL) was introduced to the microfluidic biosensor. When combined with filtration/concentration, this method is able to detect <=1 oocyst per large volume of water, comparable to or potentially better than the EPA method 1623, while effectively reducing the time and labor necessary for staining and microscopic analysis. For faster, near-real-time assays, filtration/concentration may not be used, where the detection limit was 1-10 oocysts per mL with the total assay time of 10 min including the 4 min sonication time. The linear range of assay was over 5 orders of magnitude. The final device was compact and had the potential to be used in field situations, and required less technical expertise and/or training compared to the other methods.

Angyal, A., et al. (2010). "Production of steam cracking feedstocks by mild cracking of plastic wastes." Fuel Processing Technology **91**(11): 1717-1724.

In this work the utility of new possible petrochemical feedstocks obtained by plastic waste cracking has been studied. The cracking process of polyethylene (PE), polyethylene-polypropylene (PEPP) and polyethylene-polystyrene (PEPS) has been carried out in a pilot scale tubular reactor. In this process mild reaction parameters has been applied, with the temperature of 530 C and the residence time of 15 min. The produced hydrocarbon fractions as light- and middle distillates were tested by using a laboratory steam cracking unit. It was concluded that the products of the mild cracking of plastic wastes could be applied as petrochemical feedstocks. Based on the analytical data it was determined that these liquid products contained in significant concentration (25-50 wt.%) of olefin hydrocarbons. Moreover the cracking of polystyrene containing raw material resulted in liquid products with significant amounts of aromatic hydrocarbons too. The steam cracking experiments proved that the products obtained by PE and PEPP cracking resulted in similar or better ethylene and propylene yields than the reference samples, however the aromatic content of PEPS products reduced the ethylene and propylene yields.

Ankireddy, S. R. and J. Kim (2015). "Quantum Dot-Bead-DNA Probe-Based Hybridization Fluorescence Assays on Microfluidic Chips." Journal of Nanoscience & Nanotechnology **15**(10): 7918-7921.

The development of chip-based, quantum dot (QD)-bead-DNA conjugate probes for hybridization detection is a prime research focus in the field of microfluidics. QD-Bead-DNA probe-based hybridization detection methods are often called "bead-based assays," and their success is substantially influenced by the dispensing and manipulation capabilities of microfluidic technology. Met was identified as a prognostic marker in different cancers including lung, renal, liver, head and neck, stomach, and breast. In this report, the cancer causing Met gene was detected with QDs attached to polystyrene microbeads. We constructed a microfluidic platform using a flexible PDMS polymer. The chip consists of two channels, with two inlets and two outlets. The two channels were integrated with QD-bead-DNA probes for simultaneous detection of wild type target DNA and mutant DNA, containing three nucleotide changes compared to the wild type sequence. The fluorescence quenching ability of QDs within the channels of microfluidic chips were compared for both DNAs.

Anonymous (1970). "An end to plastic pollution?" Marine Poll **Bull. 1**(9): 130.

A new development in the Department of Chemistry of the University of Aston (Birmingham, England) holds out some promise that we may be approaching the time when plastic pollution is brought under control. A research group under the direction of Professor Gerald Scott is patenting several additives which will cause plastic materials to disintegrate first to granules and then to a fine powder when exposed to ultra violet light Discarded plastic containers and packaging materials would disappear after 3-6 months exposure to summer sunlight By suitable adjustment of the additives, it would be possible to arrange that the small amount of ultra violet

radiation penetrating window glass would not be sufficient to cause disintegration of the plastic white it was in normal use indoors. In any case, it would be possible to incorporate indicator dyes in the material so that a colour change could give early warning that disintegration had started. The technique is effective with polythene and polypropylene plastics but not so Car with Polyvinylchloride (PVC).

Anonymous (1971). "Some remarks on the treatment of plastic waste material. [Dutch]." Tokio Nieuws **34**(pp 6-8).

Research is currently being carried out in a number of institutes to find methods for the disposal of various types of plastics waste material. The following methods are being studied: burning (the most promising method at present); mixing with asphalt or concrete (in an experimental stage); disintegration by exposure to u.v. radiation from the solar spectrum (insufficiently worked out as yet); the powder resulting from the disintegration of plastic might also be noxious; dumping at sea (causes undesirable pollution of the water); addition in u finely divided form to garden soil. In this final approach pulverized polystyrene foam is mixed with clay in a proportion of 20-50% which gives a porous garden soil that retains water and fertilizer. Plants allegedly grow very well on this material.

Anonymous (1973). "Utilization of waste plastic materials in Japan. [Dutch]." Metaal Kunststof **11**(21): 30-33.

A survey is made of the Japanese efforts to solve the problem of waste plastic material accumulation. Among the research and development activities reported are: the testing of an installation for the incineration of 5 tons of plastic wastes per day; a model project for the recovery of plastics from domestic wastes; and an experimental factory for thermal cracking of plastic wastes in order to regain petroleum. Industrial activities include the development of methods for shredding and pulverizing plastics; processes for separation of different types of plastics; processes for thermal decomposition, which requires improvement of the thermal conductivity of the plastic particles; a method for removing hydrochloric acid from PVC; processing fuel possessing properties similar to present fuels; incinerators; methods for recovery and reutilization of plastics from wastes; and development of degradable plastics that decompose in sunlight as a result of an increased oxygen content in the plastic molecules.

Anonymous (1974). "Disposal of plastic waste in Japan is tackled in coordinated manner (Dutch). [Dutch]." Ned.Chem.Industr **16**(21): 389.

Japan, as one of the world's largest plastic producers, has a large problem with waste plastic disposal. Plastic accounts for 8 to 10% (by weight) of Japan's household waste production. In 1970, the Plastic Waste Management Institute of Japan was set up to coordinate the efforts to cope with this problem. The institute carries on research, and provides financial help to private concerns which wish to install plastic waste processing equipment. Twenty five plastic recycling plants are now in operation; 15 more are under construction. In Japan, the plastic producing industry is legally responsible for the processing of its own wastes. Household plastic waste, on the other hand, is processed by public installations. Several processing techniques are now in use or are being investigated: incineration, remolding (into flower pots, fencing, etc.), and pyrolysis, which produces sulfurless fuel oil.

Anonymous (1998). "Imaging AIDS." Newsline/People with AIDS Coalition of New York: 34-35.

Anonymous (2005). "Amended final report on the safety assessment of polyacrylamide and acrylamide residues in cosmetics." International Journal of Toxicology **24 Suppl 2**: 21-50.

Polyacrylamide is a polymer of controllable molecular weight formed by the polymerization of acrylamide monomers available in one of three forms: solid (powder or micro beads), aqueous solution, or inverse emulsions (in water droplets coated with surfactant and suspended in mineral oil). Residual acrylamide monomer is likely an impurity in most Polyacrylamide preparations, ranging from <1 ppm to 600 ppm. Higher levels of acrylamide monomers are present in the solid form compared to the other two forms. Polyacrylamide is reportedly used in 110 cosmetic formulations, at concentrations ranging from 0.05% to 2.8%. Residual levels of acrylamide in Polyacrylamide can range from <.01% to 0.1%, although representative levels were reported at 0.02% to 0.03%. Because of the large sizes of Polyacrylamide polymers, they do not penetrate the skin. Polyacrylamide itself is not significantly toxic. For example, an acute oral toxicity study of Polyacrylamide in rats reported that a single maximum oral dose of 4.0 g/kg body weight was tolerated. In subchronic oral toxicity studies, rats and dogs treated with Polyacrylamide at doses up to 464 mg/kg body weight showed no signs of toxicity. Several 2-year chronic oral toxicity studies in rats and dogs fed diets containing up to 5% Polyacrylamide had no significant adverse effects. Polyacrylamide was not an ocular irritant in animal tests. No compound-related lesions were noted in a three-generation reproductive study in which rats were fed 500 or 2000 ppm Polyacrylamide in their diet. Polyacrylamide was not carcinogenic in several chronic animal studies. Human cutaneous tolerance tests performed to evaluate the irritation of 5% (w/w) Polyacrylamide indicated that the compound was well tolerated. Acrylamide monomer residues do penetrate the skin. Acrylamide tested in a two-generation reproductive study at concentrations up to 5 mg/kg day(- 1) in drinking water, was associated with prenatal lethality at the highest dose, with evidence of parental toxicity. The no adverse effects level was close to the 0.5 mg/kg day(- 1) dose. Acrylamide tested in a National Toxicology Program (NTP) reproductive and neurotoxicity study at 3, 10, and 30 ppm produced no developmental or female reproductive toxicity. However, impaired fertility in males was observed, as well as minimal neurotoxic effects. Acrylamide neurotoxicity occurs in both the central and peripheral nervous systems, likely through microtubule disruption, which has been suggested as a possible mechanism for genotoxic effects of acrylamide in mammalian systems. Acrylamide was genotoxic in mammalian in vitro and in vivo assays. Acrylamide was a tumor initiator, but not an initiator/promoter, in two different mouse strains at a total dose of 300 mg/kg (6 doses over 2 weeks) resulting in increased lung adenomas and carcinomas without promotion. Acrylamide was tested in two chronic bioassays using rats. In one study, increased incidence of mammary gland tumors, glial cell tumors, thyroid gland follicular tumors, oral tissue tumors, uterine tumors and clitoral gland tumors were noted in female rats. In male rats, the number of tumors in the central nervous system (CNS), thyroid gland, and scrotum were increased with acrylamide exposure. In the second study, using higher doses and a larger number of female rats, glial cell tumors were not increased, nor was there an increase in mammary gland, oral tissue, clitoral gland, or uterine tumors. Tumors of the scrotum in male rats were confirmed, as were the thyroid gland follicular tumors in males and females. Taken together, there was a dose-dependent, but not statistically significant, increase in the number of astrocytomas. Different human lifetime cancer risk predictions have resulted, varying over three orders of magnitude from 2 x 10(- 3) to 1.9 x 10(- 6). In the European Union, acrylamide has been limited to 0.1 ppm for leave-on cosmetic products and 0.5 ppm for other cosmetic products. An Australian risk assessment suggested negligible health risks from acrylamide in cosmetics. The Cosmetic

Anonymous (2008). "Loofah and plastic waste make low-cost housing." Appropriate Technology **35**(4):

15-18.

Elsa Zaldivar has found a way to mix loofah -- a cucumber-like vegetable that is dried to yield a scratchy sponge for use as an abrasive skin scrubber -- with other vegetable matter like husks from corn and caranday palm trees, along with recycled plastic, to form strong, lightweight panels. These can be used to create furniture and construct houses, insulating them from temperature and noise. Determined to find a market for the loofah waste, Zaldivar teamed up with Pedro Padros, an industrial engineer, to search for a way to use the vegetable material to construct inexpensive panels for walls and roofing for building houses. Then Padros got the idea of using plastic waste with the loofah. He invented a machine that melted a mixture of three types of recycled plastic and combined the resulting liquid with loofah and other vegetable fibres, such as cotton netting and chopped corn husks.

Anonymous (2009). "Abstracts from the 26th International Congress of Chemotherapy and Infection." International Journal of Antimicrobial Agents. Conference: 26th International Congress of Chemotherapy and Infection. Toronto, ON Canada. Sponsor: A. Menarini Diagnostics, Abbott Molecular, Alphelys, Aperio, et al. . Conference Publication: **34**(Suppl. 2).

The proceedings contain 391 papers. The topics discussed include: increased rate of true pathogen recovery from pediatric blood cultures when body weight-appropriate volumes are collected; antibody response to rabies vaccine in healthy adults following primary immunization and the importance of occupational health surveillance programs; mumps virus detection by PCR and culture during an outbreak in a highly unvaccinated population; has the 7-valent pneumococcal conjugate vaccine (PCV7) reduced hospital visits and admissions for pneumonia in young children in Calgary?; application of multiplex PCR and fluid microbead-based assay to investigation of institutional outbreaks of viral respiratory disease; etiological diagnosis of respiratory outbreaks using a combination of antigen and nucleic acid amplification tests; detection of influenza A virus resistance to oseltamivir by a single nucleotide polymorphism-based assay; and conservation of PB2 mutation among H275Y oseltamivir resistant influenza A (H1N1) isolates during 2007 2008 influenza season.

Anonymous (2010). "XVIII Annual Congress of the European Society of Gene and Cell Therapy (ESGCT)." Human Gene Therapy. Conference: 18th Annual Congress of the European Society of Gene and Cell Therapy, ESGCT **21**(10).

The proceedings contain 358 papers. The topics discussed include: microbead-assisted retroviral transduction for clinical application; efficacy of oncolytic mutants targeting pRb and p53 pathways is synergistically enhanced when combined with cytotoxic drugs in prostate cancer cells and tumor xenografts; long-term Type VII collagen restoration to human epidermolysis bullosa skin tissue; transient increase in intrahepatic pressure mediates successful treatment of the gunn rat with reduced doses of lentiviral vector; characterization of a recombinant adeno-associated virus Type 2 reference standard material; autologous transplantation of endothelial progenitor cells genetically modified by adeno-associated viral vector delivering insulin-like growth factor-1 gene after myocardial infarction; and adeno-associated virus serotype 6 capsid tyrosine-to-phenylalanine mutations improve gene transfer to skeletal muscle.

Anonymous (2012). "17th PASPCR 2012." Pigment Cell and Melanoma Research. Conference: 17th PASPCR **25**(5).

The proceedings contain 75 papers. The topics discussed include: age effect on facial skin color in Asians - an image analysis study; genetic studies of vitiligo provide new insights into an ancient disease; distinct nuclear architecture and higher order chromatin organization of melanocyte specific gene loci in human melanocytes and keratinocytes; the landscape of mutations in melanomas revealed by exome sequencing; melanocyte stem cell niche and pigment patterning in regenerating feathers; ET-1 is a transcriptional target of P53 in epidermal keratinocytes and controls UV radiation-induced melanocyte homeostasis in vivo; evaluation of melanin transfer mechanism in keratinocytes using fluorescent microbeads; aurora kinase A is involved in Cr(VI)-induced human melanomagenesis; metabolism of melatonin and biological activity of intermediates of melatoninergic pathway in skin cells; APE/Ref-1, a drugable target for the therapy of human melanoma; and targeting C-MYC with small molecules as a novel anti-melanoma therapy.

Anonymous (2014). "Polyethylene microbeads?" Hawaii Dental Association Journal: 19.

Anonymous (2015). "Federal government wants voluntary renunciation of Micro-plastic particles in cosmetic products." KW - Korrespondenz Wasserwirtschaft **8**(1): 4.

Anonymous (2015). "Great Barrier Reef corals eat plastic." Ocean News & Technology **21**(4): 22-23.

Researchers in Australia have found that corals commonly found on the Great Barrier Reef will eat micro-plastic pollution. Microplastics are tiny fragments of plastic in the environment and are a widespread contaminant in marine ecosystems, particularly in inshore coral reefs. As part of the study the researchers put corals collected from the Great Barrier Reef into plastic contaminated water. After 2 nights they found that the corals had eaten plastic particles. The team also sampled the waters adjacent to inshore coral reefs on the Great Barrier Reef.

Anonymous (2015). "Restricting Landfill Must be the Priority." Food Packaging Bulletin **24**(4): 4.

Following PlasticsEurope's call for landfill restrictions issued June 17, the organization presented its recommendations June 22 for the European Union's upcoming Circular Economy Package and called for a landfill ban on recyclable and other recoverable post-consumer waste by 2025 as the priority to improve resource efficiency in Europe. With regards to future packaging recycling targets, PlasticsEurope advocates a life cycle driven approach, based on a cost-benefit analysis. Between 2006 and 2012, the amount of post-consumer plastic waste going to landfills was reduced by 26% and, as a result, plastics recycling rose by as much as 40% and energy recovery increased by 27%." A recent study shows that with today's technology there is an optimum level for plastics packaging recycling. This optimum lies between 35% and 50% depending on the specific situation in the country.

Anonymous (2015). "Sea turtles in plastic pollution peril." Ocean News & Technology: 22.

A new global review led by the University of Exeter that set out to investigate the hazards of marine plastic pollution has warned that all seven species of marine turtles can ingest or become entangled in the discarded debris that currently litters the oceans. Annual global plastic production has grown from 1.5 million tonnes to 299 million tonnes in the last 65 years and as a result plastic pollution is increasing, both on land and at sea.

Anonymous (2016). BEAT THE MICROBEAD. Environmental Engineering. London, Professional Engineering Publishing Ltd. **29:** 56.

Greenpeace is currently running a campaign to get the UK to join America and Canada in their ban of plastic microbeads. They bypass wastewater filtration systems and have a serious, detrimental impact on the flora and fauna of the oceans. Microplastic concentrations in lakes and other closed bodies of water may be even higher than in oceans, where at least the water flows freely.

Anonymous (2016). "Erratum: "New link in the food chain? Marine plastic pollution and seafood safety"(Environ Health Perspect, 123,2, (A34-A41), 2015, 10.1289/ehp.123-a34)." Environmental Health Perspectives **124**(7): A123.

In the following sentence, the amount of plastics produced in 1950 was incorrectly cited as "approximately 1.9 tons": "World plastics production has experienced almost constant growth for more than half a century, rising from approximately 1.9 tons in 1950..." The correct number should have been 1.9 million tons. EHP regrets the error. Copyright © EPA/National Geographic Channel/Alamy.

Anonymous (2016). "Microplastics and Nanoplastics in Food - an Emerging Issue." World Food Regulation Review **26**(2): 15.

There is global interest in the impact of plastic waste in seas and waterways on natural habitats and wildlife. The European Food Safety Authority (EFSA) says it has "taken a first step" towards a future assessment of the potential risks to consumers from microplastics and nanoplastics in food, especially seafood. Dr Peter Hollman was a member of the working group that helped EFSA's Panel on Contaminants in the Food Chain (CONTAM) to draft its Statement on microplastic and nanoplastic particles in food. Dr Hollman is senior researcher at RIKILT research institute and associate professor for Nutrition and Health, both atWageningen University in The Netherlands. His research includes work on the occurrence, analysis and toxicity of micro- and nanoplastics. EFSA defines microplastics as ranging in size from 0.1 to 5000 micrometres (mu m), or 5 millimetres to give an idea. Nanoplastics measure from 0.001 to 0.1 mu m (i.e. 1 to 100 nanometres).

Anonymous (2016). "Microplastics discovered in the deep, open ocean." Ocean News & Technology: 21.

A unique study by scientists at the National Oceanography Centre (NOC) will provide valuable new insights into the concentrations of microplastics in the open ocean from surface to the seabed. Preliminary findings already show microplastic presence in the top 1,000 m of the water column at the Porcupine Abyssal Plain sustained ocean observatory in the North Atlantic. They will also analyse unique samples from sediment traps stationed in the central North and South Atlantic subtropical gyres, which are giant swirls in the ocean where microplastics tend to accumulate.

Anonymous (2016). "Three Quarters of the Population Believe that Food in Germany is Safe." World Food Regulation Review **26**(1): 20.

When it comes to food, the German population's risk perception is contradictory. This is one of the findings of the third Federal Institute of Risk Assessment (BfR) consumer monitor. On the one hand, almost three quarters of the representatively selected participants interviewed in February 2016 believe that foods offered in the market are safe. On the other hand, more than half of the respondents are concerned about topics such as pesticide residue and microplastics in food, and genetically modified foods, all of which are closely associated with the general issue of food safety. As regards awareness levels in relation to topics of consumer health protection, there were major differences compared to 2015.

Anonymous (2017). "Corals Seem to Like The Taste of Microplastics." Sea Technology **58**(12): 30.

A new Duke University study of plastic ingestion by corals suggests that visual cues, such as a resemblance to prey, don't factor into the appeal of microplastics as food because corals have no eyes. Instead, corals go by taste. Corals in the experiments ate all types of plastics but preferred unfouled microplastics by a threefold difference over microplastics covered in bacteria.

Anonymous (2017). "Larvaceans, microplastics and deep-sea food webs." Marine Pollution Bulletin **123**(1/2): 4.

Over the last decade, scientists have discovered tiny pieces of plastic in many ocean waters, and even in deep-sea mud. However, they know very little about how microplastics are transported within the ocean. A new paper by the Monterey Bay Aquarium Research Institute (MBARI) researchers in the journal Science Advances shows that filter-feeding giant larvaceans can collect and consume microplastic particles in the deep sea. The particles accumulate in larvaceans' cast-off filters and are passed into the animals' faecal pellets, which sink rapidly through the ocean, potentially carrying microplastics to the deep seafloor.

Anonymous (2017). "UK: Minister Visits North America to "Turn Tide on Marine Plastic"." Food Packaging Bulletin **26**(10): 10-11.

United Kingdom Environment Minister, Thérèse Coffey, said 16 February that she has "joined forces with Canada and the USA" in the fight against marine plastic. During a visit to Washington DC and Ottawa in February, the Minister met her international counterparts to discuss the UK's priorities for the marine environment ahead of the G7 Environment meetings to be held later this year. Like the UK, Canada has already banned microbeads in rinse-off cosmetics, and the Minister met the country's Environment and Climate Change Minister, Catherine McKenna, and Dominic LeBlanc, Minister of Fisheries, Oceans and the Canadian Coast Guard, to look at how the two countries can unite in further tackling the threats facing our oceans.

Anonymous (2018). "Ban on Straws Does Not Solve the Marine Litter Problem." Food Packaging Bulletin **27**(3): 8-9.

The German Association for Plastics Packaging and Films (IK Industrievereinigung Kunststoffverpackungen e. V). has rejected a proposed ban on selected plastic products announced 28 May by the European Commission. When it is a question of raising public awareness for the careful use of various resources, and changing behavior in the long term, bans are hardly the right option, according to IK. They do not bring about a genuine understanding of sustainable consumption and environmentally conscious behavior. Roughly 80% of global plastic waste in the oceans is generated by Asian countries, approximately 0.02% comes from Germany and about 1% from Europe. The IK takes the view that the EU Commission should concentrate on the consistent implementation of existing waste legislation in all EU member states and on an EU-wide landfill ban for plastic waste.

Anonymous (2018). "The Coca-Cola Company Announces Loan Agreement with Ioniqa." Food Packaging Bulletin **27**(9/10): 14-15.

In September 2018, Dutch company, Ioniqa Technologies, announced the launch of what it described as "the first PET plastic up-cycling plant". The intention is to convert PET plastic waste into high-grade pure PET raw material, by summer 2019, for use in new food packaging. On 13 December, the Coca-Cola Company announced a new agreement extending a loan to Ioniqa Technologies, to facilitate the development of Ioniqa's proprietary technology to produce high-grade, recycled PET content from hard-to-recycle PET waste. The agreement is designed to accelerate the development and deployment of high-grade recycled content PET for use in bottles used by Coca-Cola.

Anonymous (2018). "Corrections to: Combined effects of UV exposure duration and mechanical abrasion on microplastic fragmentation by polymer type (Environmental Science and Technology (2017) 51 (4368-4376) DOI: 10.1021/acs.est.6b06155)." Environmental Science and Technology **52**(6): 3831-3832.

In our paper, the total volume of the fragmented particles according to UV exposure was miscalculated in Figure 5 and Supporting Information Figure S7. The volume of the fragmented particles was described as 10 pellets; the remaining volume of the parent pellet was correct. In addition, the void volume of EPS pellet and the laminar shape of fragmented EPS particles were considered in recalculation of EPS volume. The corrected Figure 5 is given below. The corrected Figure S7 is provided in the Supporting Information, and the y-axis has been corrected in Figure S7. In addition, the following corrections should be made in the main text. Page 4372. The second paragraph should read, "The volume of the remaining parent pellets was calculated from the measured mean diameters, and the volume of produced particles was calculated on the assumption that all particles were spherical with a diameter at the midpoint of each size category (e.g., 150 mum for 100-200 mum). In case of EPS pellet, it consists of 98% gas and 2% polystyrene on a volume basis. The remaining EPS pellet contained void volume of gas while the fragments in very laminar shape did not have any void gas volume, which was confirmed by scanning electron microscope (data not shown). Thus, in EPS volume calculation, the volume of remaining EPS pellet included 98% of gas, but the volume of EPS fragments was calculated as laminar-shaped polystyrene itself without the void gas volume. While the volume of parent PE pellets remained almost intact (>90%) in all exposure groups, the missing portion of PE volume after weathering increased from 0% to 9.9% according to the UV exposure duration (Figure 5a). In addition, 98% and 96% of PP parent pellets remained after exposure to UV for 0 and 2 months, respectively, with corresponding proportions of 1.6% and 4.2% unaccounted for. After 6 and 12 months, the parent PP pellet volume decreased to 81% and 81%, respectively, while fragmented particles accounted for 1.2% and 2.1%, respectively (Figure 5b). After exposure to UV for 0 and 2 months, parent EPS pellets accounted for 78% and 35% of the original volume, respectively, while 5.4% and 12% of the pellets were fragmented. After 6 and 12 months, no visible parent pellets were apparent, but the volume of fragmented particles accounted for only 21% and 12% of the original parent pellet volume, respectively. The proportion of EPS pellets unaccounted for increased gradually with UV exposure duration, accounting for 17, 53, 79, and 88% in the UV0, UV2, UV6, and UV12 groups, respectively (Figure 5C)." Copyright © 2018 American Chemical Society.

Anonymous (2018). "CPI Working to Cut Plastic Waste Packaging Pollution." Food Packaging Bulletin **27**(8): 9.

In the UK, the Centre for Process Innovation (CPI) said 10 December it is collaborating on a project to cut plastic pollution by driving forward the development of food packaging that is less damaging to the environment. Working alongside industry partners, CPI is using its polymer chemistry research and materials processing and characterisation capability to support the development of alternatives to commonly used fossil-based polymers, which cannot be consumed by nature and have resulted in the continued pollution of land and seas when leaked to the natural environment. Dan Noakes, Business Manager at CPI, said we need to adopt new thinking if we are to overcome the pressing issue of plastics-persistence in our natural environment.

Anonymous (2018). "Crepidula onyx resilient towards microplastic diet." Marine Pollution Bulletin **129**: 420.

Scientists from the Hong Kong University of Science and Technology (HKUST) have shown that the growth and development of the invasive North American slipper limpet, Crepidula onyx is unaffected by the presence of microplastics at environmentally relevant concentrations. Microplastics are plastic fragments less than 5mm in size. They are of increasing concern as they account for over 90% of floating plastic in the ocean. C onyx is alien to the waters of Hong Kong which is where the study was carried out The scientists, led by Karen Chan of HKUST, found that at environmentally relevant concentrations, larval and juvenile C onyx were not affected by the presence of the particles.

Anonymous (2018). "The environmental cost of contact lenses." Marine Pollution Bulletin **135**: 1232.
Researchers who conducted studies on the effects of contact lenses presented their results during the 256th National Meeting and Exposition of the American Chemical Society (ACS). Disposal of the contact lenses in various ways according to scientists contributes to microplastic pollution in waterways.

Anonymous (2018). "High levels of hazardous chemicals found in plastics collected from Lake Geneva." Marine Pollution Bulletin **130**: 349.
The first-ever chemical analysis of plastic collected from beaches around Lake Geneva detected cadmium, mercury and lead, sometimes in very high concentrations that exceed the maximum permitted under EU law. The abundance of toxic chemicals that are now restricted or banned in plastic production reflects how old the plastic litter could be. The report, one of very few to examine plastics in freshwater lakes is published in Frontiers in Environmental Science and shows that, like oceans, freshwater habitats are also affected by plastic pollution. Plastic debris in freshwater lakes are likely to pose the same problems to wildlife as marine plastics. In this respect, entanglement and ingestion are of greatest concern states Dr. Montserrat Filella, lead author of this research, based at the Department F.-A. Forel, University of Geneva Switzerland.

Anonymous (2018). "Increase in plastics waste reaching remote South Atlantic islands." Marine Pollution Bulletin **137**: 728.
Scientists investigating plastics in seas surrounding the remote British Overseas Territories discovered they are invading these unique biologically-rich regions. This includes areas that are established or proposed Marine Protected Areas. Plastic causes many problems including entanglement, poisoning and starving through ingestion. The study highlights that the impacts of plastic pollution are not only affecting industrialized regions but also remote biodiverse areas.

Anonymous (2018). "KAYTECH SOLVES CHARLESTOWN WASTEWATER TREATMENT PROBLEM." Civil Engineering : Magazine of the South African Institution of Civil Engineering **26**(9): 48.
By supplying over 3 000 Quick4 Infiltrator Chambers for the new Charlestown Housing Project in Newcastle, KwaZulu- Natal, Kaytech was able to completely eliminate the need for a conventional French drain soakaway system. Manufactured from recycled plastic waste, Kaytech's eco-friendly Infiltrator Chambers deliver a high level of performance on every front -- from ease of transportation, handling and installation, to system reliability. Infiltrator Chamber Systems promote effluent infiltration into the soil with 100% efficiency, while requiring as little as 50% less space compared to French drain systems. With a proven track record exceeding thirty years, tried and tested Infiltrator Chambers provide numerous benefits, including quick and easy installation, flexibility, as well as chemical resistance and UV stability.

Anonymous (2018). "Land-based pollution with microplastics." Marine Pollution Bulletin **128**: 609.

It is now widely accepted that microplastics contaminate oceans and are harmful to coastal and marine habitats. But tiny plastic particles have also been found to present a threat to creatures on land and may have damaging effects similar or even more problematic than in the oceans. Researchers from the Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) in partnership with Freie Universitat Berlin warn that the impact of microplastics in soils, sediments and the freshwaters could have a long-term negative effect on terrestrial ecosystems throughout the world.

Anonymous (2018). "Plastics linked to disease in coral." Marine Pollution Bulletin **128**: 609.

Contact with plastic waste massively increases the chance of disease in corals according to an international team led by a James Cooke University (JCU) scientist Dr Joleah Lamb from the ARC Centre of Excellence for Coral Reef Studies based at JCU.

Anonymous (2018). "Plastics Makers Support Expanding Data on Microplastics, Urge Caution in Interpreting Results of Stool Study." Food Packaging Bulletin **27**(5/6): 10.

A small pilot study presented in October at the United European Gastroenterology Conference measured low concentrations of microplastics in human stool samples from eight individuals who reside in the European Union, Japan and Russia. The study was conducted by researchers from the Medical University of Vienna and Environment Agency Austria. The American Chemistry Council issued the presented statement October 24.

Anonymous (2018). "UK BANS PLASTIC MICROBEADS." BioCycle **59**(2): 9.

Plastic microbeads can no longer be used in cosmetics and personal care products in the United Kingdom, after a long-promised ban went into effect in January. "Microbeads are entirely unnecessary when there are so many natural alternatives available, and I am delighted that from today cosmetics manufacturers will no longer be able to add this harmful plastic to their rinse-off products," said UK Environment Minister Therese Coffey.

Anonymous (2018). "UK: WRAP Adds Momentum to Plastic Waste Fight with New Recycle Now Campaign." Food Packaging Bulletin **27**(1/2): 18.

Called 'Plastic Planet' to demonstrate the sheer volume of plastic in the environment; Recycle Now will call upon consumers to close the 'plastic gap' which sees only 58% of plastic bottles currently recycled in the UK--despite 99% of local authorities collecting bottles at kerbside and an increased public appetite to generally recycle more. The campaign comes as part of the Waste and Resources Action Plan's overarching ambition" to tackle the problem of plastic waste.

Anonymous (2019). "Global Alliance on Plastic Waste Launches." Sea Technology **60**(3): 28.

Energy company Total is participating in the creation of a global alliance of companies from the plastics and consumer goods value chain to help end plastic waste in the environment, especially in the ocean. The Alliance to End Plastic Waste, made up of nearly 30 member companies, has committed more than $1 billion, with the goal of investing $1.5 billion over the next five years.

Anonymous (2019). "It's not just fish, plastic pollution harms the bacteria that help us breathe." Marine Pollution Bulletin **144**: 358.

Anonymous (2019). "Peru takes aim at single-use plastic." EcoAmericas **21**(3): 11.

Peru took a major step toward reducing plastic waste with a new law that will outlaw many throwaway plastic items by the end of 2021. The measure, signed into law Dec. 18, will phase in with different timing for various provisions. The ban will affect single use plastic bags and other non-reusable plastics, drinking straws, and disposable food and drink containers made of plastic or polystyrene foam. The law requires that polyethyleneterephthalate (PET) bottles manufactured in or imported to Peru include at least 15% recycled PET plastic.

Anonymous (2019). "A steady diet of plastic particles." Nature **570**(7761): 279.

Anonymous (2019). "UK Students Conduct Microplastics Survey." Sea Technology **60**(10): 36.

The planet's use of plastics has come under much scrutiny in recent years, and particular attention is being paid to the damage caused in the marine environment by microplastics, defined as all forms of plastics less than 5 mm in size. They can enter the oceans as primary microplastics such as beads from personal-care products and microfibers from clothes, or as secondary microplastics derived from larger plastic items such as drink bottles, which slowly get broken into smaller pieces. The project, managed by the Norfolk Rivers Trust education team, measured the amount of microplastic pollution on the beaches of North Norfolk and included beach litter picking and plastic sorting. Beach samples were sent to Just One Ocean for analysis.

Anonymous (2019). "What a bottled-water habit means for intake of 'microplastics'." Nature **570**(7761): 279.

Anonymous (2020). "Correction: (The Lancet Gastroenterology & Hepatology (2019) 4(12) (907-908), (S2468125319303528), (10.1016/S2468-1253(19)30352-8))." The Lancet Gastroenterology and Hepatology **5**(2): e1.

Coburn C. Microplastics and gastrointestinal health: how big is the problem? Lancet Gastroenterol Hepatol 2019; 4: 907-08-In this In Focus piece, the fourth sentence in the fourth paragraph should have read "He believes that the fact that the samples contained nine different microplastics suggests that microplastics could be contaminating food through several routes, but he also thinks that further research is needed before we can tell whether such exposure causes any harm to human health." The third sentence in the fifth paragraph should have read "However, Schwabl believes that these mechanisms are unlikely, given that there is no evidence that the body takes up other forms of inert particulate matter; the intestines of healthy people act as a shield from particles." These corrections have been made to the online version as of Jan 8, 2020. Copyright © 2020 Elsevier Ltd

Ansari, S., et al. (2015). "Effects of the orientation of anti-BMP2 monoclonal antibody immobilized on scaffold in antibody-mediated osseous regeneration." Journal of Biomaterials Applications **30**(5): 558-567.

Recently, we have shown that anti-BMP2 monoclonal antibodies (mAbs) can trap endogenous osteogenic BMP ligands, which can in turn mediate osteodifferentiation of progenitor cells. The effectiveness of this strategy requires the availability of the anti-BMP-2 monoclonal antibodies antigen-binding sites for anti-BMP-2 monoclonal antibodies to bind to the scaffold through a domain that will leave its antigen-binding region exposed and available for binding to an osteogenic ligand. We examined whether antibodies bound to a scaffold by passive adsorption versus through Protein G as a linker will exhibit differences in mediating bone formation. In vitro anti-BMP-2 monoclonal antibodies was immobilized on absorbable collagen sponge (ACS) with Protein G as a linker to bind the antibody through its Fc region and implanted into rat calvarial defects. The biomechanical strength of bone regenerated by absorbable collagen sponge/Protein G/anti-BMP-2 monoclonal antibodies immune complex was compared to ACS/anti-BMP-2 monoclonal antibodies or ACS/Protein G/isotype mAb control group. Results demonstrated higher binding of anti-BMP-2 monoclonal antibodies/BMPs to C2C12 cells, when the mAb was initially attached to recombinant Protein G or Protein G-coupled microbeads. After eight weeks, micro-CT and histomorphometric analyses revealed increased bone formation within defects implanted with absorbable collagen sponge/Protein G/anti-BMP-2 monoclonal antibodies compared with defects implanted with absorbable collagen sponge/anti-BMP-2 monoclonal antibodies ($p < 0.05$). Confocal laser scanning microscopy (CLSM) confirmed increased BMP-2, -4, and -7 detection in sites implanted with absorbable collagen sponge/Protein G/anti-BMP-2 monoclonal antibodies in vivo . Biomechanical analysis revealed the regenerated bone in sites with Protein G/anti-BMP-2 monoclonal antibodies had higher mechanical strength in comparison to anti-BMP-2 monoclonal antibodies. The negative control group, Protein G/isotype mAb, did not promote bone regeneration and exhibited significantly lower mechanical properties ($p < 0.05$). Altogether, our results demonstrated that application of Protein G as a linker to adsorb anti-BMP-2 monoclonal antibodies onto the scaffold was accompanied by increased in vitro binding of the anti-BMP-2 mAb/BMP immune complex to BMP-receptor positive cell, as well as increased volume and strength of de novo bone formation in vivo .

Anshita, S., et al. (2013). "Biomedical Waste Management practices at King George's Medical University, Lucknow, Uttar Pradesh, India - a 3000-bed tertiary care hospital." Annals of Environmental Science **7**: 93-100.

Biomedical Waste Management (BMWM) is an integral part of infection control and hygiene programs in healthcare settings. Biomedical waste poses serious threats to environmental health and requires specific treatment and management prior to its final disposal. This study investigated the status of BMWM practices (segregation, collection, transportation, storage and final disposal) and quantification of wastes generated in King George's Medical University (KGMU), a 100 year-old, tertiary care institute in Lucknow, North India. The results of this study revealed that biomedical waste is segregated at the point of generation, which reduces the quantity of incinerable waste. Infectious waste generated in the hospital is about 19-20% of total waste generated of which only 4-5% waste is disposed off by incineration. The remaining percentage of infectious wastes (plastic, glass and sharps) is first treated in the hospital waste treatment facility. All infectious plastic waste is treated by autoclaving to make them noninfectious, than shredded into small pieces and finally sent to an authorized recycler. KGMU establishes a foolproof BMWM setup that ensures its proper collection, transportation, storage and disposal as per norms.

Anthony, R. S., et al. (1998). "Fas antigen (CD95) expression in peripheral blood progenitor cells from patients with leukaemia and lymphoma." Leukemia & Lymphoma **30**(5-6): 449-458.

Fas antigen (CD95) is a cell surface receptor belonging to the tumour necrosis factor/nerve growth factor superfamily and is able to induce apoptosis when triggered by its' natural ligand or an anti-Fas antibody. Fas expression is low on CD34+ bone marrow (BM) progenitor cells, but is increased by various cytokines in vitro. We investigated Fas expression on CD34+ cells from 39 peripheral blood progenitor cell (PBPC) harvests and from 5 normal BM harvests by dual colour flow cytometry to determine if Fas expression was altered during mobilisation. By including calibrated microbeads during flow cytometry, we quantified the number of Fas antigen molecules per cell. A low percentage of PBPC (22%) and normal BM (23%) CD34+ cells expressed Fas antigen. Fas expression varied on CD34+ cells from different diseases and the highest

expression was found in ALL (52%). There was a significant three fold increase in the number of Fas molecules/cell expressed on CD34+ cells (PBPC 6,230 molecules/cell, BM 2,236; p = 0.0003). This level of expression was considerably less than that for CD3/CD19 lymphocytes (33,095 molecules/cell) and CD14 monocytes (47,467 molecules/cell) in the PBPC harvest. In conclusion, mobilisation including the use of growth of factors, has minimal effect on CD34 progenitor cell Fas expression.

Antonsson, A. B. and S. Runmark (1987). "Airborne fibrous glass and dust originating from worked reinforced plastics." American Industrial Hygiene Association Journal **48**(8): 684-687.

The presence of respirable glass fibers in the dust from grinding, drilling and cutting of reinforced polyester plastics was investigated. The results show that 10% of the Swedish Threshold Limit Value (TLV) for synthetic inorganic fibers (3 fibers/mL) seldom will be exceeded. On the other hand, the results indicate that the Swedish TLV for thermosetting plastic dust (3 mg/m³) will be exceeded quite often. The authors examined the possibility of longitudinal glass fiber division during the working of reinforced polyester plastic and whether respirable glass fibers were produced. The results show that such a division does not occur for glass fibers embedded in polyester plastic and that the respirable fibers are related to fiber-shaped plastic particles or organic fiber particles.

Antosiak-Iwanska, M., et al. (2011). "If the parameters of encapsulation of langerhans islets influence insulin secretion?" International Journal of Artificial Organs **34 (8)**: 633.

Objectives: Diabetes remains a devastating disease, with tremendous cost in terms of human suffering and healthcare expenditures. A bioartificial pancreas has the potential as a promising approach to preventing or reversing complications associated with this disease. The immunoisolation of Langerhans islets have been developed as a method of normalization of the carbohydrate metabolism for diabetes. In this study we investigated the production of small diameter alginate microbeads (i.e.<0.3 mm) using electrostatic droplet generation. The aim of our study was to evaluate whether parameters of electrostatic droplet formation could influence the viability and secretory functions of Langerhans islets. Method(s): To investigate how the parameters of droplet generator have an influence on insulin secretion, hormone concentration was estimated during the encapsulated islets culture. Free, encapsulated islets were cultured for up to 10 days. The medium was changed every second day and the samples were taken and tested for insulin content. The islets in all tested groups were stained with dithizone and trypan blue before and after the culture. Result(s): In all groups we observed that 100% islets exhibited insulin production (red dye). In one of the tested group the islets were stained with PI in 30% after 10-day culture. In the same group a decline of insulin secretion was observed to compare with control. Conclusion(s): The viability and insulin secretion by encapsulated islets depend on the process parameters of their encapsulation.

Antunes, J., et al. (2018). "Microplastics on the Portuguese coast." Marine Pollution Bulletin **131**(Pt A): 294-302.

Marine anthropogenic litter was analysed in eleven beaches along the Portuguese coast, over a two-year period (2011-2013). Of all collected items, 99% were plastic and 68% were microplastics (MP; 1-5mm in diameter). Higher MP concentrations were found in winter/autumn, near industrial areas and/or port facilities and in beaches exposed to dominant winds. Resin pellets (79%) were the dominant category close to industrial areas and high concentrations of fragments and polymeric foams were found near fishing ports. The most frequent pellet size classes were 4 and 5mm (respectively 47% and 42%).

Apeh, C. C. (2018). "Survey of Sachet Water Waste Disposal in Liberia." Journal of Health & Pollution **8**(20): 181211.

Background: Five hundred milliliter bags of water, referred to as 'sachet water,' are widely used in Liberia, as they are low cost, safe sources of clean drinking water for the population.

Objectives: This study aims to determine sources of drinking water in the study area, the rate of sachet water use, empty sachet water disposal methods and environmental problems associated with sachet water waste disposal.

Methods: Using a simple random sampling technique, 257 respondents were interviewed between April and June 2018 using structured questionnaires. On a five-point Likert scale with a mean score of 3 as the cutoff point, data were analyzed using descriptive statistics.

Results: The paper found that sachet water (mean (M)=4.37) is an essential source of drinking water in Liberia with a daily consumption rate of at least 6 bags of sachet water per individual. Affordability, availability, and safety were named by respondents as reasons for their consumption of sachet water. Improper disposal methods practiced by the residents of Liberia included ground littering (M=3.42) and burning (M=3.03).

Conclusions: Sachet water consumption has contributed to environmental issues such as drainage system clogs, littering of the environment, the death of terrestrial and aquatic animals due to plastic waste consumption, reduction of oxygen for aquatic life and soil infertility. We recommend the creation of policies and enforcement of sachet water production to include reuse and recycling of sachet water by-products as a requirement for licensing of producers, provision of adequate waste bins and the use of public education campaigns to educate residents on environmental best practices.

Ethics Approval: This study was approved by the Institute for Population Studies, University of Liberia, Monrovia, Liberia.

Informed Consent: Obtained.

Competing Interests: The authors declare no competing financial interests.

Appel, A. A., et al. (2015). "X-ray phase contrast imaging of calcified tissue and biomaterial structure in bioreactor engineered tissues." Biotechnology & Bioengineering **112**(3): 612-620.

Tissues engineered in bioreactor systems have been used clinically to replace damaged tissues and organs. In addition, these systems are under continued development for many tissue engineering applications. The ability to quantitatively assess material structure and tissue formation is critical for evaluating bioreactor efficacy and for preimplantation assessment of tissue quality. Techniques that allow for the nondestructive and longitudinal monitoring of large engineered tissues within the bioreactor systems will be essential for the translation of these strategies to viable clinical therapies. X-ray Phase Contrast (XPC) imaging techniques have shown tremendous promise for a number of biomedical applications owing to their ability to provide image contrast based on multiple X-ray properties, including absorption, refraction, and scatter. In this research, mesenchymal stem cell-seeded alginate hydrogels were prepared and cultured under osteogenic conditions in a perfusion bioreactor. The constructs were imaged at various time points using XPC microcomputed tomography (micro CT). Imaging was performed with systems using both synchrotron- and tube-based X-ray sources. XPC micro CT allowed for simultaneous three-dimensional (3D) quantification of hydrogel size and mineralization, as well as spatial information on hydrogel structure and mineralization. Samples were processed for histological evaluation and XPC showed similar features to histology and quantitative analysis consistent with the histomorphometry. These results provide evidence of the significant potential of techniques based on XPC for noninvasive 3D imaging engineered tissues grown in

bioreactors.

Appleby, T., et al. (2016). "The marine biology of law and human health." Journal of the Marine Biological Association of the United Kingdom **96**(1): 19-27.

This review uses a multidisciplinary approach to investigate legal issues concerning the oceans and human health. It firstly seeks to define the boundaries of oceans and human health research. We use three case studies as examples: biomedical research, marine litter and human well-being. Biomedical research raises complex issues relating to coastal states' sovereign rights to exploit their marine resources and the patenting processes. Coastal states have differing degrees of control over research at sea. There are differences in EU and US law over the status of genetic discoveries, with the US having stricter criteria to qualify for patent protection. International law sets the standard for bioprospecting in developing countries under the Nagoya Protocol. The cost and complexity of marine biomedical research mean that it cannot be left to commercial exploration and needs some public funding. The second case study highlights the rise in marine plastics pollution using Marine Conservation Society beachwatch data. It details the need to alter product design to avoid marine pollution and records an unsuccessful attempt by academics and an NGO to make contact with the manufacturers of one polluting product. It also introduces the concept that faulty design could amount to a public nuisance. The third case study highlights the potential health benefits from access to the coast and the statutory responsibility which sits with the US and UK authorities in the provision of well-being. It posits that there needs to be greater inter-agency coordination to promote access to the coast for human well-being. © Marine Biological Association of the United Kingdom 2015.

Aqai, P. (2013). "Bioaffinity mass spectrometry for screening and identification of contaminants." Bioaffinity mass spectrometry for screening and identification of contaminants **199**.

Our environment is constantly threatened by large amounts and variations of manmade chemicals and natural substances. Parts of these substances accumulate and contaminate soil and surface water, affecting the organisms living in it and eventually contaminate the food chain. The European Union (EU) has imposed regulations and obliged EU member states to monitor for possible contaminants in the environment and food. For this, highly sophisticated mass spectrometry (MS) techniques, which can nowadays screen >100 contaminants in a single run, are applied. For rapid and inexpensive screening of contaminants, bioactivity-based screening assays are applied, however, identification of compounds based on their chemical-physical properties is not possible. As both methods cannot identify emerging and unknown bioactive contaminants, there is a need for new tools and concepts. In this thesis, new bioaffinity MS (BioMS) concepts, using an antibody, transport proteins and a receptor, are presented for the screening and identification of contaminants. In the first concept, monoclonal antibodies (Mabs) against ochratoxins were coupled to fluorescent labeled paramagnetic microbeads for high-throughput flow cytometric screening of ochratoxins in wheat and cereal. The identification of ochratoxins with nano-ultra performance liquid chromatography-quadrupole-time-of-flight-MS (nano-UPLC-Q-ToF-MS) was achieved in full scan accurate mass mode. In the second BioMS approach, the flow cytometer was replaced by UPLC-triple quadruple (QqQ)-MS for rapid screening of thyroid transporter ligands. For this, thyroid transport protein transthyretin (TTR) was immobilized onto inexpensive non-colored paramagnetic microbeads and a stable isotopic thyroid hormone was used as label in the competitive inhibition format. For the identification of TTR-binding endocrine disrupting chemicals (EDCs) in process water and urine, nano-UPLC-Q-ToF-MS was used. In order to perform high-throughput screening, a microtiter plate-based high-throughput BioMS approach

was developed with the same beads but coupled with recombinant human sex hormone-binding globulin (rhSHBG) for the detection of designer steroids in dietary supplements. Following the screening with rhSHBG-based BioMS using LC-QqQ-MS, the rhSHBG bioaffinity extracts were injected onto chip-UPLC-Q-ToF-MS operated in full scan mode and a wide range of steroids were identified. The same approach was applied with the estrogen receptor alpha (ER alpha) in which LC-QqQ-MS, instead of the commonly applied GC-MS, was used for the screening of estrogens with a suitable LC-MS-compatible label. The identification of estrogens in ERa-purified supplement extracts was achieved with UPLC-ion mobility (IM)-Q-ToF-MS. These new BioMS concepts present new tools for the screening and identification of emerging yet unknown food and environmental contaminants to ensure consumer's health and fair play in sports.

Aqai, P., et al. (2013). "Receptor-based high-throughput screening and identification of estrogens in dietary supplements using bioaffinity liquid-chromatography ion mobility mass spectrometry." Analytical & Bioanalytical Chemistry **405**(29): 9427-9436.

A high-throughput bioaffinity liquid chromatography-mass spectrometry (BioMS) approach was developed and applied for the screening and identification of recombinant human estrogen receptor alpha (ERalpha) ligands in dietary supplements. For screening, a semi-automated mass spectrometric ligand binding assay was developed applying (13)C2, (15) N-tamoxifen as non-radioactive label and fast ultra-high-performance-liquid chromatography-electrospray ionisation-triple-quadrupole-MS (UPLC-QqQ-MS), operated in the single reaction monitoring mode, as a readout system. Binding of the label to ERalpha-coated paramagnetic microbeads was inhibited by competing estrogens in the sample extract yielding decreased levels of the label in UPLC-QqQ-MS. The label showed high ionisation efficiency in positive electrospray ionisation (ESI) mode, so the developed BioMS approach is able to screen for estrogens in dietary supplements despite their poor ionisation efficiency in both positive and negative ESI modes. The assay was performed in a 96-well plate, and all these wells could be measured within 3 h. Estrogens in suspect extracts were identified by full-scan accurate mass and collision-cross section (CCS) values from a UPLC-ion mobility-Q-time-of-flight-MS (UPLC-IM-Q-ToF-MS) equipped with a novel atmospheric pressure ionisation source. Thanks to the novel ion source, this instrument provided picogram sensitivity for estrogens in the negative ion mode and an additional identification point (experimental CCS values) next to retention time, accurate mass and tandem mass spectrometry data. The developed combination of bioaffinity screening with UPLC-QqQ-MS and identification with UPLC-IM-Q-ToF-MS provides an extremely powerful analytical tool for early warning of ERalpha bioactive compounds in dietary supplements as demonstrated by analysis of selected dietary supplements in which different estrogens were identified.

Aqai, P., et al. (2013). "High-throughput bioaffinity mass spectrometry for screening and identification of designer anabolic steroids in dietary supplements." Analytical Chemistry **85**(6): 3255-3262.

A generic high-throughput bioaffinity liquid chromatography-mass spectrometry (BioMS) approach was developed and applied for the screening and identification of known and unknown recombinant human sex hormone-binding globulin (rhSHBG)-binding designer steroids in dietary supplements. For screening, a semi-automated competitive inhibition binding assay was combined with fast ultrahigh-performance-LC-electrospray ionization-triple-quadrupole-MS (UPLC-QqQ-MS). 17beta-Testosterone-D3 was used as the stable isotope label of which the binding to rhSHBG-coated paramagnetic microbeads was inhibited by any other binding (designer) steroid. The assay was performed in a 96-well plate and combined with the fast LC-MS, 96 measurements could be performed within 4 h. The concentration-dependent

inhibition of the label by steroids in buffer and dietary supplements was demonstrated. Following an adjusted bioaffinity isolation procedure, suspect extracts were injected into a chip-UPLC(NanoTile)-Q-time-of-flight-MS system for full-scan accurate mass identification. Next to known steroids, 1-testosterone was identified in three of the supplements studied and the designer steroid tetrahydrogestrinone was identified in a spiked supplement. The generic steroid-binding assay can be used for high-throughput screening of androgens, estrogens, and gestagens in dietary supplements to fight doping. When combined with chip-UPLC-MS, it is a powerful tool for early warning of unknown emerging rhSHBG bioactive designer steroids in dietary supplements.

Aqai, P., et al. (2012). "Triple bioaffinity mass spectrometry concept for thyroid transporter ligands." Analytical Chemistry **84**(15): 6488-6493.

For the analysis of thyroid transporter ligands, a triple bioaffinity mass spectrometry (BioMS) concept was developed, with the aim at three different analytical objectives: rapid screening of any ligand, confirmation of known ligands in accordance with legislative requirements, and identification of emerging yet unknown ligands. These three purposes share the same biorecognition element, recombinant thyroid transport protein transthyretin (rTTR), and dedicated modes of liquid chromatography-mass spectrometry (LC-MS). For screening, a rapid and radiolabel-free competitive inhibition MS binding assay was developed with fast ultrahigh performance-liquid chromatography-electrospray ionization-triple-quadrupole-MS (UPLC-QqQ-MS) as the readout system. It uses the nonradioactive stable isotopic thyroid hormone (13)C(6)-L-thyroxine as the label of which the binding to rTTR is inhibited by any ligand such as thyroid drugs and thyroid endocrine disrupting chemicals (EDCs). To this end, rTTR is either used in solution or immobilized on paramagnetic microbeads. The concentration-dependent inhibition of the label by the natural thyroid hormone l-thyroxine (T4), as a model analyte, is demonstrated in water at part-per-trillion and in urine at part-per-billion level. For confirmation of identity of known ligands, rTTR was used for bioaffinity purification for confirmation of naturally present free T4 in urine. As a demonstrator for identification of unknown ligands, the same rTTR was used again but in combination with nano-UPLC-quadrupole time-of-flight-MS (nLC-Q-TOF-MS) and urine samples spiked with the model "unknown" EDCs triclosan and tetrabromobisphenol-A. This study highlights the potential of BioMS using one affinity system, both for rapid screening and for confirmation and identification of known and unknown emerging thyroid EDCs.

Aqai, P., et al. (2011). "Immunomagnetic microbeads for screening with flow cytometry and identification with nano-liquid chromatography mass spectrometry of ochratoxins in wheat and cereal." Analytical and bioanalytical chemistry **400**(9): 3085-3096.

Multi-analyte binding assays for rapid screening of food contaminants require mass spectrometric identification of compound(s) in suspect samples. An optimal combination is obtained when the same bioreagents are used in both methods; moreover, miniaturisation is important because of the high costs of bioreagents. A concept is demonstrated using superparamagnetic microbeads coated with monoclonal antibodies (Mabs) in a novel direct inhibition flow cytometric immunoassay (FCIA) plus immunoaffinity isolation prior to identification by nano-liquid chromatography-quadrupole time-of-flight-mass spectrometry (nano-LC-Q-ToF-MS). As a model system, the mycotoxin ochratoxin A (OTA) and cross-reacting mycotoxin analogues were analysed in wheat and cereal samples, after a simple extraction, using the FCIA with anti-OTA Mabs. The limit of detection for OTA was 0.15 ng/g, which is far below the lowest maximum level of 3 ng/g established by the European Union. In the immunomagnetic isolation method, a 350-times-higher amount of beads was used to trap ochratoxins from sample extracts. Following a wash step, bound ochratoxins were dissociated from the Mabs using a small volume of acidified acetonitrile/water (2/8v/v) prior to separation plus identification with nano-LC-Q-ToF-MS. In screened suspect naturally contaminated samples, OTA and its non-chlorinated analogue ochratoxin B were successfully identified by full scan accurate mass spectrometry as a proof of concept for identification of unknown but cross-reacting emerging mycotoxins. Due to the miniaturisation and bioaffinity isolation, this concept might be applicable for the use of other and more expensive bioreagents such as transport proteins and receptors for screening and identification of known and unknown (or masked) emerging food contaminants.

Arango, C., et al. (2014). "Effect of virgin heterophasic PP copolymer content on moisture absorption, thermal and mechanical properties of recycled polyethylene wood flour composites." Journal of the Chilean Chemical Society **59**(1): 2374-2377.

The effect of virgin heterophasic PP copolymer (vPP) content on moisture absorption, as well as on thermal and mechanical properties of recycled polyethylene/wood flour composites was investigated. The polymer matrix of recycled post-consumed plastic waste (rPE) was composed of a matrix of LDPE and a part of PP. Wood flour of Pinus radiata was used as filler at a constant loading of 45 wt.%. rPE/vPP blends and their composites were manufactured by melt blending, and then by injection molding. The morphology of the blends and composites was analyzed by means of scanning electron microscopy. The addition of vPP improved tensile and flexural moduli and flexural strength of wood plastic composites (WPC). The highest increase of these properties was observed for a WPC sample with a rPE/vPP ratio of 19. WPC made with higher virgin PP content (rPE/vPP ratio=9 and 5.7) showed lower increase of mechanical properties compared to polymer matrix and WrPE samples. The moisture uptake of WPC made of rPE/vPP blend was higher than those of rPE, and their mechanical properties were more adversely affected by immersion in water. TGA results indicate that rPE are thermally more stable than rPE/vPP blends. The incorporation of heterophasic PP copolymer into the recycled polymer matrix of WPC delays the starting of wood flour degradation.

Araujo, A., et al. (2019). "Hepatotoxicity of pristine polyethylene microplastics in neotropical physalaemus cuvieri tadpoles (Fitzinger, 1826)." Journal of Hazardous Materials **386**: 121992.

Plastic waste disposal in the environment is a major issue worldwide, whose effects on different biotas are the object of several investigations. The toxicity caused by microplastics (MPs) in organisms living in freshwater environments remains little explored. Little is known about the consequences of the exposure to these pollutants on the health of amphibians. Thus, we tested the hypothesis that the exposure of Physalaemus cuvieri tadpoles to microplastic polyethylene (PE MP) causes histopathological damage to their liver. Data collected after seven days of exposure to MPs (60mg/L) have shown that pollutant bioaccumulation in tadpoles' liver was correlated to different histopathological changes (blood vessel dilation, infiltration, congestion, hydropic degeneration, hypertrophy and hyperplasia), which showed the histopathotoxicity of MPs. Furthermore, we observed changes in hepatocyte nuclei size (area and diameter), volume and shape induced by the exposure to PE MPs, a fact that evidenced the cytotoxic effect of these pollutants. To the best of our knowledge, the current study is the first to report the histopathotoxicity of PE MPs in representatives of the amphibian group, and it contributes to improving knowledge about these pollutants and how they may affect the health of these animals.

Araujo, M. C. B. and M. F. Costa (2019). "From Plant to Waste: The Long and Diverse Impact Chain Caused by Tobacco Smoking." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(15): 28.

Smoking is a social phenomenon of global scope. The impacts start from the cultivation of the plant to the disposal of cigarette butts in the most diverse places. These aspects go beyond economic and public health issues, also affecting natural environments and their biota in a serious and indistinct way. Of the six trillion cigarettes consumed globally each year, four and a half trillion are disposed somewhere in the environment. Cigarette butts are predominantly plastic, non-biodegradable waste, prevalent in coastal environments in various parts of the world, and with high potential for generating impacts on a wide range of socioeconomic and environmental aspects. Among the 5000 compounds found in a cigarette, those with higher toxic potential are mainly concentrated in the filter and in tobacco remnants, which are items found in discarded cigarette butts. After surveying published studies on this topic, the present study addressed the interaction between the impacts related to tobacco smoking, highlighting the problem as an important and emerging issue that demands joint efforts, and actions especially focused on the reduction of environmental impacts, an aspect that has not yet been assessed.

Araz, M. K., et al. (2013). "Microfluidic Multiplexing in Bioanalyses." Journal of Laboratory Automation **18**(5): 350-366.

The importance of biological assays spans from clinical diagnostics to environmental monitoring. Simultaneous detection of multiple analytes enhances the efficacy of bioassays by providing more data per assay under standardized conditions. Nevertheless, simultaneous handling and assaying of multiple samples, targets, and experimental conditions can be laborious, reagent consuming, and time intensive. Given these demands, microfluidic platforms have emerged over the past two decades as well-suited approaches for multiplexed assays. Microfluidic design supports integration of assay steps and reproducible sample manipulation across large sets of conditions-all relevant to multiplexed assays. Taken together, reduced reagent consumption, faster assay times, and potential for automation stemming from microfluidic assay design are attractive and needed multiplexed assay performance attributes. This review highlights recent advances in multiplexed bioanalyses benefitting from microfluidic integration. © 2013 Society for Laboratory Automation and Screening.

Arca-Ramos, A., et al. (2016). "Recyclable cross-linked laccase aggregates coupled to magnetic silica microbeads for elimination of pharmaceuticals from municipal wastewater." Environmental Science & Pollution Research **23**(9): 8929-8939.

In the present work, the use of magnetic mesoporous silica microbeads (MMSMB) as supports was proposed to produce magnetically-separable cross-linked enzyme aggregates (MCLEAs). The effects of cross linking time, addition of bovine serum albumin as protein feeder, pH, glutaraldehyde concentration, and laccase:MMSMB mass ratio on the immobilization yield and enzyme load were investigated. The best conditions allowed the rapid preparation of MCLEAs with high enzyme load, i.e., 1.53 U laccase/mg MCLEAs. The stability of MCLEAs was improved with regard to low pH, presence of chemical denaturants, and real wastewater matrix, compared to free laccase. In addition, the novel biocatalyst exhibited good operational stability, maintaining up to 70 % of its initial activity after 10 successive batch reactions. Finally, MCLEAs demonstrated its catalytic potential to transform acetaminophen and various non-phenolic pharmaceutical active compounds as mefenamic acid, fenofibrate, and indomethacin from biologically treated wastewater effluent, with similar or even higher efficiency than free laccase.

Archer, M. J., et al. (2008). "Development and Characterization of a Solid Phase for Single-Step Enrichment of Pathogenic Targets." Open Analytical Chemistry Journal **2**: 47-54.

The identification of low abundance target nucleic acids in a complex matrix can be challenging due to the abundance background material. Current methods use two-step processes which are time consuming, prone to contamination and usually limited to one pathogen. In this study we describe a single-step target-capture approach using magnetic microbeads with capture probes covalently attached through a phosphorus dendrimer linker. This approach was also used successfully for simultaneous capturing of two low abundance pathogenic nucleic acids present in a complex matrix (800- fold excess of background nucleic acids) by using a multi-pathogen solid phase. The thermal stability of the solid phase allows denaturation and capture to proceed sequentially and the recovery of the targets to be performed by heat denaturation without the risk of probe shedding. The critical variables involved in the development of the solid phase and the steps required for further optimization are discussed.

Arciero, R. A., et al. (2015). "The effect of a combined glenoid and Hill-Sachs defect on glenohumeral stability: a biomechanical cadaveric study using 3-dimensional modeling of 142 patients." American Journal of Sports Medicine **43**(6): 1422-1429.

BACKGROUND: Bone loss in anterior glenohumeral instability occurs on both the glenoid and the humerus; however, existing biomechanical studies have evaluated glenoid and humeral head defects in isolation. Thus, little is known about the combined effect of these bony lesions in a clinically relevant model on glenohumeral stability.

HYPOTHESIS/PURPOSE: The purpose of this study was to determine the biomechanical efficacy of a Bankart repair in the setting of bipolar (glenoid and humeral head) bone defects determined via computer-generated 3-dimensional (3D) modeling of 142 patients with recurrent anterior shoulder instability. The null hypothesis was that adding a bipolar bone defect will have no effect on glenohumeral stability after soft tissue Bankart repair.

STUDY DESIGN: Controlled laboratory study.

METHODS: A total of 142 consecutive patients with recurrent anterior instability were analyzed with 3D computed tomography scans. Two Hill-Sachs lesions were selected on the basis of volumetric size representing the 25th percentile (0.87 cm(3); small) and 50th percentile (1.47 cm(3); medium) and printed in plastic resin with a 3D printer. A total of 21 cadaveric shoulders were evaluated on a custom shoulder-testing device permitting 6 degrees of freedom, and the force required to translate the humeral head anteriorly 10 mm at a rate of 2.0 mm/s with a compressive load of 50 N was determined at 60degree of glenohumeral abduction and 60degree of external rotation. All Bankart lesions were made sharply from the 2- to 6-o'clock positions for a right shoulder. Subsequent Bankart repair with transosseous tunnels using high-strength suture was performed. Hill-Sachs lesions were made in the cadaver utilizing a plastic mold from the exact replica off the 3D printer. Testing was conducted in the following sequence for each specimen: (1) intact, (2) posterior capsulotomy, (3) Bankart lesion, (4) Bankart repair, (5) Bankart lesion with 2-mm glenoid defect, (6) Bankart repair, (7) Bankart lesion with 2-mm glenoid defect and Hill-Sachs lesion, (8) Bankart repair, (9) Bankart lesion with 4-mm glenoid defect and Hill-Sachs lesion, (10) Bankart repair, (11) Bankart lesion with 6-mm glenoid defect and Hill-Sachs lesion, and (12) Bankart repair. All sequences were used first for a medium Hill-Sachs lesion (10 specimens) and then repeated for a small Hill-Sachs lesion (11 specimens). Three trials were performed in each condition, and the mean value was used for data analysis.

RESULTS: A statistically significant and progressive reduction in load to translation was observed after a Bankart lesion was created and with the addition of progressive glenoid defects for each

humeral head defect. For medium (50th percentile) Hill-Sachs lesions, there was a 22%, 43%, and 58% reduction in stability with a 2-, 4-, and 6-mm glenoid defect, respectively. For small (25th percentile) Hill-Sachs lesions, there was an 18%, 27%, and 42% reduction in stability with a 2-, 4-, and 6-mm glenoid defect, respectively. With a >=2-mm glenoid defect, the medium Hill-Sachs group demonstrated significant reduction in translation force after Bankart repair (P < .01), and for the small Hill-Sachs group, a >=4-mm glenoid defect was required to produce a statistical decrease (P < .01) in reduction force after repair.

CONCLUSION: Combined glenoid and humeral head defects have an additive and negative effect on glenohumeral stability. As little as a 2-mm glenoid defect with a medium-sized Hill-Sachs lesion demonstrated a compromise in soft tissue Bankart repair, while small-sized Hill-Sachs lesions showed compromise of soft tissue repair with >=4-mm glenoid bone loss.

CLINICAL RELEVANCE: Bipolar bony lesions of the glenoid and humeral head occur frequently together in clinical practice. Surgeons should be aware that the combined defects and glenoid bone loss of 2 to 4 mm or approximately 8% to 15% of the glenoid could compromise Bankart repair and thus may require surgical strategies in addition to traditional Bankart repair alone to optimize stability.

Ardente, F., et al. (2010). "Life Cycle Assessment-Driven Selection of Industrial Ecology Strategies." <u>Integrated Environmental Assessment & Management</u> **6**(1): 52-60.

The paper presents an application of the Life-Cycle Assessment (LCA) to the planning and environmental management of an "eco-industrial cluster." A feasibility study of industrial symbiosis in southern Italy is carried out, where interlinked companies share subproducts and scraps, services, structures, and plants to reduce the related environmental impact. In particular, the research focuses on new recycling solutions to create open recycling loops in which plastic subproducts and scraps are transferred to external production systems. The main environmental benefits are the reduction of resource depletion, air emissions, and landfilled wastes. The proposed strategies are also economically viable and they suggest cost abatement for the involved companies. This research shows the need for a multidisciplinary approach to data processing and to complexity managing of the investigated systems. In this context, life-cycle thinking is required to be promoted throughout the economy, as well to be as a part of all decisions on products and other criteria such as functionality, health, and safety. The Life-Cycle Assessment approach can be assumed as a methodology for influencing decision makers to make sustainable choices. [ABSTRACT FROM AUTHOR]

Arena, U., et al. (2011). "A techno-economic comparison of fluidized bed gasification of two mixed plastic wastes." <u>Waste Management</u> **31**(7): 1494-1504.

A comparison between the most promising design configurations for the industrial application of gasification based, plastics-to-energy cogenerators in the 2-6. MWe range is presented. A pilot scale bubbling fluidized bed air gasifier, having a feeding capacity of 100 kg/h, provided experimental data: the syngas complete composition, the characterization of the bed material, the entrained fines collected at the cyclone and the purge material from the scrubber. Mass and energy balances and material and substance flow analyses have been therefore drawn to assess

and compare design solutions utilizing two mixed plastic wastes (MPW) obtained from separate collection of plastic packaging, after different levels of pre-treatments. The related techno-economic performances have been finally estimated on the basis of the manufacturer's specifications. The study concludes that the MPW obtained after a very simple pre-treatment and fed to a gasifier coupled with a steam turbine is the solution that currently offers the higher reliability and provides the higher internal rate of return for the investigated range of electrical energy production. © 2011.

Arena, U., et al. (2009). "Tar removal during the fluidized bed gasification of plastic waste." Waste Management **29**(2): 783-791.

A recycled polyethylene was fed in a pilot plant bubbling fluidized bed gasifier, having an internal diameter of 0.381 m and a maximum feeding capacity of 90 kg/h. The experimental runs were carried out under various operating conditions: the bed temperature was kept at about 850 degrees C, the equivalence ratio varied between 0.2 and 0.35, the amount of bed material was between 131 and 215 kg, the fluidizing velocity was between 0.5 and 0.7 m/s, quartz sand and olivine were used as bed material, and air and steam were used as fluidizing reactants. The results confirm that the tar removal treatments applied inside the gasifier (primary methods) can eliminate or strongly reduce the need for a further downstream cleanup of the syngas. In particular, the utilization of a natural olivine as an in situ tar reduction agent remarkably improves the quality of the product gas, in terms of both high hydrogen volumetric fraction and larger syngas yield.

Arias, A. H., et al. (2019). "Evidence of microplastic ingestion by fish from the Bahia Blanca Estuary in Argentina, South America." Bulletin of environmental contamination and toxicology **102**(6): 750-756.

The aim of this study was to assess - for the first time - the occurrence and distribution of microplastics (MPs) in the gastrointestinal tracts (GITs) of a marine commercial fish species (Micropogonias furnieri) from the Bahia Blanca Estuary (BBE) in Argentina, and to evaluate fish potential associated stress. In order to do this, juveniles were sampled using artisanal fishing arts at two sampling locations. Basic measurements of individual fish were taken (total length, total weight, weight of the liver) and GITs were subsequently removed, digested with 30% H₂O₂ for 5 days at 60 degrees C, filtered on Whatman paper and then dried. Samples were observed with a stereomicroscope, and it was demonstrated that 100% of the individuals contained microplastic particles in their GITs. In total, 241 microplastic particles were removed from the GITs of all fish. They were categorized as fibers (60.8%), pellets (28.9%), fragments (8.6%) and laminas (1.4%), and they ranged in size from 0.98 to >5 mm. The average number of particles per fish was higher than that reported in previous global marine studies. Moreover, a positive correlation between the number of MPs per fish and hepatosomatic index was found, suggesting a probable stress in their health condition. These findings provide the first and southernmost evidence of microplastic contamination in biota from the Argentinean sea, which is found in the South Atlantic sea.

Arias-Andres, M., et al. (2018). "Microplastics: New substrates for heterotrophic activity contribute to altering organic matter cycles in aquatic ecosystems." Science of the Total Environment **635**: 1152-1159.

Heterotrophic microbes with the capability to process considerable amounts of organic matter can colonize microplastic particles (MP) in aquatic ecosystems. Weather colonization of microorganisms on MP will alter ecological niche and functioning of microbial communities remains still unanswered. Therefore, we compared the functional diversity of biofilms on microplastics when incubated in three lakes in northeastern Germany differing in trophy and limnological features. For all lakes, we compared heterotrophic activities of MP biofilms with those of microorganisms in the surrounding water by using Biolog EcoPlates and assessed their oxygen consumption in microcosm assays with and without MP. The present study found that the total biofilm biomass was higher in the oligo-mesotrophic and dystrophic lakes than in the eutrophic lake. In all lakes, functional diversity profiles of MP biofilms consistently differed from those in the surrounding water. However, solely in the oligo-mesotrophic lake MP biofilms had a higher functional richness compared to the ambient water. These results demonstrate that the functionality and hence the ecological role of MP-associated microbial communities are context-dependent, i.e. different environments lead to substantial changes in biomass build up and heterotrophic activities of MP biofilms. We propose that MP surfaces act as new niches for aquatic microorganisms and that the constantly increasing MP pollution has the potential to globally impact carbon dynamics of pelagic environments by altering heterotrophic activities.

Arias-Andres, M., et al. (2018). "Microplastic pollution increases gene exchange in aquatic ecosystems." Environmental Pollution **237**: 253-261.

Pollution by microplastics in aquatic ecosystems is accumulating at an unprecedented scale, emerging as a new surface for biofilm formation and gene exchange. In this study, we determined the permissiveness of aquatic bacteria towards a model antibiotic resistance plasmid, comparing communities that form biofilms on microplastics vs. those that are free-living. We used an exogenous and red-fluorescent E. coli donor strain to introduce the green-fluorescent broad-host-range plasmid pKJK5 which encodes for trimethoprim resistance. We demonstrate an increased frequency of plasmid transfer in bacteria associated with microplastics compared to bacteria that are free-living or in natural aggregates. Moreover, comparison of communities grown on polycarbonate filters showed that increased gene exchange occurs in a broad range of phylogenetically-diverse bacteria. Our results indicate horizontal gene transfer in this habitat could distinctly affect the ecology of aquatic microbial communities on a global scale. The spread of antibiotic resistance through microplastics could also have profound consequences for the evolution of aquatic bacteria and poses a neglected hazard for human health.

Arias-Andres, M., et al. (2019). "Collateral effects of microplastic pollution on aquatic microorganisms: An ecological perspective." TrAC - Trends in Analytical Chemistry **112**: 234-240.

Microplastics (MP) provide a unique and extensive surface for microbial colonization in aquatic ecosystems. The formation of microorganism-microplastic complexes, such as biofilms, maximizes the degradation of organic matter and horizontal gene transfer. In this context, MP affect the structure and function of microbial communities, which in turn render the physical and chemical fate of MP. This new paradigm generates challenges for microbiology, ecology, and ecotoxicology. Dispersal of MP is concomitant with that of their associated microorganisms and their mobile genetic elements, including antibiotic resistance genes, islands of pathogenicity, and diverse metabolic pathways. Functional changes in aquatic microbiomes can alter carbon metabolism and food webs, with unknown consequences on higher organisms or human microbiomes and hence health. Here, we examine a variety of effects of MP pollution from the microbial ecology perspective, whose repercussions on aquatic ecosystems begin to be unraveled. Copyright © 2018 Elsevier B.V.

Arjomand Fard, N., et al. (2017). "Efficacy and Safety of G2013 as a Novel Immunosuppressive Agent on Differentiation, Maturation and Function of Human Dendritic Cells." Iranian Journal of Public Health **46**(2): 216-221.

BACKGROUND: The expanse of dendritic cells (DC) differentiation plays an important role in determining immune response. DC-based immunosuppressive drugs have notable side effects in increasing the risk of infectious diseases and cancers. G2013, as a novel anti-inflammatory and immunosuppressive agent, has been tested in experimental model of multiple sclerosis. The aim of this study was to conduct the safety property of G2013 on dendritic cells biology.
METHODS: The effect of G2013 on differentiation, maturation, and function of dendritic cells was examined at Tehran University in 2014. To investigate how G2013 affects human dendritic cells (DC) in a defined inflammatory environment, human peripheral blood mononuclear cells (PBMC) were isolated from healthy blood. Monocytes were then purified using anti-CD14 microbeads. Monocytes were treated with G2013 in two different doses (6 and 12 mug/well) along with adding granulocyte-macrophage colony-stimulating factor (GM-CSF) and interleukin-4 for inducing monocytes to immature DC and adding lipopolysaccharide for running DC maturation. Differentiation, maturation, and function of dendritic cells were examined with flow cytometry and ELISA.
RESULTS: G2013 therapy had no significant effect on CD83, CD86 and DR expression, as well as IL-10 and IL-12 cytokine levels and it, has no remarkable side on differentiation, maturation and function of dendritic cells in immature DC and mature DC process in vitro.
CONCLUSION: G2013 is a safe agent with no adverse effect on differentiation, maturation, and function of dendritic cells. It may be recommended as a novel immunosuppressive agent with no or little side effect in increasing the risk of infectious diseases and cancers.

Arndt, G. (2019). "Trace substances and microplastic in drinking and wastewater. Review of the Wastewater Conferences of Hach Lange GmbH." Flussiges Obst **86**(6): 198-201.

Arnold, J. C. (2004). Chapter 13: Reprocessing**:** 272-299.
This article presents chapter thirteen of the book "Green Composites: Polymer Composites and the Environment," edited by Caroline Baillie. The chapter is entitled "Reprocessing". It deals with management of waste plastics and composites, methods of recycling plastics, methods of sorting and separating polymers and plastics, and future trends. The bulk polymers of polyvinyl chloride, polyethylene, polypropylene, and polystyrene comprise 70 percent of the plastics used worldwide. There are multiple problems in dealing with waste plastics and composites.

Arnold, M. L., et al. (2017). "A normalization factor for an increased comparability within antibody results, tested by bead-based single antigen assays." Hla **89 (6)**: 393-394.
The Implementation of bead based techniques (Luminex) for anti-HLA antibody (Ab) detection has increased the complexity of Ab identification and specification. MFI values in Luminex Single Ag assays do not automatically mirror a predictable Ab concentration. The mean fluorescence intensity (MFI) of Abs is used for the definition of "unacceptable antigens", even though there are considerable inter- and intra-HLA locus differences in the MFI readout of the Luminex assays. The aim of our study was to compare reaction patterns of Ab positive sera with respect to the various HLA class I and II Ab targets. MFI values of HLA specificities were measured and calculated in 278 anti HLA class I Ab positive and 281 anti HLA class II Ab positive sera from patients on the local waiting list in Erlangen, Germany using Luminex Single Ag assays. Anti HLA-C Abs reacted with a lower mean MFI level compared to anti- HLA-A and anti-HLA-B Abs. In contrast, anti HLA-DQ Abs showed higher MFI values than HLA-DR and HLA-DP Abs. In order to define a comparable MFI cutoff for all HLA Ab specificities, two normalization factors were calculated, based on a "positive" assumed cut-off of 3000 MFI: one for anti HLA-C Ab MFI (MFI x 2.11) and one for HLA-DQ Ab (MFI x 0.64) MFI. Due to the various Ag loading densities on the

surface of the microbeads, MFI values of different HLA specificities are not comparable. Furthermore, HLA inter-specific differences in Ab binding cannot be ruled out. In the interest of treating all Ab MFI values equally, independent of the various HLA targets, a unique Ab MFI cutoff within a single patient's serum should be calculated using a normalization factor for - at least - HLA-C and HLA-DQ Abs. In order to perform a "virtual crossmatch", the definition of unacceptable antigens, based on MFI value without taking into account the inter-HLA locus variability should be discussed intensively. A comprehensive concept for the evaluation of this normalization factor would appear to be sensible.

Arnold, R., et al. (1998). "Use of plastic waste for innovative knitted fabrics for agriculture and horticulture." Plasticulture **116**: 43-55.

The recycling of plastic wastes (PES, PP and PE) into woven textiles suitable for use in agriculture and horticulture is discussed. Such textiles can be used for storing, distributing and draining water, for shielding crops from solar radiation, and for protecting crops from the wind, birds and insects. Other topics covered include the manufacture and use of textiles for irrigation, ventilation and oxygenation, for soilless culture, and for heat transfer in greenhouses.

Arnold, W. A. and A. L. Roberts (2000). "Inter- and intraspecies competitive effects in reactions of chlorinated ethylenes with zero-valent iron in column reactors." Environmental Engineering Science **17**(5): 291-302.

Reaction kinetics are a key component of process models used to design Fe(0) permeable barriers employed to treat groundwater contaminated with chlorinated solvents. In this work, columns packed with a mixture of zero-valent iron and glass microbeads were used to assess whether the competitive effects observed in batch systems also occur in column reactors. As with the batch studies previously conducted, both inter- and intraspecies competition were observed, in qualitative agreement with predictions obtained from a modified Langmuir-Hinshelwood-Hougen-Watson (LHHW) kinetic model in which species compete for a limited number of reactive sites. The observed changes in pseudo first-order rate 'constant' at different initial concentrations or in the presence of competitors could not be attributed to alterations in the transport properties of the column packing or to 'aging' of the iron. Numerical simulations were used to explore the consequences of applying a pseudo first-order kinetic model instead of the LHHW model. The results demonstrate that intraspecies competitive effects are sufficiently important to merit explicit consideration in permeable barrier design.

Arouche-Delaperche, L., et al. (2015). "Effects of auto-antibodies anti-signal recognition particle (SRP) and anti-hydroxymethylglutaryl-CoA reductase (HMGCR) on muscle cells." Neuromuscular Disorders **2)**: S250.

Necrotizing myopathies (NM) might be acquired auto-immune muscle diseases, in which muscle biopsy demonstrates marked muscle necrosis with regeneration, little or absence of inflammatory infiltrates and a particular pattern of complement C5b-9 deposition on muscle fibers. NM can be seropositive for some auto-antibodies (aAbs) such as anti-SRP as well as anti-HMGCR. The titer of those Abs is correlated with the creatine kinase levels, but their role remains unclear. In the current study, we investigated the effect of the aAbs anti-SRP and anti-HMGCR on in vitro primary human myoblasts/myotubes. Primary human myoblasts were isolated from human muscle biopsies of nonmyopathic patients. Myoblasts were sorted by CD56 immune-magnetic microbead Abs. To study the effect of the auto-Abs on muscle cells, confluent myoblasts and 3 day myotubes were incubated with anti-SRP or anti-HMGCR positive human IgG for 72 hours or with IVIg as a control. We demonstrate that the addition of the aAbs onto

differentiated myotubes leads to atrophy, as measured by the reduction of the size of myotubes (anti-SRP 66.5 +/- 2.6 mum², anti-HMGCR 66.5 +/- 4.8 mum² vs control 118.8 +/- 6.1 mum², p < 0.001). The expression of atrophic genes as Atrogin and Murf-1 was measured by qPCR; the culture with anti-SRP Abs shows an increase of Atrogin expression and the anti-HMGCR shows an increase of Murf1 compared to the control. Furthermore, addition of the aAbs to a confluent myoblasts significantly reduced the capacity of myoblasts to differentiate (anti-SRP 44.2 +/- 7.7 mum², anti-HMGCR 53.6 +/- 7.7 mum² vs control 147.8 +/- 5.4 mum², p < 0.001). These findings suggest that anti-SRP and anti- HMGCR aAbs have a pathogenic effect on muscle cells in vitro by both inhibiting cell fusion and triggering atrophy on fully differentiated myotubes.

Arp, H. P. H., et al. (2011). "Presence and partitioning properties of the flame retardants pentabromotoluene, pentabromoethylbenzene and hexabromobenzene near suspected source zones in Norway." Journal of Environmental Monitoring **13**(3): 505-513.

The brominated flame retardants (BFRs), pentabromotoluene (PBT), pentabromoethylbenzene (PBEB) and hexabromobenzene (HBB), exhibit physical-chemical properties similar to other persistent organic pollutants, and have been in use as flame retardants for several decades. Data on these BFRs in diverse environmental samples can be found in studies from the 1970s and 1980s, as well as in recent years, though very little in the years in between. Due to a lack of data, the cause for the apparent re-emergence of these BFRs in recent studies is unclear, and could reflect changes in production volumes, accumulation of transformation products from BFR precursors, improved analytical techniques or simply a re-emergence in concern. Very little data are available on their environmentally relevant partitioning properties, which could help to explain the occurrence and fate of these BFRs. In this study we analysed for the presence of HBB, PBT, and PBEB in diverse environmental samples from potential Norwegian BFR source zones. Additionally, environmental partitioning properties of these BFRs as well as brominated benzenes were estimated and validated using experimental data for brominated benzenes. Of the three BFRs, HBB was identified in detectable quantities at most source zones, PBEB only near a metal recycling factory, and PBT only in a few additional locations from where PBEB was detected. Data from this study show that HBB is likely widely distributed, as verified both by chemical analysis and estimated properties. Measured HBB levels in wastewater treatment plants indicate that the treatment practices used in the study locations are not effective at lowering HBB levels, perhaps due to association with low density suspended solids (e.g. microplastics). © 2011 The Royal Society of Chemistry.

Arrieta-Bolanos, E., et al. (2019). "Relative contribution of naive and memory T cells to alloreactivity in hematopoietic cell transplantation." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Introduction: Graft-versus-host disease (GvHD) is a major impediment to the cure of blood disorders by hematopoietic cell transplantation (HCT). GvHD is mediated by alloreactive T cells recognizing histocompatibility antigen (HAg) mismatches between patient and donor. Naive T cells are thought to be the main mediators of alloreactive responses since, theoretically, memory T cells would have never been exposed to and selected by alloantigens, except in multiparous women or transfused individuals. Accordingly, clinical trials using naive T cell-depleted allografts are being conducted with the aim to reduce GvHD after human leukocyte antigen (HLA)-matched HCT. However, several groups have shown that memory T cells can also mediate alloreactive responses, in particular against mismatched HLA. We hypothesized that the relative importance of naive vs. memory T cell alloreactivity depends on the matching status of the patient-donor pair. Specifically, we reasoned that naive-depletion strategies will be most efficient in HLA-identical sibling HCT, where minor (m)HAg presented by self-HLA are the only targets of T cell alloreactivity, but less so in HLA-matched unrelated HCT, where HLA-DPB1 mismatches (mmDPB1) are frequent and potentially recognized through molecular mimicry by both naive and memory T cells. Method(s): In order to model T cell alloreactivity to mHAg and to major HLA mismatches post HCT, we used a quantitative in vitro assay based on co-culture of responder and stimulating cells. Naive (CD45RA⁺CD45RO-) and memory (CD45RA-CD45RO⁺) CD4⁺ T cells were enriched from peripheral blood mononuclear cells from healthy individuals using microbead technology to >95% purity and used as responders. Irradiated transduced HeLa cells engineered to express single HLA-DP antigens and the necessary machinery for HLA class II antigen presentation were used to stimulate CD4⁺ T cells. HeLa transductants expressing the autologous (i.e. DP-matched, response restricted to mHAg) or an allogeneic (mmDPB1) DP antigen were used to challenge naive and memory CD4⁺ cells from each responder. After 14 days of culture, T cells were restimulated overnight and the levels of T cell response were quantified by cell surface expression of the activation marker CD137. Result(s): In 36 independent T cell cultures from 8 different individuals, the overall levels of alloreactivity against mHAg were significantly lower than those against mmDPB1 (mean 50.3% vs 20.7%, p<0.0001) (Figure 1A). Consistent with current concepts, alloreactivity to mHAg was significantly higher in the naive than in the memory subset (mean 27.7% vs 10.5%, p=0.015) (Figure 1B). This was most evident in 5/8 responders (mean 38.4% vs 13.3%, p=0.016), in particular in females under 40 years of age. In 3 of the 8 responders, mHAg alloreactivity was generally low and not significantly different between the naive and the memory subsets (mean 10.3% vs 12.9%, p=0.73). In contrast, alloreactivity against mmDPB1 was evenly distributed between the naive and the memory subset (mean 52.1% vs 48.5%, p=0.62) in all responders, independent of age, sex or cytomegalovirus serostatus of the responder (Figure 1C). Interestingly, naive DPB1*04:01-restricted mHAg alloreactive CD4⁺ T cells were able to cross-recognize the structurally similar (i.e. permissive) DPB1*04:02 (mean 43.3%) but not the dissimilar (i.e. non-permissive) DPB1*09:01 (mean 14.1%) (Figure 1D). Moreover, when purified CD4⁺ cells from self-DPB1*04:01 homozygous donors were challenged with DPB1*04:02 or DPB1*09:01, naive CD4⁺ T cells were the main source of alloreactive responses against the permissive mmDPB1 (mean 25.0% vs 7.4% for naive and memory cells, respectively), while both memory (mean 50.0%) and naive (mean 46.0%) CD4⁺ cells elicited strong alloresponses against the non-permissive mmDPB1. Conclusion(s): Our data provide the first direct experimental evidence that alloreactivity against mmDPB1 is stronger than against mHAg, and importantly that it is mediated equally by naive and memory CD4⁺ T cells while the mHAg response is mediated mainly by the naive subset. However, our data also suggests that some mmDPB1 involving structurally (and hence functionally) similar alleles (in general permissive) might behave similarly to DPB1 matches. These observations should be taken into account in clinical trials aimed at improving the outcome of unrelated HCT by selective depletion of naive T cells. (Figure Presented).

Artiga, P., et al. (2005). "An innovative biofilm-suspended biomass hybrid membrane bioreactor for wastewater treatment." Desalination **179**(1-3): 171-179.

An innovative membrane-assisted hybrid bioreactor for wastewater treatment was developed in our laboratory. This system was composed by a hybrid circulating bed reactor coupled in series to an ultrafiltration membrane module. Biomass was maintained growing both in suspension and in biofilms onto small rough plastic particles. The growth of nitrifiers in the hybrid system was promoted into biofilms while heterotrophs were in suspension. This made it feasible to operate the unit at higher SRT for nitrifiers than for heterotrophs, which resulted in the presence of a higher fraction of nitrifiers in the reactor. The hybrid bioreactor was used to treat two industrial wastewaters - from a tannery and a fish-canning factory - with high nitrogen and organic matter content. COD removals of around 99% were obtained at an organic loading rate (OLR) of 6.5 kg COD/m super(3)[sup].d and an NLR of 1.8 kg N- NH super(+) sub(4)/m super(3)[sup].d during the treatment of the fish canning wastewater. Between 50-60% of the nitrifying capacity of the reactor was located in the biofilm. During the treatment of the tannery wastewater, OLR and ALR were stepwise increased up to 4.5 kg COD/m super(3)[sup].d and 1.2 kg N- NH super(+) sub(4)/m super(3)[sup].d, respectively. COD removal efficiency was 95%, while up to 97% of ammonia removal was obtained, the concentration of ammonia in the effluent being low, 10 mg N-NH super(+) sub(4)/L. For both industrial wastewaters, the biofilm nitrifying activity was not affected by the variations in the organic loading rates, COD concentration in the influent or characteristics of the influent. Most of the dissolved COD was consumed by suspended biomass in the reactor, avoiding the competition between nitrifiers and heterothophs in the biofilm. Moreover, the membrane filtration unit made it feasible to operate the reactor at high OLR without problems related to either the settling properties of the sludge or the drop in the nitrogen conversion, which usually occurs in other hybrid biological reactors operated at high OLR or NLR.

Artimani, T., et al. (2015). "Estrogen and progesterone receptor subtype expression in granulosa cells from women with polycystic ovary syndrome." Gynecological Endocrinology **31**(5): 379-383.

We evaluated gene expression of estrogen and progesterone nuclear receptors in granulosa cells (GCs) of polycystic ovary syndrome (PCOS) women compared to women with normal cycling ovaries (control group) to achieve a better understanding of ovarian steroid status in patients with PCOS. In this prospective study, 40 patients with PCOS and 40 women with normal ovulatory function who underwent in vitro fertilization (IVF) for treatment of tubal and/or male infertility were recruited. Follicular fluid was collected from patients and GCs were isolated from follicular fluid and then were purified with Micro Beads conjugated to monoclonal anti-human CD45 antibodies. RNA was extracted and reverse transcription was performed. Gene expression of estrogen and progesterone receptors was determined by quantitative real time PCR (qRT-PCR). Estrogen receptor beta (ERbeta) expression was significantly higher than ERalpha expression in both groups ($p < 0.002$). ERalpha and ERbeta mRNA expression in PCOS was significantly lower than control group ($p < 0.002$). The expression levels of PRA and PRB in PCOS was significantly lower than control group ($p < 0.002$). In conclusion, a significant reduction of these genes in GCs from follicles of women with PCOS could be considered as a sign for maturation defect or follicular arrest in GCs. Copyright © 2015 Informa UK Ltd. All rights reserved: reproduction in whole or part not permitted.

Artimani, T., et al. (2015). "Association between nuclear receptors of estrogen and progesterone with adiponectin receptors in granulosa cells of patients with poly cystic ovary syndrome." Iranian Journal of Reproductive Medicine **1)**: 18-19.

Introduction: The poly cystic ovary syndrome (PCOS), one of the most common endocrine disorders in reproductive age women, is associated with obesity and insulin resistance predisposing to diabetes mellitus type 2 and atherosclerosis. Adiponectin is a recently discovered adipocytokine with insulin -sensitizing and putative anti atherosclerotic properties. Several studies have illustrated that adiponectin can regulate granulosa cell stroidogenesis and

the expression of genes associated with ovulation. Therefore, the aim of this study was to investigate a relationship between gene expression of estrogen and progesterone nuclear receptors and adiponectin receptors in granulosa cells (GCs) of PCOS women compared to women with normal cycling ovaries in order to achieve a better understanding of ovarian steroid status in patients with PCOS. Material(s) and Method(s): In this prospective study, 40 patients with PCOS and 40 women with normal ovulatory function who underwent IVF for treatment of tubal and/or male infertility were recruited. Follicular fluid was collected from patients and. GCs were isolated from follicular fluid by centrifugation and then were purified with Micro Beads conjugated to monoclonal anti-human CD45 antibodies. RNA was extracted and Reverse transcription was performed. Gene expression of AdipoR1, AdipoR2, estrogen and progesterone receptors was determined by quantitative real time PCR (q-PCR). All statistical procedures were run on SPSS 16. P<=0.05 was considered significant. Result(s): By considering all subjects with and without PCOS undergoing controlled ovarian hyperstimulation, we observed ERalpha and ERbeta mRNA expression correlated positively with the mRNA expression of AdipoR1 (r=0.85, p=0.0001 and r=0.92, p=0.0001, respectively) and AdipoR2 (r=0.87, p=0.0001 and r=0.88, p=0.0001, respectively). Estrogen receptor beta (ERbeta) expression was significantly higher compared to ERalpha expression in both groups (p<0.002). Moreover, progesterone receptor A (PRA) and PRB were both expressed in human GCs. However, the expression level of nuclear PRB was very low in both groups (p<0.008). There was a significant correlation between progesterone receptors and adiponectin receptors (r=0.8, p=0.0001 and r=0.88, p=0.0001). In our present results, increased ratio of PRA/PRB in women with PCOS has been revealed. Conclusion(s): This research provides more evidence about expression profiles of genes involved in metabolism, steroidogenesis and ovulation in PCOS and supports the hypothesis that abnormal hormone activity, by different receptor expressions, may be an important factor in the generation of ovarian disorder.

Arunachalam, C. and R. Rajasekaran (2009). "Studies on the productivity of poly-beta-hydroxybutyrate by Alcaligenes eutrophus and Rhizobium meliloti using waste substrate." Journal of Pure and Applied Microbiology **3**(2): 685-689.

Poly-beta-hydroxybutyrate (PHB) is polymer from microbial origin are considered good substitute for plastics and isomers. Since in properties they are similar to petrochemical plastics, yet are truly biodegradable. The two potential bacteria Alcaligenes eutrophus and Rhizobium meliloti PHB production ability were analyzed using molasses as substrate at various concentrations in the fermentative medium (10%, 20%, 30% and 40%). Among this study maximum PHB was noted in high concentration of molasses (40%) in both bacteria, compared with Rhizobium meliloti and Alcaligenes eutrophus produce high amount of PHB in 40%. Alcaligenes eutrophus were optimized for two different carbon source (Sucrose and Maltose), nitrogen source (Ammonium chloride and Sodium nitrate) and various pH (5, 6, 7, 8 and 9). Among this maximum PHB was accumulated in maltose as carbon source, ammonium chloride as nitrogen source and 7 as pH. Thus the use of petroleum derived plastics can be minimized and by which we can live in a plastic pollution free earth.

Arya, C., et al. (2016). ""Killer" Microcapsules That Can Selectively Destroy Target Microparticles in Their Vicinity." Acs Applied Materials & Interfaces **8**(43): 29688-29695.

We have developed microscale polymer capsules that are able to chemically degrade a certain type of polymeric microbead in their immediate vicinity. The inspiration here is from the body's immune system, where killer T cells selectively destroy cancerous cells or cells infected by pathogens while leaving healthy cells alone. The "killer" capsules are made from the cationic biopolymer chitosan by a combination of ionic cross-linking (using multivalent tripolyposphate anions) and subsequent covalent cross-linking (using glutaraldehyde). During capsule formation, the enzyme glucose oxidase (GOx) is encapsulated in these capsules. The target beads are made by ionic cross-linking of the biopolymer alginate using copper (Cu²⁺) cations. The killer capsules harvest glucose from their surroundings, which is then enzymatically converted by GOx into gluconate ions. These ions are known for their ability to chelate Cu²⁺ cations. Thus, when a killer capsule is next to a target alginate bead, the gluconate ions diffuse into the bead and extract the Cu²⁺ cross-links, causing the disintegration of the target bead. Such destruction is visualized in real-time using optical microscopy. The destruction is specific, i.e., other microparticles that do not contain Cu²⁺ are left undisturbed. Moreover, the destruction is localized, i.e., the targets destroyed in the short term are the ones right next to the killer beads. The time scale for destruction depends on the concentration of encapsulated enzyme in the capsules.

Asadi, M. A., et al. (2019). "Microplastics in the sediment of intertidal areas of Lamongan, Indonesia." AACL Bioflux **12**(4): 1065-1073.

Microplastics are small plastic pieces which pose a great threat to marine ecosystems. Indonesia is among the world's largest contributors to microplastics pollution. This research aimed to identify and measure the abundance of microplastics in the intertidal areas of Lamongan, Indonesia. The sediment characteristics in the study areas were also examined for correlation between soil type and microplastics abundance. Microplastics characterization of the sediments were carried out using a modified flotation method. Sediment types were determined using sieve shaker analysis and hydrometer analysis. On average, there were 206 items kg⁻¹ dry weight of microplastics in which fibers shared more than 85% of all microplastics found in the research areas, with an average abundance of 178 items kg⁻¹ dry weight. Fragments constituted 12%, with an average concentration of 25 items kg⁻¹ dry weight. There was no significant difference between microplastics abundance at depths of 0-5 cm and 5-10 cm. However, the sediment texture may contribute to a higher concentration of microplastics. On average, clayey silts held significantly higher concentrations of microplastics than sand and gravelly sand. The high concentration of microplastics in the intertidal areas of Lamongan could have a negative impact on intertidal organisms and therefore may affect humans through the food chain.

Asamoah, B. O., et al. (2019). "A prototype of a portable optical sensor for the detection of transparent and translucent microplastics in freshwater." Chemosphere **231**: 161-167.

Microplastic pollution in water bodies is an alarming problem which needs to be addressed. However, issues such as size, shape and their appearance to light (transparent or translucent) make it difficult to be optically detected. Here, a feasibility study of a portable prototype optical sensor with the capability of measuring simultaneously specular laser light reflection and transmission from microplastic particles is presented. The specular reflection signal and the transmitted interference pattern were recorded with a photodiode and a CCD camera, respectively. With the combination of these two modes of detection, it is possible to screen the type, size, and nonplanarity of two microplastics types, i.e., transparent polyethylene terephthalate (PET) and translucent low-density polyethylene (LDPE), in a volume of freshwater, with high confidence. In principle, the prototype could be used for the detection of both floating microplastics as well as microplastics experiencing sedimentation in natural water bodies, and in water filtration in water treatment plants. Image 1034309 • Development of a prototype optical sensor for microplastics detection. • Detection of transparent and translucent plastic particles in

water bodies. • Monitoring of light-microplastic interactions in water. [ABSTRACT FROM AUTHOR]

Asano, T. (1995). "Sediment transport under sheet-flow conditions." Journal of Waterway, Port, Coastal and Ocean Engineering **121**(5): 239-246.

Experiments on sediment transport under sheet-flow conditions were conducted by tracing individual and grouped light plastic particles. The measurements based on individual particles yielded the vertical and temporal variations of the instantaneous sediment concentration and transport velocity from which the sediment-transport rate per unit width was obtained. In addition, moving areas of painted particle groups were measured to estimate instantaneous sediment transport rates per unit width directly. Measured local sediment-transport rates were the largest at one or two particle diameters above the initial bed surface. Instantaneous sediment-transport rates per unit width exhibited a pi /6 phase lead relative to the free-stream velocity. The measured sediment-transport rates averaged over a half-cycle were compared with forcing functions Shields and mobility parameters. The present data as well as most available existing data in terms of the normalized transport rate without the settling velocity were well arranged by the mobility number to the power of 1.5.

Asanuma, T., et al. (2010). "Super paramagnetic iron oxide MRI shows defective Kupffer cell uptake function in non-alcoholic fatty liver disease." Gut **59**(2): 258-266.

BACKGROUND: The pathogenesis of non-alcoholic fatty liver disease (NAFLD) is incompletely understood. Kupffer cells (KCs), phagocytic liver-resident macrophages, provide a protective barrier against egress of endotoxin from the portal to the systemic circulation. It is not known if KC phagocytic function is impaired in NAFLD. Super-paramagnetic iron oxide (SPIO) magnetic resonance imaging is a comparative technology dependent on KC phagocytic function.

OBJECTIVE: To evaluate KC uptake function, in patients and experimental animals with NAFLD, using SPIO.

METHODS: Abdominal CT and histological examination of liver biopsy specimens were used to estimate the degree of steatosis in patients with NAFLD and controls with chronic hepatitis C. SPIO-MRI was then performed in all patients. Normal rats fed a methionine-choline-deficient diet to induce non-alcoholic steatohepatitis (NASH), the more severe stage of NAFLD, and obese, insulin resistant, Zucker fa/fa rats with steatohepatitis, were also studied with SPIO-MRI and analysed for hepatic uptake of fluorescent microbeads. Immunohistochemical analysis evaluated the numbers of KCs in patients and rat livers.

RESULTS: Relative signal enhancement (RSE), inversely proportional to KC function, was higher in patients with NAFLD than in controls and with the degree of steatosis on CT. RSE also positively correlated with the degree of steatosis on histology and was similarly higher in rats with induced severe NAFLD (NASH). On immunohistochemistry, defective phagocytic function was the result of reduced phagocytic uptake and not due to reduced KC numbers in rats or patients with NAFLD.

CONCLUSIONS: KC uptake function is significantly impaired in patients with NAFLD and experimental animals with NASH, worsens with the degree of steatosis and is not due to a reduction of KC

numbers.

Asari, M., et al. (2019). "Analysis of mismanaged plastic waste in Samoa to suggest proper waste management in Pacific island countries." Waste Management & Research **37**(12): 1207-1216.

Pacific island countries are facing critical challenges in managing the growing amount of increasingly diverse wastes because of changing lifestyles and the concentration of populations in urban areas. Although marine plastic waste is an issue in the Pacific region, there have been almost no studies of the estimation and impacts of ocean plastic waste, and measures to control such waste, in these countries. Here, first we conducted a questionnaire survey about consumption and disposal of plastic products at households in Samoa as one of the examples of Pacific island countries to grasp the flow of plastic materials and awareness or behaviour for plastic waste. Then we quantified ocean plastic waste and discussed the effective and needed countermeasures in Pacific island countries. The total amount of mismanaged plastic waste was estimated to be 327,000 or 156,000 t y⁻¹ (depending on the scenario) in Pacific island countries. The regional Pacific island countries contribution to the global total mismanaged plastic waste was estimated to range from 1.3% to 2.7%. The amount of mismanaged plastic waste per capita in some Pacific island countries, such as Solomon Islands and Micronesia, was also ranked highly globally. The main reasons seem to be that waste collection rates are relatively low in rural areas and rates of plastic waste generation are high. To implement solutions, including improving municipal solid waste collection, reducing plastic waste, improving the collection and recycling of plastics, and the integration of a number of policies is essential.

Ashish and W. C. Wimley (2001). "Visual detection of specific, native interactions between soluble and microbead-tethered alpha-helices from membrane proteins." Biochemistry **40**(46): 13753-13759.

Using peptides tethered to polymer microbeads, we have developed a technique for measuring the interactions between the transmembrane alpha-helices of membrane proteins and for screening combinatorial libraries of peptides for members that interact with specific helices from membrane proteins. The method was developed using the well-characterized homodimerization sequence of the membrane-spanning alpha-helix from the erythrocyte membrane protein glycophorin A (GPA). As a control, we also tested a variant with a dimer-disrupting alteration of a critical glycine residue to leucine. To test for detectable, native interactions between detergent-solubilized and microbead-tethered alpha-helices, we incubated fluorescent dye-labeled GPA analogues in sodium dodecyl sulfate solution with microbeads that contained covalently attached GPA analogues. When the dye-labeled peptide in solution and the bead-tethered peptide both contained the native glycophorin A sequence, the microbeads readily accumulated the dye through lateral peptide-peptide interactions and were visibly fluorescent under UV light. When either the peptide in solution or the peptide attached to the beads contained the glycine to leucine change, the beads did not accumulate any dye. The usefulness of this method for screening tethered peptide libraries was tested by incubating dye-labeled, native sequence peptides in detergent solution with a few native sequence beads plus an excess of beads containing the variant glycine to leucine sequence. When the dye-labeled peptide in solution was present at a concentration of > or =2 microM, the few native sequence beads were visually distinguishable from the others because of their bright fluorescence. Using this model system, we have shown that it is possible to visually detect specific, native interactions between alpha-helices from membrane proteins using peptides tethered to polymer microbeads. It will thus be possible to use this method to measure the specific lateral interactions that drive the folding and organization of membrane proteins and to screen combinatorial libraries of peptides for members that interact with them.

Ashish, Y., et al. (2016). "Removal of phenol from water by catalytic wet air oxidation using carbon bead - supported iron nanoparticle - containing carbon nanofibers in an especially configured reactor." Journal of Environmental Chemical Engineering **4**(2): 1504-1513.

Catalytic wet air oxidation (CWAO) is extensively used for the destruction of organic contaminants in wastewater. The present study describes the removal of phenol from water, used as a model organic contaminant, by CWAO with iron (Fe) metal nanoparticles (NPs)-doped carbon microbeads (~0.6 mm) as the catalyst. The Fe-carbon composite was prepared by the carbonization and activation of the phenolic precursor-based polymeric beads in which the Fe NPs were in-situ added during the polymerization stage. Carbon nanofibers (CNFs) were grown on the carbon microbead substrate by catalytic chemical vapor deposition with acetylene as the carbon source. Oxidation reactions were carried out under different operating conditions in a high pressure-stirred reactor, viz., temperature, catalyst loading, and speed of the stirrer. The reactor was fitted with an especially configured impeller cum catalyst basket which held the prepared CNF-decorated Fe-doped carbon beads. The data showed an efficient remediation of the phenol-laden water, indicating the potential scale-up of the proposed CWAO catalyst and impellor cum catalyst holder-assembly in this study.

Askun, H., et al. (2008). "Preconcentration and matrix elimination for the determination of Pb(II), Cd(II), Ni(II), and Co(II)by 8-hydroxyquinoline anchored poly(styrene-divinylbenzene) microbeads." Journal of Applied Polymer Science **107**(4): 2714-2722.

Poly(styrene-divinylbenzene), PS-DVB, microbeads were modified with 8-hydroxyquinoline (8-HQ) following nitration, reduction of NO2 to NH2, and conversion of NH2 to diazonium salt. Characterization of pristine, NO2, NH2, NN+Cl-, and 8-QH functional groups modified microbeads was made by Fourier transform-infrared spectrometry (FTIR) and porosimetry. Total reflectron-X-ray florescence spectrometer (TXRF) was used to test the affinity of the 8-HQ modified microbeads to toxic metal ions. 8-HQ-modified microbeads were used to examine the adsorption capacity, recovery, preconcentration, and the matrix elimination efficiency for Pb(II), Cd(II), Ni(II), and Co(II) ions as a function of changing pH, initial metal-ion concentrations, and also equilibrium adsorption time of the studied metal ions. Preconcentration factors for the studied toxic metal ions were found to be more than 500-fold and recovery between 93.8% and 100.6%. Ultratrace toxic metal-ion concentrations in sea water were determined easily by using modified microbeads. Reference sea-water sample was used for the validation of the method, and it was found that recovery, preconcentration, and the matrix elimination were performed perfectly. For the desorption of the toxic metal ions, 3M of HNO3 was used and desorption ratio shown to be more than 96%.

Aslam, H., et al. (2020). "Evaluation of microplastics in beach sediments along the coast of Dubai, UAE." Marine Pollution Bulletin **150**: 110739.

Microplastic contamination in beach sediments along coast of Dubai is un-documented. In this study, microplastic contamination in beach sediments collected from the wrack lines of 16 beaches in Dubai was evaluated. Five samples were collected from each beach along a 100 m stretch using a 0.5 m by 0.5 m, quadrant. The number, color, and shape of microplastics were documented. The polymer types of large fibers and strings were identified through FT-IR analysis. 480 microplastics from each of the 16 beaches were selected to detect heavy metals using XRF analysis. The results showed that the average weight of microplastic is 0.33 mg per gram of dry sediment (or 953 mg.m⁻²) and the number of microplastic is 59.71

items per kg of dry sediment (or 165 items.m⁻²). Blue and fibrous microplastics were dominant. Polyethylene strings and fibers were abundantly found. 13 heavy metals were identified of which five are priority pollutants.

Asma, S., et al. (2011). "Survivability of probiotics encapsulated in alginate gel microbeads using a novel impinging aerosols method." International Journal of Food Microbiology **145**(1): 162-168.

Encapsulation of probiotic bacteria in cross-linked alginate beads is of major interest for improving the survivability in harsh acid and bile environment and also in food matrices. Alginate micro beads (10-40 micro m) containing the probiotics Lactobacillus rhamnosus GG and Lactobacillus acidophilus NCFM were produced by a novel technique based on dual aerosols of alginate solution and CaCl₂ cross linking solution. Extruded macro beads (approximately 2 mm diameter) produced by the conventional method and micro beads produced by novel aerosols technique offered comparable protection to L. rhamnosus in high acid and bile environment. Chitosan coating of micro beads resulted in a significant increase in survival time of L. rhamnosus from 40 to 120 min in acid condition and the reduction in cell numbers was confined to 0.94 log over this time. Alginate macro beads are more effective than micro beads in protecting L. acidophilus against high acid and bile. Chitosan coating of micro beads resulted in similar protection to L. acidophilus in macro beads in acid and extended the survival time from 90 to at least 120 min. Viability of this organism in micro beads was 3.5 log after 120 min. The continuous processing capability and scale-up potential of the dual aerosol technique offers potential for an efficient encapsulation of probiotics in very small alginate micro beads below sensorial detection limits while still being able to confer effective protection in acid and bile environment.

Asmonaite, G., et al. (2018). "Size matters: ingestion of relatively large microplastics contaminated with environmental pollutants posed little risk for fish health and fillet quality." Environmental Science & Technology **52**(24): 14381-14391.

In this study, we investigated biological effects associated with ingestion of polystyrene (PS) microplastic (MPs) in fish. We examined whether ingestion of contaminated PS MPs (100-400 micro m) results in chemical stress in rainbow trout (Oncorhynchus mykiss) liver and we explored whether this exposure can affect the oxidative stability of the fillet during ice storage. Juvenile rainbow trout were fed for 4 weeks with four different experimental diets: control (1) and feeds containing virgin PS MPs (2) or PS MPs exposed to sewage (3) or harbor (4) effluent. A suite of ecotoxicological biomarkers for oxidative stress and xenobiotic-related pathways was investigated in the hepatic tissue, and included gene expression analyses and enzymatic measurements. The potential impact of MPs exposure on fillet quality was investigated in a storage trial where lipid hydroperoxides, loss of redness and development of rancid odor were assessed as indications of lipid peroxidation. Although, chemical analysis of PS MPs revealed that particles sorb environmental contaminants (e.g., PAHs, nonylphenol and alcohol ethoxylates and others), the ingestion of relatively high doses of these PS MPs did not induce adverse hepatic stress in fish liver. Apart from small effect on redness loss in fillets of fish exposed to PS MPs, the ingestion of these particles did not affect lipid peroxidation or rancid odor development, thus did not affect fillet's quality.

Ašmonaitė, G., et al. (2018). "Rainbow Trout Maintain Intestinal Transport and Barrier Functions Following Exposure to Polystyrene Microplastics." Environmental Science & Technology **52**(24): 14392.

Ingestion has been proposed as a prominent exposure route for plastic debris in aquatic organisms, including fish. While the consequences of ingestion of large plastic litter are mostly understood, the impacts resulting from ingestion of microplastics (MPs) are largely unknown. We designed a study that aimed to assess impacts of MPs on fish intestinal physiology and examined integrity of extrinsic, physical and immunological barriers. Rainbow trout were exposed to polystyrene (PS) MPs (100–400 µm) via feed for a period of 4 weeks. Fish were fed four types of diets: control, diets containing virgin PS particles, or particles exposed to two different environmental matrices (sewage or harbor effluent). Extrinsic barrier disturbance in intestinal tissue was evaluated via histology. The paracellular permeability toward ions and molecules was examined using Ussing chambers and mRNA expression analysis of tight junction proteins. Active transport was monitored as transepithelial potential difference, short-circuits current and uptake rate of amino acid 3H-lysine. Immune status parameters were measured through mRNA expression level of cytokines, lysozyme activity, and hematological analysis of immune cells. We could not show that PS MPs induced inflammatory responses or acted as physical or chemical hazards upon ingestion. No measurable effects were exerted on fish intestinal permeability, active transport or electrophysiology.

Asokan, P., et al. (2009). "Assessing the recycling potential of glass fibre reinforced plastic waste in concrete and cement composites." Journal of Cleaner Production **17**(9): 821-829.

Abstract: At present glass fibre reinforced plastic (GRP) waste recycling worldwide is very limited due to its intrinsic thermoset properties, lack of characterisation data and non availability of viable recycling and recovery routes. In the present study, efforts were made to recycle GRP waste powder and fibre in concrete and cement composites and assess its quality to comply with the British standards for use in construction applications. Results revealed that the mean compressive strength of concrete composites using 5%–50% GRP waste powder under water curing varied from 37N/mm2 to 19N/mm2. Increase in the concentration of GRP waste decreased the compressive strength. However, increase in curing duration (14–180 days) resulted in improving the compressive strength of concrete with 5% GRP application to 45.75N/mm2. Moreover, the density of concrete with 50% GRP waste was reduced by about 12% as compared to the control sample. The bending strength in terms of modules of rupture (MOR) of 12mm thickness cement composites developed using 5% GRP waste fibre attained 16.5N/mm2. The findings of this work pave the way for further GRP waste recycling in precast construction products for use in various applications. [Copyright &y& Elsevier]

Asokan, P., et al. (2010). "Improvement of the mechanical properties of glass fibre reinforced plastic waste powder filled concrete." Construction & Building Materials **24**(4): 448-460.

Abstract: A comprehensive laboratory experiments were conducted to improve the mechanical properties of glass fibre reinforced plastic (GRP) waste powder filled concrete using superplasticiser for widening the scope for GRP waste recycling for different applications. It is imperative to note that the 28days mean compressive strength of concrete specimens developed with 5–15% GRP waste powder using 2% superplasticiser resulted 70.25±1.43–65.21±0.6N/mm2 which is about 45% higher than that of without the addition of superplasticiser (with GRP waste) and about 11% higher than that of the control concrete (without GRP waste) with 2% superplasticiser. The tensile splitting strength of the concrete

showed 4.12±0.05–4.22±0.03N/mm2 with 5–15% GRP waste powder which is also higher than that of the control concrete (3.85±0.02N/mm2). The drying shrinkage, initial surface absorption and density of GRP waste filled concrete were evaluated and found better than the desirable quality for use in structural and non-structural applications. [Copyright &y& Elsevier]

Asselt, E. D. v., et al. (2017). "Overview of food safety hazards in the European dairy supply chain." Comprehensive Reviews in Food Science and Food Safety **16**(1): 59-75.

Monitoring of dairy products should preferably focus on the most relevant food safety hazards in the dairy supply chain. For this purpose, the possible presence of microbiological, chemical, and physical hazards as well as trends in the dairy supply chain that may affect their presence were assessed. A literature review was combined with available data from EFSA, RASFF, and the Dutch monitoring program on chemical hazards as well as expert information. This study revealed that microbiological hazards are encountered more frequently in dairy products than chemical and physical hazards. Listeria monocytogenes, Staphylococcus aureus, Salmonella, and human pathogenic Escherichia coli were identified as the most important microbiological hazards in dairy products. Soft and semisoft cheeses are most frequently associated with L. monocytogenes and S. aureus enterotoxins, whereas raw milk is most frequently associated with human pathogenic E. coli and Campylobacter spp., Cronobacter spp., and Salmonella spp. are the microbiological hazards of most concern in powdered infant formula. Based on literature, monitoring, and RASFF data, the most relevant chemical hazards in dairy products are aflatoxin M₁, dioxins, and dioxin-like compounds and residues of veterinary drugs. Chemical hazards primarily occur at the dairy farm and may accumulate during further processing. The most relevant physical hazards are metal, glass, and plastic particles introduced during processing. Analysis of trends in the near future revealed that increased milk production is seen as most relevant in relation to food safety. Other trends affecting food safety are climate change and changes at the farm level, which aim to improve animal welfare and environmental sustainability.

Assumpcao, L. C. F. N., et al. (2011). "Co-pyrolysis of polypropylene waste with Brazilian heavy oil." Journal of Environmental Science & Health, Part A: Toxic/Hazardous Substances & Environmental Engineering **46**(5): 461-464.

To evaluate the chemical recycling of plastic residues, co-pyrolysis of polypropylene (PP) waste with Brazilian crude oil was evaluated varying the temperature (400°C to 500°C) and the amount of PP fed to the reactor. The co-pyrolysis of plastic waste in an inert atmosphere provided around 80% of oil pyrolytic, and of these, half represent the fraction of diesel oil. This study can be used as a reference in chemical recycling of plastics, specially associated with plastics co-pyrolysis. [ABSTRACT FROM AUTHOR]

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Astner, A. F., et al. (2019). "Mechanical formation of micro- and nano-plastic materials for environmental studies in agricultural ecosystems." Science of the Total Environment **685**: 1097-1106.

Release of microplastics (MPs) and nanoplastics (NPs) into agricultural fields is of great concern due to their reported ecotoxicity to organisms that provide beneficial service to the soil such as earthworms, and the potential ability of MPs and NPs to enter the food chain. Most fundamental studies of the fate and transport of plastic particulates in terrestrial environments employ idealized MP materials as models, such as monodisperse polystyrene spheres. In contrast, plastics that reside in agricultural soils consist of polydisperse fragments resulting from degraded films employed in agriculture. There exists a need for more representative materials in fundamental studies of the fate, transport, and ecotoxicity of MPs and NPs in soil ecosystems. The objective of this study was therefore to develop a procedure to produce MPs and NPs from agricultural plastics (a mulch film prepared biodegradable polymer polybutyrate adipate-co-terephthalate (PBAT) and low-density PE [LDPE]), and to characterize the resultant materials. Soaking of PBAT films under cryogenic conditions promoted embrittlement, similar to what occurs through environmental weathering. LDPE and cryogenically-treated PBAT underwent mechanical milling followed by sieve fractionation into MP fractions of 840mum, 250mum, 106mum, and 45mum. The 106mum fraction was subjected to wet grinding to produce NPs of average particle size 366.0nm and 389.4nm for PBAT and LDPE, respectively. A two-parameter Weibull model described the MPs' particle size distributions, while NPs possessed bimodal distributions. Size reduction did not produce any changes in the chemical properties of the plastics, except for slight depolymerization and an increase of crystallinity resulting from cryogenic treatment. This study suggests that MPs form from cutting and high-impact mechanical degradation as would occur during the tillage into soil, and that NPs form from the MP fragments in regions of relative weakness that possess lower molecular weight polymers and crystallinity.

Aston, L. S., et al. (1996). "Organophosphate Flame Retardants in Needles of Pinus ponderosa in the Sierra Nevada Foothills." Bulletin of environmental contamination and toxicology **57**(6): 859.

Ponderosa pine needle samples were collected in 1993 from foothill sites used as ozone-monitoring stations in the Sierra Nevada and analyzed for concentrations of three organophosphate flame retardants: tris(2-chloroethyl)phosphate, tris(1,3-dichloroisopropyl)phosphate, and tris(2-chloropropyl)phosphate. All three compounds were found on the pine needles at orders of magnitude 13 times larger than those reported for aqueous matrices in other studies. One cause was attributed to volatilization from another location, possibly a near-by plastic-waste incineration plant, and transport to the Sierra Nevada.

Astrup, T., et al. (2009). "Recycling of plastic: accounting of greenhouse gases and global warming contributions." Waste Management & Research **27**(8): 763-772.

Major greenhouse gas (GHG) emissions related to plastic waste recycling were evaluated with respect to three management alternatives: recycling of clean, single-type plastic, recycling of mixed/contaminated plastic, and use of plastic waste as fuel in industrial processes. Source-separated plastic waste was received at a material recovery facility (MRF) and processed for granulation and subsequent downstream use. In the three alternatives, plastic was assumed to be substituting virgin plastic in new products, wood in low-strength products (outdoor furniture, fences, etc.), and coal or fuel oil in the case of energy utilization. GHG accounting was organized in terms of indirect upstream emissions (e.g. provision of energy, fuels, and materials), direct emissions at the MRF (e.g. fuel combustion), and indirect downstream emissions (e.g. avoided emissions from production of virgin plastic, wood, or coal/oil). Combined, upstream and direct emissions were estimated to be roughly between 5 and 600 kg CO(2)-eq. tonne(-1) of plastic waste depending on treatment at the MRF and CO(2) emissions from electricity production. Potential downstream savings arising from substitution of virgin plastic, wood, and energy fuels were estimated to be around 60- 1600 kg CO(2)-eq. tonne(-1) of plastic waste depending on substitution ratios and CO(2) emissions from electricity production. Based on the reviewed data, it was concluded that substitution of virgin plastic should be preferred. If this is not viable due to a mixture of different plastic types and/or contamination, the plastic should be used for energy utilization. Recycling of plastic waste for substitution of other materials such as wood provided no savings with respect to global warming.

Attia, M., et al. (2014). "In vitro characterization of satellite cells from myasthenic patients." Journal of Neuromuscular Diseases **1 (Supplement 1)**: S275.

Myasthenia gravis (MG) is a relatively uncommon neuromuscular disease caused by circulating autoantibodies against proteins of the neuromuscular junction that lead to impaired neuromuscular transmission (NMT). MG is characterized by fatigability and fluctuating muscle weakness as well as muscle atrophy. The regeneration of atrophied muscle is carried out by local stem cells called satellite cells (SC), however, molecular and cellular mechanisms of myogenesis in MG disease are still unknown. Muscle biopsies from 6 MG patients and 6 healthy age-matched controls were collected. SCs were isolated from these muscle biopsies using explant method and positive selection of CD56+ cells using magnetic microbeads. Proliferation and differentiation of SC in vitro was measured respectively by cell counting (flow cytometer) and MF-20 immunolabelling in a kinetics study (from day 0 to day 4). We observed that SCs from MG biopsies proliferate as well as differentiate more actively than SCs from healthy ones. This could be due to the known role of growth factors (IL-6, IGF-1, SDF-1) and myogenic factors (Myf5, MyoD, MRF4, MyoG) in myogenesis. Using real time qPCR, we observed that during SCs proliferation, Myf5, MyoD and Myogenin were more expressed in MG SCs compared to controls. Using immunoloabeling and western blot analyses, we observed that MF-20 and TnT, which are the specific markers of the differentiation, were more expressed in MG SCs compared to controls. In parallel, the number of SCs in muscle biopsies (using anti-Pax7 antibody) was significantly increased in the MG muscle compared to controls. These findings demonstrate the activation of SCs in MG muscle as well as functional differences between SC properties from healthy and MG muscles. The autoimmune attack in MG might lead to important changes in the number and function of SC that could represent a mechanism of compensation to regenerate muscle fibres that have been damaged by the autoantibodies.

Atwood, E. C., et al. (2019). "Coastal accumulation of microplastic particles emitted from the Po River, Northern Italy: Comparing remote sensing and hydrodynamic modelling with in situ sample collections." Marine Pollution Bulletin **138**: 561.

Microplastic research has mainly concentrated on open seas, while riverine plumes remain largely unexplored despite their hypothesized importance as a microplastic source to coastal waters. This work aimed to model coastal accumulation of microplastic particles (1–5 mm) emitted by the Po River over 1.5 years. We posit that river-induced microplastic accumulation on adjacent coasts can be predicted using (1) hydrodynamic-based and (2) remote sensing-based modelling. Model accumulation maps were validated against sampling at nine beaches, with sediment microplastic concentrations up to 78 particles/kg (dry weight).

Hydrodynamic modelling revealed that discharged particle amount is only semi-coupled to beaching rates, which are strongly mouth dependent and occur within the first ten days. Remote sensing modelling was found to better capture river mouth relative strength, and accumulation patterns were found consistent with hydrodynamic modelling. This methodology lays groundwork for developing an operational monitoring system to assess microplastic pollution emitted by a major river.

Atzori, C., et al. (1998). "Current in vitro culture systems for Pneumocystis." FEMS Immunology & Medical Microbiology **22**(1-2): 169-172.

Although Pneumocystis continuous culture systems have not yet been developed, efficient short-term in vitro methods allowing the production of infectious forms of Pneumocystis can now be employed. The quality of the inoculum will influence the in vitro development of P. carinii. For this reason, efficient extraction and cryopreservation techniques are considered in this section. In vitro growth and limited passage were obtained by inoculating freshly extracted parasites onto fibroblast- or epithelial-like cell monolayers cultivated in ordinary tissue culture flasks, culture plates, microcarrier beads or other culture devices. Cultures were usually maintained in an atmosphere of 5% CO2 at 35-37 degrees C. The results obtained in these different systems were surprisingly similar: the number of parasites increased about 6-10 times within the first 3-4 days post-inoculation, then remained stationary until day 7-14 and decreased rapidly. If passages were attempted, the growth decreased gradually and no growth was recorded after 2-3 passages. Proof of the in vitro Pneumocystis attachment to feeder cells has been furnished by electron microscopy. Two currently used feeder cell culture systems were selected in this subchapter. The first system is a co-culture of monolayer lung epithelial-like cells with Pneumocystis. After trypsin treatment and passage of cells with attached parasites to culture bottles containing fresh medium, 3 or more new culture bottles can be plated. A 2-4-fold increase in parasite number can be obtained but, interestingly, cultured parasites were more infectious to the nude rat than freshly extracted lung parasites. In the second system, the spinner flask culture method, Pneumocystis is cultivated on cell coated microbeads in slow stirring vessels, in order to exploit the beads' huge surface where microorganisms can transiently adhere and grow and from where they can be easily detached by simply leaving the beads to settle down. This culture system has ensured 10(8)-10(9) viable trophozoites in each harvest after 7-10 days of slow stirring incubation. [References: 17]

Atzori, C., et al. (1998). "XXI. Current in vitro culture systems for <i>Pneumocystis</i>." Pathogens and Disease **22**(1-2): 169-172.

Although Pneumocystis continuous culture systems have not yet been developed, efficient short-term in vitro methods allowing the production of infectious forms of Pneumocystis can now be employed. The quality of the inoculum will influence the in vitro development of P. carinii. For this reason, efficient extraction and cryopreservation techniques are considered in this section. In vitro growth and limited passage were obtained by inoculating freshly extracted parasites onto fibroblast- or epithelial-like cell monolayers cultivated in ordinary tissue culture flasks, culture plates, microcarrier beads or other culture devices. Cultures were usually maintained in an atmosphere of 5% CO2 at 35–37°C. The results obtained in these different systems were surprisingly similar: the number of parasites increased about 6–10 times within the first 3–4 days post-inoculation, then remained stationary until day 7–14 and decreased rapidly. If passages were attempted, the growth decreased gradually and no growth was recorded after 2–3 passages. Proof of the in vitro Pneumocystis attachment to feeder cells has been furnished by electron microscopy. Two currently used feeder cell culture systems were selected in this subchapter. The first system is a co-culture of monolayer lung epithelial-like cells with Pneumocystis. After trypsin treatment and passage of cells with attached parasites to culture bottles containing fresh medium, 3 or more new culture bottles can be plated. A 2–4-fold increase in parasite number can be obtained but, interestingly, cultured parasites were more infectious to the nude rat than freshly extracted lung parasites. In the second system, the spinner flask culture method, Pneumocystis is cultivated on cell coated microbeads in slow stirring vessels, in order to exploit the beads' huge surface where microorganisms can transiently adhere and grow and from where they can be easily detached by simply leaving the beads to settle down. This culture system has ensured 108–109 viable trophozoites in each harvest after 7–10 days of slow stirring incubation.

Au, S. Y., et al. (2015). "Responses of Hyalella azteca to acute and chronic microplastic exposures." Environmental Toxicology & Chemistry **34**(11): 2564-2572.

Limited information is available on the presence of microplastics in freshwater systems, and even less is known about the toxicological implications of the exposure of aquatic organisms to plastic particles. The present study was conducted to evaluate the effects of microplastic ingestion on the freshwater amphipod, Hyalella azteca. Hyalella azteca was exposed to fluorescent polyethylene microplastic particles and polypropylene microplastic fibers in individual 250-mL chambers to determine 10-d mortality. In acute bioassays, polypropylene microplastic fibers were significantly more toxic than polyethylene microplastic particles; 10-d lethal concentration 50% values for polyethylene microplastic particles and polypropylene microplastic fibers were 4.64 × 104 microplastics/mL and 71.43 microplastics/mL, respectively. A 42-d chronic bioassay using polyethylene microplastic particles was conducted to quantify effects on reproduction, growth, and egestion. Chronic exposure to polyethylene microplastic particles significantly decreased growth and reproduction at the low and intermediate exposure concentrations. During acute exposures to polyethylene microplastic particles, the egestion times did not significantly differ from the egestion of normal food materials in the control; egestion times for polypropylene microplastic fibers were significantly slower than the egestion of food materials in the control. Amphipods exposed to polypropylene microplastic fibers also had significantly less growth. The greater toxicity of microplastic fibers than microplastic particles corresponded with longer residence times for the fibers in the gut. The difference in residence time might have affected the ability to process food, resulting in an energetic effect reflected in sublethal endpoints. Environ Toxicol Chem 2015;34:2564-2572. © 2015 SETAC [ABSTRACT FROM AUTHOR]

Au, S. Y., et al. (2017). "Trophic transfer of microplastics in aquatic ecosystems: Identifying critical research needs." Integrated Environmental Assessment & Management **13**(3): 505-509.

To evaluate the process of trophic transfer of microplastics, it is important to consider various abiotic and biotic factors involved in their ingestion, egestion, bioaccumulation, and biomagnification. Toward this end, a review of the literature on microplastics has been conducted to identify factors influencing their uptake and absorption; their residence times in organisms and bioaccumulation; the physical effects of their aggregation in gastrointestinal tracts; and their potential to act as vectors for the transfer of other contaminants. Limited field evidence from higher trophic level organisms in a variety of habitats suggests that trophic transfer of microplastics may be a common phenomenon and occurs concurrently with direct ingestion. Critical research needs include standardizing methods of field characterization of microplastics, quantifying uptake and depuration rates in organisms at different trophic levels, quantifying the influence that microplastics have on the uptake and/or depuration of environmental contaminants among different trophic levels, and investigating the potential for biomagnification of microplastic-associated chemicals. More integrated approaches involving computational modeling are required to fully assess trophic transfer of microplastics. Integr Environ Assess Manag 2017;13:505-509. © 2017 SETAC.

Aucouturier, J., et al. (2001). "Assessment of efficacy and safety of various adjuvant formulations with a total soluble extract of Trichinella spiralis." Parasite **8**(2 Suppl): S126-132.

Trichinellosis, a re-emerging zoonosis in several countries and pig, is the main species responsible for its transmission to human. Vaccination of swine could be an alternative to prevent the risk of human contamination. In order to develop an efficient and safe inactivate vaccine, the choice of the adjuvant is an important issue. The aim of this study was to develop and select potent and safe adjuvants by screening them in an experimental model with a crude soluble antigen from L1 muscular larvae (ML) of Trichinella spiralis (Ts). The efficacy was checked by the quantification of specific antibody levels. Specific and non-specific IgE antibody levels were also assessed. Safety was checked by the assessment of the local reaction at the injection site. Various Montanide ISA adjuvant formulations including water in oil, oil in water and multiphasic emulsions, but also nanoparticles or microbeads were tested. The results clearly showed differences between the antibody responses induced by the adjuvants and demonstrated the necessity to use an adjuvant to obtain a specific IgG (IgG1 or IgG2a) response directed against the total soluble extract of Ts. All the formulations enhanced the humoral immune response. The origin of the oil contained in the emulsions played an important role on the efficacy. Indeed emulsions based on mineral oils were more efficient than those based on metabolisable oils. However it was linked with stronger local reactions. Multiphasic and oil in water emulsions but also nanoparticles failed to induce IgG2a antibody levels. Microbeads and water in oil formulations based on mineral oils were more efficient. This experimentation allowed then the selection of several adjuvants which efficacy will be further investigated by a challenge test and an analysis of the cellular populations involved in the mechanism of the immune response.

Auge, A. A. (2017). "Anthropogenic debris in the diet of turkey vultures (Cathartes aura) in a remote and low-populated South Atlantic island." Polar Biology **40**(4): 799-805.

Plastic pollution is becoming an increasing issue for wildlife throughout the world. Even remote areas with relatively little human activity are affected. The Falkland Islands are a South Atlantic archipelago with a small human population (<3000), mostly concentrated in one town, Stanley. One hundred regurgitated pellets from turkey vultures (Cathartes aura) were collected in Stanley in July and August 2015 to investigate the diet and amount of anthropogenic debris (human-made artificial products) ingested. The frequency of occurrence of anthropogenic debris was 58 % of pellets for plastic, 25 % for glass, 23 % for paper, 21 % for aluminium and 3 % for fabric. Aside from anthropogenic debris, the majority of pellets were made of sheep wool (on average 29 % of the volume), feathers (19 %) and vegetation (18 %). On average, when present, anthropogenic debris corresponded to 16.1 % of the mass of each pellet, equivalent to 1.6 g. The turkey vultures are known to feed in the open-air rubbish dump near the town. This study highlights that they ingest significant amounts of anthropogenic debris. Further investigations should be undertaken to monitor and identify potential health effects. Other birds also use the dump and may be affected. Even in such remote sparsely populated islands, pollution may be a significant issue. Rubbish management could be put in place to limit birds from feeding at the dumps. A low human population density may not indicate low pollution impacts on wildlife and the environment and should be investigated further in the Falkland Islands and at other remote islands.

Augustsson, P., et al. (2009). "Decomplexing biofluids using microchip based acoustophoresis." Lab on a Chip **9**(6): 810-818.

Highly efficient washing and extraction of microbeads to decomplex analytes ranging from small peptides to large viruses was realised in a microscaled continuous flow format. The bead washing principle reported herein is based on acoustophoresis, i.e. the primary acoustic radiation force in an ultrasonic standing wave and laminar flow properties are utilised to translate bioanalytes trapped on functionalised microbeads from one carrier fluid to another. The carry-over of non-specific material ranges from 1 to 50 ppm relative to input levels depending on application, making acoustophoresis suitable for extraction of rare species from complex environments. Selective extraction of a phosphopeptide relative to its unphosphorylated counterpart is demonstrated using metal oxide affinity capture (MOAC) beads and MALDI-TOF MS readout. Acoustophoresis of microbeads activated with specific binders could be used to capture phage viral particles. The efficiency of the acoustophoretic washing principle was demonstrated by an unspecific phage cross contamination level of only 10(-6) of that in the input bead/phage mixture. The continuous flow format makes acoustophoretic washing flexible regarding sample volume and also allows for easy integration into a sequence of particle handling and analytical unit operations.

Auta, H. S., et al. (2017). "Distribution and importance of microplastics in the marine environment: A review of the sources, fate, effects, and potential solutions." Environment International **102**: 165-176.

The presence of microplastics in the marine environment poses a great threat to the entire ecosystem and has received much attention lately as the presence has greatly impacted oceans, lakes, seas, rivers, coastal areas and even the Polar Regions. Microplastics are found in most commonly utilized products (primary microplastics), or may originate from the fragmentation of larger plastic debris (secondary microplastics). The material enters the marine environment through terrestrial and land-based activities, especially via runoffs and is known to have great impact on marine organisms as studies have shown that large numbers of marine organisms have been affected by microplastics. Microplastic particles have been found distributed in large numbers in Africa, Asia, Southeast Asia, India, South Africa, North America, and in Europe. This review describes the sources and global distribution of microplastics in the environment, the fate and impact on marine biota, especially the food chain. Furthermore, the control measures discussed are those mapped out by both national and international environmental organizations for combating the impact from microplastics. Identifying the main sources of microplastic pollution in the environment and creating awareness through education at the public, private, and government sectors will go a long way in reducing the entry of microplastics into the environment. Also, knowing the associated behavioral mechanisms will enable better understanding of the impacts for the marine environment. However, a more promising and environmentally safe approach could be provided by exploiting the potentials of microorganisms, especially those of marine origin that can degrade microplastics.

CAPSULE: The concentration, distribution sources and fate of microplastics in the global marine environment were discussed, so also was the impact of microplastics on a wide range of marine biota.

Auta, H. S., et al. (2018). "Growth kinetics and biodeterioration of polypropylene microplastics by Bacillus sp. and Rhodococcus sp. isolated from mangrove sediment." Marine Pollution Bulletin **127**: 15-21.

Interest in the biodegradation of microplastics is due to their ubiquitous distribution, availability, high persistence in the environment and deleterious impact on marine biota. The present study evaluates the growth response and mechanism of polypropylene (PP) degradation by Bacillus sp. strain 27 and Rhodococcus sp. strain 36 isolated from mangrove sediments upon exposure to PP microplastics. Both bacteria strains were able to utilise PP microplastic for growth as confirmed by the reduction of the polymer mass. The weight loss was 6.4% by Rhodococcus sp. strain 36 and 4.0% by Bacillus sp. strain 27 after 40days of incubation. PP biodegradation was further confirmed using Fourier-transform infrared spectroscopy and scanning electron microscopy analyses, which revealed structural and morphological changes in the PP microplastics with microbial treatment. These analyses showed that the isolates can colonise, modify and utilise PP microplastics as carbon source.

Auxilio, A. R., et al. (2017). "An experimental study on thermo-catalytic pyrolysis of plastic waste using a continuous pyrolyser." Waste Management **67**: 143-154.

A bench scale, two-stage, thermo-catalytic reactor equipped with a continuous feeding system was used to pyrolyse pure and waste plastics. Experiments using five zeolitic and clay-based catalysts of different forms (pellet and powders) and different plastic feedstocks - virgin HDPE, HDPE w1aste and mixed plastic waste (MPW) were compared to the control experiments - pyrolysis without catalyst. Results indicated that the two pelletized catalysts were the most promising for the conditions employed. Of these two, one with higher acidity and surface area was highly selective for the gasoline fraction (C<inf>5</inf>-C<inf>11</inf>) giving 80% from the total medium distillate conversion using virgin HDPE as feedstock. It also produced the least amount of olefins (17% for virgin HDPE, 4% for HDPE waste and 2% for MPW) and coke (<1% for virgin HDPE, 3% for HDPE waste and 5% for MPW), and the highest aromatics content (22% for virgin HDPE from un-distilled medium distillate, 5% for HDPE and 13% for MPW both from distilled medium distillate). The second pelletized catalyst exhibited high selectivity for the diesel fraction (C<inf>12</inf>-C<inf>25</inf>) giving 63% from the total medium distillate conversion using virgin HDPE as feedstock. The amount of coke deposited on the catalyst surface depended mainly on the mesopore volume, with less coke deposited as the mesopore volume increased. The variation in catalyst selectivity with acidity strength due to Lewis sites on the catalyst surface controls selectivity towards carbon chain length. Copyright © 2017 Elsevier Ltd

Avci, E., et al. (2015). "Piezo-actuated parallel mechanism for biological cell release at high speed." Biomedical Microdevices **17**(5): 1-10.

In this paper, a dynamic releasing approach is proposed for high-speed biological cell manipulation. A compact parallel mechanism for grasping and releasing microobjects is used to generate controllable vibration to overcome the strong adhesion forces between the end effector and the manipulated object. To reach the required acceleration of the end effector, which is necessary for the detachment of the target object by overcoming adhesion forces, vibration in the end effector is generated by applying sinusoidal voltage to the PZT actuator of the parallel mechanism. For the necessary acceleration, we focus on the possible range of the frequency of the PZT-actuator-induced vibration, while minimizing the amplitude of the vibration (14 nm) to achieve precise positioning. The effect of the air and liquid environments on the required vibration frequency for successful release is investigated. For the first time, release results of microbeads and biological cells are compared. Release of the biological cells with 100 % success rate suggests that the proposed active release method is an appropriate solution for adhered biological cells during the release task.

Avci-Adali, M., et al. (2010). "Pitfalls of cell-systematic evolution of ligands by exponential enrichment (SELEX): existing dead cells during in vitro selection anticipate the enrichment of specific aptamers." Oligonucleotides **20**(6): 317-323.

Aptamers represent auspicious ligands for recognition of target molecules on the surface of a specific cell population, such as stem or cancer cells. These ligands are able to capture and enrich desired cells from a cell mixture, and can be used for identification of new biomarkers, development of cell-specific therapeutics, and stem cell therapy. In this study, we investigated the influence of dead cells on single-stranded DNA (ssDNA) binding and established a method to eliminate dead cells from a cell suspension. Flow cytometry analyses demonstrated that all dead cells were stained with fluorescein-labeled ssDNA molecules. The increasing of the proportion of dead cells led to an increased number of cells that were positive for ssDNA staining. Using dead cell removal microbeads, the proportion of dead cells was significantly reduced. The studies demonstrated that dead cells lead to unspecific uptake/binding of ssDNA molecules during cell-Systematic Evolution of Ligands by Exponential enrichment (SELEX) and can cause failure of the selection process. Thus, the elimination of dead cell population before incubation with ssDNA molecules will reduce the loss of target binding sequences and the contamination of the enriched aptamer pool with unspecific ssDNA molecules caused by unspecific binding to dead cells.

Avci-Camur, C., et al. (2018). "Aqueous production of spherical Zr-MOF beads <i>via</i> continuous-flow spray-drying." Green Chemistry **20**(4): 873-878.

Porous metal–organic frameworks (MOFs) are attracting great attention from industry, thanks to their myriad potential applications in areas such as catalysis and gas storage. Zr-MOFs (also known as UiO-type MOFs) are especially promising, owing to their large surface areas, high chemical versatility and remarkable hydrothermal, chemical and thermal stabilities. However, among the challenges currently precluding the industrial exploitation of MOFs is the lack of green methods for their synthesis. Herein we describe a continuous-flow spray-drying method for the simultaneous synthesis and shaping of spherical MOF microbeads in a mixture of water and acetic acid. We used this approach to build two archetypical Zr-MOFs: UiO-66-NH2 and Zr-fumarate. By tuning the concentration of acetic acid in water, we were able to produce, by a scalable process, UiO-66-NH2 and Zr-fumarate beads with SBET and water-sorption values comparable to the literature values obtained with other methods.

Avecilla, S. T., et al. (2016). "How do I perform hematopoietic progenitor cell selection?" Transfusion **56**(5): 1008-1012.

Graft-versus-host disease remains the most important source of morbidity and mortality associated with allogeneic stem cell transplantation. The implementation of hematopoietic progenitor cell (HPC) selection is employed by some stem cell processing facilities to mitigate this complication. Current cell selection methods include reducing the number of unwanted T cells (negative selection) and/or enriching CD34+ hematopoietic stem/progenitors (positive selection) using immunomagnetic beads subjected to magnetic fields within columns to separate out targeted cells. Unwanted side effects of cell selection as a result of T-cell reduction are primary graft failure, increased infection rates, delayed immune reconstitution, possible disease relapse, and posttransplant lymphoproliferative disease. The Miltenyi CliniMACS cell isolation system is the only device currently approved for clinical use by the Food and Drug Administration. It uses magnetic microbeads conjugated with a high-affinity anti-CD34 monoclonal antibody capable of binding to HPCs in marrow, peripheral blood, or umbilical cord blood products. The system results in significantly improved CD34+ cell recoveries (50%-100%) and consistent 3-log CD3+ T-cell reductions compared to previous generations of CD34+ cell selection procedures. In this article, the CliniMACS procedure is described in greater detail and the authors provide useful insight into modifications of the system. Successful implementation of cell selection procedures can have a significant positive clinical effect by greatly increasing the pool of donors for recipients requiring transplants. However, before a program implements cell selection techniques, it is important to consider the time and financial resources required to properly and safely perform these procedures.

Avendano, C., et al. (2015). "Staticmagnetic fields on humansperm. A side effect of magnetic-activated cell sorting?" Fertility and Sterility **1)**: e247.

OBJECTIVE: Non-damaged sperm DNA is one of the prerequisites for achieving successful fertilization and embryo development in assisted reproductive technologies. Magnetic-activated cell sorting (MACS) using paramagnetic annexin V-conjugated microbeads has been proposed as a safe method to select non-apoptotic and viable sperm. The procedure involves the magnetic labeling of sperm with damaged DNA and the passage through a high power static magnetic field (SMF). Intact living spermatozoa without DNA fragmentation pass through the column and are collected for later use, while the fragmented cells are selectively retained. Although there are some concerns about the possible selection and use of sperm with paramegnetic beads, the potential impact of SMF has never been mentioned. Therefore, the objective of this work was to evaluate the possible effect of SMF on human sperm during in vitro manipulation. DESIGN: Prospective study. MATERIALS AND METHODS: Motile sperm from healthy men (n=5) were selected by swim up. Each sperm suspension was separated in 4 fractions (F1, F2, F3 and C). F1, F2, F3 were exposed to a SMF (1.2 Tesla) during 1, 2 and 10 minutes, respectively. Fraction C was kept as control without SMF exposure. Sperm parameters were evaluated immediately after SMF exposure on each fraction and then incubated in capacitating conditions for 3 hours at 37degreeC. Progressive sperm motility (PG, %), curvilinear velocity (VCL, mm/s) and rectilinear velocity (VSL, mm/s) were evaluated using videomicroscopy with computerized image analysis. Spontaneous (sRA) and induced (iRA) acrosomal reaction were evaluated using Coomassie brilliant blue staining. Sperm DNA fragmentation was assessed by TUNEL assay. RESULT(S): PG was increased immediately after exposure to SMF in F1 compared with C (93.5 +/- 2.9 vs. 86.9 +/- 3.9, p<0.05). Also, VSL and VCL increased after capacitation in F1 compared with C (146 +/- 35 vs. 94 +/- 19, p< 0.05 y 192 +/- 23 vs 130 +/- 16, p<0.05; respectively). sRA increased at least 3 times in all groups compared with C (p<0.05), nevertheless iRA did not show differences between groups (p>0.05). There are no differences on sperm DNA fragmentation between groups pre and post capacitation (p>0.05). CONCLUSION(S): We report for the first time the effect of SMF on human sperm. MACS have been proposed to be effective and innocuous to select ''healthy'' sperm after filtration through a high power SMF. However, in this work we have shown that sperm physiological patterns can be modified after exposure to 1.2 Tesla. Further research is needed to assess the beneficial or detrimental effect of SMF on human sperm.

Avery, S. V., et al. (1993). "Salt-stimulation of caesium accumulation in the euryhaline green microalga

Chlorella salina: Potential relevance to the development of a biological Cs-removal process." Journal of General Microbiology **139**(9): 2239-2244.

Accumulation of Cs⁺ by Chlorella salina was 28-fold greater in cells incubated in the presence than in the absence of 0.5 M-NaCl. An approximate 70% removal of external Cs⁺ resulted after 15 h incubation of cells with 50 muM-CsCl and 0.5 M-NaCl. LiCl also had a stimulatory effect on Cs⁺ uptake, although mannitol did not. Cs⁺ influx increased with increasing external NaCl concentration and was maximal between 25-500 mM-NaCl at approximately 4 nmol Cs⁺ h⁻¹ (10⁶ cells)⁻¹. Little effect on Cs⁺ uptake resulted from the presence of Mg²⁺ or Ca²⁺ or from varying the external pH, and Cs⁺ was relatively non-toxic towards C. salina. At increasing cell densities (from 4 x 10⁵ to 1 x 10⁷ cells ml⁻¹), decreasing amounts of Cs⁺ were accumulated per cell although the rate of Cs⁺ removal from the external medium was still greatest at the higher cell densities examined. Freely suspended C. salina and cell-loaded alginate microbeads accumulated similar levels of Cs⁺, however, 46% of total Cs⁺ uptake was attributable to the calcium-alginate matrix in the latter case. When Cs⁺-loaded cells were subjected to hypoosmotic shock, loss of cellular Cs⁺ occurred allowing easy Cs⁺ recovery. This loss exceeded 90% of cellular Cs⁺ when cells were washed with solutions containing <= 50 mM-NaCl between consecutive Cs⁺ uptake periods; these cells subsequently lost their ability to accumulate large amounts of Cs⁺. Maximal Cs⁺ uptake (approximately 85.1% removal after three 15 h incubations) occurred when cells were washed with a solution containing 500 mMNaCl and 200 mM-KCl between incubations. The relevance of these results to the possible use of C. salina in a salt-dependent biological Cs-removal process is discussed.

Avery, S. V., et al. (1995). "Quantification and Characterization of Phagocytosis in the Soil Amoeba Acanthamoeba castellanii by Flow Cytometry." Applied & Environmental Microbiology **61**(3): 1124-1132.

Phagocytosis in the common grazing soil amoeba Acanthamoeba castellanii was characterized by flow cytometry. Uptake of fluorescently labelled latex microbeads by cells was quantified by appropriate setting of thresholds on light scatter channels and, subsequently, on fluorescence histograms. Confocal laser scanning microscopy was used to verify the effectiveness of sodium azide as a control for distinguishing between cell surface binding and internalization of beads. It was found that binding of beads at the cell surface was complete within 5 min and 80% of cells had beads associated with them after 10 min. However, the total number of phagocytosed beads continued to rise up to 2 h. The prolonged increase in numbers of beads phagocytosed was due to cell populations containing increasing numbers of beads peaking at increasing time intervals from the onset of phagocytosis. Fine adjustment of thresholds on light scatter channels was used to fractionate cells according to cell volume (cell cycle stage). Phagocytotic activity was approximately threefold higher in the largest (oldest) than in the smallest (newly divided) cells of A. castellanii and showed some evidence of periodicity. At no stage in the cell cycle did phagocytosis cease. Binding and phagocytosis of beads were also markedly influenced by culture age and rate of rotary agitation of cell suspensions. Saturation of phagocytosis (per cell) at increasing bead or decreasing cell concentrations occurred at bead/cell ratios exceeding 10:1. This was probably a result of a limitation of the vacuolar uptake system of A. castellanii, as no saturation of bead binding was evident. The advantages of flow cytometry for characterization of phagocytosis at the single-cell level in heterogeneous protozoal populations and the significance of the present results are discussed.

Avery-Gomm, S., et al. (2018). "Linking plastic ingestion research with marine wildlife conservation." Science of the Total Environment **637-638**: 1492-1495.

Plastic is an increasingly pervasive marine pollutant. Concomitantly, the number of studies documenting plastic ingestion in wildlife is accelerating. Many of these studies aim to provide a baseline against which future levels of plastic ingestion can be compared, and are motivated by an underlying interest in the conservation of their study species and ecosystems. Although this research has helped to raise the profile of plastic as a pollutant of emerging concern, there is a disconnect between research examining plastic pollution and wildlife conservation. We present ideas to further discussion about how plastic ingestion research could benefit wildlife conservation by prioritising studies that elucidates the significance of plastic pollution as a population-level threat, identifies vulnerable populations, and evaluates strategies for mitigating impacts. The benefit of plastic ingestion research to marine wildlife can be improved by establishing a clearer understanding of how discoveries will be integrated into conservation and policy actions. Copyright © 2018

Avery-Gomm, S., et al. (2012). "Northern fulmars as biological monitors of trends of plastic pollution in the eastern North Pacific." Marine Pollution Bulletin **64**(9): 1776-1781.

Marine plastic debris is a global issue, which highlights the need for internationally standardized methods of monitoring plastic pollution. The stomach contents of beached northern fulmar (Fulmarus glacialis) have proven a cost-effective biomonitor in Europe. However, recent information on northern fulmar plastic ingestion is lacking in the North Pacific. We quantified the stomach contents of 67 fulmars from beaches in the eastern North Pacific in 2009-2010 and found that 92.5% of fulmars had ingested an average of 36.8 pieces, or 0.385 g of plastic. Plastic ingestion in these fulmars is among the highest recorded globally. Compared to earlier studies in the North Pacific, our findings indicate an increase in plastic ingestion over the past 40 years. This study substantiates the use of northern fulmar as biomonitors of plastic pollution in the North Pacific and suggests that the high levels of plastic pollution in this region warrant further monitoring.

Avery-Gomm, S., et al. (2018). "Plastic pollution in the Labrador Sea: an assessment using the seabird northern fulmar Fulmarus glacialis as a biological monitoring species." Marine Pollution Bulletin **127**: 817-822.

Plastic is now one among one of the most pervasive pollutants on the planet, and ocean circulation models predict that the Arctic will become another accumulation zone. As solutions to address marine plastic emerge, is essential that baselines are available to monitor progress towards targets. The northern fulmar (Fulmarus glacialis), a widely-distributed seabird species, has been used as a biological monitor for plastic pollution in the North Sea, and could be a useful monitoring species elsewhere. We quantified plastic ingested by northern fulmars from the southeastern Canadian waters of the Labrador Sea with the objective of establishing a standardized baseline for future comparisons. Over two years we sampled 70 fulmars and found that 79% had ingested plastic, with an average of 11.6 pieces or 0.151 g per bird. Overall, 34% of all fulmars exceeded the Ecological Quality Objective for marine litter, having ingested >0.1 g of plastic.

Avery-Gomm, S., et al. (2013). "Plastic ingestion in marine-associated bird species from the eastern North Pacific." Marine Pollution Bulletin **72**(1): 257-259.

In addition to monitoring trends in plastic pollution, multi-species surveys are needed to fully understand the pervasiveness of plastic ingestion. We examined the stomach contents of 20 bird species collected from the coastal waters of the eastern North Pacific, a region known to have high levels of plastic pollution. We observed no evidence of plastic ingestion in Rhinoceros Auklet, Marbled Murrelet, Ancient Murrelet or Pigeon Guillemot, and low levels in Common Murre (2.7% incidence rate). Small sample sizes limit our ability to draw conclusions about population level trends for the remaining fifteen species, though evidence of plastic ingestion was found in Glaucous-Winged Gull and Sooty Shearwater. Documenting levels of plastic ingestion in a wide array of species is necessary to gain a comprehensive understanding about the impacts of plastic pollution. We propose that those working with bird carcasses follow standard protocols to assess the levels of plastic ingestion whenever possible. © 2013 Elsevier Ltd.

Avio, C. G., et al. (2017). "Microplastics pollution after the removal of the Costa Concordia wreck: first evidences from a biomonitoring case study." Environmental Pollution **227**: 207-214.

Microplastics (MPs) represent a matter of growing concern for the marine environment. Their ingestion has been documented in several species worldwide, but the impact of specific anthropogenic activities remains largely unexplored. In this study, MPs were characterized in different benthic fish sampled after 2.5 years of huge engineering operations for the parbuckling project on the Costa Concordia wreck at Giglio Island. Fish collected in proximity of the wreck showed a high ingestion of microplastics compared to both fish from a control area and values reported worldwide. Also the elevated percentage of nylon, polypropylene lines and the presence of polystyrene are quite unusual for marine organisms sampled in natural field conditions, thus supporting the possible relationship of ingested microplastics with maritime operations during wreck removal. On the other hand, the use of transplanted mussels revealed a lower frequency of ingested MPs, and did not discriminate differences between the wreck and the control area. Some variations were observed in terms of typology and size of particles between surface- and bottom-caged mussels highlighting the influence of a different distribution of MPs along the water column. In conclusion, this study demonstrated that MPs pollution in the area of Costa Concordia was more evident on benthonic environment than on seawater column, providing novel insights on the possibility of using appropriate sentinel organisms for monitoring specific anthropogenic sources of MPs pollution in the marine environment.

Avio, C. G., et al. (2015). "Pollutants bioavailability and toxicological risk from microplastics to marine mussels." Environmental Pollution **198**: 211-222.

Microplastics represent a growing environmental concern for the oceans due to their potential of adsorbing chemical pollutants, thus representing a still unexplored source of exposure for aquatic organisms. In this study polyethylene (PE) and polystyrene (PS) microplastics were shown to adsorb pyrene with a time and dose-dependent relationship. Results also indicated a marked capability of contaminated microplastics to transfer this model PAH to exposed mussels Mytilus galloprovincialis; tissue localization of microplastics occurred in haemolymph, gills and especially digestive tissues where a marked accumulation of pyrene was also observed. Cellular effects included alterations of immunological responses, lysosomal compartment, peroxisomal proliferation, antioxidant system, neurotoxic effects, onset of genotoxicity; changes in gene expression profile was also demonstrated through a new DNA microarray platform. The study provided the evidence that microplastics adsorb PAHs, emphasizing an elevated bioavailability of these chemicals after the ingestion, and the toxicological implications due to responsiveness of several molecular and cellular pathways to microplastics.

Avio, C. G., et al. (2015). "Experimental development of a new protocol for extraction and characterization of microplastics in fish tissues: first observations in commercial species from Adriatic Sea." Marine Environmental Research **111**: 18-26.

The presence of microplastics in the marine environment has raised scientific interest during the last decade. Several organisms can ingest microplastics with potentially adverse effects on the digestive tract, respiratory system and locomotory appendages. However, a clear evidence of tissue accumulation and transfer of such microparticles in wild organisms is still lacking, partially hampered by technical difficulties in isolation and characterization protocols from biological samples. In this work, we compared the efficacy of some existing approaches and we optimized a new protocol allowing an extraction yield of microplastics from fish tissues ranging between 78% and 98%, depending on the polymer size. FT-IR analyses confirmed that the extraction procedure did not affect the particles characteristics. The method was further validated on the fish mullet, Mugil cephalus, exposed under laboratory conditions to polystyrene and polyethylene; the particles were isolated and quantified in stomach and liver, and their presence in the hepatic tissue was confirmed also by histological analyses. A preliminary characterization revealed the presence and distribution of microplastics in various fish species collected along the Adriatic Sea. FT-IR analyses indicated polyethylene as the predominant polymer (65%) in the stomach of fish. The overall results confirmed the newly developed method as a reliable approach to detect and quantify microplastics in the marine biota.

Avio, C. G., et al. (2017). "Plastics and microplastics in the oceans: From emerging pollutants to emerged threat." Marine Environmental Research **128**: 2-11.

Plastic production has increased dramatically worldwide over the last 60 years and it is nowadays recognized as a serious threat to the marine environment. Plastic pollution is ubiquitous, but quantitative estimates on the global abundance and weight of floating plastics are still limited, particularly for the Southern Hemisphere and the more remote regions. Some large-scale convergence zones of plastic debris have been identified, but there is the urgency to standardize common methodologies to measure and quantify plastics in seawater and sediments. Investigations on temporal trends, geographical distribution and global cycle of plastics have management implications when defining the origin, possible drifting tracks and ecological consequences of such pollution. An elevated number of marine species is known to be affected by plastic contamination, and a more integrated ecological risk assessment of these materials has become a research priority. Beside entanglement and ingestion of macro debris by large vertebrates, microplastics are accumulated by planktonic and invertebrate organisms, being transferred along food chains. Negative consequences include loss of nutritional value of diet, physical damages, exposure to pathogens and transport of alien species. In addition, plastics contain chemical additives and efficiently adsorb several environmental contaminants, thus representing a potential source of exposure to such compounds after ingestion. Complex ecotoxicological effects are increasingly reported, but the fate and impact of microplastics in the marine environment are still far to be fully clarified.

Avio, C. G., et al. (2019). "Distribution and characterization of microplastic particles and textile microfibers in Adriatic food webs: General insights for biomonitoring strategies." Environmental Pollution **258**: 113766.

This study provided a comprehensive characterization on ingestion of different typologies of microplastics in several fish and invertebrate species from the Adriatic Sea, considered as a preferential area of plastic accumulation in the Mediterranean. Almost 500 organisms were

sampled in the three sectors of Northern, Central and Southern Adriatic, testing the hypothesis that area of collection, habitat and feeding strategy might influence the occurrence of plastic particles in biota. In this study, the overall characterization considered separately plastic microparticles (MPs) from textile microfibers (MFs) which also included natural and semi-synthetic ones. Ingestion of MPs was a widespread phenomenon, but their number (typically 1 or 2) did not reveal any significant relationship with biometric values, geographical areas or ecological features of the species. Conversely, the frequency of ingestion, ranging from 13 to 35% of organisms containing MPs, appeared a more reliable index to highlight such differences, revealing higher values in species from Central and Southern basins compared to the Northern one, as well as in benthopelagic compared to benthic or pelagic organisms. Geographical differences also occurred in terms of size and typology of ingested particles, suggesting the importance of local river runoffs and surface currents dynamics. Textile microfibers (MFs) were also abundant in Adriatic food webs occurring in all the analyzed species with average numbers (3-10) and frequencies (40-70%) higher than those reported for MPs; further, an elevated percentage of MFs (>80%) was of natural or semi-synthetic origin. Overall, this study provided general insights toward the harmonization of a common biomonitoring strategy, as in the context of MSFD, including the suggestion of a frequency-based index and of a multi-species approach to increase the ecological relevance of assessment, as well as the comparability between different areas and trophic webs.

Awan, I. N., et al. (2012). "Expression and Purification of Mycobacterium tuberculosis Antigens for Use in Immunoassays for Serodetection of M. tuberculosis Infection in TB Patients." Pakistan Journal of Zoology **44**(1).

Tuberculosis (TB) is a fatal and contagious disease. The annual death toll occurring from TB is approximately 2 million according to World Health Organization (WHO). The removal of disease from global face needs immediate treatment for which early diagnosis is pre-requisite. Existing tests for the diagnosis of TB are not efficient and robust. In the present study Mycobacterium tuberculosis specific six antigens namely cfp-10, esat-6 and hspx, along with three antigens which are components of immunodominant mycolyl transferases ag85a, ag85b, ag85c were expressed and purified to evaluate their potential use in immunoassays like Western blotting and multiplex microbead immunoassay. Protein expression of all six antigenic genes was optimized for time and different concentrations of inducer isopropyl beta -D-1-thiogalactopyranoside. Protein products were confirmed by Western blotting and purified through immobilized metal affinity chromatography (IMAC) technique using columns having affinity for His-tag. Each fluorescently labeled set of microbeads were coated with one of the M. tuberculosis specific antigenic proteins and later on human plasma samples of reactivated TB patients along with healthy BCG as well as tuberculin skin test negative controls were tested for presence of antibodies against these antigenic proteins individually in a multiplex format. The results were generated in median fluorescence intensity form which detected antibodies against M. tuberculosis specific antigenic proteins only in reactivated TB patients. This system detected antibodies against four antigenic proteins in 100% of reactivated TB patients. Thus, M. tuberculosis antigens described in this study seem to have purified at the level to be used in the development of immunoassays for the detection of M. tuberculosis infection in TB patients of different categories like active and latent TB.

Awasthi, A. K. and M. Shivashankar (2017). "Study and findings of post-consumer waste PET (polyethylene terephthalate) plastic solubility in amines." Research Journal of Pharmaceutical, Biological and Chemical Sciences **8**(3): 2104-2114.

Polyethylene terephthalate plastic material consumption is increasing across the world day by day and it is used in packaging of drinking water and soft drinks. It has lot of advantages such as light weight and more durable. Post usage plastic waste management and handling is a difficult task. But there are various types of technologies available to manage the plastic waste after post usage. Reuse of plastic waste via recycling technique is effective way to manage the plastic waste. Mechanical recycling is a good technique for single polymer waste recycling while chemical recycling which convert waste plastic into small molecules. Pyrolysis is another technique to degrade the plastic waste in the absence of air. Open dumping of plastic waste is creates the severe environmental issues but it supports the biodegradation of plastic waste by microorganism. Waste to energy and other chemical recycling technologies are also good solution to manage the plastic waste. These technologies supports the manage the plastic waste. But there are still some challenges exist with current technologies. Waste PET plastic solubility with amine is an unique approach to manage the waste. In this paper we have discussed the observation and findings of solubility of PET plastic in amines at room temperature.

Awasthi, A. K., et al. (2017). Plastic solid waste utilization technologies: A Review. 14th International Conference on Science, Engineering and Technology, ICSET 2017, May 2, 2017 - May 3, 2017, Vellore, Tamil Nadu, India, Institute of Physics Publishing.

Plastics are used in more number of applications in worldwide and it becomes essential part of our daily life. In Indian cities and villages people use the plastics in buying vegetable as a carry bag, drinking water bottle, use of plastic furniture in home, plastics objects uses in kitchen, plastic drums in packing and storage of the different chemicals for industrial use, use plastic utensils in home and many more uses. After usage of plastics it will become part of waste garbage and create pollution due to presence of toxic chemicals and it will be spread diseases and give birth to uncontrolled issues in social society. In current scenario consumption of plastic waste increasing day by day and it is very difficult to manage the plastic waste. There are limited methodologies available for reutilization of plastic waste again. Such examples are recycling, landfill, incineration, gasification and hydrogenation. In this paper we will review the existing methodologies of utilization of plastic waste in current scenario. Published under licence by IOP Publishing Ltd.

Awet, T. T., et al. (2018). "Effects of polystyrene nanoparticles on the microbiota and functional diversity of enzymes in soil." Environmental Sciences Europe **30**(1): 11.

Background: The increasing production of nanoplastics and the fragmentation of microplastics into smaller particles suggest a plausible yet unclear hazard in the natural environment, such as soil. We investigated the short-term effects (28 days) of polystyrene nanoparticles (PS-NPs) on the activity and biomass of soil microbiota, and the functional diversity of soil enzymes at environmental relevant low levels in an incubation experiment.

Results: Our results showed a significant decrease in microbial biomass in treatments of 100 and 1000 ng PS-NP g⁻¹ DM throughout the incubation period. Dehydrogenase activity and activities of enzymes involved in N-(leucine-aminopeptidase), P-(alkaline-phosphatase), and C-(beta-glucosidase and cellobiohydrolase) cycles in the soil were significantly reduced at day 28 suggesting a broad and detrimental impact of PS-NPs on soil microbiota and enzymes. Leucine-aminopeptidase and alkaline-phosphatase activities tended to decrease consistently, while beta-glucosidase and cellobiohydrolase activities increased at high concentrations (e.g., PS-NP-1000) in the beginning of the incubation period, e.g., at day 1. On the other hand, basal respiration and metabolic quotient increased with increasing PS-NP application rate throughout

the incubation period possibly due to increased cell death that caused substrate-induced respiration (cryptic growth).
Conclusions: We herewith demonstrated for the first time the potential antimicrobial activity of PS-NPs in soil, and this may serve as an important resource in environmental risk assessment of PS-NPs in the soil environment.

Axworthy, J. B. and J. L. Padilla-Gamino (2019). "Microplastics ingestion and heterotrophy in thermally stressed corals." Scientific Reports **9**(1): 18193.

Rising sea temperatures and increasing pollution threaten the fate of coral reefs and millions of people who depend on them. Some reef-building corals respond to thermal stress and subsequent bleaching with increases in heterotrophy, which may increase the risk of ingesting microplastics. Whether this heterotrophic plasticity affects microplastics ingestion or whether ingesting microplastics affects heterotrophic feeding in corals is unknown. To determine this, two coral species, Montipora capitata and Pocillopora damicornis, were exposed to ambient (~27 degreeC) and increased (~30 degreeC) temperature and then fed microplastics, Artemia nauplii, or both. Following thermal stress, both species significantly reduced feeding on Artemia but no significant decrease in microplastics ingestion was observed. Interestingly, P. damicornis only ingested microplastics when Artemia were also present, providing evidence that microplastics are not selectively ingested by this species and are only incidentally ingested when food is available. As the first study to examine microplastics ingestion following thermal stress in corals, our results highlight the variability in the risk of microplastics ingestion among species and the importance of considering multiple drivers to project how corals will be affected by global change.

Ayari, M. G., et al. (2019). "Synthesis of imprinted hydrogel microbeads by inverse Pickering emulsion to controlled release of adenosine 5'-monophosphate." Materials Science & Engineering. C, Materials for Biological Applications **101**: 254-263.

Herein, we propose the synthesis of a microspherical imprinted hydrogel meant for the controlled release of a nucleotide, adenosine 5'-monophosphate (5'-AMP). Indeed, molecularly imprinted polymers-based (MIPs) materials possess remarkable selective molecular recognition ability that mimicks biological systems. MIPs have been used in numerous applications and hold great promise for the vectorization and/or controlled release of therapeutics and cosmetics. But, the conception of imprinted hydrogels-based drug delivery systems that are able to release polar bioactive compounds is explored weakly. Herein, the synthesis of imprinted hydrogel microbeads by inverse Pickering emulsion is detailed. Microspheres showed a large 5'-AMP loading capacity, around 300mg.g⁻¹, and a high binding capacity comparatively to the non-imprinted counterpart. The MIP had a thermo-responsive release behavior providing sustained release of adenosine 5'-monophosphate in an aqueous buffer simulating both human skin pH and temperature.

Aydn, M. (2017). "Determination of Salmonella spp. prevalence by a recently developed biotinyl-tyramide signal amplification from retailed poultry meat in Adyaman province." Harran Tarm ve Gda Bilimleri Dergisi / Harran Journal of Agricultural and Food Science **21**(4): 412-419.

Worldwide, species belonging to the genus Salmonella are pathogenic bacteria and are the second most food poisoning causative agents after noroviruses. More than 2600 serovar of Salmonella have been defined, and their primary reservoir is poultry. Therefore, salmonellae serovars are most frequently associated with consumption of poultry meat and poultry products, which leads to Salmonella-related foodborne illnesses. The main purpose of this study

was to determine the prevalence of Salmonella spp. by use of biotinyl-tyramide signal amplification from retail poultry (chicken) meat in Adyaman province. For this purpose, magnetic micro-beads which can specifically bind to Salmonella spp., was used for isolation by applying Immunomagnetic Separation (IMS), and Tyramide Amplification (TA) was used for detection of the bacteria in order to determine the presence (by ratio) of Salmonella spp. in poultry meat. In this study, 124 samples of poultry meat were studied and 35 (28.23%) of them were Salmonella positive.

Ayhan, F. (2003). "Surface modification and covalent coupling of Concanavalin A onto Poly(EGDMA/HEMA) microbeads for cell affinity applications." <u>Journal of Bioactive and Compatible Polymers</u> **18**(4): 297-310.

The surfaces of nonporous and porous Poly(EGDMA/HEMA) microbeads were modified by the reaction of sodium periodate, hexamethylenediamine and glutaraldehyde. Covalent immobilization of Concanavalin A (Con A) was optimized for maximum loading at various Con A concentrations, pH, temperatures, and ionic strengths. The optimal Con A immobilized concentration was determined as 0.37 and 0.75 mg/g microbeads for the nonporous and porous microbeads, respectively. Covalent coupling was achieved at 37degreeC, with 0.5 mg/mL of Con A at pH 7.4 and ionic strength of 0.01. The specific activity of Con A immobilized microbeads to carbohydrate structure was tested for affinity for myeloma HeLa cells. The data indicates that Con A may play a role in myeloma cell adhesion.

Ayhan, F., et al. (2002). "Optimization of urease immobilization onto non-porous HEMA incorporated poly(EGDMA) microbeads and estimation of kinetic parameters." <u>Bioresource Technology</u> **81**(2): 131-140.

Jack bean urease (urea aminohydrolase, EC 3.5.1.5) was immobilized onto modified non-porous poly(ethylene glycol dimethacrylate/2-hydroxy ethylene methacrylate), (poly(EGDMA/HEMA)), microbeads prepared by suspension copolymerization for the potential use in hemoperfusion columns, not previously reported. The conditions of immobilization; enzyme concentration, medium pH, substrate and ethylene diamine tetra acetic acid (EDTA) presence in the immobilization medium in different concentrations, enzyme loading ratio, processing time and immobilization temperature were investigated for highest apparent activity. Immobilized enzyme retained 73% of its original activity for 75 days of repeated use with a deactivation constant kd = 3.72 x 10(-3) day(-1). A canned non-linear regression program was used to estimate the intrinsic kinetic parameters of immobilized enzyme with a low value of observable Thiele modulus (phi < 0.3) and these parameters were compared with those of free urease. The best-fit kinetic parameters of a Michaelis-Menten model were estimated as Vm = 3.318 x 10(-4) micromol/s mg bound enzyme protein, Km = 15.94 mM for immobilized, and Vm = 1.074 micromol NH3/s mg enzyme protein, Km = 14.49 mM for free urease. The drastic decrease in Vm value was attributed to steric effects, conformational changes in enzyme structure or denaturation of the enzyme during immobilization. Nevertheless, the change in Km value was insignificant for the unchanged affinity of the substrate with immobilization. For higher immobilized urease activity, smaller particle size and concentrated urease with higher specific activity could be used in the immobilization process.

Ayhan, H. (2002). "Model protein BSA adsorption and covalent coupling onto methyl methacrylate based latex particles with different surface properties." <u>Journal of Bioactive and Compatible Polymers</u> **17**(4): 271-283.

The adsorption and covalent coupling of bovine serum albumin (BSA) onto methylmethacrylate

(MMA) based monodisperse latex particles with different hydrophylic surfaces were investigated. P(MMA) and P(MMA/HEMA) microbeads in the size range of 1.5-2.0 mum were prepared by a dispersion homopolymerization method in the presence of poly(vinylpyrrolidone) (PVP) and poly(vinyl alcohol) (PVA) as steric stabilizer and by copolymerization of MMA and 2-hydroxethyl methacrylate (HEMA) where PVP was used as steric stabilizers. Surface properties of these particles were characterized in terms of contact angle measurements and FTIR-DRS spectra. Additionally, hydroxyl groups of PMMA<inf>PVA</inf> and P(MMA/HEMA) particles were activated to provide aldehyde groups on surfaces. Adsorption of the BSA onto these five types of latex particles was examined as a function of initial albumin concentration, pH and ionic strength of the various cations (Na⁺, Ca⁺ and Mg⁺²) and anions (Cl⁻ and SCN⁻). The maximum adsorption capacities for all latex particles were obtained in solutions with 0.01 mu ionic strength and 1 mg/mL BSA concentration. When using PMMA<inf>PVP</inf>, P(MMA/HEMA) and PMMA<inf>PVP</inf>, the adsorption increased as hydrophobicity increased. Aldehyde activation of the two most hydrophobic particles elevated the coupling (immobilization) significantly in ionic strength of 0.01 mu. The adsorption and/or immobilization were maximum in the presence of monovalent cation, Na⁺ or anion, Cl⁻ for all types of latex particles.

Ayhan, H., et al. (1999). "Protein a immobilized poly(methylmethacrylate-co- hydroxyethylmethacrylate) microbeads for IgG adsorption." Journal of Bioactive and Compatible Polymers **14**(6): 490-503.

Poly (methylmethacrylate-co-2-hydroxyethylmethacrylate) microbeads in the size range of 1.5-2.0 mum were prepared by a phase inversion polymerization. The hydroxyl groups were activated by periodate oxidation, and the active ligand, i.e., protein A was immobilized via a spacer-arm, i.e., hexamethylene diamine (HDMA) by using a cross-linker, i.e., glutaraldehyde and protein A. The optimal concentration obtained for modifications are as follows: sodium periodate concentration: 0.407 x 10⁻² mmol/mL; HMDA concentration: 3.5 x 10⁻² mmol/mL; and glutaraldehyde concentration: 0.7 x 10⁻⁶ mmol/mL. Yields of immobilization of protein A onto the plain and periodate oxidized microbeads were found very dose, and were in the range of 0.01-0.02 mg protein A/g microbeads. The optimal conditions for immobilization are as follows: the initial protein A concentration: 0.1 mg/mL; temperature: 25degreeC; pH: 9.5; and immobilization time:120 min. Incorporation of protein A at these conditions resulted in 0.825 mg protein A/g microbeads. The HIgG adsorption onto these protein A incorporated microbeads was 41 mg HIgG/g microbeads.

Ayhan, H., et al. (2000). "Protein A immobilization and HIgG adsorption onto porous/nonporous and swellable HEMA-incorporated polyEGDMA microspheres." Journal of Biomaterials Science, Polymer Edition **11**(1): 13-25.

Both non swellable and swellable poly(EGDMA/HEMA) microbeads were produced by suspension copolymerization. These microbeads were modified by immobilization of a spacer-arm (hexamethylene diamine (HMDA)) and protein A. The optimal values for modifications were as follows: sodium periodate concentration, 1.0 mgml(-1); HMDA concentration, 4 mgml(-1); and glutaraldehyde concentration, 0.070 microgml(-1). Adsorption of protein A onto the plain and periodate oxidized poly(EGDMA/HEMA) microbeads were very close to each other, and were 0.01-0.02 mg protein A on the 1-g Microbeads I and II, respectively. Protein A immobilization on poly(EGDMA/HEMA) microbeads were studied at different temperatures, times, and pHs using single protein solution containing different amounts of proteins. The optimal values for immobilization were as follows: the initial protein A concentration, 0.1 mgml(-1); temperature, 25 degrees C; pH, 9.5; and immobilization time, 120

min. Incorporation of protein A resulted in 1.420 and 1.825 mg protein A on the 1-g Microbeads I and II, respectively. HIgG adsorption capacity on the protein A-incorporated poly(EGDMA/HEMA) microbeads is 27 and 35 mg HIgGg(-1) polymer for Microbeads I and II, respectively.

Ayhan, H. and E. Piskin (2000). "Collagen immobilization onto P(EGDMA/HEMA) microbeads for cell affinity systems." Journal of Bioactive and Compatible Polymers **15**(1): 27-42.

Both nonswellable and swellable poly(EGDMA/HEMA) microbeads were produced by suspension copolymerization. These microbeads were modified by immobilization of a spacer-arm (hexamethylene diamine, HMDA) and collagen. The optimal values for modifications were as follows: sodium periodate concentration: 0.467 x 10⁻² mmol/mL; HMDA concentration: 3.5 x 10⁻² mmol/mL; and glutaraldehyde concentration: 0.70 x 10⁻⁶ mmol/mL. Adsorption of collagen onto plain and periodate oxidized poly(EGDMA/HEMA) microbeads were similar, 0.25 and 0.50 mg collagen/g polymer, respectively. Collagen immobilization on poly(EGDMA/HEMA) microbeads was studied at various temperatures, times, and pH by using protein solution containing various amounts of proteins. The optimal values for immobilizations were as follows: the initial collagen concentration: 0.25 mg/mL; temperature: 4degreeC; pH 7; and the immobilization time; 120 min. Both fibroblastic 3T3 and epithelial MDBK cells were attached to these unmodified and modified microbeads. The attachments of 3T3 and MDBK cells, especially to the collagen immobilized swellable microbeads were very high. Almost 96% of the 3T3 cells available in the cell culture medium became attached to these microbeads (2297 +/- 122 cells per mg of polymer). There was no significant effect by swelling on cell attachment.

Aylor, B. (2011). "FUELING A FLEET." Recycling Today **49**(6): 102-136.

The article reports on the plan of European solid waste and recycling company Sita to power its Great Britain collection fleet with a fuel made from mixed post-consumer plastics. The company will be converting mixed plastic scrap collected from residential and commercial customers into diesel power to be used by a fleet of solid waste and recycling collection trucks in Great Britain. Sita signed an agreement with Cynar which will provide a solution to the environmental challenge of treating waste plastic that cannot be recycled.

Aytan, U., et al. (2016). "First evaluation of neustonic microplastics in Black Sea waters." Marine Environmental Research **119**: 22-30.

The Black Sea has a high risk of plastic pollution given the high river discharge of several industrialized countries into this semi-enclosed sea. Here, for the first time, the occurrence and distribution of microplastics are reported for the Black Sea. Microplastics were assessed from zooplankton samples taken during two cruises along the south eastern coast of the Black Sea in the November of 2014 and February of 2015. In each cruise neuston samples were collected at 12 stations using a WP2 net with 200 mu m mesh. Microplastics (0.2-5 mm) were found in 92% of the samples. The primary shapes were fibres (49.4%) followed by plastic films (30.6%) and fragments (20%), and no micro beads were found. Average microplastic concentration in November (1.2 plus or minus 1.1 103 p ar. m-3) was higher than in February (0.6 plus or minus 0.55 103 par. m-3). Reduced concentrations in February were possibly caused by increased mixing. The highest concentrations of microplastics were observed in offshore stations during November sampling. The heterogeneous spatial distribution (0.2 103-3.3 1 03 par. m-3 for all samples) and accumulation in some stations could be associated to transport and retention mechanisms linked with wind and the dynamics of the rim current, as well by different sources

of plastic. There were no statistically significant differences in MP concentration between sampling stations and sampling periods (t-test, p < 0.05).The relatively high microplastic concentrations suggest that Black Sea is a hotspot for microplastic pollution and there is an urgency to understand their origins, transportation and effects on marine life.

Azari, B. M., et al. (2009). "Junctional adhesion molecule-a/ F11 receptor (JAM-a/ F11R) expression in multiple myeloma (MM): A Candidate Biomarker of Aggressive Disease." Blood. Conference: 51st Annual Meeting of the American Society of Hematology, ASH. New Orleans, LA United States. Conference Publication: **114**(22).

Background: Multiple myeloma (MM) is an incurable disease of clonal plasma cells that accumulate in the bone marrow (BM), causing monoclonal IG production, bone marrow failure, osteolytic lesions and kidney disease. Although initially treatable, MM ultimately becomes refractory to treatment, and is invariably fatal, when tumor cells that harbor genetic mutations expand without regulation. Therefore novel treatment targets need to be identified. A key mechanism in MM pathogenesis is regulation of tumor growth by the bone marrow (BM) microenvironment, particularly by bone marrow neo-vascularization and adhesion of tumor cells to the marrow stroma. Aberrantly expressed genes that regulate angiogenesis by MM cells enhance MM progression and constitute targets in its treatment. JAM-A/F11R is an endothelial cell (EC) adhesion molecule of the immunoglobulin superfamily which is a multifunctional cell membrane protein that mediates intracellular signaling events that alter EC migration and paracellular permeability. For example, in breast cancer, attenuation of JAM-A increases tumor invasion and metastasis through a decrease in tumor adhesion (Ulas Naik Cell Adh Migr. 2008 Oct;2(4):249-51.). In this study we explored the JAM-A/F11R expression in MM tumor cells and in patients to determine the potential role of this molecule in the pathogenesis and progression of MM. Method(s): The MM cell lines examined were RPMI-8266, U266, and NCI-H929. Human umbilical vein endothelial cells (HUVECs) served as controls. Informed consent was obtained from patients and control subjects. Primary BM tumor cells were enriched to > 95% CD138+ cells by positive selection using anti-CD138 MACS MicroBeads. The CD138-negative fraction was used for outgrowth of confluent EPCs (> 98% vWF/CD133/KDR+). JAM-A mRNA expression was assessed using an microarray gene expression profile, JAM-A probe based real-time PCR, and JAM-A levels in each sample were measure using a standard curve and normalized to GADPH. JAM-A protein levels in MM cell lines and primary tumor cells were measured by flow cytometry and immunofluorescence. For serum studies, peripheral blood was obtained from 25 newly diagnosed MM patients and 8 healthy, age- and sex-matched controls, and JAM-A levels were measured using an ELISA. Statistical analysis was performed using Student's t-test, two-tailed, with P ' .05 considered significant. Result(s): JAM-A mRNA levels were significantly increased in MM cell lines RPMI-8266, U266, and NCI-H929 compared to HUVECs (U266, P = 3x10-5; RPM1-8266, P = 1x10-6; NC1-H929, P= 5x10-4). The JAM-A mRNA levels were significantly greater in RPMI-8226; P < .04 compared to TNFalpha-activated HUVECs for 24 hours which is a proangiogenic switch for HUVEC gene expression. The elevated mRNA expression of the JAM-A in MM cell lines was confirmed by immunofluorescence and flow cytometry which showed the presence of both membrane and cytoplasmic JAM-A protein. Microarray analysis of gene expression profiles from 20 patients' corresponding tumor cells and microenvironmental EPCs showed that JAM-A had a higher level of expression in tumor cells versus MM EPC by 12.62 fold, (P=.0000642). Furthermore, JAM-A had a higher level of expression in MM EPC versus normal control EPC by 2.41 fold, (P=.00113) reflecting a complex regulatory role of F11 signaling in MM, similar to breast cancer (Naik, U. et al 2008). JAM-A was also found to be 12.6 fold greater in tumor cells compared to EPCS (P=.0000642). In addition, circulating levels of soluble JAM-A were found to be significantly greater in the serum of MM patients compared to controls (P < .005), with an average 2-fold increase. Serum levels of JAM-A in MM patients also decreased 71% with treatment n=5, P<.05. Conclusion(s): We show for the first time that JAM-A expression is highly elevated in MM tumor cells and its levels respond to treatment. In addition, MM patients have higher circulating JAM-A levels compared to healthy individuals and circulating JAM-A levels were reduced following treatment, suggesting that JAM-A may serve as a novel biomarker in MM. Current studies in the lab are aimed at correlating these levels with clinical parameters to determine whether JAM-A levels reflect disease severity and response to treatment. Results of these analyses, as well as results of ongoing experiments using JAM-A siRNA and antibody-inhibition approaches to target JAM-A in myeloma tumor and ECs will be presented.

Aziz, F., et al. (2016). "Microbead array based technology for detection and quantitation of viral respiratory pathogens associated with pneumonia among children." International Journal of Infectious Diseases **1)**: 431.

Background: Viruses play an important role in causing respiratory infections in children worldwide. The burden of viruses in respiratory infections among children in Pakistan is unknown, largely due to absence of good quality diagnostic facilities. Common viruses associated with respiratory infections included respiratory syncytial virus (RSV), influenza A/B, along with novel viruses like human metapneumovirus, human coronavirus NL63 and HKU1, and human bocavirus, which have the potential to cause pandemics. Therefore, it is, important to delimit the burden of viral pathogens in respiratory infections among children with viral pneumonia. Advanced molecular biology techniques offer great advantage as they are more sensitive and have fast turnaround time for the identification of respiratory pathogens. Magpix platform is used to detect respiratory targets in multiplex assay based on the principle of magnetic bead which allows multiplexing of up to 50 unique assays in a single microplate well. Methods & Materials: Nasopharyngeal swabs of children with acute respiratory infections were collected in viral transport medium and spiked with Bacteriophage MS2 extrinsic control to check the efficacy of nucleic acid amplification. An automated nucleic acid extraction was done using MagNa Pure instrument. xTAG Respiratory Viral Panel fast assay was used for the detection of wide range of viruses and subtypes. Data were analysed using TDAS RVP Fast software (ver. 2.21) and reported as median fluorescent intensity. Result(s): Upon testing 734 nasopharyngeal swabs 362(49%) were positive for entero/rhinovirus, followed by 48(6.5%) positive for parainfluenza type III, 46(6.2%) RSV, 38 (5.1%) parainfluenza type IV, 35(4.7%) metapneumovirus, 25 (3.4%) bocavirus, 22 (3%) adenovirus, 19(2.6%) parainfluenza type I, 17 (2.3%) coronavirus OC43, 16(2%) influenza A/B, 7(1%) parainfluenza type II and 5 (0.68%) were positive for other coronaviruses 229E/ NL63/ HKU1. Conclusion(s): Multiplex PCR- assay is rapid and sensitive tool for the detection of major respiratory pathogens and helpful in future for vaccine development. The advantage of this system is it has shortened time to perform a wide variety of bioassays, costeffectively and accurately.

Azizan, A., et al. (2009). "Profile of time-dependent VEGF upregulation in human pulmonary endothelial cells, HPMEC-ST1.6R infected with DENV-1, -2, -3, and -4 viruses." Virology Journal **6 (no pagination)**(49).

In this study, the upregulated expression level of vascular endothelial growth factor (VEGF) in a pulmonary endothelial cell line (HPMEC-ST1.6R) infected with dengue virus serotypes 1, 2, 3, and 4 (DENV-1, -2, -3 and -4), was investigated. This cell line exhibits the major constitutive and inducible endothelial cell characteristics, as well as angiogenic response. Infection by all four

DENV serotypes was confirmed by an observed cytopathic effect (CPE), as well as RT-PCR (reverse-transcription polymerase chain reaction) assays. As we had previously reported, the DENV-infected HPMEC-ST1.6R cells exhibited an elongated cytoplasmic morphology, possibly representing a response to VEGF and activation of angiogenesis. In this study, increase in VEGF expression level at designated time points of 0, 8, 24, 96 and 192 hours post-infection was investigated, using a microbead-based Bio-Plex immunoassay. Increased level of VEGF expression in infected-HPMEC-ST1.6R was detected at 8 hours post-infection. Interestingly, VEGF expression level began to decrease up to 96 hours post-infection, after which an upsurge of increased VEGF expression was detected at 192 hours post-infection. This profile of VEGF upregulated expression pattern associated with DENV infection appeared to be consistent among all four DENV-serotypes, and was not observed in mock-infected cells. In this study, the expression level of VEGF, a well-established vascular permeabilizing agent was shown to be elevated in a time-dependent manner, and exhibited a unique dual-response profile, in a DENV-infected endothelial cell. The experimental observation described here provided additional insights into potential mechanism for VEGF-mediated vascular leakage associated with DENV, and support the idea that there are potential applications of anti-VEGF therapeutic interventions for prevention of severe DENV infections.

Azizan, A., et al. (2006). "Differential proinflammatory and angiogenesis-specific cytokine production in human pulmonary endothelial cells, HPMEC-ST1.6R infected with dengue-2 and dengue-3 virus." Journal of Virological Methods **138**(1-2): 211-217.

In this study, the ability of dengue virus serotypes 2 (DENV-2) and 3 (DENV-3) to infect and induce increased production of proinflammatory cytokines in a pulmonary endothelial cell line (HPMEC-ST1.6R) was investigated. This cell line exhibits the major constitutive and inducible endothelial cell characteristics, as well as angiogenic response. DENV-2 and DENV-3 infection was confirmed by an observed cytopathic effect (CPE), as well as RT-PCR and immunofluorescence assays. Increases in Th-1 and Th-2 cytokines IL-4, IL-8, IL-6, IL-10, GM-CSF, INF-gamma, and tumor necrosis factor (TNF-alpha) within DENV-2- and DENV-3-infected cells were demonstrated using a microbead-based Bio-plex assay. Proinflammatory cytokine increases and the expression of a potent angiogenic inducer protein, VEGF were confirmed by dot-blot analysis using the TranSignal Human Angiogenesis Antibody Array. Dengue virus-infected HPMEC-ST1.6R cells exhibited an elongated cytoplasmic morphology, possibly representing a response to VEGF and activation of angiogenesis. The increased levels of Th-1 cytokines and VEGF in DENV-2 virus infected-HPMEC-ST1.6R could be distinguished from those infected by DENV-3. This suggests that cytokine patterns associated with DENV infections may be serotype and strain-specific. The experimental approaches described here could be developed further into a useful diagnostic tool for the characterization of dengue hemorrhagic fever cases, leading to enhancement of treatment therapy.

Azmeera, V., et al. (2017). "Solution and microwave assisted synthesis of beta-Cyclodextrin grafted polyacrylamide: Water treatment and In-vitro drug release study." International Journal of Biological Macromolecules **104**(Pt A): 1204-1211.

The present article reports the application of beta-cyclodextrin grafted polyacrylamides synthesized through solution and microwave assisted polymerization techniques as flocculants and then the employment of partially hydrolyzed products of best grade of each technique in-vitro drug release study of diclofenac sodium. Five different grades of beta-cyclodextrin grafted polyacrylamides by each of solution and microwave assisted polymerization techniques have been synthesized, by varying the monomer concentration. The synthesized polymers have been well characterized and their flocculation performances have been evaluated in kaolin suspension through settling and jar test methods Then the best performing grades of both the techniques have been partially hydrolyzed to prepare three different grades each technique by varying the concentration aqueous NaOH solution. Flocculation efficiencies of these polymers have been investigated in kaolin suspension. Thus best grades of partially hydrolyzed grafted polymers of each technique have been chosen for further study of drug delivery. In-vitro drug release study has been done using diclofenac sodium loaded microbeads prepared by ionic gelation method with two partially hydrolyzed grafted polymers (one from each technique) in phosphate buffer solution (PBS) at 37+/-0.5 C and pH 7.4. The drug load and release have been analyzed by UV-vis spectroscopy.

Azubuike Francis, A., et al. (2018). "Experimental Study of Thermal and Catalytic Pyrolysis of Plastic Waste Components." Sustainability **10**(11).

The advantages of catalytic pyrolysis are degradation at a lower temperature (lower energy consumption), increased selectivity, faster-cracking reactions, shorter residence time, inhibition of the formation of undesirable products, increased product yield and production of liquid products with a lower boiling point [13,14]. [...]a product may be considered an alternative to conventional, non-renewable fuels. 4. [...]a higher proportion of PP increases the gasoline range fraction. CAT-2 HDPE LDPE PP NO 100 - - NO - 100 - NO - 75 25 NO - 66 34 NO - 50 50 NO - 34 66 NO - - 100 YES 100 - - YES - 100 - YES - 75 25 YES - 66 34 YES - 50 50 YES - 34 66 YES - - 100 CAT-2 LDPE PP No - 100 No 34 66 No 66 34 No 100 - Yes - 100 Yes 34 66 Yes 66 34 Yes 100 - GC HP 6890 Series Column DB-1 HT Column length 15 Column ID (mm) 0.32 Stationary Phase thickness 0.1 Carrier gas He/H2 Total flow rate (mL/min) 68.9 Initial column temperature (°C) 40 Final column temperature (°C) 350 Detector FID Injection temperature (°C) 340 Injection volume (µL) 1 Detector temperature (°C) 360 Heating rate (°C/min) 10 Author Contributions Conceptualization, S.B.F. and K.A.S.; Methodology, S.B.F. and K.A.S.; validation, A.F.A., L.-A.T., S.B.F. and K.A.S.; Formal Analysis, A.F.A.; Investigation, A.F.A.; Resources, Norner Research AS; Writing-A.F.A.; Writing-Review and Editing, A.F.A., L.-A.T., S.B.F. and K.A.S.; Supervision, L.-A.T. and S.B.F.; Project Administration, A.F.A. Funding This research received no external funding.

Azukizawa, H., et al. (2018). "Comparison among three methods of interferon-gamma enzyme-linked immunospot assay for identifying hypersensitivity-inducing drug culprits." Clinical and Translational Allergy. Conference: 8th Drug Hypersensitivity Meeting, DHM **8**(Supplement 3).

Background Drug-induced Interferon-gamma (IFN-g) enzyme-linked immunoSpot (ELISpot) is an useful in vitro test for identifying culprit drugs in cutaneous adverse drug reactions (cADR) cases. Recent report suggested that the measurement of oxypurinol-inducing IFN-g-releasing cells yields a high diagnostic value in distinguishing between allopurinolallergic and control subjects, when anti-programmed death ligand 1(PD-L1) antibodies were added (anti PD-L1 IFN-g ELISpot). More recently, we reported that drug-induced IFN-g ELISpot using Peripheral blood mononuclear cells (PBMCs), which were stimulated with anti-CD3/CD28 antibody-coated microbeads and IL-2 for 7 days before exposure to the culprit drugs (modified IFN-g ELISpot), was more sensitive than the conventional IFN-g ELISpot. The aim of this study was to clarify the utility of conventional IFN-g ELISpot, anti PD-L1 IFN-g ELISpot, and modified IFN-g ELISpot. Methods Seventeen patients with cADR, caused by clinically convincing culprit drugs, were enrolled in this study. In some cases, the blood samples were obtained at two or three different time points. PBMCs from total 21 samples were analyzed using conventional IFN-g ELISpot, anti PD-L1 IFN-g ELISpot, and modified IFN-g ELISpot. Results Among the culprit drugs tested in each patient, both conventional IFN-g ELISpot and modified IFN-g ELISpot were positive in six

samples, while anti PD-L1 IFN-g ELISpot were positive in four samples. Conclusion Since enrolled cases were limited, more samples are needed for clarifying the enhancement of drug induced IFN-g production by anti PD-L1 antibody. Combination of modified IFN-g ELISpot and conventional IFN-g ELISpot may increase the sensitivity for detecting IFN-g production by drug culprits.

Azzam, M. O. J., et al. (2003). "The role of particle size on the deposition efficiency of ink on plastic spheres." Colloids and Surfaces A: Physicochemical and Engineering Aspects **230**(1-3): 207-216.

Experimental investigation of the effect of carbon particle size on its deposition efficiency on the surface of plastic particles has been performed in stirred vessel. A model based on Langmuir kinetics was used, and it provided a good fit for the experimental results. The effect of de-inking conditions such as, carbon particle size, calcium chloride concentration, and carbon concentration has been investigated. Different sizes of carbon particles were tested. It was found that the deposition rate and the deposition efficiency were generally higher for the larger carbon particles. The effect of CaCl <inf>2</inf> concentration on the deposition efficiency was investigated. Results showed that the deposition rate increased when the concentration of CaCl<inf>2</inf> increased from 0.05 to 0.10g/l (the stochiometric ratio needed to react with sodium stearate). Moreover, the deposition efficiency was higher at this concentration. Concentrations above the stochiometric ratio did not show a systematic behavior for the deposition rate and the deposition efficiency. Finally, the effect of carbon concentration was examined. Carbon concentration of 0.25, 0.30, and 0.40g/l were used. Results showed that the concentration of carbon did not affect the deposition efficiency nor the rate of deposition. This study confirmed the applicability of the method of ink removal from recycled waste paper using plastic particles, proposed by previous investigators. © 2003 Elsevier B.V. All rights reserved.

Baalkhuyur, F. M., et al. (2019). "Corrigendum to "Microplastic in the gastrointestinal tract of fishes along the Saudi Arabian Red Sea coast" (Marine Pollution Bulletin (2018) 131(PA) (407-415), (S0025326X18302625) (10.1016/j.marpolbul.2018.04.040))." Marine Pollution Bulletin: 470.

The authors regret < The following list provides a description of the changes that need to be done. Page 407: In the abstract of the manuscript, the following sentence needs to be corrected: "The grouper (Epinephelus spp.) sampled at Jazan registered the highest number of ingested microplastics. This fish species is benthic and feeds on benthic invertebrates." * It should be "Parascolosps eriomma species sampled at Jazan registered the highest number of ingested microplastic. This fish species is benthic and feeds on benthic invertebrates."Page 412: In the seventh sentence of the results, the following text appears "The highest number of ingested microplastics per individual was observed in Parascolopsis eriomma, a species feeding on benthic invertebrates in muddy and sandy offshore sediments" * This should read "The highest number of ingested microplastics was observed in Parascolosps eriomma, of the 5 individuals analysed, 3 individuals (60%) had ingested plastic particles."Page 412: In the tenth sentence of the results, the following text appears: "One of the samples from Jazan had ingested 3 particles consisting of 2 films (e.g. bags, wrapper, or part of them), and 1 fishing thread (including those released from nets)." This should read "This species from Jazan had, in total, ingested 3 particles consisting of 2 films (e.g. bags, wrapper, or part of them), and 1 fishing thread (including those released from nets)." Page 412: In the twelfth sentence of the results, the following text appears: "Within a species, the highest prevalence of microplastic ingestion (>20% of individuals) was found in the groupers (Epinephelus spp.) and the blackspotted rubberlip (Plectorhinchus gaterinus)." This should read "The highest prevalence of microplastic ingestion (>20% of individuals) was found in the following species: Parascolopsis eriomma, Epinephelus chlorostigma, Plectorhinchus gaterinus and Lipochelius carnolabrum (Table 2)) Table 2, column headed "Number of microplastic found in stomach per species". Action to be taken: * The whole column must be removed.Table 2, column headed "% Ingestion". Action to be taken: All the "100" in this column should be replaced by "10". Table 2, row 29"Average by the total number of fishes by species". Action to be taken: * Change the title to "Average number of microplastic particles per species"The authors would like to apologise for any inconvenience caused. Copyright © 2018 Elsevier Ltd

Baalkhuyur, F. M., et al. (2018). "Microplastic in the gastrointestinal tract of fishes along the Saudi Arabian Red Sea coast." Marine Pollution Bulletin **131**: 407-415.

This study assesses the presence of microplastic litter in the contents of the gastrointestinal tract of 26 commercial and non-commercial fish species from four difference habitats sampled along the Saudi Arabian coast of the Red Sea. A total of 178 individual were examined for microplastics. In total, 26 microplastic fragments were found. Of these, 16 being films (61.5%) and 10 being fishing thread (38.5%). FTIR analysis revealed that the most abundant polymers were polypropylene and polyethylene. Parascolosps eriomma species sampled at Jazan registered the highest number of ingested microplastic. This fish species is benthic and feeds on benthic invertebrates. Although differences in the abundance of microplastic ingestion among species were not statistically significant, a significant change was observed when the level of ingestion of microplastics particles was compared among the habitats. The higher abundance of microplastics particles may be related to the habitats of fish and the presence of microplastics debris near the seabed. The results of this study represent a first evidence that microplastic pollution represents an emerging threat to Red Sea fishes, their food web and human consumers.

Baba, M., et al. (2016). "Removal of extracellular Toxoplasma gondii tachyzoites from suspended cell culture." Parasitology International **65**(5 Pt B): 536-538.

Tachyzoites of Toxoplasma gondii, an obligate intracellular parasite, actively invade a broad spectrum of cell types. T. gondii infects leukocytes and spreads to distant organs such as the brain, lungs and muscles. However, the mechanism of T. gondii transmission from infected leukocytes to peripheral organs is unknown. To show the dynamics of infected leukocytes and intracellular parasites in vivo, previous studies have prepared T. gondii-infected leukocytes and injected them into circulation in experimental animals. However, when the infected leukocytes are prepared in vitro, some extracellular tachyzoites remain in the leukocyte cell culture because it is almost impossible to wash out these extracellular tachyzoites. These extracellular tachyzoites may distort experimental results. In this study, we report a method for removing extracellular tachyzoites from leukocyte culture suspension using antibody-conjugated magnetic beads. Using this method, extracellular tachyzoites in suspension cell culture can be effectively eliminated.

Babu, G. L. and S. K. Chouksey (2011). "Stress-strain response of plastic waste mixed soil." Waste Management **31**(3): 481-488.

Recycling plastic waste from water bottles has become one of the major challenges worldwide. The present study provides an approach for the use plastic waste as reinforcement material in soil. The experimental results in the form of stress-strain-pore water pressure response are presented. Based on experimental test results, it is observed that the strength of soil is improved and compressibility reduced significantly with addition of a small percentage of plastic waste to the soil. The use of the improvement in strength and compressibility response due to

inclusion of plastic waste can be advantageously used in bearing capacity improvement and settlement reduction in the design of shallow foundations.

Babu, G. L. S. and S. K. Chouksey (2012). "Analytical model for stress-strain response of plastic waste mixed soil." Journal of Hazardous, Toxic, and Radioactive Waste **16**(3): 219-228.

Recycling plastic water bottles has become one of the major challenges world wide. The present study provides an approach for the use of plastic waste as reinforcement material in soil, which can be used for ground improvement, subbases, and subgrade preparation in road construction. The experimental results are presented in the form of stress-strain-pore water pressure response and compression paths. On the basis of experimental test results, it is observed that the strength of soil is improved and compressibility reduced significantly with the addition of a small percentage of plastic waste to the soil. In this paper, an analytical model is proposed to evaluate the response of plastic waste mixed soil. It is noted that the model captures the stress-strain and pore water pressure response of all percentages of plastic waste adequately. The paper also provides a comparative study of failure stress obtained from different published models and the proposed model, which are compared with experimental results. The improvement in strength attributable to the inclusion of plastic waste can be advantageously used in ground improvement projects.

Babusikova, O., et al. (1996). "Leukemia-associated phenotypes: their characteristics and incidence in acute leukemia." Neoplasma **43**(6): 367-372.

Leukemia-associated phenotypes have been suggested to be a valuable tool for the detection of minimal residual disease in acute leukemia patients, as they allow to distinguish leukemic blasts from normal hematopoietic progenitor cells. The aim of the present study was to analyze the proportion of acute leukemia patients (both with lymphoid and myeloid leukemias) in which the immunological detection of leukemia-associated phenotypes was convenient for the distinction of leukemic and normal cells. For this purpose we have studied the blast cells from 186 acute leukemia patients at diagnosis with a large panel of monoclonal antibodies by flow cytometry using double staining combinations. From aberrant phenotypes on blast cells we followed lineage infidelity (coexpression of myeloid markers in lymphoid leukemia cells and vice versa, as well as the simultaneous expression of both, T and B cell markers in one lymphoid blast cell) and asynchronous marker expression (simultaneous expression of early and late markers in one cell). One hundred and five of the 186 acute leukemia cases analyzed (56%) showed the presence of leukemia-associated phenotypes. In 41 of the 90 ALL cases followed (46%) and in 40 of the 96 AML cases studied (42%) lineage infidelity was observed. Asynchronous antigen expression was detected in 24 followed cases (13%). Evaluation of the cell marker density by means of calibration microbeads demonstrated abnormal mean channel immunofluorescence and molecules of equivalent soluble fluorescein for CD8 in two patients with T cell malignancies at diagnosis. Abnormal CD8 density might thus represent a characteristic feature of malignant CD8-positive T cell clone. Quantitative marker evaluation therefore seems to be another important mean for the detection of aberrant phenotypes on leukemia cells suitable for the detection of minimal residual disease.

Babusikova, O., et al. (1997). "Quantitative immunocytofluorometry--new parameters for the definition of leukemia cells." Neoplasma **44**(6): 348-355.

In our study we used for definition of leukemia/lymphoma cells a new parameter which allows the enumeration of mean fluorescence intensity expressed by the number of antigen molecules per cell. Quantitative immunofluorescence using calibration microbeads was performed in 36

patients with different acute and chronic lymphoid and myeloid leukemia and in 19 healthy volunteers. We showed that quantitative immunophenotyping allowed the definition of aberrant marker densities on neoplastic cells. We demonstrated under- and overexpression of CD8 marker in CD3/CD4/CD8 complex in T acute lymphatic leukemia and T non-Hodgkin's lymphoma and T leukemia of large granular lymphocytes as compared to normal counterparts. We pointed out that certain antigens (e. g. CD10, CD4, CD24) were expressed at different levels on different cell subsets (CD10 in early B-acute lymphatic leukemia and coexpressed in T-acute lymphatic leukemia, CD4 on T cells and monocytes, CD24 on B cells and granulocytes in chronic myeloid leukemia). We showed that quantitative immune fluorescence could provide new data contributing to a more precise definition of cell differentiation. We documented the significant difference between antigen density of early and late markers in B-cell and myeloid malignancies. Further, we demonstrated that quantitative immune phenotyping could help in determination of exact definition of pathologic clone in morphologically immature leukemia population and showed that parameters of this method are also convenient for cytoplasmic marker evaluation. In our study we were able to demonstrate that CD45 quantitative expression appeared to be a more informative parameter than its percentage of antigen-positive cells as a measure of antigen expression only and we pointed out that low and high CD45 densities enabled to differentiate between pathological clone and residual healthy population in examined sample. We showed that quantitative immune phenotyping could be another important parameter for definition of leukemia phenotype suitable for detection of minimal residual disease.

Babusikova, O. and A. Tomova (2003). "Hairy cell leukemia: early immunophenotypical detection and quantitative analysis by flow cytometry." Neoplasma **50**(5): 350-356.

UNLABELLED: The abnormal coexpression of the so-called 'HCL-restricted' markers (CD22+CD11c, CD25 and CD103) identified on monotypic, slightly large B-lymphocytes in the large cell-gate of dot-plots has previously been shown to be highly characteristic of hairy cell leukemia (HCL). The main aim of our present study was to determine if patterns with low levels of neoplastic cells in bone marrow (BM) or peripheral blood (PB) are of a value the early diagnosis and/or detection of minimal residual disease (MRD) in HCL. Next we wished to determine if quantitative immunophenotyping given by molecules of equivalent soluble fluoresceine (MESF) could help to distinguish pathologic B-lymphocytic pool from that of normal residual B-cells also in patients with low numbers of HCL cells. The abnormal immunophenotypes were studied in 174 specimens from 19 patients with suspect HCL or during follow-up of already treated patients. For evaluation of marker density fluorescent calibration microbeads were used. In 12 HCL patients (67%) permanent complete remission was observed after treatment. In 6 patients (33%) transient MRD+ phenotype was identified but the clinical manifestation of relapse was followed till now in only three patients. One patient was phenotyped just only at diagnosis. The pathological cells in low levels were found in 5 patients at diagnosis (in the range from 2 to 12%) and in patients with MRD+ phenotype they were recognized repeatedly in the range from 2 to 8%. Furthermore, we observed in hairy cells significantly higher values of molecule numbers of some B-cell markers, comparing to that of residual B-cells in nonleukemic lymphocyte gate of the same sample. We found profound and persistent CD4+ lymphopenia in all but one studied patients after CdA treatment.

CONCLUSIONS: Flow cytometric immunophenotyping of PB and BM is highly sensitive and specific method and is capable to detect low levels of malignant cells in HCL. Quantitative analysis of MESF values of pathological B-cells comparing to normal residual B-cells seems to be another new marker of HCL in common, which is reliable detecting also small cell numbers in examined sample. A long-term decline of CD4+ T-cells correlated with the relatively low incidence of clinical progression of HCL.

Badarinath, A. V., et al. (2010). "Formulation and characterization of alginate microbeads of flurbiprofen by ionotropic gelation technique." International Journal of ChemTech Research **2**(1): 361-367.

Flurbiprofen is a non-steroidal anti-inflammatory drug that can used for rheumatoid arthritis, osteoarthritis, ankylosing spondylitis, tendinitis etc. its shorter biological half life (3-4.5 hrs) necessitates that it to be administered in frequent doses of 50-100mg. The main objective of this study was to develop suitable microparticulate system of Flurbiprofen for controlled release delivery system by varying the alginate, CaCl² and HPMC concentrations. In the present work Flubriprofen microbeads were formulated being sodium alginate by ionotropic gelation technique. Prepared beads were evaluated for granulometric studies, micromeretic, scanning electron microscopy, drug entrapment efficiency and in-vitro dissolution studies etc. The prepared beads were free flowing and white in colour. The drug loaded beads showed 83.6-98.2% drug entrapment, which was found to increase with increase in sodium alginate concentration. Scanning electron microscopy revealed that the beads were spherical and rough in structure. The flow property of the all the batches of prepared microbeads were estimated by angle of repose in the range of 22degree30-32degree20. In vitro drug release study of these microbeads indicated controlled release for Flurbiprofen 84.54-97.74% release at the end of 10 h. Hence the observation of all results of the different batches fifth and sixth showed controlled release action and improved drug availability. The release of Flurbiprofen was found to be affected by both concentration of polymers such as sodium alginate and HPMC. By the observation of accelerated stability studies sixth batch formulation was found to be best formulation. From this study, it could be concluded that the spherical and free flowing microbeads of Flurbiprofen could be successfully prepared by ionotropic gelation technique with high entrapment efficiency and prolonged release characteristics.

Badawy, S. Z., et al. (1987). "Immune rosettes of T and B lymphocytes in infertile women with endometriosis." Journal of Reproductive Medicine **32**(3): 194-197.

We examined the cell-mediated immune response in women with pelvic endometriosis by quantitating their T and B lymphocytes. The study was conducted on heparinized peripheral blood and peritoneal fluid. The results were compared with those in a control group of women without evidence of endometriosis. Each patient underwent laparoscopy as part of her infertility evaluation. The ability of T cells to form rosettes with sheep erythrocytes was used to estimate the percentage of total and active T cells. B lymphocytes were quantitated by erythrocyte antibody complement binding capacity. In addition, T and B lymphocytes were assayed with the Immunobead technique using specific monoclonal antibodies. The helper T cell (T4) and suppressor T cell (T8) subsets of lymphocytes were evaluated with specific monoclonal antibodies coupled to microbeads. The results demonstrated an increased number of T and B cells in peritoneal fluid and peripheral blood from patients with endometriosis as compared with controls. Furthermore, the ratio T4:T8 was significantly increased in patients with endometriosis. These results suggest a cell-mediated immune response in the presence of endometriosis.

Badida, M. P., et al. (2013). CHANGE OF SELECTED MECHANICAL PROPERTIES OF RECYCLED PET ON THE TEMPERATURE CONDITIONS. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **1:** 161-168.

The plastic bottles have wide using as one of the most used custom packing materials in market. They are used mainly by food industry also by chemical industry. This paper deals about the

analysis of changes of mechanical properties changed by influence of temperature of selected PET bottles as incoming plastic waste. This material was tested in two temperature conditions. First was low temperature for simulating the cold weather in winter and the second one was the high temperature simulating the hot weather in summer. To find out the changed mechanical properties of PET bottles was made the tensile test where were defined certain parameters. Achieved values of selected mechanical properties - yield strength, tensile strength and relative elongation were compared with the measured values in natural environment. To comparing the material composition of both materials was made the Raman spectroscopy. [PUBLICATION ABSTRACT]

Bae, S. B., et al. (2019). "Electrospraying of environmentally sustainable alginate microbeads for cosmetic additives." International Journal of Biological Macromolecules **133**: 278-283.

Polymer microbeads (MBs) for scrubbing additives have generally been prepared from non-biodegradable synthetic polymers. The worldwide pollution of the marine ecosystem by microplastics urgently demands novel environment-friendly MBs. In this study, Ca-alginate MBs were fabricated by electrospraying an aqueous alginate solution into distilled water containing calcium ions. The size and shape of the Ca-alginate MBs were controlled by electrospraying parameters, such as nozzle diameter and solution concentration. As the alginate concentration and needle diameter were increased, the size of alginate MBs was gradually increased, because of the higher mass flow rate. In addition, the adsorption and degradation behavior of alginate MBs were examined using model contaminants and sea water, respectively. In particular, alginate MBs rapidly degraded in sea water, due to the reversible ion-exchange reaction between Ca²⁺ in MBs and Na⁺ in sea water. Therefore, the electrosprayed Ca-alginate MBs offer a promising alternative for environment-friendly cosmetic additives.

Baek, C., et al. (2018). "Elimination of Humic Acid from Aqueous Sample Using Zinc Oxide/Graphene Oxide-Coated Microbeads." Journal of Nanoscience & Nanotechnology **18**(9): 6360-6363.

Natural organic matter (NOM) is known to cause major problems with drinking water quality management, such as sedimentation of disinfectants during the purification process, microbial growth of water pipes, and corrosion of pipes. For efficient and continuous removal of NOM from drinking water, a packed bed-type platform containing microbeads based on nanostructured zinc oxide (ZnO) was developed. ZnO was synthesized on graphene oxide (GO)-coated microbeads by optimizing the ZnO concentration and reaction time. The morphology of the synthesized ZnO-coated microbeads was confirmed by scanning electron microscopy, and an adsorption test was conducted using a cationic dye. The ZnO/GO microbeads were packed in a microtube. A humic acid contaminated aqueous solution was allowed to flow through the microbeads, and its removal rate was measured by UV-vis spectroscopy. This study confirmed that the purification platform containing ZnO removed more than 90% of humic acid of about 1,000 ppm.

Bagaev, A., et al. (2018). "Anthropogenic microlitter in the Baltic Sea water column." Marine Pollution Bulletin **129**(2): 918-923.

Microlitter (0.5-5mm) concentrations in water column (depth range from 0 to 217.5m) of the main Baltic Proper basins are reported. In total, 95 water samples collected in 6 research cruises in 2015-2016 in the Bornholm, Gdansk, and Gotland basins were analysed. Water from 10- and 30-litre Niskin bathometers was filtered through the 174mum filters, and the filtrate was examined under optical microscope (40x). The bulk mean concentration was 0.40+/-0.58 items per litre, with fibres making 77% of them. Other types of particles are the paint flakes (19%) and fragments (4%); no microbeads or pellets. The highest concentrations are found in the near-bottom samples from the coastal zone (2.2-2.7 items per litre max) and from near-surface waters (0.5m) in the Bornholm basin (5 samples, 1.6-2.5 items per litre). Distribution of particles over depths, types, and geographical regions is presented.

Bagaev, A., et al. (2017). "Anthropogenic fibres in the Baltic Sea water column: Field data, laboratory and numerical testing of their motion." Science of the Total Environment **599**: 560-571.
Distribution of microplastics particles (MPs) in the water column is investigated on the base of 95 water samples collected from various depths in the Baltic Sea Proper in 2015–2016. Fibres are the prevalent type of MPs: 7% of the samples contained small films; about 40% had (presumably) paint flakes, while 63% contained coloured fibres in concentrations from 0.07 to 2.6 items per litre. Near-surface and near-bottom layers (defined as one tenth of the local depth) have 3–5 times larger fibre concentrations than intermediate layers. Laboratory tests demonstrated that sinking behaviour of a small and flexible fibre can be complicated, with 4-fold difference in sinking velocity for various random fibres' curvature during its free fall. Numerical tests on transport of fibres in the Baltic Sea Proper were performed using HIROMB reanalysis data (2007) for the horizontal velocity field and laboratory order-of-magnitude estimates for the sinking velocity of fibres. The model takes into account (i) motion of fibres together with currents, (ii) their very slow sinking, and (iii) their low re-suspension threshold. Sensitivity of the final distribution of fibres to variations of those parameters is examined. These experiments are the first step towards modelling of transport of fibres in marine environment and they seem to reproduce the main features of fibres distribution quite well. [ABSTRACT FROM AUTHOR]

Bagheri, M., et al. (2020). "Towards a circular economy: A comprehensive study of higher heat values and emission potential of various municipal solid wastes." Waste Management **101**: 210-221.
Maximizing resource recovery from waste streams (e.g., energy) is a critical challenge for municipalities. Utilizing the ultimate analysis and high heat value (HHV), we investigated the energy recovery and emission characteristics for 252 solid wastes of a diverse range of geographical origins classifications (e.g., 30 paper, 12 textile, 12 rubber and leather, 29 MSW mixture, 34 plastic, 61 wood, 20 sewage sludge and 53 other wastes) under the thermal waste-to-energy operation. Given the significance of wastes' HHV data, we proposed a rapid and cost-effective methodology for filling the gaps in the experimental data by prediction of the missing or uncertain wastes' HHV. We further employed wastes' nitrogen and sulphur contents to assess their atmospheric emissions. The results from this analysis show the highest energy content belonged to plastic waste, but higher levels of air pollution (mainly due to nitrogen and sulfur) could be emitted during thermal energy recovery of sewage sludge, rubber, and textile wastes. Also, we demonstrated more significant potential for recovering energy from plastic, wood, and paper wastes, while emitting less nitrogen and sulphur compounds to the atmosphere. Finally, our presented HHV models outperform concerning generalizability, validity, and accuracy when comparing the obtained results to those of previously published models. The

results from this present study are particularly advantageous in designing sustainable thermal waste-to-energy systems to facilitate cities' transition into a circular economy.

Bai, B., et al. (2019). "Experimental investigation on liquefaction of plastic waste to oil in supercritical water." Waste Management **89**: 247-253.

In order to solve the problem of low thermal conductivity and high viscous molten liquid reaction product in the process of plastic liquefaction, the experiments of high impact polystyrene (HIPS) plastic liquefaction were carried out in supercritical water. In this paper, the effects of different operating conditions (temperature, time, feedstock concentration and pressure) on liquid products were studied. It is found that the novel phenomenon that the liquid products of HIPS plastic were mainly toluene and ethylbenzene rather than styrene, which was a product of polystyrene. The experimental results showed that plastic first depolymerized to form styrene and 1,3-diphenylpropane, which were then converted to toluene and ethylbenzene. The increase in temperature promoted this transformation process and some traces of polycyclic aromatic hydrocarbons also produced. At 490degreeC, the maximum carbon liquefaction rate of 77.0wt% was obtained, which was 6 times higher than the conventional pyrolysis, and the content of toluene and ethylbenzene were 14wt% and 51.3wt%, respectively. Increasing the reaction pressure and prolonging the reaction time all promoted the progress of the plastic liquefaction reaction, while increasing the feedstock concentration caused the carbon liquefaction rate to increase first and then slightly decrease.

Bai, M., et al. (2018). "Occurrence, characteristics of microplastic during urban sewage treatment process." China Environmental Science **38**(5): 1734-1743.

By extracting microplastics (MPs) in the water and sludge samples, the occurrence of MPs in a coastal municipal sewage plant in Shanghai was studied. This study firstly investigated the characteristics and emissions of MPs in the coastal WWTP of China. Fiber was the most common shape. Rayon was the most common polymer type in the influents. In the effluents, synthetic leather accounted for the largest porpotion followed by rayon, polyester and polyethylene. The abundances of MPs in the influents, mixed water, effluent and sludge stages were 117n/L, 90n/L, 52n/L and 180n/50 g (wet weight), respectively. The removal efficiency of microplastics in the WWTP was 55.6%. Cursory calculations estimated the abundance of MPs in the waters decrease from 3.276 trillion in the influents to 1.456 trillion in the effluents, and the excess sludge contain approximately 54 million MPs. Moreover, a miscalculation of personal care product MP discharge from the mainland China to the ocean was also be discussed.

Baig, T., et al. (2015). "Preparation and evaluation of multi particulates drug delivery system using natural polymers." Current Drug Delivery **12**(3): 314-322.

Simvastatin potassium is a hypolipidemic drug used with exercise, diet, and weight-loss to control elevated cholesterol, or hypercholesterolemia. It is a member of the statin class of pharmaceuticals. Okra mucilage is used to reduce the cholesterol level since microspheres has formulated by using okra mucilage to developed a synergistic effect. Calcium chloride act as a cross linking agent, when react with sodium alginate form a calcium alginate, since develope a gel like microbeads (microspheres). The half life of simvastatin is 2h for simvastatin acid. Simvastatin microspheres were prepared by using sodium alginate in combination with Abelmoschus esculentus (Okra), as drug release modifiers in various proportions to overcome the drug related adverse effects. The drug entrapment efficiency increased progressively with increasing concentration of both sodium alginate and okra mucilage resulting in the formation of larger microspheres entrapping greater amounts of the drug. The prepared microspheres were subjected to various evaluation and in vitro release studies. The particle sizes of the prepared microspheres were determined by optical microscopy and Scanning Electron Microscopy (SEM) analysis. The prepared microspheres had good spherical geometry with smooth surface as evidence by SEM. Study the capability of the formulation to withstand the physiological environment of the stomach and small intestine.

Bailey, K. (2018). "Who's Really to Blame for the Plastics Recycling Crisis? (Hint: It's Not China)." Waste360: 2-2.

The article explores the global crisis of plastic waste and the response to the crisis. It blames the plastic industry for ever-increasing production of plastics and admits to the inability of recyclers to keep pace with the explosion of plastics on the market. The role of plastics in many advancements in medicine, technology and transportation is recognized. The environmental, health and climate impact of the explosion of plastics is also discussed.

Bailey, S. (2012). "SME delivers pots of solutions." Materials Recycling World **200**(7): 99-100.

The article reports on a partnership formed by Müller Dairy and Summit Systems to construct a recycling line intended specifically for plastic waste from yogurt production. The discussions between the companies were centered on several issues, such as production waste of polystyrene with a heat-sealed metallised paper layer. The recycling operation was dubbed Boomerang Plastics.

Baillie, C., et al. (2011). "Waste-based composites - Poverty reducing solutions to environmental problems." Resources, Conservation and Recycling **55**(11): 973-978.

This paper highlights an innovative model of waste management combined with poverty reduction, which has been developed by the organisation Waste for Life (wasteforlife.org) - a network of academics, students, practitioners and on the ground cooperative partners in low income communities. The Waste for Life teams work with local cooperatives to create waste-based composites, which may be sold in local markets, thereby creating an income stream. The application of this model to the context of cartoneros (waste picker) cooperatives in Buenos Aires, Argentina, reveals that viable products can be made from paper and plastic waste, with low-impact material preparation that circumvents the need for chemically intensive, polluting and mechanically degrading procedures, preserving recycled fibre integrity. Tests on material samples indicate mechanical properties comparable to products made with more complex processing. The production model is based on the philosophy that not only the waste materials, but also the production equipment should be locally sourced and manufactured and products created to suit local markets. A simple reproducible model has been developed for the local manufacture of composites from waste, which can provide an income source for waste pickers as well as providing an innovative waste management solution. © 2011 Elsevier B.V. All rights reserved.

Baini, M., et al. (2018). "Abundance and characterization of microplastics in the coastal waters of Tuscany (Italy): The application of the MSFD monitoring protocol in the Mediterranean Sea." Marine Pollution Bulletin **133**: 543-552.

Monitoring efforts are required to understand the sources, distribution and abundance of microplastic pollution. To verify the abundance of microplastics along the Tuscan coastal waters (Italy), water-column and surface samples were collected in two seasons across four transects at different distances to the coast (0.5, 5, 10 and 20km), within the implementation of the European Marine Strategy Framework Directive. The results show an average concentration of

0.26items/m³ in the water-column samples and 41.1g/km² and 69,161.3items/km² of floating microplastics, with an increase with the distance to the coast The seasonality and the sampling area do not affect the abundance of microplastics. The most abundant size class is 1-2.5mm as fragments and sheets suggesting that fragmentation of larger polyethylene and polypropylene items could be the main source of microplastics. These data represent the application of a harmonized protocol to make the data on microplastics comparable and reliable.

Bair, R. J., et al. (2014). "Radiopaque polymer hydrogel used as a fiducial marker in gynecologic brachytherapy." Brachytherapy **1)**: S73.

Purpose: Implantable fiducial markers are radiopaque materials used to aid in the clinical and radiographic localization of tumors and normal tissues. We assessed a novel FDA-approved hydrogel synthesized as microbeads impregnated with iodine contrast material (TRACE-IT, Augmenix, Waltham, MA) not previously used as a marker in patients undergoing gynecologic brachytherapy. Material(s) and Method(s): Fifteen patients underwent brachytherapy for recurrent endometrial cancer at the vaginal cuff (3, 20%), recurrent cervical cancer (1, 6%) or primary cervical cancer (11, 73%). Patients underwent 3-D image-based brachytherapy that was CT-planned tandem and ring (5), MR-planned tandem and ring (2), CT-planned interstitial (4) or MR-planned interstitial (4). Pretreatment CT scans were obtained for all 15 patients, and 6/15 also underwent MRI prior to hydrogel injection. The hydrogel material was injected using an 18-gauge spinal needle into the target as determined by the physician using a transvaginal approach with direct visualization of the injection site. The injected amount ranged from 0.1-0.4 ml. A total of 62 injections were placed; locations included the primary tumor within the cervix (32) or endometrium (3), right fornix (4), left fornix (5), non-cancerous endometrium (1), non-cancerous cervix (4), vaginal wall/cuff (7) and parametrial tissue (6). Eight target areas received 0.1 cc, 26 had 0.2 cc, 26 had 0.3 cc and 2 had 0.4 cc. To assess the unadjusted effect of baseline parameters on hydrogel visibility, we modeled each outcome using the linear mixed effect model for continuous outcomes. Post-implantation imaging using CT (15) and MRI (6) with T2-weighted images was performed. Two physicians separately scored the visibility of the tracer on CT and on MR using a 5-point scoring scale: 1-not visualized; 2-faint or trace visibility (shadow or haze); 3-visible but indistinct borders (definable entity, not just haze); 4- partially distinct border, partial haze; and 5-clearly visualized, unequivocal. A Cohen's Kappa statistic was calculated to assess interobserver agreement. Result(s): Injection of the radiopaque gel was accomplished without significant bleeding or other complication. The weighted Cohen's Kappa Statistic was 0.75 (95% confidence interval, 0.65-0.86). Post-implantation analysis included mean, median and range of fiducial marker visibility according to disease site and amount of volume injected (see table). The volume of hydrogel injected was significantly associated with visibility on both CT (p=0.047) and MRI (p=0.023). In some situations, accurate characterization of the injectable marker was limited by diffusion of the gel into adjacent tissues and needle tracks with residual marker leading to distortion of the implantation site. When hydrogel implantation was effective, the T2 MRI demonstrated a well-delineated hyperintense focus in the target injection site; a corresponding hyperdense focus was also seen on the post-implantation CT. Conclusion(s): This is the first reported series of the use of an injectable radiopaque hydrogel (TRACE-IT) to visualized targets on 3D imaging during brachytherapy for endometrial or cervical cancer. Our experience demonstrates the technical feasibility and the variation in radiographic visibility of this novel fiducial marker implant. Its effectiveness varied between primary and recurrent malignancies and between imaging modalities. Injection of 0.4 cc or greater is required for unequivocal visibility on CT or MR. (Table Presented).

Baird, G. S. and T. J. Montine (2008). "Multiplex immunoassay analysis of cytokines in idiopathic inflammatory myopathy." Archives of Pathology & Laboratory Medicine **132**(2): 232-238.
CONTEXT: Idiopathic inflammatory myopathies (IIMs), including dermatomyositis, polymyositis, and inclusion-body myositis, can be difficult to diagnose.
OBJECTIVE: To determine if a multiplex immunoassay for markers of inflammation in muscle homogenates correlates with a diagnosis of IIM.
DESIGN: Frozen archived muscle biopsy specimens from 30 patients with IIM and 34 patients without IIM were homogenized and analyzed for cytokine content with a multiplex microbead-based immunoassay system. Analyte concentrations were normalized to total lysate protein concentration prior to comparison.
RESULTS: Two cytokines, interleukin 1ra and monocyte chemoattractant protein 1, and 1 soluble adhesion molecule, intracellular adhesion molecule 1, were found at significantly greater concentrations in muscle samples from patients with IIM. Intracellular adhesion molecule 1 levels alone were 83% sensitive and 91% specific for IIM at a cutoff of 1240 pg/mg muscle protein.
CONCLUSIONS: Immunoassays for selected inflammatory markers can serve in conjunction with histopathologic analysis as sensitive and specific tools for the diagnosis of IIM.

Bajek, A., et al. (2011). "Prostate epithelial stem cells are resistant to apoptosis after alpha1-antagonist treatment. The impact for BPH patients." Central European Journal of Urology **64**(4): 256-257.
INTRODUCTION: Induction of apoptosis in prostatic epithelial cells by doxazosin, terazosin and prazosin has been well documented. However, the biochemical pathways of doxazosin action is still unclear. Aforementioned drugs should lead to decrease of prostate volume, although this effect was never observed in patients suffering from BPH after treatment with alpha1-antagonists. Probably, it is connected with cancer stem cells' resistance on chemotherapeutic agents. The aim of this study was to compare incidence of apoptosis induced by doxazosin in progenitor and differentiated cells isolated from human prostate epithelium.
MATERIAL AND METHODS: For this purpose tissue specimens were obtained from 10 patients suffering from BPH, the primary cultures of prostate epithelium were established and CD133 MicroBeads sorting was prepared. Both, CD133(+)/CD133(-) co-cultures and CD133(+) cells were incubated with different concentration of doxazosin for 12 h. Cell viability and apoptosis was estimated with Annexin V-FITC.
RESULTS: 12 h incubation of CD133(+)/CD133(-) co-cultures with doxazosin resulted in increase of apoptotic cells, while in CD133(+) cultures no changes were observed. Correlation between apoptotic cell number and doxazosin concentration in CD133(+)/ CD133(-) co-cultures group was high (R = 0.99).
CONCLUSION: Doxazosin induced apoptosis in co-cultures of progenitor and differentiated epithelial cells. However, progenitor cells were not susceptible to apoptosis, what can be a reason of treatment failure in BPH patients.

Baker, J. (2010). "Polymer processing has it all mixed up." Materials Recycling Week **195**(2): 18-19.
The article focuses on the recycle of plastic packaging film waste through polythene film reprocessors in Great Britain. It says that plastic recycling requires careful collection of wastes because recycling of mixed plastics is not permissible due to their different physical characteristics. It mentions offshore recycling as a way to deal with the loss of connection between waste handling at source and an end processor wherein collected materials are delivered abroad. However, the Department for Environment, Food and Rural Affairs (Defra) still

favors more with the existing system than with offshore recycling especially for recycling commercial polythene packaging.

Bakir, A., et al. (2016). "Relative importance of microplastics as a pathway for the transfer of hydrophobic organic chemicals to marine life." Environmental Pollution **219**: 56-65.

It has been hypothesised that, if ingested, plastic debris could act as vector for the transfer of chemical contaminants from seawater to organisms, yet modelling suggest that, in the natural environment, chemical transfer would be negligible compared to other routes of uptake. However, to date, the models have not incorporated consideration of the role of gut surfactants, or the influence of pH or temperature on desorption, whilst experimental work has shown that these factors can enhance desorption of sorbed contaminants several fold. Here, we modelled the transfer of sorbed organic contaminants dichlorodiphenyltrichloroethane (DDT), phenanthrene (Phe) and bis-2-ethylhexyl phthalate (DEHP) from microscopic particles of polyvinylchloride (PVC) and polyethylene (PE) to a benthic invertebrate, a fish and a seabird using a one-compartment model OMEGA (Optimal Modelling for EcotoxicoloGical Applications) with different conditions of pH, temperature and gut surfactants. Environmental concentrations of contaminants at the bottom and the top of published ranges were considered, in combination with ingestion of either 1 or 5% by weight of plastic. For all organisms, the combined intake from food and water was the main route of exposure for Phe, DEHP and DDT with a negligible input from plastic. For the benthic invertebrate, predictions including the presence of contaminated plastic resulted in very small increases in the internal concentrations of DDT and DEHP, while the net change in the transfer of Phe was negligible. While there may be scenarios in which the presence of plastic makes a more important contribution, our modelling study suggests that ingestion of microplastic does not provide a quantitatively important additional pathway for the transfer of adsorbed chemicals from seawater to biota via the gut.

Bakir, A., et al. (2012). "Competitive sorption of persistent organic pollutants onto microplastics in the marine environment." Marine Pollution Bulletin **64**(12): 2782-2789.

Plastics are known to sorb persistent organic pollutants from seawater. However, studies to quantify sorption rates have only considered the affinity of chemicals in isolation, unlike the conditions in the environment where contaminants are present as complex mixtures. Here we examine whether phenanthrene and 4,4'-DDT, in a mixture, compete for sorption sites onto PVC with no added additives (unplasticised PVC or uPVC) and Ultra-High Molecular Weight polyethylene. Interactions were investigated by exposing particles of uPVC and UHMW PE to mixtures of 3H and 14C radiolabelled Phe and DDT. Changes in sorption capacity were modelled by applying a Freundlich binding sorption isotherms. An Extended Langmuir Model and an Interaction Factor Model were also applied to predict equilibrium concentrations of pollutants onto plastic. This study showed that in a bi-solute system, DDT exhibited no significantly different sorption behaviour than in single solute systems. However, DDT did appear to interfere with the sorption of Phe onto plastic, indicating an antagonistic effect.

Balakrishnan, G., et al. (2019). "Towards more realistic reference microplastics and nanoplastics: preparation of polyethylene micro/nanoparticles with a biosurfactant (Electronic supplementary information (ESI) available. See DOI: 10.1039/c8en01005f)." Environmental Science: Nano **6**(1): 315-324.

Microplastics are ubiquitous in the aquatic environment and polyethylene (PE) fragments are commonly identified in field samples. Studies are needed to evaluate the toxicity of microplastics, especially for the smallest ones that can be ingested by a wide range of organisms. However, due to a lack of preparation methods, small PE microplastics are not often used in laboratory studies. Here, a simple method was developed for the preparation of PE microparticles using dissolution of PE in toluene followed by emulsification in water. After complete evaporation of water and toluene, a powder of PE microparticles was obtained with radii between 0.2 to 0.80 µm. The protocol could be optimized by adding surfactants like Tween 60 or Tween 80, and the possible use of a solution of microalgae exudates as a biosurfactant was also demonstrated. Planktonic crustaceans were exposed to different types of microparticles to evaluate their bioavailability depending on the surfactant.

Balanc, B., et al. (2016). "Calcium-Alginate-Inulin Microbeads as Carriers for Aqueous Carqueja Extract." Journal of Food Science **81**(1): E65-E75.

Carqueja (Pterospartum tridentatum) is an endemic species and various bioactive compounds have been identified in its aqueous extract. The aim of this study was to protect the natural antioxidants from the aqueous extract of carqueja by encapsulation in Ca-alginate microbeads and Ca-alginate microbeads containing 10% and 20% (w/v) of inulin. The microbeads produced by electrostatic extrusion technique had an average diameter from 625 µm to 830 µm depending on the portion of inulin. The sphericity factor of the hydrogel microbeads had values between 0.014 and 0.026, while freeze dried microbeads had irregular shape, especially those with no excipient. The reduction in microbeads size after freeze drying process (expressed as shrinkage factor) ranged from 0.338 (alginate microbeads with 20% (w/v) of inulin) to 0.523 (plain alginate microbeads). The expressed radical scavenging activity against ABTS and DPPH radicals was found to be between 30% and 40% for encapsulated extract, while the fresh extract showed around 47% and 57% of radical scavenging activity for ABTS and DPPH radicals, respectively. The correlation between antioxidant activity and the total phenolic content were found to be positive (in both assay methods, DPPH and ABTS), which indicate that the addition of inulin didn't have influence on antioxidant activity. The presence of inulin reduced stiffness of the hydrogel, and protected bead structure from collapse upon freeze-drying. Alginate-inulin beads are envisaged to be used for delivery of aqueous P. tridentatum extract in functional food products. Practical Application The alginate-inulin formulations are aimed at delivery of bioactive compounds in functional food products. The mechanical properties of the microbeads were assessed as they indicate how the particles will be able to withstand stress (for example, during process of incorporation into food). In addition, freeze-dried forms of the microbeads were also considered, as they are more convenient for long-term applications.

Balasubramanian, M. and S. Raiyani (2014). Biodegradable packaging: Competitor and technology landscape report. Flexible Packaging Conference, FlexPackCon 2014, October 19, 2014 - October 22, 2014, Myrtle Beach, SC, United states, Society of Plastics Engineers.

Biodegradable packaging is a great need as plastic is harmful to people and the environment. Plastic leaches out chemicals called phthalates into the food, food products and water in plastic bottles. Phthalates are oestrogen mimics and they increase the levels of oestrogen in humans and food chains and there is evidence that they cause cancer including breast cancers and lead to low fertility in men. So, replacing plastic would be good for people's health. Biodegradable packaging is made from natural raw materials such as corn starch and sugar cane, both of which are consumed by humans and are not harmful to people's health. Another great thing about biodegradable packaging is that it takes less energy to produce, has less carbon emissions and therefore helps reduce climate change. Biodegradable packaging is entirely compostable in industrial facilities and is therefore less harmful than the incineration of plastic waste which releases harmful chemicals into the atmosphere. Furthermore, plastics take a long time to degrade and fill up landfill sites so biodegradable packaging is better for the environment and sustainable living. Many companies are switching to bio-packing for their products. Considering numerous advantages that biodegradable packaging offer over Synthetic plastics, it can be anticipated that it has a great future in the different areas of packaging. Research and Development efforts are required to develop biodegradable packaging having good packaging performance besides being economical. Dolcera report focuses on finding the relevant patents encompassing the Biodegradable packaging for Liquids. Patents cover various types of films and laminates, containers, methods of producing containers etc are described mostly in relevant patents. The keywords used in the search were obtained after an extensive study of relevant patents. The class codes for the search were obtained from the control patents and more class codes with manual search of classification index. The report highlights year-wise patent activity (trend line) along with the key industrial players in the field. Patents are categorized on the basis of patent focus-Biodegradable containers for liquid products. The categorized patents were further analyzed to determine the key players under each category. A comprehensible result in the form of Dolcera dashboard has been given. Dashboard links the companies in each category to their patents, hence making an interactive platform for analysis. Furthermore, patents have been mapped to commercially available products produced by the respective assignees and other licensees. Copyright (2014) by the Society of Plastics Engineers All rights reserved.

Balasubramanian, V., et al. (2010). "High-density polyethylene (HDPE)-degrading potential bacteria from marine ecosystem of Gulf of Mannar, India." Letters in Applied Microbiology **51**(2): 205-211.

AIMS: Assessment of high-density polyethylene (HDPE)-degrading bacteria isolated from plastic waste dumpsites of Gulf of Mannar.

METHODS AND RESULTS: Rationally, 15 bacteria (GMB1-GMB15) were isolated by enrichment technique. GMB5 and GMB7 were selected for further studies based on their efficiency to degrade the HDPE and identified as Arthrobacter sp. and Pseudomonas sp., respectively. Assessed weight loss of HDPE after 30 days of incubation was nearly 12% for Arthrobacter sp. and 15% for Pseudomonas sp. The bacterial adhesion to hydrocarbon (BATH) assay showed that the cell surface hydrophobicity of Pseudomonas sp. was higher than Arthrobacter sp. Both fluorescein diacetate hydrolysis and protein content of the biofilm were used to test the viability and protein density of the biomass. Acute peak elevation was observed between 2 and 5 days of inoculation for both bacteria. Fourier transform infrared (FT-IR) spectrum showed that keto carbonyl bond index (KCBI), Ester carbonyl bond index (ECBI) and Vinyl bond index (VBI) were increased indicating changes in functional group(s) and/or side chain modification confirming the biodegradation.

CONCLUSION: The results pose us to suggest that both Pseudomonas sp. and Arthrobacter sp. were proven efficient to degrade HDPE, albeit the former was more efficacious, yet the ability of latter cannot be neglected.

SIGNIFICANCE AND IMPACT OF THE STUDY: Recent alarm on ecological threats to marine system is dumping plastic waste in the marine ecosystem and coastal arena by anthropogenic activity. In maintenance phase of the plastic-derived polyethylene waste, the microbial degradation plays a major role; the information accomplished in this work will be the initiating point for the degradation of polyethylene by indigenous bacterial population in the marine ecosystem and provides a novel eco-friendly solution in eco-management.

Balasubramanian, V., et al. (2014). "Enhancement of in vitro high-density polyethylene (HDPE) degradation by physical, chemical, and biological treatments." Environmental Science & Pollution Research **21**(21): 12549-12562.

Partially degraded high-density polyethylene (HDPE) was collected from plastic waste dump yard for biodegradation using fungi. Of various fungi screened, strain MF12 was found efficient in degrading HDPE by weight loss and Fourier transform infrared (FT-IR) spectrophotometric analysis. Strain MF12 was selected as efficient HDPE degraders for further studies, and their growth medium composition was optimized. Among those different media used, basal minimal medium (BMM) was suitable for the HDPE degradation by strain MF12. Strain MF12 was subjected to 28S rRNA sequence analysis and identified as Aspergillus terreus MF12. HDPE degradation was carried out using combinatorial physical and chemical treatments in conjunction to biological treatment. The high level of HDPE degradation was observed in ultraviolet (UV) and KMnO4/HCl with A. terreus MF12 treatment, i.e., FT10. The abiotic physical and chemical factors enhance the biodegradation of HDPE using A. terreus MF12.

Balbi, C., et al. (2019). "Flow Cytometric Analysis of Extracellular Vesicles from Cell-conditioned Media." Journal of Visualized Experiments **144**(02): 12.

Flow cytometry (FC) is the method of choice for semi-quantitative measurement of cell-surface antigen markers. Recently, this technique has been used for phenotypic analyses of extracellular vesicles (EV) including exosomes (Exo) in the peripheral blood and other body fluids. The small size of EV mandates the use of dedicated instruments having a detection threshold around 50-100 nm. Alternatively, EV can be bound to latex microbeads that can be detected by FC. Microbeads, conjugated with antibodies that recognize EV-associated markers/Cluster of Differentiation CD63, CD9, and CD81 can be used for EV capture. Exo isolated from CM can be analyzed with or without pre-enrichment by ultracentrifugation. This approach is suitable for EV analyses using conventional FC instruments. Our results demonstrate a linear correlation between Mean Fluorescence Intensity (MFI) values and EV concentration. Disrupting EV through sonication dramatically decreased MFI, indicating that the method does not detect membrane debris. We report an accurate and reliable method for the analysis of EV surface antigens, which can be easily implemented in any laboratory.

Balcom, P. and P. C. Van (2019). Exergy-based sustainability analysis for tile production from waste plastics in Uganda. ASME 2019 13th International Conference on Energy Sustainability, ES 2019, collocated with the ASME 2019 Heat Transfer Summer Conference, July 14, 2019 - July 17, 2019, Bellevue, WA, United states, American Society of Mechanical Engineers (ASME).

This paper presents an exergy-based sustainability analysis of manufacturing roof tiles from plastic waste in Uganda. Exergy analyses measure the sustainability of industrial processes. This work focuses specifically on the developing country context and on utilizing waste material. A summary of the current plastic waste situation in Uganda, the environmental and health issues associated with plastic waste, current means of recycling plastic waste into new products, and an analysis of the Ugandan roofing market are presented. The motivation for this study is to examine the resources utilized to improve overall exergy efficiency, reduce production costs, and reduce negative environmental impacts. The company, Resintile, is the only manufacturer of roof tiles from plastic waste in Uganda. Their tiles comprised mainly of sand and plastic waste are manufactured in an industrialized process involving drying, extrusion, and pressing. The exergy consumed at each stage including transportation is presented. The extruder consumes the majority of the exergy, but wrapping insulation around the barrel could save over 3 MJ, and a heat engine could provide over 7.5 MJ of usable exergy. The total exergy consumed to produce one batch of seventy-five tiles is over 122 MJ, the potentially recoverable exergy is over 5 MJ (4.3% of consumed exergy), and the realistic recoverable exergy is nearly 10.7 MJ (8.7% of consumed exergy). The realistic can be greater than the potential by adding a heat engine to the sand drying process to generate usable exergy rather than merely recover consumed exergy.

Resintile's plastic roof tiles save a net 86.3 kg of CO2 from entering the atmosphere per batch of tiles and adoption of the suggested improvements to the manufacturing process would save an additional 3.8 kg of CO2 per batch. Copyright 2019 ASME

Baldissera, L., et al. (2012). "Soluble guanylyl cyclase activation inhibits human eosinophil chemotaxis and reduces murine allergic inflammation." Annals of Allergy, Asthma and Immunology **5)**: A126.

Eosinophil recruitment to inflamed lung is a hallmark of allergic asthma, where the chemokine eotaxin acts as selective eosinophil chemoattractant released upon allergen challenge (Holgate, 2008). Increased cGMP intracellular levels inhibit eosinophil chemotaxis (Thomazzi et al., 2004). Therefore, this study aimed to investigate the inhibitory effects of BAY 60-2770 (NOand haem-independent sGC activator) in eotaxin-induced human eosinophil chemotaxis and pulmonary allergic inflammation in mice. Human blood eosinophils (4x106 cells/mL) were isolated from healthy volunteers by negative immunomagnetic anti-CD16 microbeads separation, after approval from National Committee for Ethics in Human Research - CONEP (number 44347) and written informed consent from subjects. Cells were incubated with BAY 60-2770 (1-10 muM; 30 min, 37degreeC) and allowed to migrate toward eotaxin (300 etag/ml; 1 h, 37degreeC) in chemotaxis chamber. Our data showed that human eosinophil migration to eotaxin was significantly inhibited (p<0.001) by BAY 60-2770 (10 muM: 17+/-5 eosinophil/HPF) compared with vehicle (0.1% DMSO)- treated cells (113+/-13 eosinophil/HPF). In separate experiments, C57BL6 mice were subjected to immunization and challenge with ovalbumin (OVA), after approval of by The Ethical Principles in Animal Research (number 2622-1). After 48 h post-OVA challenge, total and differential cell counts in bronchoalveolar lavage (BAL) fluids and bone marrow cells were obtained. Chronic oral treatment with BAY 60-2770 (1 mg/kg/gavage; 14 days) significantly reduced (p<0.001) the eosinophil counts in BAL fluid (1.7+/-0.4 x 106/mL) compared with untreated mice (6.0+/-0.7 x 106/mL). The bone marrow eosinophilopoiesis was also reduced by BAY 60-2770 treatment (1.4+/-0.15 vs 0.7+/-0.14 x106/mL for untreated and treated groups, respectively; p<0.001). Our findings that BAY 60-2770 inhibits human eosinophils chemotaxis and allergic pulmonary eosinophilic inflammation suggest that this sGC activator may be of therapeutic value in the treatment of asthma.

Baldwin, A. K., et al. (2016). "Plastic Debris in 29 Great Lakes Tributaries: Relations to Watershed Attributes and Hydrology." Environmental Science & Technology **50**(19): 10377-10385.

Plastic debris is a growing contaminant of concern in freshwater environments, yet sources, transport, and fate remain unclear. This study characterized the quantity and morphology of floating micro- and macroplastics in 29 Great Lakes tributaries in six states under different land covers, wastewater effluent contributions, population densities, and hydrologic conditions. Tributaries were sampled three or four times each using a 333 mum mesh neuston net. Plastic particles were sorted by size, counted, and categorized as fibers/lines, pellets/beads, foams, films, and fragments. Plastics were found in all 107 samples, with a maximum concentration of 32 particles/m³ and a median of 1.9 particles/m³. Ninety-eight percent of sampled plastic particles were less than 4.75 mm in diameter and therefore considered microplastics. Fragments, films, foams, and pellets/beads were positively correlated with urban-related watershed attributes and were found at greater concentrations during runoff-event conditions. Fibers, the most frequently detected particle type, were not associated with urban-related watershed attributes, wastewater effluent contribution, or hydrologic condition.

Balić, K., et al. (2019). THE IMPACT OF PLASTIC ON THE MARINE ENVIRONMENT. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **19:** 557-564.

The harmfulness of plastic waste on marine organisms and species has been demonstrated. Throwing and dumping plastic waste is causing damage to the environment, causing economic damage to activities such as tourism, fisheries, and sea traffic, and can affect people's health through the food chain. The paper will outline ways and measures to prevent the introduction of single-use plastic into the marine environment as well as the possibility of producing biodegradable plastics. Through this paper concept of marine waste and its impact on the environment, as well as the legal regulation of the protection of the sea and the marine environment will be analysed. Reducing the production of single-use plastics reduces its disposal to the marine environment, and the production of plastic that can be composted allows for a permanent reduction in the disposal of plastic waste into the marine environment. If it is desired to achieve a circular life cycle for plastics, measures must be taken to increase the generation of plastic waste and its release into the environment. It is considered that the active support of the recycled plastics market should be encouraged by the use of environmental materials and high quality recycling in order to achieve the ultimate goal of reducing the amount of plastic waste in the environment.

Baljit, S. and S. Nisha (2007). "Optimized synthesis and characterization of polystyrene graft copolymers and preliminary assessment of their biodegradability and application in water pollution alleviation technologies." Polymer Degradation and Stability **92**(5): 876-885.

With more and more plastics being employed in human lives and increasing pressure being placed on capacities available for plastic waste disposal, the need for biodegradable plastics and biodegradation of plastic wastes has assumed increasing importance in the last few years. Keeping in view the environmental pollution caused by the waste polystyrene and to make the waste polystyrene technologically important, we have modified/functionalized the polystyrene with natural polymers and hydrophilic monomer through graft copolymerization. The present paper discusses the optimum conditions for the synthesis of graft copolymers and characterization of these polymers with SEMs and FTIR and thereafter biodegradation studies of these polymers by soil burial method. The present paper also discusses the effect of crosslinker concentration on the swelling and metal ion sorption (As⁺⁵ uptake) through the functionalized polystyrene, with the intention to make use of these polymeric networks in water pollution alleviation technology. It has been observed that percent As⁵⁺ uptake decreases from 80% to 60% as the crosslinker concentration increases from 0.032 mM to 0.162 mM in the polymeric networks. It has also been observed from the degradation studies that the grafting of starch onto polystyrene has induced 37% degradation after 160 days soil burial treatment and no degradation has been observed in case of grafting of acrylic acid onto polystyrene.

Ballent, A., et al. (2016). "Sources and sinks of microplastics in Canadian Lake Ontario nearshore, tributary and beach sediments." Marine Pollution Bulletin **110**(1): 383-395.

Microplastics contamination of Lake Ontario sediments is investigated with the aim of identifying distribution patterns and hotspots in nearshore, tributary and beach depositional environments. Microplastics are concentrated in nearshore sediments in the vicinity of urban and industrial regions. In Humber Bay and Toronto Harbour microplastic concentrations were consistently >500 particles per kg dry sediment. Maximum concentrations of ~28,000 particles per kg dry sediment were determined in Etobicoke Creek. The microplastic particles were primarily fibres and fragments <2mm in size. Both low- and high-density plastics were identified using Raman spectroscopy. We provide a baseline for future monitoring and discuss potential sources of microplastics in terms of how and where to implement preventative measures to reduce the contaminant influx. Although the impacts of microplastics contamination on ecosystem health and functioning is uncertain, understanding, monitoring and preventing further microplastics contamination in Lake Ontario and the other Great Lakes is crucial.

Balter, M. L., et al. (2016). "System Design and Development of a Robotic Device for Automated Venipuncture and Diagnostic Blood Cell Analysis." Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems **2016**: 514-520.

Diagnostic blood testing is the most prevalent medical procedure performed in the world and forms the cornerstone of modern health care delivery. Yet blood tests are still predominantly carried out in centralized labs using large-volume samples acquired by manual venipuncture, and no end-to-end solution from blood draw to sample analysis exists today. Our group is developing a platform device that merges robotic phlebotomy with automated diagnostics to rapidly deliver patient information at the site of the blood draw. The system couples an image-guided venipuncture robot, designed to address the challenges of routine venous access, with a centrifuge-based blood analyzer to obtain quantitative measurements of hematology. In this paper, we first present the system design and architecture of the integrated device. We then perform a series of in vitro experiments to evaluate the cannulation accuracy of the system on blood vessel phantoms. Next, we assess the effects of vessel diameter, needle gauge, flow rate, and viscosity on the rate of sample collection. Finally, we demonstrate proof-of-concept of a white cell assay on the blood analyzer using in vitro human samples spiked with fluorescently labeled microbeads.

Balter, M. L., et al. (2018). "Automated end-to-end blood testing at the point-of-care: Integration of robotic phlebotomy with downstream sample processing." Technology **6**(2): 59-66.

Diagnostic blood testing is the most commonly performed clinical procedure in the world, and influences the majority of medical decisions made in hospital and laboratory settings. However, manual blood draw success rates are dependent on clinician skill and patient physiology, and results are generated almost exclusively in centralized labs from large-volume samples using labor-intensive analytical techniques. This paper presents a medical device that enables end-to-end blood testing by performing blood draws and providing diagnostic results in a fully automated fashion at the point-of-care. The system couples an image-guided venipuncture robot, developed to address the challenges of routine venous access, with a centrifuge-based blood analyzer to obtain quantitative measurements of hematology. We first demonstrate a white blood cell assay on the analyzer, using a blood mimicking fluid spiked with fluorescent microbeads, where the area of the packed bead layer is correlated with the bead concentration. Next we perform experiments to evaluate the pumping efficiency of the sample handling module. Finally, studies are conducted on the integrated device - from blood draw to analysis - using blood vessel phantoms to assess the accuracy and repeatability of the resulting white blood cell assay.

Balzer, K. M., et al. (2004). "Donor-specific sensitization by cadaveric venous allografts used for arterial reconstruction in peripheral arterial occlusive vascular disease." Tissue Antigens **64**(1): 13-17.

The use of allogeneic venous grafts from postmortal organ donors allows for the reconstruction of critically affected arteries in patients with peripheral occlusive vascular disease. We were interested to determine the prevalence and specificity of anti-HLA antibodies in patients after allogeneic vein transplantation. Anti-HLA class I and II alloantibodies were analyzed by

flowcytometric analysis using color-coded microbeads coated with HLA antigens including recombinant single antigens. Nine out of 10 patients involving 12 venous allografts were positive for anti-HLA alloantibodies. All antibody-positive patients carried both anti-HLA class I and II alloantibodies. Anti-donor HLA specificity of the anti-HLA alloantibodies was seen in seven out of nine patients for anti-class I antibodies and in eight out of nine patients for anti-HLA class II antibodies. A high rate of donor-specific allosensitization was seen after allogeneic venous transplantation. In conclusion, allosensitization not only includes a humoral response against the constitutively expressed class I antigens but also extends to class II antigens.

Banaee, M., et al. (2019). "Evaluation of single and combined effects of cadmium and micro-plastic particles on biochemical and immunological parameters of common carp (Cyprinus carpio)." Chemosphere **236**(124335).

The growing accumulation of microplastics (MPs) in aquatic environments is a global concern. MPs are capable to interact with other environmental contaminants, including heavy metals, altering their toxicity. The aim of the study was to investigate the sub-lethal effects of cadmium chloride (Cd) alone and in combination with MPs on common carp (Cyprinus carpio). Multi-biomarkers, including plasma biochemical parameters and intrinsic immunological factors, were measured after 30 days of exposure. Exposure to Cd or NPs reduced the plasma activities of acetylcholinesterase (AChE) and gamma-glutamyl-transferase (GGT) and increased aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH) and alkaline phosphatase (ALP). Exposure to both compounds enhanced the observed effects except for AST activity and ALP at the highest concentrations, whereas evidenced an antagonistic interaction in ALT. Plasma total protein, albumin, and globulin levels were decreased, and the levels of glucose, triglyceride, and cholesterol levels increased mainly in the Cd groups with no additional effects derived from the co-exposure to both stressors. Lysozyme and alternative complement (ACH50) activities and the levels of total immunoglobulins, and complement C3 and C4 in fish exposed to Cd and MPs were lower than those in the control group and this decrease was more significant by the mixture of both compounds. These findings showed that the exposure to Cd or MPs alone is toxic to fish altering the biochemical and immunological parameters. Moreover, these alterations are even greater when the Cd and the MPS are combined suggesting synergistic effects in increasing Cd toxicity and vice versa.

Banati, H., et al. (2017). "Determination of Mycotoxin Production of Fusarium Species in Genetically Modified Maize Varieties by Quantitative Flow Immunocytometry." Toxins **9**(2): 22.

Levels of mycotoxins produced by Fusarium species in genetically modified (GM) and near-isogenic maize, were determined using multi-analyte, microbead-based flow immunocytometry with fluorescence detection, for the parallel quantitative determination of fumonisin B1, deoxynivalenol, zearalenone, T-2, ochratoxin A, and aflatoxin B1. Maize varieties included the genetic events MON 810 and DAS-59122-7, and their isogenic counterparts. Cobs were artificially infested by F. verticillioides and F. proliferatum conidia, and contained F. graminearum and F. sporotrichoides natural infestation. The production of fumonisin B1 and deoxynivalenol was substantially affected in GM maize lines: F. verticillioides, with the addition of F. graminearum and F. sporotrichoides, produced significantly lower levels of fumonisin B1 (~300 mg.kg⁻¹) in DAS-59122-7 than in its isogenic line (~580 mg.kg⁻¹), while F. proliferatum, in addition to F. graminearum and F. sporotrichoides, produced significantly higher levels of deoxynivalenol (~18 mg.kg⁻¹) in MON 810 than in its isogenic line (~5 mg.kg⁻¹). Fusarium verticillioides, with F. graminearum and F. sporotrichoides, produced lower amounts of deoxynivalenol and zearalenone than F.

proliferatum, with F. graminearum and F. sporotrichoides. T-2 toxin production remained unchanged when considering the maize variety. The results demonstrate the utility of the Fungi-PlexTM quantitative flow immunocytometry method, applied for the high throughput parallel determination of the target mycotoxins.

Banchón, C., et al. (2019). "Biostabilization of sewage sludge in the Antarctic." Antarctic Science **31**(4): 216-217.

Antarctica is no longer a pristine environment due to atmospheric pollution, fuel spills, inadequate waste management and wastewater discharges from anthropogenic activities (Harris 1998, Stark et al. 2015). Approximately 37% of the permanent stations and 69% of the summer stations lack any form of sewage treatment (Gröndahl et al. 2009). The characteristics of wastewater from stations are also of concern because they are a complex mix of contaminants containing human waste, cosmetics, viruses, dyes, detergents, medications, chemicals from laboratories and even microplastics (Bhardwaj et al. 2018). In Antarctica, treatment plants discharge treated water into the sea and then sludge is packed and sealed into drums for later shipment to Chile. Nevertheless, sewage sludge (c. 59–88% organic matter) could become a biosolid instead of being a waste if correctly stabilized. The Ecuadorian Antarctic station 'Pedro Vicente Maldonado' produced c. 200 kg of sewage sludge during expeditions in 2017 and 2018. Thus, the aim of the present study was to biostabilize sewage sludge using two methods (one thermal and one biological) at the Ecuadorian Antarctic station. As a result, the stabilization of sewage sludge produced a biosolid that was easier and more cost effective to transport, avoiding odour problems.

Bandow, N., et al. (2017). "Contaminant release from aged microplastic." Environmental Chemistry **14**(6): 394-405.

Recycled plastic granules of high-density polyethylene, polyvinyl chloride and polystyrene the size of microplastics were exposed to artificial aging conditions (2000 h; photooxidative and thermo-oxidative) to simulate their fate outdoors. Their potential to leach into water during the aging process was investigated using column percolation tests. Aging-related changes on the surface of the material were characterised by IR measurements indicating oxidation reactions with the formation of new adsorption bands (C=O, C-O and OH), especially in the case of photooxidative aging. These findings were confirmed by the identification of leachable organic compounds. Leaching of total organic carbon, Cl, Ca, Cu and Zn is clearly affected by changes due to aging, and their release is increased after photooxidative aging. In general, exposure to photooxidative conditions shows a greater influence on aging and thus on leaching and seems to be the more important mechanism for the aging of microplastic in the environment. Comparison with the total content of inorganic species revealed that, for most elements, less than 3% of the total content is released after 2000 h of photooxidative aging.

Bank, M. S. and S. V. Hansson (2019). "The Plastic Cycle: A Novel and Holistic Paradigm for the Anthropocene." Environmental Science and Technology **53**(13): 7177-7179.

Bank, M. S., et al. (2013). Albatross as Sentinels of Heavy Metal Pollution: Local and Global Factors. Les Ulis, EDP Sciences. **1**.

Heavy metal pollution in the Pacific Ocean has garnered significant attention in recent years, especially with regard to rising mercury emissions from Asia. Uncertainty exists over the extent to which mercury in biota may have resulted from increases in anthropogenic emissions over time. Albatrosses, including those inhabiting the North Pacific, are wide-ranging, long-lived, keystone, avian predators. Consequently, they serve as ideal sentinel species for investigating the effects of historical and contemporary pollution as well as local and global factors related to heavy metal exposure, bioaccumulation, and ecotoxicological risk. To date, high levels of mercury and lead have been documented in albatross species throughout the Pacific. To address biotic exposure to these multiple stressors, here we synthesize and conduct meta-analyses of total mercury, methylmercury, and lead exposure data in Black-footed albatross (Phoebastria nigripes) and Laysan albatross (Phoebastria immutabilis). Our approach includes data from the field and literature, and for total mercury and methyl mercury, we use measurements from museum feathers spanning the past 130 years for Black-Footed albatross. We discuss the use and application of stable isotopes (δ15N and δ13C) as a way to control for temporal changes in trophic structure and diet and we demonstrate the importance of conducting speciation analyses for mercury to account for historical, curator-mediated, inorganic mercury contamination of specimens. Our data showed higher levels of inorganic mercury in older specimens of Black-Footed albatross as well as two non-pelagic species (control samples) lacking historical sources of bioavailable mercury exposure, which suggests that studies on bioaccumulation should measure methylmercury rather than total mercury when utilizing museum collections. Changes in methylmercury levels in Black-Footed albatross were consistent with historical global and recent regional increases observed among published estimates and proxies of anthropogenic mercury emissions. At the local scale, previous research has also reported that lead paint exposure from buildings was also an important environmental stressor for Laysan albatross. Thus, albatross species face heavy metal exposure threats at both local (lead) and global scales (mercury, and potentially heavy metals in plastics). Specific types of plastic pollution entering marine environments have been documented to contain heavy metals at levels, which if bio-available, may present a non-localized source of lead exposure in albatross species known to ingest (and regurgitate to their young) large amounts of marine plastic. Heavy metal toxicity along with other stressors may undermine current and future reproductive outcomes in these seabird species, although unraveling effects from specific metals in the context of a complex metal mixture presents some challenges. Collectively, our findings and review of the literature suggest that albatrosses in this region may be an effective marine flagship species and raising the profile of these organisms likely would successfully support broader biodiversity conservation efforts in the North Pacific.

Bano, K., et al. (2019). "A novel, thermotolerant, extracellular PHB depolymerase producer Paenibacillus alvei PHB28 for bioremediation of biodegradable plastics." Turkish Journal of Biochemistry **44**(3): 344-353.

Background: Poly-beta-hydroxybutyrate (PHB) is the most important and versatile class of biodegradable polymers used successfully in the medical, agricultural and industrial field. Idea is to find the novel isolate for degradation of biodegradable plastics that can enhance the bioremediation. Material(s) and Method(s): Thirty-one PHB and PHB depolymerase enzyme producing isolates out of 80 mesophilic bacteria from Lucknow region were further screened for PHB degradation capability by secreting extracellular PHB depolymerase enzyme in minimal salt media supplemented with PHB (0.15%). Various biodegradable plastic films were tested by soil burial method for weight loss determination. Result(s): 37.3% weight loss has been observed in PHB films when buried under the soil for 45 days in the presence of a novel PHB degrader identified as Paenibacillus alvei PHB28 by 16S rRNA sequencing (GenBank accession number KX886342). These Gram-negative, spore-forming, thermotolerant bacteria produce maximum PHB depolymerase (5.03 U/mL) at 45degreeC, pH 8.0, with 0.15% substrate concentration when incubated for 96 h with starch (0.1%) and yeast extract (0.01%) as an additional nutrient

supplements. Conclusion(s): To the best of our knowledge this is the first report of PHB depolymerase production by P. alvei PHB28 which may contribute successfully to combat plastic pollution and to sustain the green environment.

Bar Oz, M., et al. (2016). "Acetylation reduces SOX9 nuclear entry and ACAN gene transactivation in human chondrocytes." Aging Cell **15**(3): 499-508.

Changes in the content of aggrecan, an essential proteoglycan of articular cartilage, have been implicated in the pathophysiology of osteoarthritis (OA), a prevalent age-related, degenerative joint disease. Here, we examined the effect of SOX9 acetylation on ACAN transactivation in the context of osteoarthritis. Primary chondrocytes freshly isolated from degenerated OA cartilage displayed lower levels of ACAN mRNA and higher levels of acetylated SOX9 compared with cells from intact regions of OA cartilage. Degenerated OA cartilage presented chondrocyte clusters bearing diffused immunostaining for SOX9 compared with intact cartilage regions. Primary human chondrocytes freshly isolated from OA knee joints were cultured in monolayer or in three-dimensional alginate microbeads (3D). SOX9 was hypo-acetylated in 3D cultures and displayed enhanced binding to a -10 kb ACAN enhancer, a result consistent with higher ACAN mRNA levels than in monolayer cultures. It also co-immunoprecipitated with SIRT1, a major deacetylase responsible for SOX9 deacetylation. Finally, immunofluorescence assays revealed increased nuclear localization of SOX9 in primary chondrocytes treated with the NAD SIRT1 cofactor, than in cells treated with a SIRT1 inhibitor. Inhibition of importin beta by importazole maintained SOX9 in the cytoplasm, even in the presence of NAD. Based on these data, we conclude that deacetylation promotes SOX9 nuclear translocation and hence its ability to activate ACAN.

Barbakadze, K., et al. (2018). "Separation of metal and plastic wastes from wire and cable manufacturing for effective recycling." Resources, Conservation & Recycling **139**: 251-258.

The trend to recycle materials in industry has increased over the last few years as manufacturers seek ways to decrease material costs and reduce their environmental footprints. In the wire and cable manufacturing industry, excess wire and cable is shredded into a mixture commonly known as fluff. Because fluff is comprised of different metals as well as polymers of varying physical and chemical properties, it cannot be recycled into a usable product until the different components comprising fluff have been separated. Metallic components could possibly be used for recovery of metals from zinc-carbon and alkaline spent batteries. However, the amount of metals in fluff is low from the economical point of view. Polymeric components might be used in the production of aggregate in concrete – considered for this application together with fly ash. We have employed different concentrations and combinations of frothers, wetting agents, and inorganic materials, encouraging the separation of the different components of fluff by taking advantage of each component's physical properties. An essential stage of the operation was separating metals from polymers. Among polymers, the main component of fluff was PVC – that we successfully reclaimed and then verified our results through the use of differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). Success in this endeavor would spell dramatic reductions in unrecyclable wire and cable waste, increase reclamation of materials, and further improve our understanding of the pros and cons of different density-based separation methods. [ABSTRACT FROM AUTHOR]

Barbee, K. D., et al. (2009). "Electric field directed assembly of high-density microbead arrays." Lab on a Chip **9**(22): 3268-3274.

We report a method for rapid, electric field directed assembly of high-density protein-conjugated microbead arrays. Photolithography is used to fabricate an array of micron to sub-micron-scale wells in an epoxy-based photoresist on a silicon wafer coated with a thin gold film, which serves as the primary electrode. A thin gasket is used to form a microfluidic chamber between the wafer and a glass coverslip coated with indium-tin oxide, which serves as the counter electrode. Streptavidin-conjugated microbeads suspended in a low conductance buffer are introduced into the chamber and directed into the wells via electrophoresis by applying a series of low voltage electrical pulses across the electrodes. Hundreds of millions of microbeads can be permanently assembled on these arrays in as little as 30 seconds and the process can be monitored in real time using epifluorescence microscopy. The binding of the microbeads to the gold film is robust and occurs through electrochemically induced gold-protein interactions, which allows excess beads to be washed away or recycled. The well and bead sizes are chosen such that only one bead can be captured in each well. Filling efficiencies greater than 99.9% have been demonstrated across wafer-scale arrays with densities as high as 69 million beads per cm(2). Potential applications for this technology include the assembly of DNA arrays for high-throughput genome sequencing and antibody arrays for proteomic studies. Following array assembly, this device may also be used to enhance the concentration-dependent processes of various assays through the accelerated transport of molecules using electric fields.

Barbieri, E. (2009). "Occurrence of plastic particles in procellariiforms, south of Sao Paulo State (Brazil)." Brazilian Archives of Biology and Technology **52**(2): 341-348.

Seabirds ingest plastic particles floating on the surface of the world's oceans. The birds can ingest plastic particles that they mistakenly identify as prey items. Alternatively, plastics can be taken up in the stomach contents of prey species. Plastic is often passed from parents to chicks in regurgitated food. In this study, individual petrels and albatrosses brought in by the tide onto Ilha Comprida beach between January 2000 and December 2002 were collected. Ilha Comprida, a barrier island in southern Sao Paulo, Brazil, was traversed by car along a transect of 70 kilometers. A total of 110 birds of 10 species were collected and 64.54% had plastic panicles in their stomach. Frequencies of occurrence were Macronectes giganteus (64.28%), Thalassarche melanophrys (73.07%), Thalassarche chlororhinchos (44.44%), Puffinus puffinus (85.71%), Puffinus gravis (7.41%), Puffinus griseus (63.63%), Fumarus glacialoides (33.33%), Daption capensis (75%), Pachyptila belcheri (33.33%), Procellaria aequinoctialis (25%). These results demonstrated the extent of contamination with plastic and the possible harmful effects on seabirds.

Barboza, L. G. A., et al. (2018). "Marine microplastic debris: An emerging issue for food security, food safety and human health." Marine Pollution Bulletin **133**: 336-348.

Recent studies have demonstrated the negative impacts of microplastics on wildlife. Therefore, the presence of microplastics in marine species for human consumption and the high intake of seafood (fish and shellfish) in some countries cause concern about the potential effects of microplastics on human health. In this brief review, the evidence of seafood contamination by microplastics is reviewed, and the potential consequences of the presence of microplastics in the marine environment for human food security, food safety and health are discussed. Furthermore, challenges and gaps in knowledge are identified. The knowledge on the adverse effects on human health due to the consumption of marine organisms containing microplastics is very limited, difficult to assess and still controversial. Thus, assessment of the risk posed to humans is challenging. Research is urgently needed, especially regarding the potential exposure and associated health risk to micro- and nano-sized plastics.

Barboza, L. G. A., et al. (2019). "Microplastics in wild fish from North East Atlantic Ocean and its potential for causing neurotoxic effects, lipid oxidative damage, and human health risks associated with ingestion exposure." Science of the Total Environment: 134625.

Microplastics (MP) pollution has received increased attention over the last few years. However, while the number of studies documentating the ingestion of microplastics by fish has increased, fewer studies have addressed the toxicological effects derived from the ingestion of these small items in wild conditions. Here, MP contamination and effect biomarkers were investigated in three commercially important fish species from the North East Atlantic Ocean. From the 150 analysed fish (50 per species), 49 % had MP. In fish from the 3 species, MP in the gastrointestinal tract, gills and dorsal muscle were found. Fish with MP had significantly (p <= 0.05) higher lipid peroxidation levels in the brain, gills and dorsal muscle, and increased brain acetylcholinesterase activity than fish where no MP were found. These results suggest lipid oxidative damage in gills and muscle, and neurotoxicity through lipid oxidative damage and acetylcholinesterase induction in relation to MP and/or MP-associated chemicals exposure. From the 150 fish analysed, 32 % had MP in dorsal muscle, with a total mean (+/- SD) of 0.054 +/- 0.099 MP items/g. Based on this mean and on EFSA recommendation for fish consumption by adults or the general population, human consumers of Dicentrachus labrax, Trachurus trachurus, Scomber colias may intake 842 MP items/year from fish consumption only. Based on the mean of MP in fish muscle and data (EUMOFA, NOAA) of fish consumption per capita in selected European and American countries, the estimated intake of microplastics through fish consumption ranged from 518 to 3078 MP items/year/capita. Considering that fish consumption is only one of the routes of human exposure to microplastics, this study and others in the literature emphasize the need for more research, risk assessment and adoption of measures to minimize human exposure to these particles. Thus, MP pollution and its effects should be further investigated and addressed according to the WHO 'One Health' approach.

Barboza, L. G. A., et al. (2018). "Microplastics increase mercury bioconcentration in gills and bioaccumulation in the liver, and cause oxidative stress and damage in Dicentrarchus labrax juveniles." Scientific Reports **8**(1): 15655.

The presence of microplastics and several other pollutants in the marine environment is of growing concern. However, the knowledge on the toxicity of mixtures containing microplastics and other contaminants to marine species is still scarce. The main goals of this study were to investigate the oxidative stress and lipid oxidative damage potentially induced by 96 h of exposure to mercury (0.010 and 0.016 mg/L), microplastics (0.26 and 0.69 mg/L), and mixtures of the two substances (same concentrations, full factorial) in the gills and liver of D. labrax juveniles, and the possible influence of microplastics on mercury bioconcentration (gills) and bioaccumulation (liver). The results indicate that the presence of microplastics in the water increased the concentration of mercury in gills and liver of D. labrax juveniles. Microplastics and mercury, alone and in mixtures, caused oxidative stress in both organs. Based on the total induction of antioxidant enzymatic activity, the type of toxicological interaction in fish exposed to the mixture containing the lowest concentration of the two substances was addition in gills,

and addition or synergism in the liver. These results stress the need to further address the role of microplastics in the bioconcentration, bioaccumulation, and toxicity of other environmental contaminants in different species.

Barboza, L. G. A., et al. (2018). "Microplastics cause neurotoxicity, oxidative damage and energy-related changes and interact with the bioaccumulation of mercury in the European seabass, Dicentrarchus labrax (Linnaeus, 1758)." Aquatic Toxicology **195**: 49-57.

Microplastics pollution is a global paradigm that raises concern in relation to environmental and human health. This study investigated toxic effects of microplastics and mercury in the European seabass (Dicentrarchus labrax), a marine fish widely used as food for humans. A short-term (96h) laboratory bioassay was done by exposing juvenile fish to microplastics (0.26 and 0.69mg/L), mercury (0.010 and 0.016mg/L) and binary mixtures of the two substances using the same concentrations, through test media. Microplastics alone and mercury alone caused neurotoxicity through acetylcholinesterase (AChE) inhibition, increased lipid oxidation (LPO) in brain and muscle, and changed the activities of the energy-related enzymes lactate dehydrogenase (LDH) and isocitrate dehydrogenase (IDH). All the mixtures caused significant inhibition of brain AChE activity (64-76%), and significant increase of LPO levels in brain (2.9-3.4 fold) and muscle (2.2-2.9 fold) but not in a concentration-dependent manner; mixtures containing low and high concentrations of microplastics caused different effects on IDH and LDH activity. Mercury was found to accumulate in the brain and muscle, with bioaccumulation factors of 4-7 and 25-40, respectively. Moreover, in the analysis of mercury concentrations in both tissues, a significant interaction between mercury and microplastics was found. The decay of mercury in the water increased with microplastics concentration, and was higher in the presence of fish than in their absence. Overall, these results indicate that: microplastics influence the bioaccumulation of mercury by D. labrax juveniles; microplastics, mercury and their mixtures (ppb range concentrations) cause neurotoxicity, oxidative stress and damage, and changes in the activities of energy-related enzymes in juveniles of this species; mixtures with the lowest and highest concentrations of their components induced different effects on some biomarkers. These findings and other published in the literature raise concern regarding high level predators and humans consuming fish being exposed to microplastics and heavy metals, and highlight the need of more research on the topic.

Barboza, L. G. A., et al. (2018). "Single and combined effects of microplastics and mercury on juveniles of the European seabass (Dicentrarchus labrax): changes in behavioural responses and reduction of swimming velocity and resistance time." Environmental Pollution **236**: 1014-1019.

Microplastics and mercury are environmental pollutants of great concern. The main goal of the present study was to investigate the effects of these pollutants, both individually and in binary mixtures, on the swimming performance of juvenile European seabass, Dicentrarchus labrax. Microplastics alone, mercury alone and all the mixtures caused significant reduction of the swimming velocity and resistance time of fish. Moreover, changes in behavioural responses including lethargic and erratic swimming behaviour were observed. These results highlight that fish behavioural responses can be used as sensitive endpoint to establish the effects of contamination by microplastics and also emphasizes the need to assess the combined effects of microplastics and other environmental contaminants, with special attention to the effects on behavioural responses in fish and other aquatic species.

Barceló, D. and Y. Picó (2019). "Microplastics in the global aquatic environment: Analysis, effects, remediation and policy solutions." Journal of Environmental Chemical Engineering **7**(5).

This opinion paper reports on Microplastics (MPs) pollution in the aquatic environment. MPs are a global problem being detected everywhere: marine environment, wastewaters, surface waters, soils, sediments, food and air. MPs can also absorb organic contaminants, and can be ingested by organisms and introduced into the food web. MPs can be a vector as well of pathogens whereas airborne fibrous MPs may enter our respiratory system with risk to the environment and humans. Main issues and gaps related to MPs on-going and future research are highlighted: chemical analysis, fate in wastewater and drinking water treatment plants, environmental and human health effects as well as remediation strategies. Policy recommendations towards limiting the amount of plastic waste are being formulated to mitigate MPs pollution. © 2019 Elsevier Ltd.

Barfield, R. C., et al. (2004). "A one-step large-scale method for T- and B-cell depletion of mobilized PBSC for allogeneic transplantation." Cytotherapy **6**(1): 1-6.

BACKGROUND: The presence of T and B cells in allogeneic grafts contributes to GvHD and to EBV-associated lymphoproliferative disease (LPD). Depletion of T and B cells from the graft decreases the risk of these complications.

METHODS: T and B cells were depleted from mobilized peripheral stem cells from volunteer donors (n=5) using anti-CD3 and anti-CD19 Abs conjugated to magnetic microbeads, and the CliniMACS device. The function of the stem cells after depletion was evaluated using colony assays and non-obese diabetic (NOD)/SCID repopulating experiments.

RESULTS: The mean mononuclear cell (MNC) count prior to T- and B-cell depletion was 2.19x10(10) (range 1.48-3.53). After depletion, the mean percentage of contaminating T cells was 0.02% (range 0.01-0.04%) with a mean log(10) depletion of 3.4 (range 3-3.8). The mean percentage of contaminating B cells was 0.1% (range 0.01-0.4%) with a mean log(10) depletion of 2.2 (range 1.4-3). The mean recovery of CD3- and CD19-negative MNCs after depletion was 70% (range 54-88%) and the mean recovery of CD34(+) stem cells was 69% (range 52-98%). The mean number of natural killer (NK) cells after T- and B-cell depletion was 5.2x10(8) (range 2-10x10(8)). In vitro colony assays and in vivo NOD/SCID repopulation assays showed no negative impact of this method on the function of the hematopoietic stem cells.

DISCUSSION: Our results show that the CliniMACS system can be used to efficiently deplete PBSC of T and B cells simultaneously, without adverse effect on the graft.

Bargallo, M. E., et al. (2017). "Utility of Systematic Isolation of immune cell subsets from HIV-infected individuals for miRNA profiling." Journal of Immunological Methods **442**: 12-19.

INTRODUCTION: Peripheral blood mononuclear cells (PBMCs) are frequently used for genomic analyses, but several factors can affect the yield and integrity of nucleic acids, including the methods of cell collection and isolation. The goal of this work was to analyze the utility of systematic isolation of different immune cell subsets by immunomagnetic separation and the RNA integrity after isolated cells from samples of HIV-infected patients.

METHODS: PBMC from Healthy Controls (HC, n=15), Elite Controllers (EC, n=15), Viremic Controllers (VC, n=15), Viremic Progressors (VP, n=15) and HIV-infected patients on therapy (ART, n=15) were isolated by Ficoll-Paque density gradient centrifugation. Subsets were separated with monoclonal antibodies (CD56, CD14, CD4, and CD8) conjugated to microbeads. We evaluated the yield and purity of each subset isolated from PBMCs under resting and activated conditions; LPS, anti-CD3/CD28 and anti-CD16 were used to activate monocytes, PBMC, T cells and NK cells, respectively. The quality of extracted RNA was tested by 2100 Bioanalyzer.

RESULTS: In resting conditions, the average yield of CD14⁺ (monocytes) was decreased (p=0.021) in HIV+ patients compared with healthy controls. CD56⁺ (Natural

Killer-NKs; p=0.03) and CD8⁺ (Cytotoxic T lymphocytes-CTL p=0.001) cells were increased in HIV+ patients after 72h of activation. The purity assay detected significant differences in CD14⁺ (p<=0.001) and CD8⁺ (p=0.034) subpopulations when comparing PBMC isolated either from healthy controls or HIV+ patients. The number of activated cells in HIV+ presented differences in CD8 subset (p=0.003). Finally, similar quantities of high quality RNA were extracted from immune cells subsets obtained by our method. Specifically, we show that Bioanalyzer electrophenograms reveal optimal RIN values in HIV positive and negative patients in resting condition (EC:8;HC:6.5;VC:8.80;VP:8;HAART:7.5) and activated condition (EC:9;HC:6.7;VC:8.2;VP:7.2;HAART:8.6).

CONCLUSION: This method allowed us to obtain a sufficient quantity of different isolated immune cell subsets from HIV-infected individuals at different disease stages. Moreover, the assessed qualities of nucleic acids allow us to perform subsequent molecular studies, such as microRNA profiling.

Barletta, M. and A. R. A. Lima (2019). "Systematic review of fish ecology and anthropogenic impacts in South American estuaries: Setting priorities for ecosystem conservation." Frontiers in Marine Science **6**(May).

Research on estuarine ecology in South America (SA) increased quali-quantitatively since the early 1980 in search of consistent recommendations for estuarine conservation. The most important ecological theory achieved is that the seasonal fluctuation of the salinity gradient creates an ecocline influenced by gradual changes between river-dominated to marine-like waters. Estuarine fish fauna adapts to these changeable abiotic characteristics, including the spatial, and seasonal bioavailability of dissolved oxygen and numerous pollutants. However, studies on the influence of the estuarine ecocline are still missing for key estuarine systems. This study provides an overview of fish ecology and anthropogenic impacts within estuarine systems of SA and discusses priorities for environmental conservation. Research on fish reached important conclusions regarding essential habitats and fish interaction with other biological and abiotic compartments over spatio-temporal settings, including conditions of severe anthropogenic impacts. These impacts are related to unplanned urban settlements, industrial estates, ports, damming of major rivers, dredging activities, and deforestation for extensive farming. Changes in estuarine morphology alter natural flows and lead to habitat losses, disrupting the ecocline and impairing fishes from moving among formerly connected habitats, especially earlier ontogenetic phases. In addition, industrial, urban, and farming activities often result in high loads of metals and persistent organic pollutants, organic enrichment and oxygen depletion. Moreover, plastic debris, a ubiquitous contaminant with sources on every human activity, including fishing, when fragmented into microplastics, become preferably concentrated in semi-enclosed environments, as estuaries. Metals, POPs and microplastics are actually asserted to be persistent. When in high concentrations, they become bioavailable to the estuarine trophic web through bioaccumulation, being biomagnified or biotransfered toward higher trophic level organisms, such as top predator fishes. Therefore, research on environmental quality and fish ecology must be based on robust sampling designs along the whole ecocline using long-term approaches. In addition, basic sanitation, co-management, an improved licensing system and scientifically-based risk assessments/monitoring for all sorts of enterprise are also urgent. These conservation priorities need to be in place before human-driven changes surpass the ecosystem's capacity to produce resources and maintain services. © 2019 Barletta and Lima.

Barletta, M., et al. (2019). "Distribution, sources and consequences of nutrients, persistent organic

pollutants, metals and microplastics in South American estuaries." Science of the Total Environment **651**(Pt 1): 1199-1218.

Estuarine pollution imposes rapid, increasing and lasting environmental modifications. In the present review, especial attention is given to estuaries in South America (SA), where legislation, policies and actions to guarantee environmental quality remain ineffective. There, the majority of estuaries face uncontrolled occupation of its margins by urban and industrial centres, agriculture and aquaculture expansion, water extraction and flow control. The lack of basic sanitation and poor environmental management (including territories within Marine Protected Areas) often lead to hydrological alterations, high nutrient loads, and the presence and dynamics of pollutants (nutrient loads, persistent organic pollutants (POPs), metals and plastic debris) along the entire estuarine ecocline. Organic enrichment has increased dissolved oxygen consumption, with wide spatio-temporal variability along latitudes and estuarine gradients. The toxicity, biogeochemistry and availability of metals and POPs depend on the annual fluctuations of salinity, water renewal, dissolved oxygen levels, suspended particulate loads, sediment mobility, grain size and composition at the sink. Plastic debris from land sources are widespread in estuaries, where they continue to fragment into microplastics. River basins are the main contributors of plastics to estuaries, whose transportation and accumulation are subjected to interannual water flow variations. Although some systems seems to be in a better condition in relation to others around the world (e.g. Goiana and Negro estuaries), many others are among the most modified worldwide (e.g. Guanabara Bay and Estero Salado System). We propose that, estuarine conservation plans should consider year-round fluctuations of the ecocline and the resulting cycles of retention and flush of environmental signals and their influence on trophic webs over the whole extent of estuarine gradients.

Barnaby, R., et al. (2017). "Effectiveness of table top water pitcher filters to remove arsenic from drinking water." Environmental Research **158**: 610-615.

Arsenic contamination of drinking water is a serious threat to the health of hundreds of millions of people worldwide. In the United States ~3 million individuals drink well water that contains arsenic levels above the Environmental Protection Agency (EPA) maximum contaminant level (MCL) of 10mug/L. Several technologies are available to remove arsenic from well water including anion exchange, adsorptive media and reverse osmosis. In addition, bottled water is an alternative to drinking well water contaminated with arsenic. However, there are several drawbacks associated with these approaches including relatively high cost and, in the case of bottled water, the generation of plastic waste. In this study, we tested the ability of five tabletop water pitcher filters to remove arsenic from drinking water. We report that only one tabletop water pitcher filter tested, ZeroWater, reduced the arsenic concentration, both As³⁺ and As⁵⁺, from 1000mug/L to < 3mug/L, well below the MCL. Moreover, the amount of total dissolved solids or competing ions did not affect the ability of the ZeroWater filter to remove arsenic below the MCL. Thus, the ZeroWater pitcher filter is a cost effective and short-term solution to remove arsenic from drinking water and its use reduces plastic waste associated with bottled water.

Barnard, R. T., et al. (2011). "Expecting the unexpected: Nucleic acid-based diagnosis and discovery of emerging viruses." Expert Review of Molecular Diagnostics **11**(4): 409-423.

Extrapolation from recent disease history suggests that changes in the global environment, including virus, vector and human behavior, will continue to influence the spectrum of viruses to which humans are exposed. In this article, these environmental changes will be enumerated, and their potential impact on target-focused, nucleic acid-based diagnostic tests will be

considered, followed by a presentation of some emerging technological responses. © 2011 Expert Reviews Ltd.

Barnes, D. K., et al. (2009). "Accumulation and fragmentation of plastic debris in global environments." Philosophical Transactions of the Royal Society of London - Series B: Biological Sciences **364**(1526): 1985-1998.

One of the most ubiquitous and long-lasting recent changes to the surface of our planet is the accumulation and fragmentation of plastics. Within just a few decades since mass production of plastic products commenced in the 1950s, plastic debris has accumulated in terrestrial environments, in the open ocean, on shorelines of even the most remote islands and in the deep sea. Annual clean-up operations, costing millions of pounds sterling, are now organized in many countries and on every continent. Here we document global plastics production and the accumulation of plastic waste. While plastics typically constitute approximately 10 per cent of discarded waste, they represent a much greater proportion of the debris accumulating on shorelines. Mega- and macro-plastics have accumulated in the highest densities in the Northern Hemisphere, adjacent to urban centres, in enclosed seas and at water convergences (fronts). We report lower densities on remote island shores, on the continental shelf seabed and the lowest densities (but still a documented presence) in the deep sea and Southern Ocean. The longevity of plastic is estimated to be hundreds to thousands of years, but is likely to be far longer in deep sea and non-surface polar environments. Plastic debris poses considerable threat by choking and starving wildlife, distributing non-native and potentially harmful organisms, absorbing toxic chemicals and degrading to micro-plastics that may subsequently be ingested. Well-established annual surveys on coasts and at sea have shown that trends in mega- and macro-plastic accumulation rates are no longer uniformly increasing: rather stable, increasing and decreasing trends have all been reported. The average size of plastic particles in the environment seems to be decreasing, and the abundance and global distribution of micro-plastic fragments have increased over the last few decades. However, the environmental consequences of such microscopic debris are still poorly understood. [References: 96]

Barnes, S. J. (2019). "Out of sight, out of mind: Plastic waste exports, psychological distance and consumer plastic purchasing." Global Environmental Change Part A: Human & Policy Dimensions **58**: N.PAG-N.PAG.

• Exporting plastic waste creates psychological distance from plastic waste pollution. • Exporting plastic waste creates an artificially cleaner local environment. • Artificially cleaner local environments encourage plastics consumption. • Level of plastic waste acts as a mediator in the relationship. • Examines policy aimed at reducing future plastics consumption and pollution. Per capita consumption of plastic continues to increase and remains at high levels in high-income countries, despite obvious contributions to the global problem of plastics pollution. This paper attempts to provide an explanation for this phenomenon based on construal level theory, positing that plastic waste is a problem that is perceived as "out of sight and out of mind" for consumers in high plastic consumption (typically high income) countries and that this is influenced by the export of plastic waste to other (typically lower income and lower consumption) countries for disposal – shifting the burden of mismanaged plastic waste and perceptions of plastics pollution in the countries creating the majority of plastic waste. The apparent lack of plastics pollution in a local environment becomes a mediator, influenced by the export of plastic waste, which may then contribute to further plastics consumption. The theory is tested using structural equation modelling using rare, available matched data for mismanaged plastic waste, plastic waste exports, and plastics consumption at an aggregate country level. All study hypotheses are supported. The paper concludes with recommendations for future research and practice, including potential changes to government policy aimed at reducing future plastics consumption and pollution. [ABSTRACT FROM AUTHOR]

Barnes, S. J. (2019). "Understanding plastics pollution: The role of economic development and technological research." Environmental Pollution **249**: 812-821.

Our world is awash with plastic. The massive increase in plastics production, combined with a shift to single-use, disposable plastics and widespread mismanagement of plastic waste, has created a huge "tragedy of the commons" (Hardin, 1968) in our oceans, seas and waterways. Plastics pollution is now a global externality that damages ecosystems, curtails biodiversity and ultimately has the potential to affect everyone on the planet. Although waste output is often modelled separately from environmental pollution in research, in the case of plastics, the waste problem has become one of global pollution. In this paper, we model the relationship between mismanaged plastic waste 1 and income per capita for 151 countries, and for the first time find empirical support for the environmental Kuznets curve using plastics pollution data. Further, we find support for the hypothesis that a key instrument for reducing plastics pollution is investment in scientific and technological research. The paper concludes with a discussion of the results, limitations, and implications for future research and practice. Image 1 • Models the relationship between mismanaged plastic waste and economic development. • Finds original empirical support for the EKC in the context of mismanaged plastic waste. • Plastics pollution reduced in countries through scientific and technical research. • Examines policy implications of research findings in reducing plastics pollution. Original empirical support for environmental Kuznets curve for plastics pollution and reduction in plastics pollution via research investment, based on data for 151 countries. [ABSTRACT FROM AUTHOR]

Barnsley, L. C., et al. (2017). "Understanding the dynamics of superparamagnetic particles under the influence of high field gradient arrays." Physics in Medicine & Biology **62**(6): 2333-2360.

The aim of this study was to characterize the behaviour of superparamagnetic particles in magnetic drug targeting (MDT) schemes. A 3-dimensional mathematical model was developed, based on the analytical derivation of the trajectory of a magnetized particle suspended inside a fluid channel carrying laminar flow and in the vicinity of an external source of magnetic force. Semi-analytical expressions to quantify the proportion of captured particles, and their relative accumulation (concentration) as a function of distance along the wall of the channel were also derived. These were expressed in terms of a non-dimensional ratio of the relevant physical and physiological parameters corresponding to a given MDT protocol. The ability of the analytical model to assess magnetic targeting schemes was tested against numerical simulations of particle trajectories. The semi-analytical expressions were found to provide good first-order approximations for the performance of MDT systems in which the magnetic force is relatively constant over a large spatial range. The numerical model was then used to test the suitability of a range of different designs of permanent magnet assemblies for MDT. The results indicated that magnetic arrays that emit a strong magnetic force that varies rapidly over a confined spatial range are the most suitable for concentrating magnetic particles in a localized region. By comparison, commonly used magnet geometries such as button magnets and linear Halbach arrays result in distributions of accumulated particles that are less efficient for delivery. The trajectories predicted by the numerical model were verified experimentally by acoustically focusing magnetic microbeads flowing in a glass capillary channel, and optically tracking their path past a high field gradient Halbach array.

Barral, A. M., et al. (2018). "Bacterial colonization and partial degradation of plastic debris in California coastal waters." FASEB Journal. Conference: Experimental Biology **32**(1 Supplement 1).

Several studies have addressed the role of microbes associated with plastic marine debris. However, little is known about the nature of microbes attaching to plastic in coastal areas, and how it could potentially impact humans. The goal of this project is to evaluate the microbial diversity on plastic marine debris, specifically the more abundant types of floating plastic (ex. single-use plastic bags) made of polyethylene (PE) and polypropylene (PP) in coastal waters. Our hypothesis is that microbes will colonize plastic and that the diversity and abundance of microbial communities will be directly influenced by plastic resin type. We are also interested in colonization of plastic by pathogenic species and/or species with potential to degrade plastic. Three plastic resin types (high density polyethylene (HDPE), low density polyethylene (LDPE), and polypropylene (PP)) were placed in stainless steel cages, submerged to approx. 50 cm depth in Southern California coastal waters and retrieved at 4 different time points between 3 and 40 days along with water samples for comparative purposes. Two sample sets were collected between May 2016 and May 2017. DNA was extracted and 16S rRNA metagenomic tag sequencing was used to differentiate the microbial community. Colonies grown parallel on Salt Water Agar and Vibrio-specific media were characterized by 16S amplicon sequencing. In addition, Fourier Transform Infrared Spectroscopy (FTIR) was used to analyze the breakdown of plastic over time and scanning electron microscopy (SEM) to visualize the biofilms attached to plastic on day 40. Our results indicate that over 40% of the sequences obtained are from unclassified organisms. The three plastic resin types exhibited a diverse assemblage of heterotrophic bacterial taxa, while in water samples photosynthetic genera were the most prevalent. There were differences between plastic resin types and the surrounding water, as well as temporal differences. We did not find evidence of Vibrio cholerae either by 16S metagenomic sequencing or by 16S sequencing of colonies isolated on ChromAgar Vibrio. However, other potentially pathogenic genera such as Francisella and Rickettsia were present on plastic at earlier sampling time points. In addition, all three plastic resins showed signs of chemical degradation over time, and SEM revealed a rich biofilm containing diatoms, bacterial, and protist populations. Together, this study indicates that there are differences in the microbial communities growing on coastal marine plastic debris with potential implications for human health and the environment.

Barria, C., et al. (2019). "Effect of nanoplastics on fish health and performance: A review." Marine Pollution Bulletin **(no pagination)**(110791).

Small plastic particles are considered emerging pollutants, and this has motivated a considerable number of studies to establish their environmental consequences. At present, the study of the

effects of nanoplastics (NPs) on aquatic organisms is still scarce, especially in organisms from higher trophic levels such as fish. This review describes the effects reported in different fish species after exposure to plastic particles smaller than 100 nm. Studies show that NPs can adversely affect fish at different stages of development, with reported accumulation in tissues, decreased locomotor and foraging activities, effects on growth and the immune system and alterations on lipid metabolism and neurotoxicity. However, mortality, effects on hatching success or malformations related to NPs have not been reported to this date. Copyright © 2019 Elsevier Ltd

Barrows, A. P. W., et al. (2018). "Marine environment microfiber contamination: Global patterns and the diversity of microparticle origins." Environmental Pollution **237**: 275-284.

Microplastic and microfiber pollution has been documented in all major ocean basins. Microfibers are one of the most common microparticle pollutants along shorelines. Over 9 million tons of fibers are produced annually; 60% are synthetic and ~25% are non-synthetic. Non-synthetic and semi-synthetic microfibers are infrequently documented and not typically included in marine environment impact analyses, resulting in underestimation of a potentially pervasive and harmful pollutant. We present the most extensive worldwide microparticle distribution dataset using 1-liter grab samples (n=1393). Our citizen scientist driven study shows a global microparticle average of 11.8+/-24.0 particles L⁻¹ (mean+/-SD), approximately three orders of magnitude higher than global model predictions. Open ocean samples showed consistently higher densities than coastal samples, with the highest concentrations found in the polar oceans (n=51), confirming previous empirical and theoretical studies. Particles were predominantly microfibers (91%) and 0.1-1.5mm in length (77%), a smaller size than those captured in the majority of surface studies. Using muFT-IR we determined the material types of 113 pieces; 57% were classified as synthetic, 12% as semi-synthetic, and 31% as non-synthetic. Samples were taken globally, including from coastal environments and understudied ocean regions. Some of these sites are emerging as areas of concentrated floating plastic and anthropogenic debris, influenced by distant waste mismanagement and/or deposition of airborne particles. Incorporation of smaller-sized microfibers in oceanographic models, which has been lacking, will help us to better understand the movement and transformation of synthetic, semi-synthetic and non-synthetic microparticles in regional seas and ocean basins.

Barrows, A. P. W., et al. (2018). "A watershed-scale, citizen science approach to quantifying microplastic concentration in a mixed land-use river." Water Research **147**: 382-392.

Microplastic (particles<5mm) pollution dynamics are well documented in oceans and increasingly studied in freshwater. We used a watershed-scale approach to examine spatial and temporal patterns in microplastic concentrations in the Gallatin River watershed (Montana, USA). At 72 sites, trained volunteers collected ~1-L grab samples at 4 seasons per year over 2 years (n=714 samples). Microplastics were found in 57% of the samples (mean=1.2 particles L⁻¹). The majority of particles were fibers (80%), 0.1-1.5mm long. Chemical identification determined 93% of particles measured by muFT-IR were synthetic or semi-synthetic materials. Microplastic concentration differed significantly among dates, but showed no longitudinal pattern or relationship to land-use among subwatersheds. At two sites with gaging stations, microplastic was negatively related to discharge when compared across dates. This suggests stormwater is not a source of microplastic in this watershed, but instead dilutes microplastic inputs from other sources. We conclude that microplastic sources are diverse, and measurements of microplastic deposition, resuspension, and transport may be

needed to clarify the role of land-use patterns on microplastic pollution. This large scale, citizen science based approach provides a model for future analysis which can further expand microplastic collection at the watershed scale.

Barrows, A. P. W., et al. (2017). "Grab vs. neuston tow net: a microplastic sampling performance comparison and possible advances in the field. (Special Issue: Microplastics in the environment.)." Analytical Methods **9**(9): 1446-1453.

With the rapid evolution of microplastic research over several decades, there is an urgent need to compare methodologies for quantifying microplastic in aquatic environments. The most common method for sea surface sampling is a neuston net tow. This method captures microplastic from large water volumes, and although is widely employed, it is specifically designed for studying plankton ecology. Its effectiveness for microplastic research is limited by the net's mesh size as well as the likelihood of contamination. In our study, we compared a 1 L surface grab sampling method to a 335 micro m neuston net tow. Grab sampling collected over three orders of magnitude more microplastic per volume of water as well as a smaller size range and greater proportion of non-fibrous plastic than sampling with a neuston net. Consequently, solely relying on neuston net samples appears to result in an underestimation of the extent of microplastic pollution. For studies aiming to capture and sort larger microplastics without a microscope, the neuston tow method is preferred, since it samples a greater volume of water, increasing the potential of capturing microplastic pieces. Grab sampling can capture plastic at the micro- and nano-scale and in environments where neuston nets are impractical, but the small volume of water sampled may result in high variability among samples. The comparison of these techniques comes at a critical time when sampling methods need standardization for the accurate measurement of the distribution and composition of microplastic in aquatic environments worldwide.

Barry, J., et al. (2009). "Aerosol and spray deposition in a child nasal phantom." Journal of Aerosol Medicine and Pulmonary Drug Delivery **22 (2)**: 186.

The current work is motivated by the need for efficient intranasal delivery of vaccines in a mass campaign scenario for diseases such as influenza. An optimal nasal delivery system seeks to penetrate the nasal valve and efficiently target the mucosal membranes. A child nasal airway phantom was constructed by stere-olithography techniques in five coronal sections based on CT images of an 8-year-old male. The anterior section comprising the nasal airway up to the nasal valve was molded of soft silicone rubber. The other sections were constructed of hard plastic resin. Regional deposition was measured for two classes of devices: a nasal spray device (median aerosol diameter of 80 mum) and a vibrating-mesh nebulizer with orifice size selected for intranasal delivery (median aerosol diameter of 24 mum). Deposition was assessed using the fluorescent tracer technique. Significant differences in deposition were observed between the child phantom and a previously-developed adult nasal airway phantom (53-year-old male constructed of 77 machined acrylic plates). The anatomy of the child phantom placed the device tip in closer proximity to the nasal valve, and the soft nares of the child phantom enabled more realistic placement. Deposition also differed markedly between the spray and the aerosol. The spray deposited mostly as one or more large droplets at or just beyond the nasal valve. The aerosol deposited more broadly to mucosal surfaces in the nasal tract.

Barry, J., et al. (2011). "Intranasal dry powder deposition in a child phantom." Journal of Aerosol Medicine and Pulmonary Drug Delivery **24 (3)**: 45.

Intranasal delivery of vaccines in dry powder form has significant potential as an alternative to vaccination by injection or nasal spray. An optimal nasal delivery system seeks to penetrate the nasal valve and efficiently target the nasal airway mucosal membranes. Iterative evaluation of airway deposition patterns is highly useful for optimization of dry powder delivery system design. Experiments utilized a nasal airway phantom constructed by stereolithography techniques in five sections based on CT images of a 5-year-old child. The anterior section comprising the nasal airway up to the nasal valve was molded of soft silicone rubber to mimic facial flexibility. The other sections were constructed of hard plastic resin. A mucous simulant was applied to the interior surfaces of the model. Dry fluorescein powders sieved to 60 /mum. were introduced into one nares using a prototype intranasal device powered by a breathing simulator. Regional deposition was assessed by visual inspection of the opened airway sections and quantified by eluting powders from sections and measuring fluorescence. Test data show 60% or more of the dry powder loaded into the device deposited in the internal nasal airway sections of the phantom beyond the nasal valve. The deposition rates were not sensitive to the alignment of the intranasal device. These results contrast with lower deposition fractions and much higher sensitivity to alignment for liquid aerosols in similar phantom tests.

Barton, R. (2011). "A very British approach." Local Authority Waste & Recycling **19**(11): 18-18.
The article discusses the disadvantages of offshore recycling for Europe and suggests an alternative to it. The practice of Europe to export plastic waste to the Far East particularly China for recycling is said to contribute to a massive carbon footprint. It is noted that China uses large amounts of fossil and non-renewable fuels and has high levels of pollution. The author suggests to use the services of recycling companies in Great Britain such as recycled products.

Barwicki, J. (2010). "Testing of the disc-, anchor- and paddle-type mixing units by the use of non-invasive method to evaluate the mixing quality." Problemy Inzynierii Rolniczej **18**(1): 97-104.
Investigations were conducted on an experimental stand consisted of: cylindrical steel tank, electric motor of variable rotation rate, energy demand meter, piezoelectric transducer to measure mixture homogeneity and the computer for recording test results. Disc-, anchor- and paddle-type mixing units were investigated. Water and artificial (plastic) particulates, similar in physico-mechanical properties to fruit and vegetable products processed in the food industry, were used as media in the experiment. Energy consumption in mixing process was measured for four rotational speeds of the mixing units: 150, 250, 300 and 400 r.p.m. The effects of mixing unit construction on duration and energy consumption in mixing process were stated. Obtained results may be useful at designing new types, as well as to improving construction of existing mixing units.

Basarova, P., et al. (2005). "The influence of flotation agent concentration on the wettability and flotability of polystyrene." Journal of Colloid & Interface Science **286**(1): 333-338.
The fundamental flotation process is the formation of a flocculant by air bubbles and solid particles in an aqueous solution. The behavior of plastic particles is significantly influenced by the wettability of the plastics. In this article the reciprocal relationship between the flotability and wettability of polystyrene was studied at different concentrations of flotation agents, particularly terpineol, polyethylene glycol dodecyl ether, tannic acid, and calcium lignosulfonate. The conclusions obtained demonstrate the dissimilar action of flotation depressants, what means different adhesion mechanisms on a plastic surface.

Bashan, Y., et al. (2006). "Increase in auxiliary photoprotective photosynthetic pigments in wheat seedlings induced by Azospirillum brasilense." Biology and Fertility of Soils **42**(4): 279-285.

Inoculation of wheat seedlings with the plant growth-promoting bacterium Azospirillum brasilense Cd was immobilized in alginate microbeads and, without applying any stress, significantly increased the quantity of several photosynthetic pigments, such as chlorophyll a, chlorophyll b, and the auxiliary photoprotective pigments violaxanthin, zeaxanthin, antheroxanthin, lutein, neoxanthin, and beta -carotene. This resulted in greener plants with no apparent visible stress. After monitoring the quantity of photosynthetic pigments for 4 weeks, we observed that inoculated plants had higher quantities of pigments in shoot and stem. The greatest difference in the quantity of all pigments between inoculated and noninoculated plants occurred in the first week of growth. Regardless of treatment, the quantity of pigments in stems was three to four times less than the quantity of these pigments in shoots. Application of Azospirillum, either as liquid inoculant or as alginate microbeads, did not alter the positive effect of the bacteria on pigment production or the positive response of the plants towards A. brasilense Cd inoculation.

Bashan, Y., et al. (2002). "Alginate microbeads as inoculant carriers for plant growth-promoting bacteria." Biology and Fertility of Soils **35**(5): 359-368.

A method of inoculating wet and dry seeds with plant growth-promoting bacteria (PGPB) using alginate microbeads as a substrate and Azospirillum brasilense as the model PGPB was developed. The microbeads were produced by low pressure spraying of an alginate solution mixed with liquid bacterial culture suspended in a very rich medium through a small nozzle resulting in small-diameter droplets. These droplets, when sprayed into a slowly stirred solution of CaCl₂, immediately hardened into microbeads at diameters ranging between 100 and 200 micro m. Although the process killed part of the entrapped bacteria, the remaining bacteria residing in the microbeads were sufficient (>10¹¹ colony-forming units (CFU) g⁻¹ inoculant) for seed inoculation. Further, it was found that the bacterial population in the inoculant could be enhanced by secondary multiplication in the same medium for an additional 16 h. It was found that the microbeads could be used either wet or dry. Dry inoculant was produced using dry air at 38 degrees C, creating a powdery substance loaded with >10⁹ CFU g⁻¹ beads. Alternatively, dry microbeads were produced using a standard freeze-drying procedure. This dry preparation was easily attached to dry seed surfaces with the addition of 1% alcohol-diluted lecithin or with 0.5% synthetic paper adhesive (Resistol). The bacteria were slowly released from the microbeads in amounts ranging from 10⁴ to 10⁶ CFU g⁻¹ depending on the type (wet or dry, with or without skim milk) and the time of incubation (the longer the incubation period, the smaller the amount of bacteria released with time). The wet and dry inoculants enhanced the development of wheat and tomato seedlings growing in unfertile soil, and biodegraded within 15 days in moist soil.

Baskin, L. S., et al. (2004). "Anatomical studies of the mouse genital tubercle." Advances in Experimental Medicine & Biology **545**: 103-121.

BACKGROUND: To study the etiology of hypospadias, we propose the use of a mouse model, the embryonic mouse genital tubercle. In this study, we define the development of the mouse genital tubercle with special emphasis on urethral formation demonstrating anatomical similarities to human development.

MATERIALS AND METHODS: Serial sections of genital tubercles from embryonic male and female mice ages 14 to 21 days gestation from timed pregnant animals, newborn and adult mice were immunohistochemical stained with antibodies to E-cadherin, cytokeratins 7, 10, and 14. Patency of the urethral was assessed by india ink injection via the bladder. Urethral lumen morphology was determined by the creation of plastic resin cast. Surface morphology of the genital tubercle was defined by scanning electron microscopy.

RESULTS: India Ink injection into the bladder showed that the urethral lumen was patent from 14 days gestation. Plastic resin casts revealed that the male urethra was characterized by a S shaped curve, the presence of the bulbar urethral gland and a longer length than age matched females. The ontogeny of the genital tubercle development revealed two epithelial edges that subsequently touched and fused into the completed urethra. During development cytokeratin immunohistochemical staining demonstrated that the epithelial cells of the urethral lumen are of bladder origin and the surface cells of skin origin.

CONCLUSION: The functional and developmental anatomy of the mouse genital tubercle provides a useful model to study normal and abnormal human urethral development.

Bassett, D. C., et al. (2014). "Dissolution of copper mineral phases in biological fluids and the controlled release of copper ions from mineralized alginate hydrogels." Biomedical materials (Bristol, England) **10**(1): 015006.

Here we investigate the dissolution behaviour of copper minerals contained within biocompatible alginate hydrogels. Copper has a number of biological effects and has most recently been evaluated as an alternative to expensive and controversial growth factors for applications in tissue engineering. Precise control and sustained release of copper ions are important due to a narrow therapeutic window of this potentially toxic ion, and alginate would appear to be a good material of choice for this purpose. We found that aqueously insoluble copper minerals could be precipitated during gelling within or mixed into alginate hydrogels in the form of microbeads prior to gelling to serve as depots of copper. These minerals were found to be soluble in a variety of biological fluids relevant to in vitro and in vivo investigations, and the alginate carrier served as a barrier to diffusion of these ions and therefore offered control over the rate and duration of release (Cu(2+) release rates observed between 10-750 µMol g(-1) h(-1) and duration for up to 32 d). Copper mineral and copper mineralized alginate microbeads were characterized using powder x-ray diffraction, FTIR, thermogravimetric analysis and scanning electron microscopy. Dissolution kinetics were studied based on measurements of copper ion concentrations using colourimetric methods. In addition we characterized the complexes formed between released copper ions and biological fluids by electron paramagnetic spectroscopy which offers an insight into the behaviour of these materials in the body.

Basto, M. N., et al. (2019). "Plastic ingestion in aquatic birds in Portugal." Marine Pollution Bulletin **138**: 19-24.

In modern society, plastic items have become indispensable. The rapid growth of plastic production has led to an increase in the concentration of plastic waste in the environment and, consequently, wildlife has been severely affected. As wide-ranging foragers and predators, aquatic birds are ideal sentinels for monitoring changes in their environment. Plastic found in stomach contents of stranded aquatic birds collected throughout Portugal was examined. Out of the 288 birds processed, 12.9% ingested plastics. Six of the 16 species assessed showed evidence of plastic ingestion. The Lesser Black-backed Gull (18.7%) had the highest incidence while, among those that did ingest plastics, the Northern Gannet (4.8%) had the lowest. User plastics were the most common type of plastic ingested, while microplastics and off/white-clear were the most common size and colour respectively of plastics found. This study sets a first multispecies baseline for incidence of plastic ingestion by aquatic birds in Portugal. Copyright © 2018 Elsevier Ltd

Batel, A., et al. (2018). "Microplastic accumulation patterns and transfer of benzo[a]pyrene to adult zebrafish (Danio rerio) gills and zebrafish embryos." Environmental Pollution **235**: 918-930.

Since only a few studies have investigated effects of microplastics (MPs) by routes other than ingestion, this study was designed to analyze the accumulation patterns and transfer of toxic substances associated with microplastic exposure by simple attachment to (1) adult zebrafish (Danio rerio) gills and (2) zebrafish embryos. Two sizes of fluorescently labelled polymers (1-5 and 10-20 micro m) loaded with the model polycyclic aromatic hydrocarbon (PAH) benzo[a]pyrene (BaP) were used to analyze fate, accumulation and transfer of microplastic-associated persistent organic pollutants (POPs) on gills and embryos. Results indicate that microplastics did not permanently accumulate at high amounts in adult zebrafish gills after 6 nor 24 h of incubation: Most particles only superficially adhered to the mucus layer on the filaments, which is constantly being excreted. In contrast, the smaller and heavier MPs (1-5 micro m) accumulated in high numbers on the surface of zebrafish egg chorions. In both exposure scenarios, transfer of BaP could be visualized with fluorescence microscopy: A prominent BaP signal was visible both in gill filaments and arches after 6 and 24 h incubation and in zebrafish embryos after exposure to BaP-spiked microplastics. Furthermore, the gill EROD (Ethoxyresorufin-O-deethylase) assay showed a clear trend to CYP 1A (Cytochrom P450 1 A) induction via exposure to BaP-spiked microplastics. However, BaP from spiked microplastics did not reach sufficiently high concentrations to be able to induce morphological effects in the fish embryo toxicity test (FET). In contrast, control exposure to waterborne BaP did induce effects in the FET. As a conclusion, microplastics can also transfer POPs not only via ingestion, but also by simple attachment to epithelia or via the water column. However, further studies are needed to clarify if these interactions are of environmental concern relative to waterborne exposure to toxic substances.

Batel, A., et al. (2016). "Transfer of benzo[a]pyrene from microplastics to Artemia nauplii and further to zebrafish via a trophic food web experiment: CYP1A induction and visual tracking of persistent organic pollutants." Environmental Toxicology & Chemistry **35**(7): 1656-1666.

The uptake of microplastic particles and the transfer of potential harmful substances along with microplastics has been studied in a variety of organisms, especially invertebrates. However, the potential accumulation of very small microplastic particles along food webs ending with vertebrate models has not been investigated so far. Therefore, a simple artificial food chain with Artemia sp. nauplii and zebrafish (Danio rerio) was established to analyze the transfer of microplastic particles and associated persistent organic pollutants (POPs) between different trophic levels. Very small (1-20 µm) microplastic particles accumulated in Artemia nauplii and were subsequently transferred to fish. Virgin particles not loaded with POPs did not cause any observable physical harm in the intestinal tracts of zebrafish, although parts of the particles were retained within the mucus of intestinal villi and might even have been taken up by epithelial cells. The transfer of associated POPs was tested with the polycyclic aromatic hydrocarbon benzo[a]pyrene and an ethoxyresorufin- O-deethylase (EROD) assay for CYP1A induction in zebrafish liver as well as via fluorescence analyses. Whereas a significant induction in the EROD assay could not be shown, because of high individual variation and low sensitivity regarding substance concentration, the fluorescence tracking of benzo[a]pyrene indicates that food-borne microplastic-associated POPs may actually desorb in the intestine of fish and are thus transferred to the intestinal epithelium and liver. Environ Toxicol Chem 2016;35:1656-1666. © 2016 SETAC [ABSTRACT FROM AUTHOR]

Bates, M. C., et al. (2019). "Translational Research and Early Favorable Clinical Results of a Novel Polyphosphazene (Polyzene-F) Nanocoating." Regenerative Engineering and Translational Medicine **5**(4): 341-353.

Abstract: This manuscript is a review of the preclinical and early clinical findings related to a unique fluorinated polyphosphazene nanolayer device surface modification. Polyzene-F (PzF) is a novel, high-molecular weight, highly pure polyphosphazene that was designed to enhance the biologic interface between a medical device surface and human tissue or blood. The polymer also has unique mechanical properties that for the first time allow implants to be paved with a coating that has a nanoscale thickness of < 50 nm. The coating has inherent thrombus resistant properties and takes on biomimetic properties soon after implant due to favorable protein adhesion. Over the last 1.5 decades, PzF has undergone extensive preclinical testing including benchtop endothelial cell migration and platelet adhesion studies followed by increasingly sophisticated evaluation in 16 different animal models. The coating consistently has shown reduced platelet adhesion, decreased clotting, reduced inflammation, and accelerated healing compared with different surfaces as well as uncoated controls. These preclinical findings have translated into early compelling clinical evidence that suggest enhanced healing and reduced thrombosis can be achieved with a PzF-coated implant. There are now two PzF nanocoated products approved by the US Food and Drug Association (FDA), embolic spheres, and a coronary stent. This is the first detailed overview of the history, preclinical findings, and current clinical results attributed to the PzF coating with emphasis on the coronary stent Cobra-PzF. Lay Summary: Over the last few decades, we have seen remarkable advances in medical technology including the development of less invasive surgical alternatives for the treatment of heart and vascular disease. One of the key advances in treating or preventing heart attack, stroke, and limb loss has been the development of stents. Stents are small, metallic, mesh-like devices that can be expanded within blocked vessels via small catheters placed through the groin or wrist. These stents provide structural support while the vessel heals. One of the challenges with stents and other permanent device implants is related to how our bodies react to foreign materials. One of the most feared complications of stents is clotting, which can result in abrupt closure of the treated artery. In the case of heart stents, abrupt closure can cause a heart attack or even sudden death whereas clotting within stents in the neck arteries (carotids) can cause stroke. Additional normal body defense mechanisms include complicated immune responses that trigger inflammation and can cause scarring resulting in early recurrence of the blockage or so-called "restenosis." In an effort to eliminate restenosis, many stents are now coated with drugs that slow or prevent healing. The downside of this approach has been the need for long-term blood-thinning medications like Plavix and aspirin. In this article, we review the history and current clinical findings of a new way to potentially make medical implants invisible to the normal foreign body defense responses that cause subsequent complications. The innovation involves the development of a new compound called Polyzene-F (CeloNova BioSciences, San Antonio, TX) that can be placed on the surface of a device in a layer that is extremely thin. This new coating is so thin it cannot be seen with even the strongest available microscopes and falls into a new category of material science called nanotechnology. Nanotechnology involves materials that are measured on a molecular level rather than the

traditional measurements used in the field of medical devices. We describe many experiments done on the benchtop alongside animal studies and early clinical results that support the hypothesis that an enhanced biologic response can be expected for implants coated with Polyzene-F. The initial types of heart disease patients being studied with this new coated stent (Cobra-PzF) are those at high risk for bleeding since we know these patients are less tolerant of blood thinning medicine. This initial narrow focus was selected based on the experience from our team and others suggesting animal studies do not always predict how humans respond to new treatments coupled with the knowledge that drug-eluting stents are getting better each day. We do see signals in the completed Cobra-PzF clinical trials that clotting and recurrence (restenosis) are low, but these studies do not directly compare this device to alternative stents in a type of study we call a "randomized trial." There is an ongoing large randomized trial comparing the Polyzene-F nanocoated stent (Cobra PzF) with contemporary drug-eluting stents in patients at high risk for bleeding, which should complete enrollment in 2019. At the same time, the US FDA-approved Polyzene-F-coated microbeads (Embozene, Boston Scientific, Marlborough, MA) are being studied for the treatment of tumors and cancer. If an enhanced biologic response is proven in the ongoing randomized trials being conducted on the currently approved Polyzene-F-coated devices, then this new surface enhancement may have broader application for a variety of medical device implants. Copyright © 2019, The Author(s).

Batool, S., et al. (2019). "Gastroretentive clarithromycin loaded sodium alginate microbeads: Effect of needle size and drying processes on the swelling and release profile." Latin American Journal of Pharmacy **38**(2): 271-280.

The aim of this study was to investigate the influence of processing parameters such as drying conditions and needle gauges on the size, morphology and drug release from alginate beads using clarithromycin as model drug. The microbeads were prepared by ionotropic gelation method using three needle sizes (18G, 21G, and 23G). The size distribution of prepared beads for air drying, fluidized bed drying and freeze drying was 745, 672, and 1530 micro m, respectively. XRD and DSC depicts that crystallization of drug was suppressed in the beads. Freeze dried beads showed maximum swelling and release in both acidic and alkaline as compared to other two formulations. Fluidized bed dried formulations were relatively robust with predictable swelling and drug release. Copyright © 2018, Colegio de Farmaceuticos de la Provincia de Buenos Aires. All rights reserved.

Battle, R., et al. (2014). "A strategy for the identification of denatured antigen reactive antibodies-a case review reveals a natural antibody capable of generating a positive crossmatch." Tissue Antigens **84 (1)**: 73.

Antibody reactivity to denatured HLA antigens coated onto the surface of microbeads, in HLA antibody (anti-HLA) single antigen bead assays (SAB) is not new, nor is the reported existence of HLA cross reactive 'natural antibodies' in individuals with no history of alloimmunization. This reactivity can make the interpretation of transplant recipients' HLA antibody profiles problematic, and can potentially lead to the listing of clinically irrelevant HLA antibodies.However, dismissing this reactivity in patients known to be non-sensitised (such as non-transfused, non-transplanted males) may not be safe due to the possibility of 'natural antibodies' which may cross-react with HLA antigens. A consequence of this may be an unexpected positive crossmatch (XM) or, if a transplant proceeds, antibody mediated allograft damage. In order to determine between genuine and denatured HLA reactivity we have established a protocol for testing suspected denatured antibody cases, with the aim of maximising patients' opportunity for transplant. Here we report a case of a 41 year old, non-sensitised male, with extensive class I antibody reactivity defined by routine SAB (cPRA 54%). Many of the HLA antibodies were against antigens previously reported as suspected denatured targets. An assessment of the epitopes present within the serum reactivity demonstrated only a single group of antibody targets (HLA-A*23,24) possessed an epitope not present upon antigens determined as negative in the SAB assay. Testing using an in-house denatured antigen assay confirmed this finding as HLA-A*23, 24 reactivity disappeared while all other reactivity remained. Furthermore a SAB assay using HLA targets with a reduced amount of denatured antigen, iBeads (One Lambda), demonstrated reactivity to only HLA-A*23, 24. Finally a flow XM was performed against cells expressing HLA-A*24, producing a positive result (T cell RMF 6.81, B cell RMF 13.24). The use of the methods described above can help to better define unexpected antibody reactivity and reduce the risk of listing antibodies which are not clinically relevant; in this case cPRA was reduced to 21% via the removal of denatured antigen specific antibodies. Further studies are required to better understand the provenance of HLA alloantibodies in patients with no history of exposure to alloHLA.

Bau, D., et al. (2019). "Solid phase-based cross-matching for solid organ allo-grafting using the luminex platform: Rather regression than progress in comparison to the ELISA-based precursor procedure." Hla **93 (5)**: 304.

Donor-specific anti-HLA antibodies (DSA) of a given donor represent the most prominent cause for hyper-acute and acute rejections. In order to select recipients without DSA the complement-dependent cytotoxicity (CDC) crossmatch as the standard procedure was established. As a functional assay it strongly depends on the availability of isolated donor lymphocytes and especially on their vitality. During the last ten years several disadvantages of the CDC-based procedure have increasingly been discussed with respect to this assay's high susceptibility to disruptive factors such as autoimmune diseases of the immune complex type (type III) or pharmacological treatment of a given recipient often leading to unexpected "false-positive" results of the CDC-cross match. As methodical alternatives for anti-HLA antibody specific cross-matching two ELISA-based procedures i) the Antibody Monitoring System (AMS) and ii) the Ab Cross assay had been established in our laboratory. Both systems, however, were later discontinued for commercial reasons in the years 2013 and 2016, respectively. Using the same set of diagnostic antibodies the AMS-ELISA, now named DSA, was again manufactured as a micro bead-based array using the Luminex platform. With a view to establishing the DSAprocedure as the only remaining solid phase-based crossmatch system commercially available, this procedure was systematically evaluated in our laboratory. Primarily but not exclusively, based on drawbacks of the evaluation software, about 44% of the virtually negative and about 19% of the virtually positive cross match results had to be classified as divergent. We provide evidence that for various reasons the outcomes provided by the DSA-assay, in contrast to those of the AMS-ELISA as its precursor system, have to be critically challenged. Thus, modifications are urgently required by the manufacturer in order to lead to a system of sufficient validity again usable for any laboratory's routine diagnostics.

Bau, D., et al. (2019). "Solid phase-based cross-matching using the luminex platform for solid organ allo-grafting: Rather regression than progress in comparison to the ELISA-based precursor procedure." Hla **94 (Supplement 1)**: 22-23.

Many disadvantages of the CDC-based crossmatch (XM) procedure have been discussed in the last few years regarding this assay's high susceptibility to disruptive factors which frequently lead to false positive outcomes. In this context, autoimmune diseases especially of the immune complex type (type III) or pharmacological treatment of a given recipient have been shown to

lead to unexpected "false-positive" outcomes of the CDC-XM. As methodical alternatives for anti-HLA antibody specific cross-matching two ELISA-based procedures i) the AMS-ELISA and ii) the AbCrossELISA had been established in our tissue typing laboratory and those of some other groups. Both systems, however, were discontinued for mere commercial reasons in the years 2013 and 2016, respectively. Using the same set of diagnostic antibodies, the AMS-ELISA, now named Donor-Specific Antibodies/DSA, was afterwards again manufactured as a microbead-based array using the Luminex platform. With a view to establishing the DSA-assay as the only remaining solid phase-based XM-system commercially available, this procedure was systematically evaluated in our laboratory. Primarily but not exclusively based on drawbacks of the evaluation software, however, 69 (32.5%) of the virtually defined XM-results (n = 212 independent anti-HLA class I and II specifications and their corresponding DSA-assays, respectively) were classified as divergent using the DSA-assay whereas only 143 results (67.5%) were classified as accordant by this assay's software. Referring to the chosen cohort of recipients (n = 106) not less than 62 (58.4%) of them were characterized by findings which are not supported by virtual cross-matching. We here provide evidence that the outcomes provided by the DSA-assay, in contrast to those of the AMS-ELISA as its precursor system, have critically to be challenged. Thus, modifications are urgently required by the manufacturer in order to lead again to a system of sufficient validity usable for any laboratory's routine diagnostics.

Bau, D., et al. (2018). "Solid phase-based cross-matching using the luminex platform for solid organ allo-grafting: Regression rather than progress in comparison to the elisa-based precursor procedure." Hla **92 (Supplement 1)**: 18.

In order to select recipients without harmful donor-specific antibodies, the complement-dependent cytotoxicity (CDC) crossmatch (XM) was established as the standard procedure. As a functional assay it strongly depends on the availability of vital donor lymphocytes. Its negative pre-transplant outcome is currently regarded as the most important requirement for a successful kidney graft survival. During the last ten years, however, several disadvantages of the CDC-based procedure have increasingly been discussed due to this assay's high susceptibility to disruptive factors. In this context, several autoimmune diseases of the immune complex type (type III) or pharmacological treatment of a given recipient have been shown to lead to unexpected "false-positive" results of the CDC-XM. As methodical alternatives for anti-HLA antibody specific cross-matching two ELISA-based procedures i) the Antibody Monitoring System-(AMS) and ii) the AbCross-ELISA were established in our tissue typing laboratory and those of some other groups. Both systems, however, were discontinued for mere commercial reasons in the years 2013 and 2016, respectively. Using the same set of diagnostic antibodies the AMS-ELISA was then again manufactured as a microbead-based array using the Luminex platform. With a view to establishing this DSA-named-procedure as the only remaining solid phase-based XM-system commercially available, it was systematically evaluated in our laboratory. Primarily but not exclusively based on drawbacks of the evaluation software, however, more than 40% of the virtually negative crossmatch results were classified as divergent i.e. as false positive. We here provide evidence that the outcome provided by the DSA-assay, in contrast to that of its precursor AMS-ELISA has to be critically challenged. Thus, modifications are urgently required in order to lead to a system of sufficient validity and usability for any laboratory's routine diagnostics again.

Baudrimont, M., et al. (2019). "Ecotoxicity of polyethylene nanoplastics from the North Atlantic oceanic gyre on freshwater and marine organisms (microalgae and filter-feeding bivalves)." Environmental Science & Pollution Research **02**: 02.

Each year, 5 to 10 million tons of plastic waste is dumped in the oceans via freshwaters and accumulated in huge oceanic gyres. Under the effect of several abiotic factors, macro plastic wastes (or plastic wastes with macro sizes) are fractionated into microplastics (MP) and finally reach the nanometric size (nanoplastic NP). To reveal potential toxic impacts of these NPs, two microalgae, Scenedemus subspicatus (freshwater green algae), and Thalassiosira weissiflogii (marine diatom) were exposed for up to 48 h at 1, 10, 100, 1000, and 10,000 mug/L to reference polyethylene NPs (PER) or NPs made from polyethylene collected in the North Atlantic gyre (PEN, 7th continent expedition in 2015). Freshwater filter-feeding bivalves, Corbicula fluminea, were exposed to 1000 mug/L of PER and PEN for 48 h to study a possible modification of their filtration or digestion capacity. The results show that PER and PEN do not influence the cell growth of T. weissiflogii, but the PEN exposure causes growth inhibition of S. subspicatus for all exposure concentrations tested. This growth inhibition is enhanced for a higher concentration of PER or PEN (10,000 mug/L) in S. subspicatus. The marine diatom T. weissiflogii appears to be less impacted by plastic pollution than the green algae S. subspicatus for the exposure time. Exposure to NPs does not lead to any alteration of bivalve filtration; however, fecal and pseudo-fecal production increased after PEN exposure, suggesting the implementation of rejection mechanisms for inedible particles.

Bauernhofer, T., et al. (2005). "Association of disease progression and poor overall survival with detection of circulating tumor cells in peripheral blood of patients with metastatic breast cancer." Oncology Reports **13**(2): 179-184.

The aim of this study was to define the frequency and clinical relevance of cytokeratin positive metastatic tumor cells in the peripheral circulation of patients with stage IV breast cancer. Peripheral blood was collected from 32 consecutive patients with metastatic breast cancer and 23 healthy donors. Tumor cells were enriched using positive selection with anti-HEA125-microbeads and cytospins were prepared of the positive selection eluate. Slides were incubated with a Fab2 fragment of the pancytokeratin antibody A45-B/B3 conjugated with alkaline phosphatase (AKP) and a CAM5.2-AKP monoclonal antibody and developed with an alkaline phosphatase anti-alkaline phosphate reaction (APAAP). All samples were evaluated using light microscopy and an automated image analysis system. In 8/32 (25%) patients cytokeratin positive (CK+) cells could be detected after anti-HEA125 enrichment in the peripheral blood whereas in none out of 23 healthy donors. One to 1000 (median 5) positive cells per patient sample were observed and cluster of tumor cells in one patient. Automated image analysis was as powerful in detecting micrometastases as conventional light microscopy. All patients with CK+ cells in the peripheral circulation (8/8, 100%) showed progressive disease at the time-point of blood draw whilst only 9/24 (37.5%) showed disease progression without detection of positive cells. The median overall survival of CK+ patients was 4+/-2 months compared to 13+/-7 months of CK- patients (p<0.001). CK+ cells are detectable in the peripheral circulation of 25% of patients with metastatic breast cancer after positive selection with anti-HEA125. Detection of tumor cells in the peripheral circulation might be correlated with progression of disease and shorter overall survival.

Baumann, L., et al. (2016). "Comment on "Uptake and Accumulation of Polystyrene Microplastics in zebrafish (Danio rerio) and Toxic Effects in Liver"." Environmental Science & Technology **50**(22): 12521-12523.

Bawazer, L. A., et al. (2012). "Evolutionary selection of enzymatically synthesized semiconductors from biomimetic mineralization vesicles." Proceedings of the National Academy of Sciences of the United

States of America **109**(26).

The way nature evolves and sculpts materials using proteins inspires new approaches to materials engineering but is still not completely understood. Here, we present a cell-free synthetic biological platform to advance studies of biologically synthesized solid-state materials. This platform is capable of simultaneously exerting many of the hierarchical levels of control found in natural biomineralization, including genetic, chemical, spatial, structural, and morphological control, while supporting the evolutionary selection of new mineralizing proteins and the corresponding genetically encoded materials that they produce. DNA-directed protein expression and enzymatic mineralization occur on polystyrene microbeads in water-in-oil emulsions, yielding synthetic surrogates of biomineralizing cells that are then screened by flow sorting, with light-scattering signals used to sort the resulting mineralized composites differentially. We demonstrate the utility of this platform by evolutionarily selecting newly identified silicateins, biomineralizing enzymes previously identified from the silica skeleton of a marine sponge, for enzyme variants capable of synthesizing silicon dioxide (silica) or titanium dioxide (titania) composites. Mineral composites of intermediate strength are preferentially selected to remain intact for identification during cell sorting, and then to collapse postsorting to expose the encoding genes for enzymatic DNA amplification. Some of the newly selected silicatein variants catalyze the formation of crystalline silicates, whereas the parent silicateins lack this ability. The demonstrated bioengineered route to previously undescribed materials introduces in vitro enzyme selection as a viable strategy for mimicking genetic evolution of materials as it occurs in nature. [PUBLICATION ABSTRACT]

Baynham, R. (2015). "Reform would solve confidence crisis." Materials Recycling World **204**(8): 19-19.

The author discusses the issues faced by Closed Loop Recycling Ltd. and many other plastic recycling companies in Great Britain which include the strong demand for unprocessed plastic waste from export markets that has kept prices at level and untenable by recyclers during volatility in prime polymer prices due to lower oil prices. It notes the proposal of British Plastics Federation Recycling Group to amend the packaging recovery note (PRN).

Bayo, J., et al. (2018). "Microplastics as vector for persistent organic pollutants in urban effluents: the role of polychlorinated biphenyls. (Special Issue: Sustainable city.)." International Journal of Sustainable Development and Planning **13**(4): 671-682.

The presence of microplastics in the environment is considered a global threat, not only for the physical damage induced to the organisms that ingest them and leachability of their constituent, but also as a potential carrier of organic and inorganic contaminants, with an interaction poorly described. Microbeads collected from four facial cleansers, with a well-known polymeric and additive composition, were used as an indicator for the sorption of polychlorinated biphenyls (PCBs) in treated urban effluents, in order to study the behavior of microplastics versus these persistent organic pollutants in water. A stock standard solution (EPA 525, 525.1 PCB mix) was used for this purpose, being a certified material produced in accordance with ISO Guide 34:2009 and ISO/IEC 17025:2005. It consists of a mixture of eight congeners: PCB1, PCB5, PCB31, PCB47, PCB91, PCB154, PCB171 and PCB200 in n-hexane (500 micro g/ml of each component). Sorption experiments were carried out in batch mode, previously in bi-distilled water, and finally in treated urban effluents. PCB congeners retained by microplastics and remaining in water were further analyzed by means of gas chromatography, using a protocol previously described with an initial column temperature of 70 degrees C and a ramp of 10 degrees C/min up to 150 degrees C, 3 degrees C/min up to 200 degrees C, and 8 degrees C/min to a final temperature of 280 degrees C. The sorption process proved to be reliable and repeatable both for samples in bi-distilled water and treated urban effluents, showing different interactions between the organic pollutants and the microplastics. PCB congeners with a low-molecular weight proved to be preferentially sorbed by an oxidized polyethylene included in one of the microbeads, although the maximum amount for total PCB sorption was for the facial cleanser with TiO₂ in its composition.

Bayo, J., et al. (2017). "Microbeads in commercial facial cleansers: threatening the environment." CLEAN Soil, Air, Water **45**(7).

The presence of primary microplastics in the environment is considered a major concern because of three main reasons: the physical damage to organisms that ingest them, the leaching of constituent contaminants such as monomers or additives, and the sorption of inorganic and organic chemicals. Microbeads collected from four facial cleansers, a personal care product commonly used by European consumers, have been analyzed in this paper. The variability in size distribution, specific surface area, the oxidation state of the polymer and the presence of whitening agents in one of the cosmetic formulations proved to be related with the ability to sorb heavy metals and polychlorinated biphenyls (PCBs), both in bi-distilled water and treated urban effluents. The sorption process for heavy metals proved to be related to a physical mechanism, without a specific interaction between the adsorbate and the microbead. In the case of PCBs, low molecular weight congeners proved to be preferentially sorbed by oxidized polyethylene (Microbead-B, MB-B), although the maximum amount for total PCBs sorption was for the facial cleanser with TiO₂ in its composition (Microbead-A, MB-A) and a moderate ecotoxicity. Regression models developed for PCBs showed a similar behavior of these pollutants in bi-distilled and real treated urban effluents for microbeads, indicating that the exposed surface area was not the only mechanism responsible for sorption, but also the specific partitioning into the bulk microplastic.

Bayo, J., et al. (2018). "Non-polymeric chemicals or additives associated with microplastic particulate fraction in a treated urban effluent." WIT Transactions on the Built Environment **179**: 303-314.

The presence of microplastics in freshwater environments is of emerging concern, because they have been ubiquitously detected. Different adverse effects have been described in ingesting organisms: physical damage due to the plastic particles themselves, leaching of constituent monomers, the potential transport of organic and inorganic pollutants, and leaching of additives used in the manufacturing and polymerization of plastic products. In this last case, especially when additives are not chemically bound to the polymer structure, may be leached out into the aquatic environment. This paper deals with the role of wastewater treatment plants as sources of additives associated to particulate forms. A 9.0% of particulate fraction was a source of plastic additives, such as antioxidants, lubricants, corrosion inhibitors, plasticizers, adhesives, heat stabilizers or flame retardants, among others. The main plastic additives found in the wastewater samples were Zn/Ca PVC stabilizer, Methyl Tin Mercaptide (MTM), Ethoxylated Tallow Alkyl Amine (ETAA), Methyl Alkyl Imidazoline Sodium Salts (MAISS), Butyl Ricinoleate (BR), Di-o-benzamido diphenyl disulfide (DBD), RTV-730 and Molybdenum-Zinc Oxygen Complex (MZO Complex). There was a statistically significant removal of all of them after the wastewater treatment process, accounting for a 91.14%, although some of them proved to disappear in the biological reactor or even in the primary clarifier.

Bayo, J., et al. (2020). "Microplastics in an urban wastewater treatment plant: The influence of physicochemical parameters and environmental factors." Chemosphere **238**: 124593.

This paper presents the abundance, concentration and variability of microplastics (MP) in an

urban wastewater treatment plant (WWTP), according to different water parameters and environmental factors, their possible sources and removal efficiency. A total of 352.6L of wastewater from four stages of the treatment process were processed following a standardized extraction protocol by density separation, trinocular microscopic identification and polymeric analysis by Fourier transform infrared spectroscopy. MP comprised a 46.6% of total microlitter, with a statistically significant removal of 90.3% in the final effluent of the WWTP. Five different shapes were isolated; i.e. fragment, film, bead, fiber, and foam. The most prominent MP forms in the final effluent were fragments and fibers, with the most common size class being 400-600mum. Seventeen different polymer families were identified, with low-density polyethylene being the most prevalent one (52.4%) in a film form (27.7%), mostly from agriculture greenhouses near the sewage plant and single plastic bags (it is noted that only a year ago consumers are charged for them in Spain). Influent wastewater with high concentrations of suspended solids proved to have a low MP burden with a larger MP size, possibly due to a hetero-aggregation with particulate matter. Agglomeration of polystyrene and polyethylene terephthalate with organic material is also suggested, both with surface energies higher than 25mNm⁻¹ enough for a high biofouling rate. The sewage plant cushions sharp-point microplastic concentrations during the warm season, allowing a stable performance of the WWTP.

Bayo, J., et al. (2016). "Microplastics and microfibers in the sludge of a municipal wastewater treatment plant." International Journal of Sustainable Development and Planning **11**(5): 812-821.

The presence of microplastics and synthetic microfibers in the environment is increasing, causing an accumulation in the food chain because their ingestion by different organisms in the ecological community. This paper deals with the importance of wastewater treatment plants (WWTPs) as a source of microplastics and microfibers from the sludge to the environment. These micropollutants have been monitored in an urban WWTP during 2015, after being separated from the sludge. Micro-pollutants were extracted by flotation, using a concentrated solution of sodium chloride and several stainless steel sieves. After an initial screening performed with a trinocular microscope, the samples were analyzed by Fourier transform infrared spectrometry and a differential scanning calorimeter, this last technique only for the identified subsamples. Significant matches with databases could be observed, identifying different compounds such as polypropylene, Nylon copyright , transparent thermoplastic polyamides, norbornene, and ethyl acrylate, among others. These microplastics and microfibers could be transported with organic matter on fertilizers, being used as compost in the field crops of Campo de Cartagena.

Bayo, J., et al. (2019). "Abundance, morphology and chemical composition of microplastics in sand and sediments from a protected coastal area: The Mar Menor lagoon (SE Spain)." Environmental Pollution **252**: 1357-1366.

This paper presents the abundance and ubiquitous presence of microplastics in a protected coastal zone located in the southeast of Spain: The Mar Menor lagoon, an important tourist destination in this region. Seventeen sampling sites, corresponding to both intertidal and backshore points, were collected during winter 2017 and 2018, being situated in different protected areas according to international, European and Spanish environmental policies. The main objectives of the study were to examine microplastics in both protected and non-protected areas, and to test the importance of local activities on their presence. Northwest samples reported higher average microplastic concentrations than samples collected in the southeastern part of the coastal lagoon, likely due to the extensive use of sludge from wastewater treatment plants besides the fragmentation of low density polyethylene from plastic greenhouses, being microplastic films also higher for northwest than for southeast samples. Moreover, large inter-site differences observed in microplastic concentrations also demonstrated that local activities, mainly tourism and fishery, may play an important role as microplastic sources. The extensive amount of 17 different polymer types identified in this paper, much higher than most reported in similar studies, together with the variety of colors of microplastics most of them in a fragmented form (59.4%) and mainly detected in urban beaches, should be related to the geographical situation of this coastal lagoon, together with enormous environmental passives accumulated over the past 50 years. Only polyvinyl ester resins proved to be statistically higher in non-protected than in protected zones, probably related to their use in manufacturing boat hulls, although sources and pathways for microplastics are always difficult to assess. Measures to avoid microplastic pollution should be taken through educational programs, with also a clear commitment from plastic producers and transformers. Image 1 • Microplastic represented 51.1% of total microlitter. • Microplastic concentrations were highest northwest, consistent with water runoff. • Local activities; i.e., tourism and fishery, also influence microplastic abundance. • Film forms mainly made up of LDPE were present as a consequence of plastic greenhouses degradation. [ABSTRACT FROM AUTHOR]

Bayramoglu, G. and M. Y. Arica (2017). "Polyethylenimine and tris(2-aminoethyl)amine modified p(GA-EGMA) microbeads for sorption of uranium ions: equilibrium, kinetic and thermodynamic studies." Journal of Radioanalytical and Nuclear Chemistry **312**(2): 293-303.

Poly(glycidyl methacrylate-ethyleneglycol dimethacrylate), p(GA-EGMA), microbeads were prepared through suspension polymerization. It was decorated with polyethylene imine (PEIM) and tris(2-aminoethyl)amine (TAEA) ligands to decorate with polyamine groups. These microbeads were used for sorption of uranium ions from aqueous solution. The maximum sorption of uranium ions on the PEIM and TAEA modified microbeads was observed at pH 6.0. The maximum sorption capacity of acid hydrolyzed p(GA-EGMA)-OH, p(GA-EGMA)-PEIM and p(GA-EGMA)-TAEA microbeads was found to be 7.21, 87.8 and 64.3 mg g⁻¹. The sorption process conforms to the pseudo-second order kinetic model and the Langmuir and Temkin isotherm models well. Copyright © 2017, Akademiai Kiado, Budapest, Hungary.

Bayramoglu, G., et al. (2016). "Removal of bisphenol A from aqueous medium using molecularly surface imprinted microbeads." Chemosphere **150**: 275-284.

The aim of this study is to prepare bisphenol A (BPA) imprinted polymers, which can be used for the selective removal of BPA from aqueous medium. The BPA-imprinted (MIP) and non-imprinted (NIP) microbeads were synthesized, and characterized by Zeta-sizer, FTIR, SEM and BET method. Bisphenol A was determined in solutions using liquid chromatography-mass spectroscopy (LC-MS). The effect of initial concentration of BPA, the adsorption rate and the pH of the medium on the capacity of BPA-imprinting polymer were studied. Adsorption capacity of BPA was affected by the amount of the incorporated functional monomer in the polymer network. BPA adsorption capacity of MIP-3 and NIP microbeads from aqueous medium was estimated as 76.7 and 59.9 mg g(-1), respectively. The binding efficiencies of BPA-MIP-3

microbeads for different phenolic compounds (i.e., BPA with p-toluidine, 4-aminophenol or 2-naphthol) were explored at binary solutions, and the binding capacities of BPA-imprinted microbeads were found to be 2.79 x 10(-1), 2.39 x 10(-1), 7.59 x 10(-2) and 5.48 x 10(-2) mmol g(-1) microbeads, respectively. The satisfactory results demonstrated that the obtained BPA-MIP microbeads showed an appreciable binding specificity toward BPA than similar structural compounds in the aqueous medium. Moreover, the reusability of BPA-MIP-3 microbeads was tested for several times and no significant loss in adsorption capacity was observed. Finally, the binary and multi-component systems results show that MIP-3 microbeads have special recognition selectivity and excellent binding affinity for template molecule "BPA".

Bayramoglu, G., et al. (2011). "Immobilization of catalase via adsorption on poly(styrene-d-glycidylmethacrylate) grafted and tetraethyldiethylenetriamine ligand attached microbeads." Bioresource Technology **102**(4): 3653-3661.

Fibrous poly(styrene-d-glycidylmethacrylate) (P(S-GMA)) brushes were grafted on poly(styrene-divinylbenzene) (P(S-DVB)) beads using surface initiated-atom transfer radical polymerization (SI-ATRP). Tetraethyldiethylenetriamine (TEDETA) ligand was incorporated on P(GMA) block. The multi-modal ligand attached beads were used for reversible immobilization of catalase. The influences of pH, ionic strength and initial catalase concentration on the immobilization capacities of the P(S-DVB)-g-P(S-GMA)-TEDETA beads have been investigated. Catalase adsorption capacity of P(S-DVB-g-P(S-GMA)-TEDETA beads was found to be 40.8 +/- 1.7 mg/g beads at pH 6.5 (with an initial catalase concentration 1.0mg/mL). The K(m) value for immobilized catalase on the P(S-DVB-g-P(S-GMA)-TEDETA beads (0.43 +/- 0.02 mM) was found about 1.7-fold higher than that of free enzyme (0.25 +/- 0.03 mM). Optimum operational temperature and pH was increased upon immobilization. The same support was repeatedly used five times for immobilization of catalase after regeneration without significant loss in adsorption capacity or enzyme activity.

Bazilchuk, N. (2006). "High-Seas Garbage Pickup." Conservation in Practice **7**(1): 1.

The article describes an effort to track ocean debris aboard a National Oceanic and Atmospheric Administration hurricane hunter airplane in the Pacific. The crew of the airplane found plastic fishing debris, such as individual floats and great balls of netting. Fishing nets kill fish and marine mammals and harming coral reefs. Abandoned fishing nets in the North Pacific also damage the Hawaiian archipelago.

Baztan, J., et al. (2014). "Protected areas in the Atlantic facing the hazards of micro-plastic pollution: First diagnosis of three islands in the Canary Current." Marine Pollution Bulletin **80**(1-2): 302-311.

Coastal zones and the biosphere as a whole show signs of cumulative degradation due to the use and disposal of plastics. To better understand the manifestation of plastic pollution in the Atlantic Ocean, we partnered with local communities to determine the concentrations of micro-plastics in 125 beaches on three islands in the Canary Current: Lanzarote, La Graciosa, and Fuerteventura. We found that, in spite of being located in highly-protected natural areas, all beaches in our study area are exceedingly vulnerable to micro-plastic pollution, with pollution levels reaching concentrations greater than 100. g of plastic in 1. l of sediment. This paper contributes to ongoing efforts to develop solutions to plastic pollution by addressing the questions: (i) Where does this pollution come from?; (ii) How much plastic pollution is in the world's oceans and coastal zones?; (iii) What are the consequences for the biosphere?; and (iv) What are possible solutions?. © 2014 Elsevier Ltd.

Beato, F., et al. (2012). "Purification and expansion of antigen-specific human tregs for clinical application using a single step CD25 positive selection." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Background: Regulatory T cells (Tregs) play a role in maintaining T cell homeostasis and self-tolerance. Tregs immunotherapy has great potential for the prevention of allograft rejection and graft-vs-host disease (GVHD), but GMP reagents and procedures are required for clinical use. We have shown that allo-specific Tregs can be isolated by positive CD25 selection and negative selection of CD127, CD8 and CD19 by Miltenyi immunobeads, and then expanded in amounts sufficient for potential clinical use. Such a number of immunobeads would make a GMP procedure so costly to be clinically unaffordable. Therefore, in this study we tested whether a single step of CD25 positive selection using magnetic micro beads followed by expansion with allogeneic DC, rapamycin, IL-2, and IL-15 for 12 days generates Tregs that retain their phenotype (Foxp3) expression to a high level, are minimally contaminated with non-Tregs, and are highly suppressive. We explored a simplified approach that employs only CD25 positive selection, followed by culture. Concerns still remain on the purity and contamination of the expanded population, in particular contamination with cytotoxic CD8⁺T cells as these cells could have unfavorable outcomes in immunotherapy trials. Method(s): We purified Tregs using the 'clinical grade' CD25 human positive selection magnetic beads from Miltenyi; we then labeled the Tregs with CFSE and cultured with allogeneic monocyte-derived DC as stimulus in the presence of rapamycin, IL-2 and IL-15. At the end of 12 days expanded allo-specific Tregs were analyzed for their phenotype, sorted and tested for alloreactive and suppressive functions. We performed a total of 10 experiments: Results: The purity of CD4⁺CD25⁺CD127dim Foxp3⁺after the initial separation ranged from 20-83%, median-44%. (Table Presented) To assess whether the non-Tregs in the culture were allo-reactive we sorted the expanded Tregs into: CFSE⁺CD25⁺, CFSE-CD25-, CFSE⁺CD25-, CFSE-CD25⁺, we then set up a 3 and 6 days mixed leukocyte reaction (MLR) against the initial stimulator or self. Non-Tregs in the culture did not respond to antigen with or without IL-2, whereas the allo-reactive Tregs, CFSE-CD25⁺, responded to allogeneic DC only in the presence of IL-2. CFSE⁺ Tregs did not respond even in the presence of IL-2. To determine whether the entire expanded population was enriched with antigen specific suppression, we culture the enriched 'Tregs' at various ratios with naive autologous CD4⁺CD25-responder T cells and allogeneic DC from original stimulator, and found that a 50% suppression was achieved with a 1:2000 Treg:Tconv ratio. To analyze fidelity of cytokine secretion profile, we re-stimulated cultured 'Tregs' with allogeneic DC or PMA/Iononycin and compared data to expanded Tconv from the same individual; Tregs had significantly more TGF-beta and less TNF-alpha secretion than Tconv. Conclusion(s): Our data demonstrate that Tregs purified with the GMP-compatible CD25 Miltenyi immunobeads can be expanded, retain high levels of Foxp3 expression, and maintain high suppressive potency. The frequency of contaminating cells after culture was small and we did not observed residual alloreactivity.

Beaumont, N. J., et al. (2019). "Global ecological, social and economic impacts of marine plastic." Marine Pollution Bulletin **142**: 189-195.

This research takes a holistic approach to considering the consequences of marine plastic pollution. A semi-systematic literature review of 1191 data points provides the basis to determine the global ecological, social and economic impacts. An ecosystem impact analysis demonstrates that there is global evidence of impact with medium to high frequency on all subjects, with a medium to high degree of irreversibility. A novel translation of these ecological impacts into ecosystem service impacts provides evidence that all ecosystem services are impacted to some extent by the presence of marine plastic, with a reduction in provision predicted for all except one. This reduction in ecosystem service provision is evidenced to have implications for human health and wellbeing, linked particularly to fisheries, heritage and charismatic species, and recreation.

Becker-Merok, A., et al. (2012). "Interferon-alpha2 protein levels are increased in the majority of patients with systemic lupus erythematosus and associated with disease activity and activation of multiple cytokines." Scandinavian Journal of Rheumatology **126)**: 25.

Background: Associations between systemic lupus erythematosus (SLE) and mutations in interferon (IFN) regulatory factor genes and expression of IFNinducible genes are well known. The impact of circulating IFN-alpha protein in SLE has not yet been studied extensively. Objective(s): To determine the function of circulating IFN-alpha protein in SLE. Method(s): We used a highly sensitive solution-phase multiplex magnetized bead assay to investigate circulating levels of IFN-alpha2 in relation to autoantibody profiles, clinical disease activity, and other inflammatory cytokines in a cross-sectional study of SLE patients (n = 87). Cytokine levels were determined on stored sera aliquots and cut-off levels were determined by the geometric mean + 2 SD in healthy controls (n = 27). Result(s): IFN-alpha2 levels were increased in 64% of SLE patients, who displayed a higher prevalence of ongoing renal disease (nephritis defined as proteinuria > 0.5 g/24 h with active urinary sediment; 0 vs. 11%, p = 0.06), higher disease activity [SLE Disease Activity Index (SLEDAI) score 4 vs. 8, p = 0.07], and had a significantly higher sum of activated cytokines (median 4.5, range 7) compared to patients with normal IFN-alpha2 (median 1, range 3; p < 0.001). Conclusion(s): Solution-phase microbead assay identified increased IFN-alpha2 levels in two-thirds of SLE patients with longstanding disease. These data indicate that IFN-alpha2 not only is a susceptibility factor for SLE but also has a role in disease perpetuation in a large subset of SLE patients. The results are encouraging with respect to potential therapeutic implications.

Becker-Merok, A., et al. (2013). "Circulating interferon-alpha2 levels are increased in the majority of patients with systemic lupus erythematosus and are associated with disease activity and multiple cytokine activation." Lupus **22**(2): 155-163.

Mutations in interferon (IFN) regulatory factor genes and the biological activity of type I IFN on expression of specific genes that are induced by IFN have been associated with various aspects of systemic lupus erythematosus (SLE). Circulating levels of IFN-alpha in SLE has not been extensively studied because of limited sensitivity of available ELISA assays. We performed a cross-sectional case-control study where circulating levels of IFN-alpha2 were measured by a highly sensitive, solution phase multiplex magnetized bead assay and investigated the relation of IFN-alpha2 with autoantibody profiles, clinical disease activity and levels of inflammatory cytokines in SLE patients (n = 87). Cytokine levels were determined on stored sera aliquots with cut-off levels determined by the geometric mean + 2SD in healthy controls (n = 27). IFN-alpha2 levels were increased in 64% of SLE patients, who displayed more renal disease and higher disease activity (p = 0.06) and had a significantly higher sum of activated cytokines (median 4.5, range 7) compared to patients with normal IFN-alpha2 (median one, range 3; p < 0.001). Solution phase micro-bead assay thus identified increased IFN-alpha2 levels in two-thirds of SLE patients with longstanding disease. The association with clinical disease and activation of multiple inflammatory cytokines supports a role for IFN-alpha2 in disease perpetuation in a large subset of SLE patients.

Beckingham, B. and U. Ghosh (2017). "Differential bioavailability of polychlorinated biphenyls associated with environmental particles: Microplastic in comparison to wood, coal and biochar." Environmental Pollution **Part A. 220**: 150-158.

Microplastic particles are increasingly being discovered in diverse habitats and a host of species are found to ingest them. Since plastics are known to sorb hydrophobic organic contaminants (HOCs) there is a question of what risk of chemical exposure is posed to aquatic biota from microplastic-associated contaminants. We investigate bioavailability of polychlorinated biphenyls (PCBs) from polypropylene microplastic by measuring solid-water distribution coefficients, gut fluid solubilization, and bioaccumulation using sediment invertebrate worms as a test system. Microplastic-associated PCBs are placed in a differential bioavailability framework by comparing the results to several other natural and anthrogenic particles, including wood, coal, and biochar. PCB distribution coefficients for polypropylene were higher than natural organic materials like wood, but in the range of lipids and sediment organic carbon, and smaller than black carbons like coal and biochars. Gut fluid solubilization potential increased in the order: coal < polypropylene < biochar < wood. Interestingly, lower gut fluid solubilization for polypropylene than biochar infers that gut fluid micelles may have solubilized part of the biochar matrix while bioaccessibility from plastic can be limited by the solubilizing potential of gut fluids dependent on the solid to liquid ratio or renewal of fluids in the gut. Biouptake in worms was lower by 76% when PCBs were associated with polypropylene compared to sediment. The presence of microplastics in sediments had an overall impact of reducing bioavailability and transfer of HOCs to sediment-ingesting organisms. Since the vast majority of sediment and suspended particles in the environment are natural organic and inorganic materials, pollutant transfer through particle ingestion will be dominated by these particles and not microplastics. Therefore, these results support the conclusion that in most cases the transfer of organic pollutants to aquatic organisms from microplastic in the diet is likely a small contribution compared to other natural pathways of exposure. Copyright © 2016 Elsevier Ltd

Beckman, J. A., et al. (2019). "Comparative Transcriptomics of Ex Vivo, Patient-Derived Endothelial Cells Reveals Novel Pathways Associated With Type 2 Diabetes Mellitus." JACC **4**(5): 567-574.

In this study low-input RNA-sequencing was used to annotate the molecular identity of endothelial cells isolated and immunopurified with CD144 microbeads. Using this technique, comparative gene expression profiling from healthy subjects and patients with type 2 diabetes mellitus identified both known and novel pathways linked with EC dysfunction. Modeling of diabetes by treating cultured ECs with high glucose identified shared changes in gene expression in diabetic cells. Overall, the data demonstrate how purified ECs from patients can be used to generate new hypotheses about mechanisms of human vascular disease.

Beckwith, V. K. and M. M. P. B. Fuentes (2018). "Microplastic at nesting grounds used by the northern Gulf of Mexico loggerhead recovery unit." Marine Pollution Bulletin **131**: 32-37.

Microplastics can impact key habitats used by endangered species, such as marine turtles. They impact the environment by transporting toxicants and altering sediment properties affecting temperature and sediment permeability. Our study determined the exposure of the ten most important nesting sites for the Northern Gulf of Mexico Loggerhead Recovery Unit to microplastic. Sand samples were obtained at each nesting site during the 2017 nesting season and analyzed for abundance and characteristics of microplastic. Microplastic was found at all sites, with an average abundance of 61.08+or-34.61 pieces/m², and 59.9% located at the dunes, where turtles primarily nest. A gradual decrease in microplastics abundance was observed from the most western nesting ground to the east. The results from this study indicate that microplastic accumulation on nesting sites for the Northern Gulf of Mexico may be of great concern, and could negatively affect the incubating environment for marine turtles.

Becquart, P., et al. (2006). "Quantitation of HIV-1 RNA in breast milk by real time PCR." Journal of Virological Methods **133**(1): 109-111.

HIV-1 RNA in breast milk is a strong predictor of HIV-1 transmission through breastfeeding. In the present report, breast milk samples from HIV-1 uninfected donors were spiked with dilution of quantified culture supernatant from HIV-1_{NDK} infected PBMC. Two RNA extraction techniques based on silica extraction, NuclisensReg. (BioMerieux) and Triazol (Qiagen), two techniques based on guanidine thiocynanate/chloroforme extraction, TRIzol (Life Technologie) and Amplicor HIV-1 Monitor^{TM} (Roche Diagnostic Systems), and one technique based on electrostatic adsorption on iron oxide micro beads (Promega) were compared. HIV-1 RNA was quantitated by real time PCR (LTR gene) and Amplicor HIV-1 Monitor^{TM}. Combining magnetic micro beads extraction and real time PCR quantitation allowed to correctly quantify breast milk HIV-1 RNA, with a difference between the expected and measured HIV-1 RNA levels always lower than 0.3 log copies/ml. The same combination was confirmed on 25 breast milk samples from HIV-1 infected women collected in Kwazulu-Natal, South Africa, by comparing measurements with those obtained by the Amplicor HIV-1 Monitor^{TM} (r²=0.88). Nucleic acid extraction by magnetic micro beads followed by real time PCR is a reliable, sensitive, rapid and simple procedure to quantify HIV-1 RNA in breast milk and allows for PCR inhibitors found frequently in these samples.

Beer, S., et al. (2018). "No increase in marine microplastic concentration over the last three decades - A case study from the Baltic Sea." Science of the Total Environment **621**: 1272-1279.

Microplastic is considered a potential threat to marine life as it is ingested by a wide variety of species. Most studies on microplastic ingestion are short-term investigations and little is currently known about how this potential threat has developed over the last decades where global plastic production has increased exponentially. Here we present the first long-term study on microplastic in the marine environment, covering three decades from 1987 to 2015, based on a unique sample set originally collected and conserved for food web studies. We investigated the microplastic concentration in plankton samples and in digestive tracts of two economically and ecologically important planktivorous forage fish species, Atlantic herring (Clupea harengus) and European sprat (Sprattus sprattus), in the Baltic Sea, an ecosystem which is under high anthropogenic pressure and has undergone considerable changes over the past decades. Surprisingly, neither the concentration of microplastic in the plankton samples nor in the digestive tracts changed significantly over the investigated time period. Average microplastic concentration in the plankton samples was 0.21+/-0.15particlesm⁻³. Of 814 fish examined, 20% contained plastic particles, of which 95% were characterized as microplastic (<5mm) and of these 93% were fibres. There were no significant differences in the plastic content between species, locations, or time of day the fish were caught. However, fish size and microplastic in the digestive tracts were positively correlated, and the fish contained more plastic during summer than during spring, which may be explained by increased food uptake with size and seasonal differences in feeding activity. This study highlights that even though microplastic has been present in the Baltic environment and the digestive tracts of fishes for decades, the levels have not changed in this period. This underscores the need for greater understanding of how plastic is cycled through marine ecosystems. The stability of plastic concentration and contamination over time observed here indicates that the type and level of

microplastic pollution may be more closely correlated to specific human activities in a region than to global plastic production and utilization as such.

Beiras, R., et al. (2018). "Ingestion and contact with polyethylene microplastics does not cause acute toxicity on marine zooplankton." Journal of Hazardous Materials **360**: 452-460.

Toxicity of polyethylene microplastics (PE-MP) of size ranges similar to their natural food to zooplanktonic organisms representative of the main taxa present in marine plankton, including rotifers, copepods, bivalves, echinoderms and fish, was evaluated. Early life stages (ELS) were prioritized as testing models in order to maximize sensitivity. Treatments included particles spiked with benzophenone-3 (BP-3), a hydrophobic organic chemical used in cosmetics with direct input in coastal areas. Despite documented ingestion of both virgin and BP-3 spiked microplastics no acute toxicity was found at loads orders of magnitude above environmentally relevant concentrations on any of the invertebrate models. In fish tests some effects, including premature or reduced hatching, were observed after 12 d exposure at 10 mg L-1 of BP-3 spiked PE-MP. The results obtained do not support environmentally relevant risk of microplastics on marine zooplankton. Similar approaches testing more hydrophobic chemicals with higher acute toxicity are needed before these conclusions could be extended to other organic pollutants common in marine ecosystems. Therefore, the replacement of these polymers in consumer products must be carefully considered.

Beiras, R., et al. (2019). "Polyethylene microplastics do not increase bioaccumulation or toxicity of nonylphenol and 4-MBC to marine zooplankton." Science of the Total Environment **692**: 1-9.

Global production of synthetic polymers, led by polyethylene (PE), rose steadily in the last decades, and marine ecosystems are considered as a global sink. Although PE is not biodegradable, in coastal areas it fragments into microplastics (MP) readily taken up by biota, and have been postulated as vectors of hydrophobic chemicals to marine organisms. We have tested this hypothesis using two organisms representative of the marine plankton, the holoplanktonic copepod Acartia clausi, and the meroplanktonic larva of the Paracentrotus lividus sea-urchin, and two model chemicals with similar hydrophobic properties, the 4-n-Nonylphenol and the 4-Methylbenzylidene-camphor used as plastic additive and UV filter in cosmetics. Both test species actively ingested the MP particles. However, the presence of MP never increased the bioaccumulation of neither model chemicals, nor their toxicity to the exposed organisms. Bioaccumulation was a linear function of waterborne chemical disregarding the level of MP. Toxicity, assessed by the threshold (EC₁₀) and median (EC₅₀) effect levels, was either independent of the level of MP or even in some instances significantly decreased in the presence of MPs. These consistent results challenge the assumption that MP act as vectors of hydrophobic chemicals to planktonic marine organisms.

Beiras, R. and T. Tato (2019). "Microplastics do not increase toxicity of a hydrophobic organic chemical to marine plankton." Marine Pollution Bulletin **138**: 58-62.

Planktonic sea-urchin larvae actively ingest polyethylene microplastics (MP) that accumulate in the larval stomach and can be distinguished from natural food using polarized light microscopy. MP filtering rates were similar to those of natural particles (microalgae) of the same size range; 0.30 to 0.35 mL min⁻¹. However, the ingestion of MP did not increase the toxicity of a hydrophobic organic chemical, the 4-n-nonylphenol (NP), either in microalgae-fed or starved larvae. The 48 h EC₅₀ of NP was more than two fold higher in fed (158.8 to 190.9 micro g L⁻¹) compared to starved larvae (64.3 to 83.7 micro g L⁻¹), disregarding the presence and amount of MP, which did not significantly affect larval growth. Therefore, MP did not act as vectors of a hydrophobic chemical such as NP to these planktonic organisms. These results challenge the hypothetical role of MP as vectors of organic contaminants to marine food webs.

Beiras, R., et al. (2019). "A 2-Tier standard method to test the toxicity of microplastics in marine water using <i>Paracentrotus lividu</i>s and <i>Acartia clausi</i> larvae." Environmental Toxicology and Chemistry **38**(3): 630-637.

A 2-tier standardized protocol was designed to test the toxicity of microplastics to planktonic organisms. This approach uses sea urchin (Paracentrotus lividus) and copepod (Acartia clausi) larvae because they are common biological models in marine research, and standard methods for toxicity testing with regulatory applications are available. In Tier I, leachates obtained at a 100 to 1 liquid to solid ratio are tested, and toxic units are calculated using a probit dose–response model to quantify the toxicity of the plastics. In Tier II, which is conducted only if significant toxicity (> 1 toxic unit) is found in Tier I, particles less than 20 μm in size are tested at concentrations between 0.1 and 10 mg L−1, and a toxicity threshold suitable for ranking materials according to their toxicity is obtained from the 10% effect concentration (EC10) values. Results point to chemical additives as being responsible for the toxicity found in certain plastic materials. This process is suitable for both a priori identification of the hazard posed by plastic objects in the aquatic environment, and a posteriori assessment of environmental risk caused by microplastic pollution. The method also provides a quantitative procedure appropriate for ranking plastic materials according to their toxicity to aquatic organisms. Environ Toxicol Chem 2019;38:630–637. © 2018 SETAC

Bekhit, M., et al. (2016). "Encapsulation of Lactococcus lactis subsp. lactis on alginate/pectin composite microbeads: effect of matrix composition on bacterial survival and nisin release." Journal of Food Engineering **180**: 1-9.

Alginate/pectin hydrogel microspheres were prepared by extrusion based on a vibrating technology to encapsulate bacteriocin-producing lactic acid bacteria. Effects of both alginate/pectin (A/P) biopolymers ratio and physiological state of Lactococcus lactis subsp. lactis (exponential phase, stationary phase) were examined for nisin release properties, L. lactis survival and beads physico-chemical properties. Results showed that A/P composites were more efficient to increase beads properties than those formulated with pure alginate or pectin. Association of alginate and pectin induces synergistic effect which improves microbeads mechanical properties. FTIR spectroscopy confirms possible interactions between alginate and pectin during inter-penetrating network formation. Physiological state of bacteria during encapsulation process and microbeads composition (A/P ratio, enrichment of internal medium with nutrients) were determining factors for both bacteria viability and bacteriocin release. Of the several matrices tested A/P (75/25) with glucose-enriched M17 gave the best results when L. lactis was encapsulated in exponential state.

Belak-Cvitanovi, A., et al. (2011). Comparative analysis of different alginate-based immobilization systems for encapsulation of polyphenolic antioxidants from red raspberry leaves (Rubus idaeus L.) by electrostatic extrusion. 7th International Congress of Food Technologists, Biotechnologists and Nutritionists, 2011, September 20, 2011 - September 23, 2011, Opatija, Croatia, Croatian Society of Food Technologists, Biotechnologists and Nutritionists.

Traditionally used in folk medicine for its health benefits, leaves of red raspberry (Rubus idaeus L.) present a rich source of bioactive compunds and contributes to an increase of the overall intake of bioactive compounds in the daily diet, so an effective supplementation form containing red raspberry leaves bioactives should be established. Up to date spray drying has been mainly used as a technique for the entrappment of polyphenolic compounds from various plant substrates. Since spray-drying requires complex equipment and high energy inputs, a need arises for development of an effective immobilization system applying a simple technique, such as electrostatic extrusion. The aim of this study was to encapsulate polyphenolic compounds from red raspberry leaves extract in different alginate-based matrices using electrostatic extrusion. For that purpose plain alginate, as well as caseine and chitosan reinforced alginate microbeads were evaluated in terms of encapsulation efficiency and release profiles of polyphenols in water. The release kinetics was determined by following total phenol content and antioxidant capacity during time period of 24h, where antioxidant capacity was measured by ABTS radical scavenging assay. The obtained results revealed the same difussion controlled release patterns for all samples. The majority of polyphenolic compounds are released during 10-15 min, while the encapsulation efficiency varied between 80.5 % for alginate and 84.4 % for chitosan-alginate microbeads. In addition to alginate-based microbeads described above, Ca-alginate microbeads containing dextrose as a filler substance were prepared by absorption of raspberry leaves extract compounds in blank Ca-alginate microbeads. In this case, somewhat lower encapsulation efficiency (77%) was determined, while diffussion rate of polyphenolic compounds was nearly the same. The results suggest the potential of alginate-based microbeads prepared by electrostatic extrusion to be used for delivery of bioactive compounds, and contribute to the development of novel functional food products, as well as antioxidant-containing supplements for pharmaceutical and cosmetic aplications.

Belharet, K., et al. (2014). Study on rotational and unclogging motions of magnetic chain-like microrobot. IEEE International Conference on Intelligent Robots and Systems.

Magnetic microrobotics was nowadays one of the most advanced technique to reach deep locations in human body for future biomedical applications. Different magnetic microrobot designs were proposed, such as bead pulling or microswimmers. In this paper, the use of chain-like of magnetic N-microspheres was investigated to enable new kind of motions and applications. An accurate theoretical model of chain-like magnetic microbeads navigating in viscous fluidic environments is described. Thus, the behavior of such microrobot was analyzed for different number of microspheres (ranging from N = 2 to 5). The efficiency of the proposed technique was demonstrated experimentally in a microfluidic vessel phantom to mimic atherosclerosis disease leading to plaque formation that fully occluded a vasculature. © 2014 IEEE.

Beligaswatte, A., et al. (2013). "The mean fluorescence intensities of anti-HLA antibodies detected using micro-bead flow cytometry predict the risk of platelet transfusion refractoriness." British Journal of Haematology **162**(3): 409-412.

There are no accepted methods to predict the development of platelet transfusion refractoriness (PTR) due to human leucocyte antigen (HLA)-alloimmunization. Hence, matched platelets are usually given only to patients demonstrating PTR, necessarily resulting in some ineffective random donor platelets (RDPLT) transfusions. To assess its utility in predicting PTR, we retrospectively tested samples from 387 patients receiving chemotherapy for acute leukaemia or autologous transplantation using a micro-bead flow cytometry assay. The average of the mean fluorescence intensities (avgMFI) of the class I beads in the screening assay was correlated with outcomes of RDPLT transfusions during a 2 week period. Antibodies were detected in 57 patients; 66 developed PTR, of whom 28 were alloimmunized. avgMFI usefully predicted the development of PTR (area under the receiver operating curve 0.87, 95%

confidence interval: 0.77-0.96). A logistic regression model estimated the probability of PTR to be >90% when avgMFI >5440. These results indicate that micro-bead flow cytometry assays could inform a risk-adapted strategy for managing thrombocytopaenic HLA allo-immunized patients.

Belkaid, Y., et al. (1998). "Analysis of cytokine production by inflammatory mouse macrophages at the single-cell level: selective impairment of IL-12 induction in Leishmania-infected cells." European Journal of Immunology **28**(4): 1389-1400.

Intracellular staining for cytokines and parasites, combined with 2-colour flow cytometric analyses, were used to examine the frequencies of IL-12-, TNF- alpha - and IL-6-producing macrophages in response to Leishmania major infection and/or activation with IFN- gamma /lipopolysaccharide (LPS). Inflammatory macrophages were obtained from nonimmune granulomas, initiated by the injection of polyacrylamide microbeads (Bio-gel P-100) into subcutaneous pouches of 4 mouse strains (BALB/c, C3H/HeN, C57BL/6, CBA). Infection of inflammatory macrophages in vitro using metacyclic promastigotes produced identical effects on cytokine responses regardless of whether cells from genetically resistant or susceptible mouse strains were used: IL-12 was not produced in response to infection itself, virtually every infected cell lost its ability to produce IL-12 in response to IFN- gamma /LPS, and the IL-6 response was partially inhibited, whereas the TNF- alpha response of infected cells was unimpaired. Low-multiplicity infection of inflammatory macrophages in vivo using either metacyclic promastigotes or tissue amastigotes also resulted in the complete and selective inhibition of IL-12 responses in infected cells. These data establish the physiologic relevance of prior observations regarding the selective impairment of IL-12 induction pathways in infected macrophages, and suggest a mechanisms for the delayed onset of cell-mediated control mechanisms that is typical of even self-limiting forms of leishmanial disease.

Bellas, J., et al. (2016). "Ingestion of microplastics by demersal fish from the Spanish Atlantic and Mediterranean coasts." Marine Pollution Bulletin **109**(1): 55-60.

Microplastic pollution has received increased attention over the last few years. This study documents microplastic ingestion in three commercially relevant demersal fish species from the Spanish Atlantic and Mediterranean coasts, the lesser spotted dogfish Scyliorhinus canicula, the European hake Merluccius merluccius and the red mullet Mullus barbatus. Overall 212 fish were examined, 72 dogfish, 12 hakes and 128 red mullets. The percentage of fish with microplastics was 17.5% (15.3% dogfish, 18.8% red mullets and 16.7% hakes), averaging 1.56+or-0.5 items per fish, and the size of the microplastics ranged from 0.38 to 3.1 mm. These fish species are used currently as biomonitors for marine pollution monitoring within the Spanish Marine Pollution Monitoring Programme (SMP), and may be as well suitable candidates for monitoring spatial and temporal trends of ingested litter. The data presented here represent a baseline for the implementation of the Marine Strategy Framework Directive descriptor 10 in Spain.

Belli, B. (2012). "Plastic Seas." E THIS WEEK: 8-8.

The article presents information related to the problem of plastic waste in the oceans around the world. It is stated that a research by the Five Gyres found that much of the plastic waste is distributed vertically due to wind mixing ocean layers. It is mentioned that plastic debris also breaks down fairly rapidly in sea water besides strangling and choking marine life.

Bellingeri, A., et al. (2019). "Combined effects of nanoplastics and copper on the freshwater alga Raphidocelis subcapitata." Aquatic Toxicology **210**: 179-187.

Nanoplastics are recognized as able to interact with other pollutants including heavy metals, and with natural organic matter, with implications for the potential risks to biota. We investigated the interaction of carboxylated polystyrene nanoparticles (PS-COOH NPs) with copper (Cu) and algal exudates (EPS) and how such interaction could affect Cu toxicity towards the freshwater microalga Raphidocelis subcapitata. PS-COOH NPs behavior in the presence of Cu and EPS was determined by dynamic light scattering (DLS), while PS-COOH NPs surface interaction with Cu ions and EPS was investigated by fluorimetric analysis. ICP-MS was used to test Cu ion adsorption to PS-COOH NPs in the presence and absence of algae. The interaction between PS-COOH NPs and the algal cell wall was assessed by fluorescence microscopy. Short- and long-term toxicity tests were carried out in parallel to assess the impact of PS-COOH NPs on algal growth.

Bellofiore, A., et al. (2012). "Impact of acute pulmonary artery stiffening on right ventricular function in a canine model." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **185**(MeetingAbstracts).

RATIONALE Stiffening of the large pulmonary arteries (PA) is a stronger predictor of mortality in pulmonary arterial hypertension (PAH) than either mean PA pressure (mPAP) or pulmonary vascular resistance (PVR) [1]. However, the determinants of PA stiffening in PAH are not well understood. Pressure alone increases arterial stiffness via stretch/strain (strain-stiffening) [2]; chronic accumulation of extracellular matrix such as collagen [3] also increases stiffness (remodeling). Here we sought to create PA strain-stiffening in the absence of PA remodeling and quantify right ventricular (RV) function and the efficiency of RV-PA hemodynamic interactions (eta<inf>vv</inf>). We hypothesize that PA strain-stiffening impairs RV function but that a healthy RV is able to compensate and maintain adequate efficiency (eta<inf>vv</inf> > 1) [4]. METHODS Acute PAH was induced in six female beagles under isoflurane anesthesia by injecting micro-beads (150-500 mum) into the RV. Right heart catheterization (RHC) was performed to measure RV and mPAP. Cardiac MRI was performed to assess RV function (2D CINE balanced SSFP) and PA relative area change (RAC) over the cardiac cycle (velocity-encoded 2D phase contrast). Both RHC and MRI were performed before (PRE) and after (POST) embolization. RESULTS Hemodynamic, RV function and eta<inf>vv</inf> measures PRE and POST are shown in Table 1. Embolization increased mPAP and PVR, decreased PA compliance (RAC and CPA) and increased PA stiffness (beta). RV volumes (ESV, EDV, SV and EF) did not change significantly, although the increased afterload resulted in a threefold increase in stroke work. The RV-PA hemodynamic coupling efficiency eta<inf>vv</inf> decreased from 3.28+/-1.08 to 1.63+/-0.93 (p<0.05). A novel MRI-only technique for calculating eta<inf>vv</inf> recently proposed by Sanz et al. [5] also decreased but the change was not significant. CONCLUSIONS An acute increase in mPAP dramatically stiffens the main PA, which contributes to increased RV afterload. This increase in afterload decreases the hemodynamic efficiency of RV-PA interactions but does not cause decoupling (eta<inf>vv</inf> < 1). Comparison to a model in which both strain-stiffening and remodeling occur will help clarify the mechanisms by which PA stiffening impairs RV function and thus predicts RV failure in patients with PAH. (Table Presented).

Beloki, L., et al. (2013). "The abrogation of TCR-independent interactions with human serum ensures a selective capture of therapeutic virus-specific CD8+ T-cells by multimer technology in Adoptive Immunotherapy." Journal of Immunological Methods **396**(1-2): 168-172.

Multimers are complexes of recombinant MHC-class I molecules conjugated with antigenic immunodominant peptides and labeled with fluorescent molecules or magnetic microbeads that allow the quantification and selection of virus-specific cytotoxic T-cell subpopulations. Specific

T-cell receptors recognize the immunodominant peptides and bind to the multimers. Although these complexes are only recognized by CD8(+) T cells with specific T-cell receptors for the particular antigen, it has been observed that multimers can also bind non-specifically to CD8- cells, such as B-cells and monocytes. Using PBMCs from CMV-seropositive healthy donors, we analyze the tendency of Pentamer and Streptamer multimers towards non-specific interactions and describe a method to avoid this unwanted event. We find that a notable proportion of multimer-positive cells are likely to represent cross-contamination by cells lacking a TCR specific for pp65. In addition, we demonstrate that this unspecific interaction can be overcome by the pre-incubation of multimer-stained PBMCs with human AB serum, without altering their capacity to bind specifically to the CD8(+) T cell population of interest. In conclusion, in this study we characterize a novel method to abrogate TCR-independent interactions of multimers to ensure a pure and safe therapeutic product for Adoptive Immunotherapy.

Belontz, S. L., et al. (2019). "Embracing an interdisciplinary approach to plastics pollution awareness and action." AMBIO - A Journal of the Human Environment **48**(8): 855-866.

This paper considers how an interdisciplinary approach to the "wicked problem" of plastics pollution offers unique and important collaborative possibilities. Specially, the paper considers the approach of the Synthetic Collective, a group comprising artists, humanities scholars, and scientists. Considering first how artists and scientists might respond differently to tracking, mapping, understanding, and representing plastics pollution, we then look for potential points of commonality across disciplinary difference. In respect to the urgent and multifaceted problem of marine plastics pollution in the Great Lakes region, we ask what are some of the successes and pitfalls of bringing together diverse approaches and interests? The paper concludes with a clear strategy: a set of instructions geared towards building successful interdisciplinary collaborations. Ultimately, we conclude that a strong relationship amongst scientists and artists is possible, fruitful, and indeed warranted when shared goals are the driving principle of the group. [ABSTRACT FROM AUTHOR]

Belscak-Cvitanovic, A., et al. (2017). "Chemometric evaluation of binary mixtures of alginate and polysaccharide biopolymers as carriers for microencapsulation of green tea polyphenols." International Journal of Food Properties **20**(9): 1971-1986.

In this study principal component analysis and artificial neural networks were used to evaluate the potential of using binary mixtures of sodium alginate and other polysaccharide biopolymers as the carriers for microencapsulation of green tea bioactive compounds. Using binary mixtures of alginate and adjunct biopolymers increased the particle size (from 722 to 1344 micro m) and textural parameters of the microbeads. Chemometric techniques revealed the combination of biopolymers and their ratio as the main factors influencing the encapsulation performance. The combination of alginate with hydroxypropyl methylcellulose and locust bean gum enabled to retain the highest (-)-epigallocatechin gallate and caffeine contents, the highest total phenols encapsulation efficiency, and their most retarded release in water, confirming these as the best delivery systems of polyphenol-type active compounds and signifying their potent food applications.

Belscak-Cvitanovic, A., et al. (2017). "Modification of functional quality of beer by using microencapsulated green tea (Camellia sinensis L.) and Ganoderma mushroom (Ganoderma lucidum L.) bioactive compounds." Chemical Industry & Chemical Engineering Quarterly **23**(4): 457-471.

Increasing interest in production of frequently consumed functional food products has focused the present study on implementation of microencapsulated Ganoderma mushroom and green tea bioactive compounds in beer production. Electrostatic extrusion assisted microencapsulation of green tea and Ganoderma extracts enabled production of particles ranging from 490 to 1000 micro m in size, with up to 75% of entrapped total polyphenols. Dried, powdered extracts, as well as microparticles encapsulating Ganoderma and green tea extracts that exhibited the best morphological properties and retarded release of polyphenols (alginate and alginate-chitosan coated, as well as chitosan coated pectin microbeads) were implemented in beer production. The addition of Ganoderma microbeads to pilsner beer did not augment its polyphenolic concentration (TPC), as opposed to the addition of green tea encapsulating microbeads to radler, while adding dried Ganoderma and spray dried green tea extracts enabled to increase the TPC for up to 3-fold higher values. Ganoderma dried extract-enriched pilsner beer and spray dried green tea extract-enriched radler were preferred in terms of sensory properties, due to the lowest bitterness intensity and most pronounced herbal aroma of the added adjuncts. Refrigerated storage of Ganoderma hydrogel microbeads-enriched pilsner beer revealed fluctuations of TPC, while green tea hydrogel microbeads-enriched radler exhibited better stability. The established methodology provides a procedure suitable for microencapsulate-enrichment of drink and food products, thus setting a reliable basis for future functional food production by microencapsulate implementation strategies.

Belscak-Cvitanovic, A., et al. (2011). "Encapsulation of polyphenolic antioxidants from medicinal plant extracts in alginate-chitosan system enhanced with ascorbic acid by electrostatic extrusion." Food Research International **44**(4): 1094-1101.

In this study the encapsulation of raspberry leaf, hawthorn, ground ivy, yarrow, nettle and olive leaf extracts was performed by electrostatic extrusion in alginate-chitosan microbeads, with ascorbic acid being used for the dissolution of chitosan. The original and encapsulated plant extracts were characterized for their polyphenol content and composition, mineral content and antioxidant capacity. Raspberry leaf encapsulating microbeads exhibited the highest total phenol content and antioxidant capacity, followed by hawthorn, while olive leaf microbeads contained the lowest total phenol content. High encapsulation efficiency was obtained for all extract encapsulating microbeads (80-89%). Nettle extract-containing microparticles were characterized with the largest particle size and irregular shape, due to a high content of microelements (copper, strontium, and zinc), which affected the gelling process of alginate. Although the antioxidant stability of hydrogel microcapsules was deteriorated during refrigerated storage, which might be attributed to the instability of ascorbic acid, the obtained microbeads deliver significant biological activity and antioxidant potential which may increase the daily intake of antioxidants when implemented in a food product.

Beltran-Sanahuja, A., et al. (2019). "Monitoring polymer degradation under different conditions in the marine environment." Environmental Pollution **259**: 113836.

The perdurability of plastics in the environment is one of the major concerns of plastic pollution and, as a consequence, oceans are accumulating large amounts of plastic. The degradation of conventional and biobased materials was evaluated through a laboratory experiment for a year simulating four different conditions in the marine environment. The water column

environmental compartment was simulated under euphotic and aphotic (with and without light availability) conditions. The seafloor environmental compartment was simulated with sediment under non-polluted and polluted conditions. By combining weight loss (%), spectroscopic and thermal analyses, the degradation patterns regarding the polymer structure were assessed. The studied biobased materials were polylactic acid (PLA) based materials and showed higher degradability than conventional ones. The weight loss of conventional materials was not influenced by the water column or sediment, while in PLA-based materials, the degradation rates were ca. 5 times greater in the sediment than in the water column. The absorbance (Abs) value at 3400 cm⁻¹ for polyethylene terephthalate (PET), and carbonyl (CO) index for PET and PLA could be useful to detect early signs of degradation. The crystallization index could be a useful parameter to discriminate degradation stages. The obtained results highlight the different degradability rates of materials depending on the specific environmental marine conditions.

Belzagui, F., et al. (2019). "Microplastics' emissions: Microfibers' detachment from textile garments." Environmental Pollution **248**: 1028-1035.

Microplastics (synthetic polymers <5mm) have been recently recognized as a big environmental concern, as their ubiquity is an undeniable fact. Their wide variety regarding shapes, sizes, and materials turn them into an intrinsically risky pollutant capable of causing several environmental impacts. Textile microfibers (MF) are a microplastic sub-group. These are mostly shed when a normal laundry of any garment takes place. Special attention has been put onto them, as high concentrations have been found in products for human consumption as shellfish and tap water. However, as there is no consensus on the methodologies to quantify and report the results of MFs detached from textile garments, the degree of similarity between published studies is very low. Hence, the aim of this research was to evaluate the microfibers' detachment rates of finished garments and to provide a set of comparable units to report the results. These were found to range between 175 and 560MF/g or 30000-465000MF/m² of garment. In addition, there was a high correlation between the MF detachment and the textile article superficial density. Finally, our results were compared with a recent paper that estimated the annual mass flow of MFs to the oceans. This previous publication is 30 times higher when related to the mass but 40 times lower if related to the number of MFs.

Bembridge, G. P., et al. (2000). "Respiratory syncytial virus infection of gene gun vaccinated mice induces Th2-driven pulmonary eosinophilia even in the absence of sensitisation to the fusion (F) or attachment (G) protein." Vaccine **19**(9-10): 1038-1046.

Complete protection against respiratory syncytial virus (RSV) infection was induced in mice vaccinated on two occasions with 2.5 mu g of DNA, encoding the fusion (F) protein of RSV, precipitated onto gold microbeads. In contrast, immunisation with DNA encoding the attachment (G) protein of RSV resulted in a significant reduction in viral load following infection, but did not afford complete protection. Gene gun delivery of DNA-F elicited a T helper-2 (Th2) biased immune response that could not be modulated by the co-delivery of plasmids encoding IL-2, IL-12 or IFN gamma . Similarly gene gun delivery of DNA-G primed a Th2 response. Thus, all gene gun vaccinated mice produced a predominant Th2 biased pulmonary immune response characterised by the production of IL-4 and IL-5 with little IFN gamma following RSV challenge. Analysis of bronchoalveolar lavage (BAL) cells, 5 days post challenge, indicated that there was only a two-fold increase in the number of inflammatory cells in vaccinated compared with control animals. Despite the strong Th2 cytokine bias of lung lymphocytes and the predominant recruitment of CD4 super(+) T cells, following challenge, there was not a marked pulmonary eosinophilic response (range from 2 to 7% of BAL). In contrast, the BAL from mice vaccinated with control plasmid contained significantly more eosinophils than any other group.

Ben Jazia, D., et al. (2011). "Imbibing drops of ethanol/water mixtures in model nanoporous networks with tunable pore structure: Deviation from square root to linear time regime imbibition kinetics." Colloids and Surfaces A: Physicochemical and Engineering Aspects **384**(1-3): 643-652.

In this paper, we report on the imbibition of model hydrophobic nanoporous networks formed by polystyrene (PS) microbead assemblies. Spontaneous imbibition of these structures with sessile drops was achieved using water/ethanol mixtures of higher wettability than pure water. We used the high sensitivity of particle coalescence to tiny temperature variations around T<inf>g</inf> to finely adjust the topographical features, and thereafter the imbibition properties of the porous networks. Reconstructions of the networks led to distinct and quantifiable variations of the free volume, and pore sizes. These model hydrophobic nanoporous systems allowed addressing the important issue of the interplay between the topographical features of a porous medium, and the free-imbibition kinetics of a liquid mixture droplet over a wide range of concentration, surface tension and hence, of driving capillary pressure. Our results show deviations from the expected square root time-dependence characterizing the imbibition in the Darcy's regime. In particular, a linear time-regime was observed above a threshold ethanol concentration (capillary pressure), and below a threshold sintering temperature of the microbead assembly. While the latter arises naturally as a result of the modification of the pore structure (sintering and pore closure), and hence of the pellet's permeability following the annealing, the deviation related to the composition of the liquid mixture is a less trivial and a quite new behaviour. Here we propose a phenomenological picture which allows accounting for this concentration-driven acceleration of the spontaneous imbibition, based on the singular properties of the liquid mixture which dynamically modify the local structure and conditions around the confined imbibition front, especially at high ethanol content. This work may thus contribute understanding imbibition behaviour of liquid mixtures and of complex fluid in general in nanoporous networks, an issue that is of technological relevance in current material science and engineering. © 2011 Elsevier B.V.

Benavides, P. T., et al. (2017). "Life-cycle analysis of fuels from post-use non-recycled plastics." Fuel **203**: 11.

Plastic-to-fuel (PTF) technology uses pyrolysis to convert plastic waste--especially non-recycled plastics (NRP)--into ultra-low sulfur diesel (ULSD) fuel. To assess the potential energy and environmental benefits associated with PTF technology, we calculated the energy, water consumption, and greenhouse gas emissions of NRP-derived ULSD and compared the results to those metrics for conventional ULSD fuel. For these analyses, we used the Greenhouse gases, Regulated Emissions and Energy use in Transportation (GREET®) model. Five companies provided pyrolysis process product yields and material and energy consumption data. Co-products of the process included char and fuel gas. Char can be landfilled, which, per the company responses, is the most common practice for this co-product, or it may be sold as an energy product. Fuel gas can be combusted to internally generate process heat and electricity. Sensitivity analyses investigated the influence of co-product handling methodology, product yield, electric grid composition, and assumed efficiency of char combustion technology on life-cycle greenhouse gas emissions. The sensitivity analysis indicates that the GHG emissions would likely be reduced up to 14% when it is compared to conventional ULSD, depending on the co-product treatment method used. NRP-derived ULSD fuel could therefore be considered at a minimum carbon neutral with the potential to offer a modest GHG reduction. Furthermore, this

waste-derived fuel had 58% lower water consumption and up to 96% lower fossil fuel consumption than conventional ULSD fuel in the base case. In addition to the comparison of PTF fuels with conventional transportation fuels, we also compare the results with alternative scenarios for managing NRP including power generation and landfilling in the United States.

Bencic-Nagale, S., et al. (2006). "Microbead chemical switches: an approach to detection of reactive organophosphate chemical warfare agent vapors." Journal of the American Chemical Society **128**(15): 5041-5048.

In this article, we describe the preparation and application of microbeads that exhibit a "turn on" fluorescence response within seconds of exposure to diethyl chlorophosphate (DCP) vapor. This sensing approach is modeled after the mechanism for acetylcholinesterase enzyme activity inhibition and uses a specific and irreversible reaction between phosphoryl halides and a fluorescent indicator. The microbeads are fabricated by adsorbing fluoresceinamine (FLA) onto carboxylate-functionalized polymer microbeads coated with poly(2-vinylpyridine) (PVP). When the microbeads are subjected to DCP vapor, the conversion of FLA into a phosphoramide causes a rapid and intense fluorescence increase. The PVP layer provides a high density of proton-accepting pyridine nitrogen sites that neutralize the HCl released during the reaction, thereby maintaining high product fluorescence, even after vapor exposure. No significant response is observed when the microbeads are subjected to other nerve agent simulants, a mustard gas simulant, and volatile organics. The size, sensitivity, and subsecond response of these microbeads make them suitable for nerve agent vapor detection and inclusion into microbead sensor arrays.

Bencic-Nagale, S. and D. R. Walt (2005). "Extending the longevity of fluorescence-based sensor arrays using adaptive exposure." Analytical Chemistry **77**(19): 6155-6162.

Fluorescent microbead sensor arrays were prepared to determine sensor array longevity. Sensor longevity is limited by photobleaching of the dyes attached to the microbeads and presents one of the biggest drawbacks of most fluorescent dye-based arrays. Responses of an array of organic vapor sensors were acquired for 2 weeks to evaluate the sensor performance over time. Photobleaching effects were overcome in two ways: (1) by limiting the excitation light power and gradually increasing the power at a rate comparable to the sensor photobleaching rates and (2) by illuminating subsections of the array through an optical slit. Both approaches extended the longevity of a sensor array. During the longevity study, the sensor arrays were employed to test their ability to correctly distinguish between responses to seven vapors. A high classification accuracy (99.8%) was obtained after 17,700 exposures for vapor responses collected over two weeks using only approximately 8% of the array's surface area.

Benez, A., et al. (1999). "Detection of circulating melanoma cells by immunomagnetic cell sorting." Journal of Clinical Laboratory Analysis **13**(5): 229-233.

We developed a cellular approach to the identification of circulating melanoma cells in peripheral blood using immunomagnetic cell sorting. One hundred seventy-eight blood samples from 129 melanoma patients and 30 samples from healthy persons and nonmelanoma patients were examined. After density gradient centrifugation the interphase was incubated with the mAb 9.2.27. Positive cells were labeled with magnetic microbeads and enriched by immunomagnetic cell sorting. Cells were stained using an alkaline phosphatase-antialkaline phosphatase assay and examined by light microscopy. In spiking experiments, melanoma cells seeded at a concentration of one melanoma cell per ml whole blood could be detected reliably with the assay. Circulating melanoma cells were not found in 30 controls examined, nor were

9.2.27-positive cells found in 41 patients with primary malignant melanoma. In patients with regional lymph node metastases and in patients with disseminated disease, circulating 9.2.27-positive cells could be detected in 3 out of 22 patients (13.6%) and 10 out of 66 patients (15.2%) examined. We present a sensitive and specific immunocytological approach to detect circulating melanoma cells in peripheral blood. The method is not suitable for early detection of metastases but is a valuable tool for further investigating biological characteristics of circulating melanoma cells.

Benez, A., et al. (2001). "Morphologically intact melanoma cells may be detected in peripheral blood of melanoma patients." Recent Results in Cancer Research **158**: 113-117.

The detection of circulating melanoma cells has been the subject of numerous investigations in recent years. We developed a cellular approach to identifying circulating melanoma cells in peripheral blood using immunomagnetic cell sorting. The examination covered 205 blood samples from 155 melanoma patients and 30 samples from healthy persons and nonmelanoma patients. After density gradient centrifugation, the interphase was incubated with the 9.2.27 antibody. Positive cells were labeled with magnetic microbeads and enriched by immunomagnetic cell sorting. Cells were stained using an alkaline phosphatase-anti-alkaline phosphatase assay and examined by light microscopy. In spiking experiments, melanoma cells seeded at a concentration of one melanoma cell per milliliter of whole blood could be detected reliably. Circulating melanoma cells were not found in 30 controls, nor were 9.2.27-positive cells found in 41 patients with primary malignant melanoma. In patients with regional lymph node metastases and disseminated disease, circulating 9.2.27-positive cells could be detected in 3 of 29 patients (10%) and 13 of 85 patients (15%) examined, respectively. We conclude that immunomagnetic cell sorting is a promising method with high sensitivity and specificity. The method is not suitable for early detection of metastases but is a valuable tool for further investigating the biological characteristics of circulating melanoma cells.

Benitez-Mateos, A. I., et al. (2019). "Selective Immobilization of Fluorescent Proteins for the Fabrication of Photoactive Materials." Molecules **24**(15): 30.

The immobilization of fluorescent proteins is a key technology enabling to fabricate a new generation of photoactive materials with potential technological applications. Herein we have exploited superfolder green (sGFP) and red (RFP) fluorescent proteins expressed with different polypeptide tags. We fused these fluorescent proteins to His-tags to immobilize them on graphene 3D hydrogels, and Cys-tags to immobilize them on porous microparticles activated with either epoxy or disulfide groups and with Lys-tags to immobilize them on upconverting nanoparticles functionalized with carboxylic groups. Genetically programming sGFP and RFP with Cys-tag and His-tag, respectively, allowed tuning the protein spatial organization either across the porous structure of two microbeads with different functional groups (agarose-based materials activated with metal chelates and epoxy-methacrylate materials) or across the surface of a single microbead functionalized with both metal-chelates and disulfide groups. By using different polypeptide tags, we can control the attachment chemistry but also the localization of the fluorescent proteins across the material surfaces. The resulting photoactive material formed by His-RFP immobilized on graphene hydrogels has been tested as pH indicator to measure pH changes in the alkaline region, although the immobilized fluorescent protein exhibited a narrower dynamic range to measure pH than the soluble fluorescent protein. Likewise, the immobilization of Lys-sGFP on alginate-coated upconverting nanoparticles enabled the infrared excitation of the fluorescent protein to be used as a green light emitter. These novel photoactive biomaterials open new avenues for innovative technological developments towards

the fabrication of biosensors and photonic devices.

Benjamin, D., et al. (2014). "Plastic ingestion by Bigeye Thresher shark Alopias superciliosus off Ratnagiri southwest coast of India." International Journal of Environmental Sciences **5**(2): 277-281.

Marine debris a majority of which is plastic is negatively affecting the survival of aquatic life worldwide. Ingestion of plastic debris by turtles, seabirds, marine mammals, and occasionally fish has been well documented but from sharks are rare from Indian Coast. The specimen obtained measured 346 cm in total length (TL), 190 cm in standard length (SL) and weighed 51 kg. The gut was examined thoroughly and 2 transparent plastic covers weighing 3.48 g and 4.32 g of 40 micron each with an area of 1200 cm² respectively partially in tampered condition was pulled out from the foregut region. Therefore microplastic ingestion is now a common phenomenon not only affecting the lower trophic level animals but also sharks which constitute an important predator group in marine ecosystems and consequently play an essential role on energy exchange within the highest trophic levels.

Benjamin, M. and F. J. Newhook (1982). "Effect of glass microbeads on Phytophthora zoospore motility." Transactions of the British Mycological Society **78**(1): 43-46.

Six P. spp. in the confined environment of glass microbeads were used. Results indicated that different spp. are affected to varying degrees by the 'contact stimulus' phenomenon described by previous workers. P. cinnamomi was the least sensitive to contact stimulus. It is considered that zoospores of even the most sensitive spp., P. megasperma var. megasperma and P. citricola, would retain motility long enough for this attribute to make an effective contribution to dispersal in soil micro-environments.

Bennett, N. (2015). "Our triple crisis opens the door to real change." ENDS (Environmental Data Services)(480): 8-9.

The author shares her thoughts on crises affecting the British economy and environment and how environmentalists can push for change in the 2015 election. Issues raised include the failure of the government's energy savings bill known as the Green Deal, the lack of jobs and affordable housing, and environmental issues that may come up in election campaigns such as wildlife restoration, flooding and plastic waste.

Benson, M., et al. (2011). "A Bruton's tyrosine kinase inhibitor prevents antigen-driven B cell activation in vivo." Arthritis and Rheumatism. Conference: Annual Scientific Meeting of the American College of Rheumatology and Association of Rheumatology Health Professionals **63**(10 SUPPL. 1).

Background/Purpose: Therapeutic targeting of B cells has proven effective for a multitude of human autoimmune indications. Most investigative and approved therapies are injected monoclonal antibodies that either deplete or inactivate B cells by targeting B cell surface moieties directly or by inactivating B cell modulating cytokines, with orally-available B cell modulating treatments currently lacking. Proximal to the intracellular signaling components of the B cell receptor (BCR) resides a network of adaptor proteins and protein tyrosine kinases that include the Tec family kinase Bruton's Tyrosine Kinase (BTK). The kinase activity of BTK is critical for transmitting signals received through the BCR to downstream signaling pathways that direct B cell activation. In this study, we assessed the ability of an orally-accessible BTK inhibitor to prevent antigen-driven B cell activation in vivo. Method(s): C57BL/6 mice were dosed orally with either vehicle alone or vehicle with BTK inhibitor at 10, 3, 1, or 0.3 mgs/kg as indicated. For the anti-IgD model, either 100mg of agonistic anti-CD40 (clone 1C10) or 200ml of goat-anti-mouse anti-IgD antisera (Ebioscience) were injected intraperitoneally (i.p) two hours after dosing. Mice were sacrificed between 4-18 hours later and splenic B cells analyzed. For mRNA transcript analysis, mature B220⁺CD23⁺ B cells were enriched to >93% purity by B cell negative selection followed by CD23 positive selection by antibody-coupled microbeads. Purified RNA was analyzed for mRNA transcript levels. To analyze the induction of B cell surface activation markers, B220⁺ B cells were analyzed by FACS for CD86 expression levels. For the NP-Ficoll model, 100mg of NP-Ficoll were injected i.p. the day after dosing with either vehicle alone or vehicle with BTK inhibitor. BTK inhibitor was dosed daily for the duration of the experiment until day 7, whereupon anti-NP serum IgM and IgG3 titers were quantified by ELISA. Result(s): We report that dosing with a BTK inhibitor suppressed, in a dose dependent manner, both anti-IgD driven B cell activation and NP-Ficoll elicited anti-NP IgM and IgG3 antibody titers in vivo. The suppression of anti-IgD driven B cell activation was manifested by suppression of the surface activation markers CD86 as well as suppression of mRNA transcripts (e.g. c-Myc, Bcl-xL, CCL3, CD98, EBI2, EGR1, EGR2 and IRF4), all markers otherwise rapidly induced upon engagement of the BCR with antigen. BTK inhibition had no impact on agonistic anti-CD40 driven B cell activation, indicating the specificity of the BTK inhibitor used in this study for the BCR signaling pathway. Lastly, inhibition of BTK prevented, in a dose-dependent manner, the generation of anti-NP IgM and IgG3antibodies upon immunization with NP-Ficoll. Conclusion(s): Our results provide mechanistic insight into the role of BTK inhibition in a mouse model of in vivo BCR-driven B cell activation and support the concept that BTK kinase inhibitors represent a promising therapeutic approach for patients with B cell-dependent autoimmune disorders.

Bentley, R. (1994). Evaluation of environmentally acceptable packaging for Navy use.

When man operates at sea, he generates solid waste. Under ideal conditions, all waste would be returned to shore for treatment and disposal. However, when operating periods at sea are prolonged, much of the waste must be disposed in the marine environment. Discarded plastic items pose a special ecological problem because they are buoyant, durable and strong. Sea life is endangered by entanglement or ingestion. Sea lanes can be identified by the concentration of floating debris, much of which is plastics. Shores and beaches are littered with plastic discards that appear on the incoming tide. Public Law 100-220, the U.S. Marine Plastic Pollution Research and Control Act of 1987 not only adopted Annex V of the International Maritime Pollution (MARPOL) Protocol, it extended its application to U.S. Navy vessels. Coordination of the Navy's implementation of the public law is administered by the Plastics Removal In the Marine Environment (PRIME) Program Manager. Responsibility for various aspects of the PRIME Program are shared by the System Commands, primarily the Naval Supply, Naval Sea, and Naval Air Systems Command. Other major agencies of the Federal Government are also heavily involved in the implementation of the PRIME effort, namely the Defense Logistics Agency, the General Services Administration, and the sister services to the Navy. The Naval Supply Systems Command's effort in support of the PRIME Program has been directed at reduction or elimination of plastic consumable commodities going aboard U.S. Navy ships. This involves a comprehensive review of the governing specifications and ordering data as well as investigations of the commercial marketplace for new materials, products, processes, and ideas. One especially notable area of plastic waste generation is packaging materials. Studies of waste generation aboard Navy ships have shown that 7% of the trash is composed of plastic, with 70% of the plastics being packaging and packing materials. This paper presents the results of evaluations of new products and processes that support the plastic waste reduction goal, particularly in the area of packaging and packing applications.

Benyamini, N., et al. (2016). "The effect of lenalidomide on multiple myeloma associated macrophages." Blood. Conference: 58th Annual Meeting of the American Society of Hematology, ASH **128**(22).

Introduction: In multiple myeloma (MM), accessory cells, such as monocytes and macrophages, located in the bone marrow (BM) tumor microenvironment play a crucial role in the fate of malignant cells. Under the influence of the surrounding milieu, monocytes can change their migratory capacity and differentiate into tumor-associated macrophages (TAMs). In the tumor site, TAMs can alter their profile from M1 macrophages with antitumor activities to M2-like macrophages that support tumor growth. Lenalidomide (Len), an immunomodulatory drug, used for MM treatment, is known to target different immune components inducing inflammatory responses; however, its direct influence on monocyte migration, macrophage differentiation and function in the tumor microenvironment is still unclear. The current study has aimed to explore the effect of Len on monocyte recruitment, macrophage polarization and pro-tumor functions. Method(s): Monocytes were isolated from peripheral blood mononuclear cells of healthy donors, using anti-CD14 microbeads. To assess their migration capacity, monocytes were allowed to migrate through transwell insert towards the conditioned medium (CM) obtained from the BM of newly diagnosed MM patients or from MM cell lines (RPMI or U266) in the presence or absence of Len (10muM); the percentage of migrating monocytes was determined by FACS. For macrophage generation, monocytes were cultured with M-CSF followed by incubation with IL-4 to obtain M2 macrophages. To generate TAMs, CM obtained from the BM of MM patients was used. Len was added to the culture every 24 hours. The phenotype and functional properties of the generated macrophages were assessed. Endocytosis was evaluated by an antigen uptake assay. Macrophages were incubated with FITC-dextran at 37degreeC or 4degreeC, as a control, for 60 minutes, and analyzed by FACS. To test T cell proliferation, autologous lymphocytes labeled with CFSE, were stimulated with PHA and co-cultured with macrophages. T cell (CD3+) division was assessed by FACS. For IFN-gamma secretion evaluation, lymphocytes co-cultured with macrophages were stimulated with PMA and ionomycin. The percentage of T cells expressing IFN-gamma was quantified by FACS. Result(s): Monocyte migration towards CM obtained from MM cell lines (RPMI or U266) or from BM of MM patients (80.89%; n=4; p<0.01, 57.17%; n=4; p<0.01 and 42.9%; n=9; p<0.05, respectively) was significantly higher compared to migration towards normal BM CM (25.39%; n=2). Monocytes treated with Len demonstrated significantly decreased migration toward CM of MM cell lines (RPMI or U266) compared to untreated monocytes (45% vs. 80.8%; n=4 and 30.2% vs. 57.1%; n=4, respectively; p<0.01). The effect of Len on monocyte migration toward patientderived CM was diverse. While 4 samples demonstrated decreased migration compared to untreated cells [51.1% vs. 59.6%; n=4; p<0.01], in 5 samples it increased [39.8% vs. 29.7%; n=5; n=5; p<0.01]. To evaluate the effect of Len on macrophage polarization we examined their phenotype and functions. Both M2 macrophages and TAMs treated with Len expressed higher levels of M2 markers CD206, CD163, and cytokine IL-10 compared to untreated macrophages. Functional assays showed that Len increased endocytosis of both M2 macrophages [50% vs. 20%; n=5; P<0.01] and TAMs [47.4% vs. 41.4%; n=6; NS]. Exposure to Len led to suppression of T cell proliferation, when T cells were co-cultured with either autologous M2 macrophages [31% vs. 16%; n=4; p<0.05] or TAMs [39.7% vs. 31.5%; n=3; p<0.01]. In addition, M2 macrophages treated with Len demonstrated a reduction in IFN-gamma secretion from T cells compared to untreated M2 macrophages (10.6% vs. 7.1%; n=4; NS). Conclusion(s): This study has demonstrated that Len has a direct effect on monocyte/macrophage behavior in the microenvironment generated by MM cells. Len is found to reduce monocyte migration, support polarization of macrophages towards the M2 phenotype and promote macrophage immunosuppressive functions, such as endocytosis, reduction of T-cell proliferation and

inhibition of IFN-gamma production. These findings need to be further investigated in in vivo experiments and could support the benefit of using agents targeting specific pathways associated with TAM development in the treatment of MM patients.

Berber, A. A. (2019). "POLYSTYRENE NANOPLASTICS TRIGGER TOXICITY ON TWO DIFFERENT AQUATIC ORGANISMS (BRACHIONUS PLICATILIS, DAPHNIA MAGNA)." Fresenius Environmental Bulletin **28**(8): 6146.

Micro and nano-sized plastic particles are found almost everywhere, especially the aquatic system and because of their size, they can be ingested as food by many organisms and these plastics which enter the food chain, raise a great concern. In this study, the effects of 50 nm diameter of polystyrene nanoplastics (PNPs) on Brachionus plicatilis and Daphnia magna were investigated. The acute toxicity tests were conducted on Brachionus plicatilis. According to the tests LC50 value was determined as 1.22 mg/ mL (0.34-15.13, 95% confidence limits). Three parameters, tail length, tail intensity and tail moment were evaluated to detect genotoxic effect of PNPs on Daphnia magna with single cell gel electrophoresis (Comet). According to the result PNPs were increased three parameters compared to the control. As a result, PNPs have negative effects on both aquatic organisms Brachionus plicatilis and Daphnia magna.

Berber, A. A. and M. Yurtsever (2018). "TOXICOLOGICAL EFFECT OF POLYETHYLENE MICROSPHERE ON BRACHIONUS PLICATILIS AND DAPHNIA MAGNA." Fresenius Environmental Bulletin **27**(7): 4972-4979.

Pollution of the aquatic environment by microplastic could be having a massive impact on marine life. As far as the dimensions of the microplastics decrease, the negative effects are also increasing. In this study, the effects of 10-22 µm diameter fluorescent polyethylene microplastics (PEMs) on Brachiomus plicatilis and Daphnia magna were investigated. The acute toxicity and population growth test were conducted on Brachiomus plicatilis. According to the tests LC50 value was calculated as 0.764 mg/mL (0.4-1.458, 95% confidence limits). Statistically significant differences were found in the 90-hour population growth test compared to the control. According to genotoxic evaluation on Daphnia magna with single cell gel electrophoresis (Comet), tail length, tail intensity and tail moment were increased by PEMs compared to the control. In conclusion, PEMs (10-22 µm) have negative effects on both aquatic organisms Brachiomus plicatilis and Daphnia magna. [ABSTRACT FROM AUTHOR]

Berg, K. (2019). "Sailing to the heart of the plastic wasteland." Recycling International: 52-53.

Bergami, E., et al. (2016). "Nano-sized polystyrene affects feeding, behavior and physiology of brine shrimp Artemia franciscana larvae." Ecotoxicology & Environmental Safety **123**: 18-25.

Nano-sized polymers as polystyrene (PS) constitute one of the main challenges for marine ecosystems, since they can distribute along the whole water column affecting planktonic species and consequently disrupting the energy flow of marine ecosystems. Nowadays very little knowledge is available on the impact of nano-sized plastics on marine organisms. Therefore, the present study aims to evaluate the effects of 40 nm anionic carboxylated (PS-COOH) and 50 nm cationic amino (PS-NH 2) polystyrene nanoparticles (PS NPs) on brine shrimp Artemia

franciscana larvae. No signs of mortality were observed at 48 h of exposure for both PS NPs at naplius stage but several sub-lethal effects were evident. PS-COOH (5–100 µg/ml) resulted massively sequestered inside the gut lumen of larvae (48 h) probably limiting food intake. Some of them were lately excreted as fecal pellets but not a full release was observed. Likewise, PS-NH 2 (5–100 µg/ml) accumulated in larvae (48 h) but also adsorbed at the surface of sensorial antennules and appendages probably hampering larvae motility. In addition, larvae exposed to PS-NH 2 undergo multiple molting events during 48 h of exposure compared to controls. The activation of a defense mechanism based on a physiological process able to release toxic cationic NPs (PS-NH 2) from the body can be hypothesized. The general observed accumulation of PS NPs within the gut during the 48 h of exposure indicates a continuous bioavailability of nano-sized PS for planktonic species as well as a potential transfer along the trophic web. Therefore, nano-sized PS might be able to impair food uptake (feeding), behavior (motility) and physiology (multiple molting) of brine shrimp larvae with consequences not only at organism and population level but on the overall ecosystem based on the key role of zooplankton on marine food webs. [ABSTRACT FROM AUTHOR]

Bergami, E., et al. (2019). "Polystyrene nanoparticles affect the innate immune system of the Antarctic sea urchin <i>Sterechinus neumayeri</i>." Polar Biology **42**(4): 743-757.

Plastic debris has been recognised as a potential stressor for Antarctic marine organisms. In this study, the effects of surface charged polystyrene nanoparticles (PS NPs) on the immune cells (coelomocytes) of the Antarctic sea urchin Sterechinus neumayeri were assessed through in vitro short-term cultures. The behaviour of anionic carboxylated (PS-COOH) and cationic amino-modified (PS-NH2) NPs in filtered natural sea water (NSW) from King George Island (South Shetland Islands) was characterised by dynamic light scattering. Cellular morphology, NP uptake, phagocytic capacity and gene expression were evaluated after 6 and 24 h of exposure to 1 and 5 µg mL−1 PS NPs. Secondary characterisation showed an initial good dispersion of PS NPs in NSW, followed by nano-scale aggregation after 24 h. Both PS NPs affected cellular phagocytosis and generated an inflammatory response against oxidative stress and apoptosis at the molecular level. Fluorescently labelled PS-COOH aggregates were internalised by phagocytes and associated to the modulation of genes related to external challenges, antioxidant responses and cell protection against stress and apoptosis. Exposure to PS-NH2 caused a strong decrease in phagocytic capacity and the formation of cellular debris at 5 µg mL−1 after 24 h, but low gene modulation, suggesting a threshold in coelomocytes defence ability against PS-NH2. This study represents the first attempt to assess the impact of nanoplastics on Antarctic marine organisms. Our findings demonstrate that PS NPs with different surface charges constitute a challenge for S. neumayeri immune cells.

Bergami, E., et al. (2017). "Long-term toxicity of surface-charged polystyrene nanoplastics to marine planktonic species Dunaliella tertiolecta and Artemia franciscana." Aquatic Toxicology **189**: 159-169.

Plastic pollution has been globally recognized as a critical issue for marine ecosystems and nanoplastics constitute one of the last unexplored areas to understand the magnitude of this threat. However, current difficulties in sampling and identifying nano-sized debris make hard to

assess their occurrence in marine environment. Polystyrene nanoparticles (PS NPs) are largely used as nanoplastics in ecotoxicological studies and although acute exposures have been already investigated, long-term toxicity on marine organisms is unknown. Our study aims at evaluating the effects of 40 nm PS anionic carboxylated (PS-COOH) and 50 nm cationic amino-modified (PS-NH₂) NPs in two planktonic species, the green microalga Dunaliella tertiolecta and the brine shrimp Artemia franciscana, respectively prey and predator. PS NP behaviour in exposure media was determined through DLS, while their toxicity to microalgae and brine shrimps evaluated through 72 h growth inhibition test and 14 d long-term toxicity test respectively. Moreover, the expression of target genes (i.e. clap and cstb), having a role in brine shrimp larval growth and molting, was measured in 48 h brine shrimp larvae. A different behaviour of the two PS NPs in exposure media as well as diverse toxicity to the two planktonic species was observed. PS-COOH formed micro-scale aggregates (Z-Average >1 micro m) and did not affect the growth of microalgae up to 50 micro g/ml or that of brine shrimps up to 10 micro g/ml. However, these negatively charged NPs were adsorbed on microalgae and accumulated (and excreted) in brine shrimps, suggesting a potential trophic transfer from prey to predator. On the opposite, PS-NH₂-formed nano-scale aggregates (Z-Average <200 nm), caused inhibition of algal growth (EC₅₀=12.97 micro g/ml) and mortality in brine shrimps at 14 d (LC₅₀=0.83 micro g/ml). Moreover, 1 micro g/ml PS-NH₂ significantly induced clap and cstb genes, explaining the physiological alterations (e.g. increase in molting) previously observed in 48 h larvae, but also suggesting an apoptotic pathway triggered by cathepsin L-like protease in brine shrimps upon PS-NH₂ exposure. These findings provide a first insight into long-term toxicity of nanoplastics to marine plankton, underlining the role of the surface chemistry in determining the behaviour and effects of PS NPs, in terms of adsorption, growth inhibition, accumulation, gene modulation and mortality. The use of long-term end-point has been identified as valuable tool for assessing the impact of nanoplastics on marine planktonic species, being more predictable of real exposure scenarios for risk assessment purposes.

Berger, C., et al. (2003). "CD28 costimulation and immunoaffinity-based selection efficiently generate primary gene-modified T cells for adoptive immunotherapy." Blood **101**(2): 476-484.

The introduction of an inducible suicide gene has been proposed as a strategy to exploit the antitumor reactivity of donor T cells after allogeneic hematopoietic stem cell transplantation but permit control of graft-versus-host disease. However, there are several obstacles to this approach that may impair the ability of T cells to function and survive in vivo. These include the requirement for in vitro activation or long-term culture to introduce the transgene and obtain therapeutic cell numbers, the toxicity of drug selection to enrich transduced cells, and the immunogenicity of the transgene-encoded products. Here we have developed a transduction and selection strategy for generating large numbers of polyclonal T cells transduced with a retroviral vector encoding the human low-affinity nerve growth factor receptor (LNGFR) for selection and a Fas-based suicide construct (LV'VFas). Ligation of CD28 in conjunction with a T-cell receptor signal permitted efficient transduction, substantially promoted T-cell growth, and contributed to the generation of gene-modified T cells that retained clonal diversity, functional properties, and a homing receptor profile similar to untransduced peripheral blood lymphocytes. Microbeads conjugated directly to antibody specific to LNGFR significantly improved the immunomagnetic selection of LV'VFas-modified T cells and assisted in scaling of the selection procedure to therapeutic cell numbers. Thus, these studies identified a strategy that requires only a brief ex vivo culture and does not use drug selection to obtain large numbers of functional gene-modified polyclonal T cells that can be used for adoptive

immunotherapy.

Berglund, E., et al. (2019). "Microplastics in a freshwater mussel (Anodonta anatina) in Northern Europe." Science of the Total Environment **697**: N.PAG-N.PAG.

Unlabelled Image • Plastic fibres and particles could be confirmed in freshwater mussels. • Higher concentrations of microplastics in urban areas compared to a rural location. • Higher concentrations of microplastics in areas with wastewater treatment plants. • All mussels contained microfibers. Alarming amounts of microplastics have recently been shown to accumulate in the environment. Recent focus has been on synthetic material contaminating the marine environment, while effects on freshwater habitats and organisms have received less attention. We here confirm and analyse occurrence of microplastics in the duck mussel, Anodonta anatina, in a Swedish river. All analysed mussels contained microplastics, and the number of microplastic debris found in the mussels increased with mussel size. In addition, we demonstrate higher concentrations of microplastics downstream urban areas with wastewater treatment plants compared to a rural upstream location. Both fibres and particles were found in the mussels, indicating that the emissions of these pollutants may have varying origin. Our study indicates that microplastics can be suspended in the water column in streams and that concentrations are higher downstream anthropogenic activity. We discuss our results in light of potential pathways in rural versus surrounding arable land, and highlight a number of required research directions in the aquatic system. [ABSTRACT FROM AUTHOR]

Bergmann, M., et al. (2017). "Citizen scientists reveal: Marine litter pollutes Arctic beaches and affects wild life." Marine Pollution Bulletin **125**(1-2): 535-540.

Recent data indicate accumulation areas of marine litter in Arctic waters and significant increases over time. Beaches on remote Arctic islands may be sinks for marine litter and reflect pollution levels of the surrounding waters particularly well. We provide the first quantitative data from surveys carried out by citizen scientists on six beaches of Svalbard. Litter quantities recorded by cruise tourists varied from 9-524 g m^{- 2} and were similar to those from densely populated areas. Plastics accounted for > 80% of the overall litter, most of which originated from fisheries. Photographs provided by citizens show deleterious effects of beach litter on Arctic wildlife, which is already under strong pressure from global climate change. Our study highlights the potential of citizen scientists to provide scientifically valuable data on the pollution of sensitive remote ecosystems. The results stress once more that current legislative frameworks are insufficient to tackle the pollution of Arctic ecosystems. Copyright © 2017 The Authors

Bergmann, M., et al. (2019). "White and wonderful? Microplastics prevail in snow from the Alps to the Arctic." Science Advances **5**(8): eaax1157.

Microplastics (MPs) are ubiquitous, and considerable quantities prevail even in the Arctic; however, there are large knowledge gaps regarding pathways to the North. To assess whether atmospheric transport plays a role, we analyzed snow samples from ice floes in Fram Strait. For comparison, we investigated snow samples from remote (Swiss Alps) and populated (Bremen,

Bavaria) European sites. MPs were identified by Fourier transform infrared imaging in 20 of 21 samples. The MP concentration of Arctic snow was significantly lower (0 to 14.4 x 10³ N liter⁻¹) than European snow (0.19 x 10³ to 154 x 10³ N liter⁻¹) but still substantial. Polymer composition varied strongly, but varnish, rubber, polyethylene, and polyamide dominated overall. Most particles were in the smallest size range indicating large numbers of particles below the detection limit of 11 mum. Our data highlight that atmospheric transport and deposition can be notable pathways for MPs meriting more research.

Berman, P. (1991). "McDonald's Caves In." Forbes **147**(3): 73.
McDonald's has ceased plans to recycle its polystyrene packaging. The company was developing a project to build seven polystyrene recycling plants in concert with its suppliers, turning the recycled material into plastic resin pellets to be sold to rubber companies. They had also formed a task force with the Environ Defense Fund to study solid waste, but the environmental group disapproved of the recycling plan for fear of a perception by environmental fringe" groups of consorting with the capitalist" interests. McDonald's has replaced polystyrene packaging with polycoated paper, a material hard to recycle once it has been contaminated with food. In addition, making paperboard uses more energy and generates more pollution than producing polystyrene.

Bernard, K. A., et al. (2016). "Ophthalmic Drug Packaging: Safety Risks and Patient Acceptability Issues." Pharmaceutical Technology **40**(10): 44-51.
The article presents case studies related to ophthalmic drug container closure design flaws and the measures taken by the U.S. Food and Drug Administration in mitigating safety risks and patient acceptability. Topics discussed include the safety risk and patient acceptability issues associated with ophthalmic drug packaging, the tamper-evident ring features of packaging, shedding of plastic particles, and the issues of patient-packaging interface with the overly tight bottle closures.

Bernardini, I., et al. (2018). "First data on plastic ingestion by blue sharks (Prionace glauca) from the Ligurian Sea (North-Western Mediterranean Sea)." Marine Pollution Bulletin **135**: 303-310.
Few studies have focused so far on plastic ingestion by sharks in the Mediterranean Sea. The aim of this paper was to determine, for the first time, the plastic litter ingested by blue sharks (Prionace glauca), categorized as "Critically Endangered" in the Mediterranean Sea by IUCN, caught in the Pelagos Sanctuary SPAMI (North-Western Mediterranean Sea). The analysis of the stomach contents was performed following the MSFD Descriptor 10 standard protocol implemented with FT-IR spectroscopy technique. The results showed that 25.26% of sharks ingested plastic debris of wide scale of sizes from microplastics (<5 mm) to macroplastics (>25 mm). The polyethylene sheetlike user plastics, widely used as packaging material, are the most ingested debris. This research raises a warning alarm on the impact of plastic debris on a threatened species, with a key role in the food web, and adds important information for futures mitigation actions.

Berti, F., et al. (2009). "Microfluidic-based electrochemical genosensor coupled to magnetic beads for hybridization detection." Talanta **77**(3): 971-978.
This paper describes the development of a rapid and sensitive enzyme- linked electrochemical genosensor using a novel microfluidic-based platform. In this work, hybridization was performed on streptavidin-coated paramagnetic micro-beads functionalized with a biotinylated capture

probe. The complementary sequence was then recognized via sandwich hybridization with a capture probe and a biotinylated signaling probe. After labeling the biotinylated hybrid with a streptavidin-alkaline phosphatase conjugate, the beads were introduced in a disposable cartridge composed of eight parallel microchannels etched in a polyimide substrate. The modified beads were trapped with a magnet addressing each microchannel individually. The presence of microelectrodes in each channel allowed direct electrochemical detection of the enzymatic product within the microchannel. Detection was performed in parallel within the eight microchannels, giving rise to the possibility of performing a multiparameter assay. Quantitative determinations of the analyte concentrations were obtained by following the kinetics of the enzymatic reaction in each channel. The chip was regenerated after each assay by removing the magnet and thus releasing the magnetic beads. The system was applied to the analytical detection of PCR amplified samples with a RSD% = 6. A detection limit of 0.2 nM was evaluated.

Berto, D., et al. (2017). "Preliminary study to characterize plastic polymers using elemental analyser/isotope ratio mass spectrometry (EA/IRMS)." Chemosphere **176**: 47-56.

Plastic waste is a growing global environmental problem, particularly in the marine ecosystems, in consideration of its persistence. The monitoring of the plastic waste has become a global issue, as reported by several surveillance guidelines proposed by Regional Sea Conventions (OSPAR, UNEP) and appointed by the EU Marine Strategy Framework Directive. Policy responses to plastic waste vary at many levels, ranging from beach clean-up to bans on the commercialization of plastic bags and to Regional Plans for waste management and recycling. Moreover, in recent years, the production of plant-derived biodegradable plastic polymers has assumed increasing importance. This study reports the first preliminary characterization of carbon stable isotopes (δ 13 C) of different plastic polymers (petroleum- and plant-derived) in order to increase the dataset of isotopic values as a tool for further investigation in different fields of polymers research as well as in the marine environment surveillance. The δ 13 C values determined in different packaging for food uses reflect the plant origin of “BIO” materials, whereas the recycled plastic materials displayed a δ 13 C signatures between plant- and petroleum-derived polymers source. In a preliminary estimation, the different colours of plastic did not affect the variability of δ 13 C values, whereas the abiotic and biotic degradation processes that occurred in the plastic materials collected on beaches and in seawater, showed less negative δ 13 C values. A preliminary experimental field test confirmed these results. The advantages offered by isotope ratio mass spectrometry with respect to other analytical methods used to characterize the composition of plastic polymers are: high sensitivity, small amount of material required, rapidity of analysis, low cost and no limitation in black/dark samples compared with spectroscopic analysis. [ABSTRACT FROM AUTHOR]

Bertoldo, M., et al. (2016). "Emulsion Blending Approach for the Preparation of Gelatin/Poly(butylene succinate-co-adipate) Films." ACS Biomaterials Science and Engineering **2**(4): 677-686.

Emulsion blending as a new method to combine a water-soluble biopolymer, gelatin, with a synthetic biodegradable elastomer, poly(butylene succinate-co-adipate) (PBSA), was investigated. Blending by wet processing a hydrophilic biopolymer with a hydrophobic synthetic polymer aimed at evaluating the potential for improving the mechanical properties of the biopolymer without affecting its biodegradability. The effect of the variation of blend composition, and of the experimental procedure for the emulsification and the subsequent preparation of cast films from the resulting oil-in-water emulsions was analyzed. In particular, processing temperature, concentration of the precursor solutions (aqueous gelatin and PBSA in dichloromethane, respectively), blending method and post treatment conditions (T, P) affect the quality and stability of the aqueous gelatin emulsion containing PBSA in dichloromethane as the dispersed phase. Control of the aqueous phase viscosity is a key parameter for both the emulsion stability and the morphology of the final heterophasic cast films. In fact, viscosity must be sufficiently low to allow high shear emulsification, but high enough to prevent coalescence among the organic phase droplets. The process conditions optimized for a 80/20 blend were extended to the preparation of blends with 5-30 wt % PBSA. It was found that evaporation of the organic phase must be nearly quantitative before casting to allow the formation of uniform films at any investigated composition of the immiscible polymer blend. In fact, when the films are produced by casting, the presence of residual organic solvent along with too high a viscosity of the aqueous gelatin phase promotes the formation of cavities opening up at the lower film surface as a result of the higher density of CH<inf>2</inf>Cl<inf>2</inf>. However, such cavities, internally sheathed with PBSA microbeads precipitated upon evaporation of the organic phase, if smaller than 100 mum turned out to improve the flexibility of the films. Copyright © 2016 American Chemical Society.

Besley, A., et al. (2017). "A standardized method for sampling and extraction methods for quantifying microplastics in beach sand." Marine Pollution Bulletin **114**(1): 77-83.

Microplastics are ubiquitous in the environment, are frequently ingested by organisms, and may potentially cause harm. A range of studies have found significant levels of microplastics in beach sand. However, there is a considerable amount of methodological variability among these studies. Methodological variation currently limits comparisons as there is no standard procedure for sampling or extraction of microplastics. We identify key sampling and extraction procedures across the literature through a detailed review. We find that sampling depth, sampling location, number of repeat extractions, and settling times are the critical parameters of variation. Next, using a case-study we determine whether and to what extent these differences impact study outcomes. By investigating the common practices identified in the literature with the case-study, we provide a standard operating procedure for sampling and extracting microplastics from beach sand.

Bessa, F., et al. (2018). "Occurrence of microplastics in commercial fish from a natural estuarine environment." Marine Pollution Bulletin **128**: 575-584.

Microplastic ingestion has been reported for several marine species, but the level of contamination in transitional systems and associated biota is less known. The aim of this study was to assess the occurrence of microplastic ingestion in three commercial fish species: the sea bass (Dicentrarchus labrax), the seabream (Diplodus vulgaris) and the flounder (Platichthys flesus) from the Mondego estuary (Portugal). Microplastics were extracted from the gastrointestinal tract of 120 individuals by visual inspection and digestion solution. A total of 157 particles were extracted from 38% of total fish (96% fibers), with 1.67+or-0.27 (SD) microplastics per fish. Significantly higher amount of ingested microplastics was recorded for D. vulgaris (73%). The dominant polymers identified by micro -FTIR were polyester, polypropylene and rayon (semi-synthetic fiber). It is reported for the first time the presence of this pollutant in fish populations from the Mondego estuary raising concerns on their potential negative effects.

Bessa, F., et al. (2019). "Microplastics in gentoo penguins from the Antarctic region." Scientific Reports **9**(1): 14191.

There is growing evidence that microplastic pollution (<5 mm in size) is now present in virtually all marine ecosystems, even in remote areas, such as the Arctic and the Antarctic. Microplastics have been found in water and sediments of the Antarctic but little is known of their ingestion by higher predators and mechanisms of their entry into Antarctic marine food webs. The goal of this study was to assess the occurrence of microplastics in a top predator, the gentoo penguin Pygoscelis papua from the Antarctic region (Bird Island, South Georgia and Signy Island, South Orkney Islands) and hence assess the potential for microplastic transfer through Antarctic marine food webs. To achieve this, the presence of microplastics in scats (as a proof of ingestion) was investigated to assess the viability of a non-invasive approach for microplastic analyses in Antarctic penguins. A total of 80 penguin scats were collected and any microplastics they contained were extracted. A total of 20% of penguin scats from both islands contained microplastics, consisting mainly of fibers and fragments with different sizes and polymer composition (mean abundance of microplastics: 0.23 +/- 0.53 items individual⁻¹ scat, comprising seven different polymers), which were lower values than those found for seabirds in other regions worldwide. No significant differences in microplastic numbers in penguin scats between the two regions were detected. These data highlight the need for further assessment of the levels of microplastics in this sensitive region of the planet, specifically studies on temporal trends and potential effects on penguins and other organisms in the Antarctic marine food web.

Besseling, E., et al. (2014). "Nanoplastic Affects Growth of S. obliquus and Reproduction of D. magna." Environmental Science & Technology **48**(20): 12336-12343.

The amount of nano- and microplastic in the aquatic environment rises due to the industrial production of plastic and the degradation of plastic into smaller particles. Concerns have been raised about their incorporation into food webs. Little is known about the fate and effects of nanoplastic, especially for the freshwater environment. In this study, effects of nano-polystyrene (nano-PS) on the growth and photosynthesis of the green alga Scene desmus obliquus and the growth, mortality, neonate production, and malformations of the zoo plankter Daphnia magna were assessed. Nano-PS reduced population growth and reduced chlorophyll concentrations in the algae. Exposed Daphnia showed a reduced body size and severe alterations in reproduction. Numbers and body size of neonates were lower, while the number of neonate malformations among neonates rose to 68% of the individuals. These effects of nano-PS were observed between 0.22 and 103 mg nano-PS/L. Malformations occurred from 30 mg of nano-PS/L onward. Such plastic concentrations are much higher than presently reported for marine waters as well as freshwater, but may eventually occur in sediment pore waters. As far as we know, these results are the first to show that direct life history shifts in algae and Daphnia populations may occur as a result of exposure to nanoplastic. [ABSTRACT FROM AUTHOR]

Besseling, E., et al. (2017). "The Effect of Microplastic on the Uptake of Chemicals by the Lugworm Arenicola marina (L.) under Environmentally Relevant Exposure Conditions." Environmental Science & Technology **51**(15): 8795-8804.

It has been hypothesized that ingestion of microplastic increases exposure of aquatic organisms to hydrophobic contaminants. To date, most laboratory studies investigated chemical transfer from ingested microplastic without taking other exposure pathways into account. Therefore, we studied the effect of polyethylene (PE) microplastic in sediment on PCB uptake by Arenicola marina as a model species, quantifying uptake fluxes from all natural exposure pathways. PCB concentrations in sediment, biota lipids (Clip) and porewater measured with passive samplers were used to derive lipid-normalized bioaccumulation metrics Clip, Biota sediment accumulation factor (BSAF), Bioaccumulation factor (BAF) and the Biota plastic accumulation factor (BPAF). Small effects of PE addition were detected suggesting slightly increased or decreased bioaccumulation. However, the differences decreased in magnitude dependent on the metric used to assess bioaccumulation, in the order: Clip > BSAF > BPAF > BAF, and were nonsignificant for BAF. The fact that BAF, that is, normalization of Clip on porewater concentration, largely removed all effects of PE, shows that PE did not act as a measurable vector of PCBs. Biodynamic model analysis confirmed that PE ingestion contributed marginally to bioaccumulation. This work confirmed model-based predictions on the limited relevance of microplastic for bioaccumulation under environmentally realistic conditions, and illustrated the importance of assessing exposure through all media in microplastic bioaccumulation studies. [ABSTRACT FROM AUTHOR]

Besseling, E., et al. (2015). "Microplastic in a macro filter feeder: Humpback whale Megaptera novaeangliae." Marine Pollution Bulletin **95**(1): 248-252.

Marine filter feeders are exposed to microplastic because of their selection of small particles as food source. Baleen whales feed by filtering small particles from large water volumes. Macroplastic was found in baleen whales before. This study is the first to show the presence of microplastic in intestines of a baleen whale (Megaptera novaeangliae). Contents of its gastrointestinal tract were sieved, dissolved in 10% potassium hydroxide and washed. From the remaining dried material, potential synthetic polymer particles were selected based on density and appearance, and analysed by Fourier transform infrared (FTIR) spectroscopy. Several polymer types (polyethylene, polypropylene, polyvinylchloride, polyethylene terephthalate, nylon) were found, in varying particle shapes: sheets, fragments and threads with a size of 1. mm to 17. cm. This diversity in polymer types and particle shapes, can be interpreted as a representation of the varying characteristics of marine plastic and the unselective way of ingestion by M. novaeangliae. Copyright © 2015 Elsevier Ltd.

Besseling, E., et al. (2017). "Fate of nano- and microplastic in freshwater systems: A modeling study." Environmental Pollution **220**: 540-548.

Riverine transport to the marine environment is an important pathway for microplastic. However, information on fate and transport of nano- and microplastic in freshwater systems is lacking. Here we present scenario studies on the fate and transport of nano-to millimetre sized spherical particles like microbeads (100 nm–10 mm) with a state of the art spatiotemporally resolved hydrological model. The model accounts for advective transport, homo- and heteroaggregation, sedimentation-resuspension, polymer degradation, presence of biofilm and burial. Literature data were used to parameterize the model and additionally the attachment efficiency for heteroaggregation was determined experimentally. The attachment efficiency ranged from 0.004 to 0.2 for 70 nm and 1050 nm polystyrene particles aggregating with kaolin or bentonite clays in natural freshwater. Modeled effects of polymer density (1–1.5 kg/L) and biofilm formation were not large, due to the fact that variations in polymer density are largely overwhelmed by excess mass of suspended solids that form heteroaggregates with microplastic. Particle size had a dramatic effect on the modeled fate and retention of microplastic and on the positioning of the accumulation hot spots in the sediment along the river. Remarkably, retention was lowest (18–25%) for intermediate sized particles of about 5 µm, which implies that the smaller submicron particles as well as larger micro- and millimetre sized plastic are preferentially retained. Our results suggest that river hydrodynamics affect microplastic size distributions with profound implications for emissions to marine systems. [ABSTRACT FROM AUTHOR]

Besseling, E., et al. (2019). "Quantifying ecological risks of aquatic micro- and nanoplastic." Critical Reviews in Environmental Science and Technology **49**(1): 32-80.

Diverse effects of nano- and microplastic (NMP) have been demonstrated in the laboratory. We provide a broad review of current knowledge on occurrence, measurement, modeling approaches, fate, exposure, effects, and effect thresholds as regard to microplastics in the aquatic environment. Using this information, we perform a 'proof of concept' risk assessment for NMP, accounting for the diversity of the material. New data is included showing how bioturbation affects exposure, and exposure is evaluated based on literature data and model analyses. We review exposure and effect data and provide a worst case risk characterization, by comparing HC<inf>5</inf> effect thresholds from 'all inclusive' Species Sensitivity Distributions (SSDs) with the highest environmental concentrations reported. HC<inf>5</inf> values show wide confidence intervals yet suggest that sensitive aquatic organisms in near-shore surface waters might be at risk. Copyright © 2018, © 2018 Ellen Besseling, Paula Redondo-Hasselerharm, Edwin M. Foekema, and Albert A. Koelmans. Published with license by Taylor & Francis Group, LLC.

Besseling, E., et al. (2013). "Effects of Microplastic on Fitness and PCB Bioaccumulation by the Lugworm Arenicola marina (L.)." Environmental Science & Technology **47**(1): 593-600.

It has been speculated that marine microplastics may cause negative effects on benthic marine organisms and increase bioaccumulation of persistent organic pollutants (POPs). Here, we provide the first controlled study of plastic effects on benthic organisms including transfer of POPs. The effects of polystyrene (PS) microplastic on survival, activity, and bodyweight, as well as the transfer of 19 polychlorinated biphenyls (PCBs), were assessed in bioassays with Arenicola marina (L.). PS was pre-equilibrated in natively contaminated sediment. A positive relation was observed between microplastic concentration in the sediment and both uptake of plastic particles and weight loss by A. marina. Furthermore, a reduction in feeding activity was observed at a PS dose of 7.4% dry weight. A low PS dose of 0.074% increased bioaccumulation of PCBs by a factor of 1.1–3.6, an effect that was significant for ΣPCBs and several individual congeners. At higher doses, bioaccumulation decreased compared to the low dose, which however, was only significant for PCB105. PS had statistically significant effects on the organisms' fitness and bioaccumulation, but the magnitude of the effects was not high. This may be different for sites with different plastic concentrations, or plastics with a higher affinity for POPs. [ABSTRACT FROM AUTHOR]

Bethge, W. A., et al. (2008). "Haploidentical allogeneic hematopoietic cell transplantation in adults using CD3/CD19 depletion and reduced intensity conditioning: an update." Blood Cells Molecules & Diseases **40**(1): 13-19.

Haploidentical hematopoietic cell transplantation (HHCT) after high dose conditioning with CD34-selected stem cells has been complicated by high regimen related toxicities, slow engraftment and delayed immune reconstitution leading to increased treatment related mortality (TRM). A new regimen using reduced intensity conditioning (RIC) and graft CD3/CD19 depletion with anti-CD3 and anti-CD19 coated microbeads on a CliniMACS device may allow HHCT with lower toxicity and faster engraftment. CD3/CD19 depleted grafts not only contain CD34+ stem cells but also CD34 negative progenitors, natural killer, graft facilitating and dendritic cells. RIC was performed with fludarabine (150-200 mg/m(2)), thiotepa (10 mg/kg), melphalan (120 mg/m(2)) and OKT-3 (5 mg/day, day -5 to +14) and no posttransplant immunosuppression. Twenty nine patients (median age=42 (range, 21-59) years) have been transplanted with this regimen. Diagnosis were AML (n=16), ALL (n=7), NHL (n=3), MM (n=2) and CML (n=1). Patients were "high risk" with refractory disease or relapse after preceding HCT. The CD3/CD19 depleted haploidentical grafts contained a median of 7.6x10(6) (range, 3.4-17x10(6)) CD34+ cells/kg, 4.4x10(4) (range, 0.006-44x10(4)) CD3+ T cells/kg and 7.2x10(7) (range, 0.02-37.3x10(7)) CD56+ cells/kg. Donor-recipient KIR-ligand-mismatch was found in 19 of 29 patients. The regimen was well tolerated with maximum acute toxicity being grade 2-3 mucositis. Because of severe neurotoxicity in 4 patients treated with 200 mg/m(2) fludarabine, the dose was reduced to 150 mg/m(2). Engraftment was rapid with a median time to >500 granulocytes/microL of 12 (range, 10-21) days, >20,000 platelets/microL of 11 (range, 7-38) days and full donor chimerism after 2-4 weeks in all patients. Incidence of grade II-IV degrees GVHD was 48% with grade II degrees =10, III degrees =2 and IV degrees =2. One patient, who received the highest T-cell dose, developed lethal grade IV GVHD. TRM in the first 100 days was 6/29 (20%) with deaths due to idiopathic pneumonia syndrome (n=1), mucormycosis (n=1), pneumonia (n=3) or GVHD (n=1). Overall survival is 9/29 patients (31%) with deaths due to infections (n=7), GVHD (n=1) and relapse (n=12) with a median follow-up of 241 days (range, 112-1271). In conclusion, this regimen is promising in high risk patients lacking a suitable donor, and a prospective phase I/II study is ongoing.

Betts, K. (2008). "Why small plastic particles may pose a big problem in the oceans." Environmental

Science & Technology **42**(24): 8995-8995.

The article focuses on the role that plastic trash fragments play in marine pollutant transport. It states that an international conference sponsored by the U.S. National Oceanic and Atmospheric Administration held in September of 2008 examined the microplastic problem and defined microplastics as plastic fragments smaller than 5 millimeters. It mentions that flame retardants, antimicrobials, and plasticizers can be released into the ocean environment as plastic items break down, and the plastics can behave in a sponge-like fashion to collect hydrophobic persistent organic pollutants. Hideshige Takada of the Tokyo University of Agriculture and Technology is investigating if microplastics expose marine animals to phenolic compounds through ingestion.

Beubler, E., et al. (2016). "Influence of the Surfactant Tyloxapol on Mucociliary Clearance in Human Respiratory Cystic Fibrosis Cells." Pharmacology **98**(1-2): 1-3.

Dehydration of the apical surface of cystic fibrosis (CF) airway epithelia leads to a greatly impaired mucociliary clearance function in CF patients. In an in vitro cell model of human airway epithelia taken from CF patients and cultivated for 60 days, mucociliary clearance was zero. Tyloxapol, a synthetic surfactant, is able to restore the mucociliary clearance of the CF epithelia. The velocity of mucociliary clearance, using polystyrene microbeads as markers, increased within the first minute of tyloxapol treatment from zero to 12 micro m/s and reached a maximum of 22 micro m/s after 120 min. In conclusion, tyloxapol restores mucociliary clearance in a MucilAirTM-CF model and may accordingly be efficient in CF patients to restore mucociliary clearance.

Beycan, A., et al. (2015). "Comparative proteomic analysis of bone marrow plasma cells by using mass spectrometry based bottom up proteomic strategies." Blood **126 (23)**: 5334.

Aim : As all other cancer types, multiple myeloma is a complex disease, yet its molecular mechanism that is not fully understood and needs to be furtherly investigated. Besides, the molecular mechanism responsible from the transition of healthy cells into malignant ones is still under investigation. In such comparative studies, human myeloma cell lines are preferred as positive control, while tonsillar plasma cells are used as negative control. The aim of this study is to perform a comparative proteomic analysis regarding the progression of Multiple Myeloma (MM) by using protein profiles of plasma cells obtained from MGUS, SMM, symptomatic myeloma patients, tonsil plasma cells obtained from healthy individuals and human myeloma cells of cell line origin to elucidate the underlying molecular mechanism involved in myeloma. Material(s) and Method(s): Five groups were adopted in the experiment. Of these groups, MM patients were classified mainly into three groups according to marrow plasma cell content (PCC) validated by flow cytometry: group1: 0-9, group 2: 10-20 and group 3: >20 %. The fourth group consisted of human myeloma cell line (HMCL) RPMI 8226 and was designated as positive control, while tonsil plasma cells were used as negative control and specified as the fifth group. Marrow samples were collected from 30 patients newly diagnosed with Multiple Myeloma (n: 28 symptomatic and n: 1 smoldering (SMM)) and MGUS (n: 1)).Tonsil plasma cells were isolated from healthy tonsil tissue treated with trypsin enzyme and were then confirmed by using Selection Kit microbead specific for EasySep Human CD138 marker. Protein profile maps of groups were obtained via 2D gel electrophoresis and comparative analysis and detection of up/down regulated protein spots was performed by using PDQuest 8.01 software. Proteins from differently expressed protein spots were then identified using Matrix-assisted laser desorption/ionization mass spectroscopy (MALDI) by Peptide Mass Fingerprinting (PMF) analysis Results: By using bottom up strategies, nine of the significantly expressed protein spots were identified with PMF analyses. The identified proteins are as follows:, Calreticulin (ERp60), Endoplasmin/ tumor rejection antigen (ERp99), MZB1(Marginal zone B and B1 cell specific protein/ pERp1), Actin cytoplasmic1 (ACTB), Thioredoxin domain-containing protein 5 (TXNDC5/ERp46), Protein disulfide isomerase (PDI) and HLA class I histocompatibility antigen (MHC class I antigen A*2). According to the results, calreticulin (which functions as chaperones and is responsible for Ca+2regulation and cell proliferation) showed a weak positive correlation with increase in patient PC content. The level was lowest in normal B cells. Endoplasmin/ tumor rejection antigen (which is assigned as chaperones and function in apoptotic process and Ca+2 regulation)declined by increase in PC content in patient samples. Level was lowest in HMCL. Marginal zone B and B1 cell specific protein (which functions as chaperones and is involved in apoptotic process, oxidoreductase activity, regulation of Ca+2, cell proliferation and activates B cell quantiity) correlated with PC percentage and was highest in HCML and lowest in normal B cells. Actin cytoplasmic1 protein (which functions in cell proliferation)synthesis showed a minimum decline in synthesis by increase in PC content .Level was highest in normal B cells. Thioredoxin domain-containing protein 5 which plays role in apoptotic process and shows oxireductase activity within MM/MGUS plasma cells also displayed a positive correlation but we were not able to detect a difference in HMCL and normal B cells which were synthesized less than the patient samples. Protein disulfide isomerase (which acts as chaperones and plays part in apoptotic process and shows oxireductase function) has a weak negative correlation with PC content and synthesis was lowest in HMCL. HLA class I histocompatibility antigen production did not correlate with PC content , it was higher in normal B cells compared to HMCL. Conclusion(s): In conclusion in this study we were able to confirm our previous findings which were presented at ASH 2013 by comparing the results with normal tonsil CD138+ plasma cells and a HMCL. Our study results suggest that the proteins which are involved in Calcium metabolism, chaperone binding and oxidative stress are also associated with low vs. high proliferation profile in myeloma.

Beyer, J., et al. (2017). "Blue mussels (Mytilus edulis spp.) as sentinel organisms in coastal pollution monitoring: A review." Marine Environmental Research **130**: 338.

The blue mussel (Mytilus spp.) is widely used as a bioindicator for monitoring of coastal water pollution (mussel watch programs). Herein we provide a review of this study field with emphasis on: the suitability of Mytilus spp. as environmental sentinels; uptake and bioaccumulation patterns of key pollutant classes; the use of Mytilus spp. in mussel watch programs; recent trends in Norwegian mussel monitoring; environmental quality standards and background concentrations of key contaminants; pollutant effect biomarkers; confounding factors; particulate contaminants (microplastics, engineered nanomaterials); climate change; harmonization of monitoring procedures; and the use of deployed mussels (transplant caging) in pollution monitoring. Lastly, the overall state of the art of blue mussel pollution monitoring is discussed and some important issues for future research and development are highlighted.

Bez, J., et al. (1998). "Waste treatment in product specific life cycle inventories." International Journal of Life Cycle Assessment **3**(2): 100-105.

The model approach described in this paper shows an operationalized concept for the allocation of the environmental effects caused by the landfill process to special input components. The calculation of the landfill emissions in the model is based on the emission spectrum (landfill gas and seepage water) of an average-sized landfill in Germany and the elementary composition of the single waste fraction under consideration. The resulting reactor landfill module comprises an average split for diffuse and captured landfill emissions, the use of captured landfill gases in a

gas engine and a cleaning of captured seepage water in a waste water treatment plant. A short case study demonstrates the calculation of the effects of landfilling of a defined waste fraction (bottle fraction in post-consumer plastic waste).

Bhagat, S., et al. (2016). "Evaluating plastic waste disposal options in Delhi using multi criteria decision analysis." IIOAB Journal **7**(11Specialissue): 25-35.

Continuous rise in the population of India has led to a steep increase in the amount of solid waste generated, particularly from urban areas which ultimately deteriorates soil and water due to unscientific disposal methods. Plastic forms an important constituent in the composition of the urban MSW because of its increasing use in our everyday lives and therefore requires the selection of a sustainable management option which is currently absent in the existing policy framework of India. This study uses the Multi Criteria decision analysis approach (MCDA) in order to evaluate different options for waste disposal for arriving at the most sustainable option for management and disposal of plastic waste in Delhi. A panel of nine members, who were faculty, researchers and students from the Indian Institute of Technology (IIT), Delhi was made and they evaluated seven disposal options against a set of environmental, health, financial and legislative criteria. The seven options included Landfill, Recycling, Incineration, Pyrolysis and a combination of two processes each from the first three mentioned in the study. The panel weighed the criteria and scored the options on them to arrive at an overall aggregate score for the best option. The study reveals that MCDA is a very effective and transparent measure of involving and encouraging public participation in decision making with highly successful results in the context of waste management. The panel suggested that a blend of recycling along with incineration was the best option which was followed by recycling and incineration. The worst method in the panel's consideration was the open landfilling currently practiced in Delhi which is a big source of soil contamination. The paper suggests that MCDA approach for evaluation of waste disposal options can arrest soil contamination to a great extent by providing the best waste management choice. Copyright © 2016, Institute of Integrative Omics and Applied Biotechnology. All rights reserved.

Bhandari, A., et al. (2019). "Early-Stage Ocular Hypertension Alters Retinal Ganglion Cell Synaptic Transmission in the Visual Thalamus." Frontiers in Cellular Neuroscience **13**: 426.

Axonopathy is a hallmark of many neurodegenerative diseases including glaucoma, where elevated intraocular pressure (ocular hypertension, OHT) stresses retinal ganglion cell (RGC) axons as they exit the eye and form the optic nerve. OHT causes early changes in the optic nerve such as axon atrophy, transport inhibition, and gliosis. Importantly, many of these changes appear to occur prior to irreversible neuronal loss, making them promising points for early diagnosis of glaucoma. It is unknown whether OHT has similarly early effects on the function of RGC output to the brain. To test this possibility, we elevated eye pressure in mice by anterior chamber injection of polystyrene microbeads. Five weeks post-injection, bead-injected eyes showed a modest RGC loss in the peripheral retina, as evidenced by RBPMS antibody staining. Additionally, we observed reduced dendritic complexity and lower spontaneous spike rate of On-alphaRGCs, targeted for patch clamp recording and dye filling using a Opn4-Cre reporter mouse line. To determine the influence of OHT on retinal projections to the brain, we expressed Channelrhodopsin-2 (ChR2) in melanopsin-expressing RGCs by crossing the Opn4-Cre mouse line with a ChR2-reporter mouse line and recorded post-synaptic responses in thalamocortical relay neurons in the dorsal lateral geniculate nucleus (dLGN) of the thalamus evoked by stimulation with 460 nm light. The use of a Opn4-Cre reporter system allowed for expression of ChR2 in a narrow subset of RGCs responsible for image-forming vision in mice. Five weeks following OHT induction, paired pulse and high-frequency stimulus train experiments revealed that presynaptic vesicle release probability at retinogeniculate synapses was elevated. Additionally, miniature synaptic current frequency was slightly reduced in brain slices from OHT mice and proximal dendrites of post-synaptic dLGN relay neurons, assessed using a Sholl analysis, showed a reduced complexity. Strikingly, these changes occurred prior to major loss of RGCs labeled with the Opn4-Cre mouse, as indicated by immunofluorescence staining of ChR2-expressing retinal neurons. Thus, OHT leads to pre- and post-synaptic functional and structural changes at retinogeniculate synapses. Along with RGC dendritic remodeling and optic nerve transport changes, these retinogeniculate synaptic changes are among the earliest signs of glaucoma.

Bharadwaj, D. N. (2010). "Use and environment impact of biodegradable plastics - a review." Current Advances in Agricultural Sciences **2**(2): 65-69.

Persistence of chemical compounds in plastic made them non-biodegradable polluting the environment. Disposal of plastic waste in a country like India where municipal waste management systems are already weak becomes a brutal problem. This garbage even had reached onto mountains and the deep oceans. Petroleum plastics with synthetic additives proved carcinogenic and have several harmful effects on animal life. To overcome this problem India needs to use biodegradable plastics in several areas viz., agricultural mulch, industrial packaging, wrapping, milk packets, food service, personal care, pharmaceuticals, surgical implants, medical devices and recreation. In the interest of public health and environmental catastrophes it is now critical to generate alternative resources of biodegradable plastics and avoid the use of petrochemical plastics. Exploitation of cellulose from bagasse, cotton lint and regenerated cellulose from non-edible starch (from waste and spoiled grains) can be converted to lactic acid polymers; plasticized thermoplastic starch is good for making disposables.

Bhardwaj, L., et al. (2019). "Persistent organic pollutants in lakes of Broknes peninsula at Larsemann Hills area, East Antarctica." Ecotoxicology **28**(5): 589-596.

Anthropogenic activity in East Antarctica has increased since the last 2-3 decades because of various scientific expeditions. Additionally, global pollution due to various newly introduced pollutants like pesticides is on use since the past century and many factors contribute to contamination even in Antarctica. During thirty fourth Indian Scientific Expedition to Antarctica (ISEA) in austral summer of 2014-2015, fifteen lake water samples were collected from five different lakes at Broknes peninsula, Larsemann Hills, East Antarctica. Persistent Organic Pollutants (POPs) residue levels found in lake water samples varied from 10.33-70.00 pg/mL in five different lakes. Presence of p,p'-DDT was detected in all different lakes but high concentration found in P4 lake water. After study confirms that Broknes peninsula in the Larsemann Hills area, East Antarctica has a trace amount of POPs which is an alarming situation and needs to be investigated further to maintain the pristine environment in Antarctica. The presence of POPs may be attributed to orographic effects, migratory birds, biomagnification and anthropogenic sources. In the future, new emerging pollutants must be analyzed like microplastics, phthalate, Paraxanthene etc.

Bhattacharya, S. S., et al. (2013). "Tranexamic acid loaded gellan gum-based polymeric microbeads for controlled release: In vitro and in vivo assessment." Colloids and Surfaces B: Biointerfaces **112**: 483-491.

Gellan gum (GG) microbeads containing tranexamic acid (TA), an anti-fibrinolytic drug were prepared by a classic sol-gel transition induced by ionic crosslinking technique using aluminum chloride (AlCl<inf>3</inf>) as cross-linking agent. The influence of different formulation variables on in vitro physico-chemical parameters and drug release studies were performed systematically. The microbeads were evaluated by scanning electron microscopy (SEM), Fourier transform infra-red (FTIR) spectroscopy, X-ray diffraction (XRD), differential scanning calorimetry (DSC) and high performance liquid chromatographic (HPLC) analysis. Particle size and swelling behavior of microbeads were also investigated. Microbeads showed improved drug encapsulation efficiency along with enhanced drug release. The in vivo studies exhibited sustained drug release in rabbits over a prolonged period after oral administration of these newly developed TA loaded GG microbeads. Based on the results of in vitro and in vivo studies in experimental animal model it was concluded that these microbeads provided intestinal specific controlled release of TA. © 2013 Elsevier B.V.

Bhattacharya, S. S., et al. (2013). "A RP-HPLC method for quantification of diclofenac sodium released from biological macromolecules." International Journal of Biological Macromolecules **58**: 354-359.

Interpenetrating network (IPN) microbeads of sodium carboxymethyl locust bean gum (SCMLBG) and sodium carboxymethyl cellulose (SCMC) containing diclofenac sodium (DS), a nonsteroidal anti-inflammatory drug, were prepared by single water-in-water (w/w) emulsion gelation process using AlCl<inf>3</inf> as cross-linking agent in a complete aqueous environment. Pharmacokinetic study of these IPN microbeads was then carried out by a simple and feasible high-performance liquid chromatographic method with UV detection which was developed and validated for the quantification of diclofenac sodium in rabbit plasma. The chromatographic separation was carried out in a Hypersil BDS, C18 column (250mmx4.6mm; 5m). The mobile phase was a mixture of acetonitrile and methanol (70:30, v/v) at a flow rate of 1.0ml/min. The UV detection was set at 276nm. The extraction recovery of diclofenac sodium in plasma of three quality control (QC) samples was ranged from 81.52% to 95.29%. The calibration curve was linear in the concentration range of 20-1000ng/ml with the correlation coefficient (r²) above 0.9951. The method was specific and sensitive with the limit of quantification of 20ng/ml. In stability tests, diclofenac sodium in rabbit plasma was stable during storage and assay procedure. © 2013.

Bhattacharya, S. S., et al. (2012). "Al3+ ion cross-linked interpenetrating polymeric network microbeads from tailored natural polysaccharides." International Journal of Biological Macromolecules **51**(5): 1173-1184.

Interpenetrating network (IPN) microbeads of sodium carboxymethyl locust bean gum (SCMLBG) and sodium carboxymethyl cellulose (SCMC) containing diclofenac sodium (DS), a non steroidal anti-inflammatory drug were prepared by single water-in-water (w/w) emulsion gelation process using AlCl(3) as cross-linking agent in a complete aqueous environment. The influence of different variables like total polymer concentration, gelation time and crosslinker content on in vitro physico-chemical characteristics and drug release rate in different media was investigated. Drug loaded microbeads were evaluated through Fourier transform infra-red (FTIR), X-ray diffraction (XRD) and differential scanning calorimetry (DSC) analyses. Scanning electron microscopy (SEM) micrograph of the beads suggested the formation of spherical particles. FTIR analysis indicated the stable nature of the drug in the blend microbeads. DSC and XRD analysis revealed amorphous state of drug after encapsulation. The drug release profile in acidic medium was considerably less in comparison to alkaline media. Formulations showed non-Fickian type transport mechanism. These tri-valent ion crosslinked beads not only improve drug encapsulation efficiency but also enhance drug release in phosphate buffer.

Bhogayata, A. C. and N. K. Arora (2019). "Utilization of metalized plastic waste of food packaging articles in geopolymer concrete." The Journal of Material Cycles and Waste Management **21**(4): 1014-1026.

The metalized plastics are extensively used by the food packaging industry. The metalized plastic wastes (MPW) are largely unfit for reuse and recycle process and impose harmful impacts to the environment. The MPW may be sustainably utilized in construction materials. The fly ash-based geopolymer concrete (GPC) has emerged as a sustainable construction material in the past few decades. Therefore, a novel combination of MPW and GPC may hold the potential of preparing a greener and sustainable construction material. The objectives were to obtain the optimum dosage of MPW fibers and to evaluate the corresponding response of the fresh and strength properties of the modified GPC. To explore the effectiveness of the addition of MPW into GPC, the life cycle assessment was studied for MPW and the novel composite prepared by combining GPC and MPW. The results exhibited improvement of strength properties of modified GPC specimens due to MPW fibers with a reduced trend of improvement of workability. It was observed that an addition of 1% MPW fibers by volume of the mix showed good performance of the composite for all test conditions. The sustainability assessment of the novel composite demonstrated promising outcomes ensuring the feasibility of usage of MPW into the GPC.

Biagini, R. E., et al. (2002). "Development of multiplexed fluorescence microbead covalent assays (FMCAs) for pesticide biomonitoring." Bulletin of environmental contamination and toxicology **68**(4): 470-477.

Biagini, R. E., et al. (2004). "Comparison of a multiplexed fluorescent covalent microsphere immunoassay and an enzyme-linked immunosorbent assay for measurement of human immunoglobulin G antibodies to anthrax toxins." Clinical & Diagnostic Laboratory Immunology **11**(1): 50-55.

Recently, the Centers for Disease Control and Prevention reported an accurate, sensitive, specific, reproducible, and quantitative enzyme-linked immunosorbent assay (ELISA) for immunoglobulin G (IgG) antibodies to Bacillus anthracis protective antigen (PA) in human serum (C. P. Quinn, V. A. Semenova, C. M. Elie et al., Emerg. Infect. Dis. 8:1103-1110, 2002). The ELISA had a minimum detectable concentration (MDC) of 0.06 microgram/ml, which, when dilution adjusted, yielded a whole-serum MDC of 3.0 micro g of anti-PA IgG per ml. The reliable detection limit (RDL) was 0.09 microgram/ml, while the dynamic range was 0.06 to 1.7 microgram/ml. The diagnostic sensitivity of the assay was 97.6% and the diagnostic specificity was 94.2% for clinically verified cases of anthrax. A competitive inhibition anti-PA IgG ELISA was also developed to enhance the diagnostic specificity to 100%. We report a newly developed fluorescence covalent microbead immunosorbent assay (FCMIA) for B. anthracis PA which was Luminex xMap technology. The FCMIA MDC was 0.006 microgram of anti-PA IgG per ml, the RDL was 0.016 microgram/ml, and the whole-serum equivalent MDC was 1.5 micrograms/ml. The dynamic range was 0.006 to 6.8 microgram/ml. Using this system, we analyzed 20 serum samples for anti-PA IgG and compared our results to those measured by ELISA in a double-masked analysis. The two methods had a high positive correlation ($r2 = 0.852$; $P < 0.001$). The FCMIA appears to have benefits over the ELISA for the measurement of anti-PA IgG, including greater sensitivity and speed, enhanced dynamic range and reagent stability, the use of smaller sample volumes, and the ability to be multiplexed (measurement of more than one analyte simultaneously), as evidenced by the multiplexed measurement in the present report of anti-PA and anti-lethal factor IgG in serum from a confirmed clinical anthrax infection.

Biagini, R. E., et al. (2004). "Development of a sensitivity enhanced multiplexed fluorescence covalent microbead immunosorbent assay (FCMIA) for the measurement of glyphosate, atrazine and metolachlor mercapturate in water and urine." Analytical & Bioanalytical Chemistry **379**(3): 368-374.

Body burdens from exposures to pesticides may be estimated from urinary analyses of pesticide

parent/metabolite concentrations. Pesticide applicators and others are often exposed to numerous unrelated pesticides, either sequentially or simultaneously. Classically, body burdens of pesticides are analyzed using chemical/instrumental analysis (CIM) or enzyme immunoassays (EIAs). Both of these technologies can usually be used to quantitate one analyte (or closely related groups of analytes) per analysis. Alternatively, multiple analytes can be measured simultaneously using a multiplexed fluorescence covalent microbead immunoassay (FCMIA). We developed a multiplexed FCMIA to simultaneously measure glyphosate (Gly), atrazine (Atz), and metolachlor mercapturate (MM) in water and urine. The assay had least detectable doses (LDDs) in water/diluted urine of 0.11/0.09 ng/ml (Gly, water/urine LDD), 0.10/0.07 ng/ml (Atz) and 0.09/0.03 ng/ml (MM). The sensitivity for the measurement of Gly was enhanced by derivatization. All assays gave linear responses from the LDDs for each respective pesticide to 300 ng/ml. There was no cross-reactivity between the three analytes. Using a 96-well microplate and an autosampler, as many as 288 separate analyses can be completed in approximately 120 min with precision, sensitivity, and specificity equivalent to, if not better, than that found when these same analytes are measured by CIM or EIA.

Bian, J., et al. (2019). "Study on safety of melamine tableware in market." Journal of Food Safety and Quality **10**(23): 8157-8163.

Objective: To determine and analyze the sensory, formaldehyde migration and melamine migration of commercially available melamine tableware, and to evaluate the safety of commercially available melamine tableware.

Biber, N. F. A., et al. (2019). "Characterising the deterioration of different plastics in air and seawater." Marine Pollution Bulletin **141**: 595-602.

In situ studies of plastic deterioration can help us understand the longevity of macroplastic as well as the generation of microplastics in the environment. Photo-oxidation contributing to the generation of microplastics in the marine environment was explored using four types of plastic (polyethene, polystyrene, poly(ethylene terephthalate) and Biothene exposed in light and in shade, in both air and sea water. Metrics for deterioration were tensile extensibility and oxidation rate. Measurements were conducted at intervals between 7 and 600days' exposure. Deterioration was faster in air than in sea water and was further accelerated in direct light compared to shade. Extensibility and oxidation were significantly inversely correlated in samples exposed in air. Samples in sea water lost extensibility at a slower rate. Polystyrene, which enters the waste stream rapidly due to its wide application in packaging, deteriorated fastest and is, therefore, likely to form microplastics more rapidly than other materials, especially when exposed to high levels of irradiation, for example when stranded on the shore.

Bierbaum, S. and H. Notbohm (1998). "Tyrosine phosphorylation of 40 kDa proteins in osteoblastic cells after mechanical stimulation of beta1-integrins." European Journal of Cell Biology **77**(1): 60-67.

Using a method for the mechanical stimulation of cells which was adapted from one developed by Wang and Ingber employing magnetic microbeads [Wang, N. D., D. E. Ingber: Control of cytoskeletal mechanics by extracellular matrix, cell shape, and mechanical tension. Biophys. J. 66, 2181-2189 (1994)], mechanical stress could be applied to specific receptors on the cell surface. To achieve this, ferromagnetic microbeads coated with different ligands were magnetized after adhesion to the cells. The beads were then 'twisted' using a second magnetic field oriented perpendicular to the magnetizing one. Contrary to most current methods, it was possible to confer the strain without deforming the cell as a whole, thus being able to observe the individual reactions of transmembrane receptors to mechanical stress. An increase in

tyrosine phosphorylation of proteins migrating at approximately 40 kDa could be observed as a reaction to stress on the beta1-subunits of the integrin family, while stress to other transmembrane molecules like the transferrin or low density lipoprotein receptors with no connection to the cytoskeleton did not give this reaction. Fibroblastic cells showed, contrary to osteoblastic cells, no reaction to stress applied on transmembrane proteins.

Bigalke, M., et al. (2018). "Micro- and Nanoplastic Analysis in Soils." Chimia **72**(12): 901.

Biginagwa, F. J., et al. (2016). "First evidence of microplastics in the African Great Lakes: recovery from Lake Victoria Nile perch and Nile tilapia." Journal of Great Lakes Research **42**(1): 146-149.

Microplastic contamination in the African Great Lakes is currently unreported, and compared to other regions of the world little is known about the occurrence of microplastics in African waters and their fauna. The present study was conducted in the Mwanza region of Tanzania, located on the southern shore of Lake Victoria. The gastrointestinal tracts of locally fished Nile perch (Lates niloticus) and Nile tilapia (Oreochromis niloticus) were examined for plastics. Plastics were confirmed in 20% of fish from each species by Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy. A variety of polymer types were identified with likely sources being urban waste and consumer use. Although further research is required to fully assess the impact of plastic pollution in this region, our study is the first to report the presence of microplastics in Africa's Great Lakes and within the fish species that inhabit them.

Bilgili, M. S., et al. (2019). "Characterisation of wastes collected from beaches, coastlines, marine surface cleaning processes and ships: A case study of Istanbul." Waste Management and Research **37**(6): 621-630.

Marine waste management is crucial for Istanbul because of the significant location for intercontinental transition, international trade, tourism, industry and shipping. This study is the first one realised in Turkey for the detailed characterisation of marine waste. The amount and characteristics of solid wastes originating from beaches, coastlines, sea surface cleaning processes and ships (both cargo and cruise ships) were determined. It was observed that marine wastes includes a significant amount of recyclable materials. Although, it was ascertained that the amount and composition of waste differs according to the collecting sources, the majority of wastes are composed of different types of plastics. The average calorific value of marine waste was determined as 2500 kcal kg⁻¹, which is higher than that of mixed municipal solid waste. There is a lack of studies on the pathways of disposal alternatives of marine waste after collection. As landfilling is the common pathway for disposal after collecting, it is clear that recycle/reuse and energy recovery options are possible for marine waste. Copyright © The Author(s) 2019.

Bimali Koongolla, J., et al. (2018). "Evidence of microplastics pollution in coastal beaches and waters in southern Sri Lanka." Marine Pollution Bulletin **137**: 277-284.

The abundance of microplastics (MPs) in surface water and beach sediment in Southern Sri Lanka covering a distance of 91km of coastline is reported. MPs were classified according to polymer type, geometry and color of the sites tested 60% showed MP contamination in sand and 70% in surface waters off the coast. The size range of MPs from surface waters and beaches were to 1.5-2.5mm and 3-4.5mm, respectively. Majority of these were identified as polyethylene (PE) and polypropylene (PP) with some polystyrene (PS) foam at a few sites. Fragments derived from larger debris appears to be the dominant type of MP at most sites and only 2 sites showed virgin pellets that accounted for 14% of the samples collected.

Binelli, A., et al. (2020). "Hazard evaluation of plastic mixtures from four Italian subalpine great lakes on the basis of laboratory exposures of zebra mussels." Science of the Total Environment **699**: N.PAG-N.PAG.

Studies related to the evaluation of plastics in freshwaters have been increasing in recent years because approximately 80% of plastic items found in the sea are from inland waters. Despite the ecological relevance of these surveys, no information has been available until now about the hazard related to plastic mixtures in freshwaters. To fill this knowledge gap, we carried out a study aimed to assess the environmental risk associated with the "cocktail" of plastics and environmental pollutants adsorbed on their surface in one of the larger European freshwater basins. Plastic debris was collected by a manta trawl along one transect each in four of the Italian subalpine great lakes (Lake Maggiore, Como, Iseo and Garda) and administered to zebra mussels (Dreissena polymorpha), a useful freshwater biological model present in all these lakes. We estimated a plastic density from 4908 MPs/km2 (Lake Iseo) to 272,261 MPs/km2 (Lake Maggiore), while the most common polymers found were polyethylene and polypropylene, with percentages varying between 73% and 100%. A biomarkers suite consisting of 10 different endpoints was performed after 7 days of exposure to investigate the molecular and cellular effects of plastics and related adsorbed pollutants. The main results highlighted a diffuse but different toxicity due to plastics for each lake, and there were significant changes in the antioxidant and detoxifying enzyme activities in Lake Maggiore, Iseo and Garda, an increase in protein carbonylation in L. Como, and a cellular viability decrease of approximately 30% for zebra mussels from L. Iseo and Garda. Despite this variability in the endpoints' responses, the application of the biomarker response index showed a similar environmental hazard due to plastics for all the sampled lakes. Unlabelled Image • Plastics were from 11,000 MPs/km2 (L. Iseo) up to 100,000/km2 (L. Maggiore). • A similar environmental hazard due to plastics was found for all the sampled lakes. • Some enzymatic activities, protein carbonylation and cell viability were changed. • No relation between sampled plastic amount and biomarkers data was found. [ABSTRACT FROM AUTHOR]

Binhussain, M. A. and M. M. El-Tonsy (2013). "Palm leave and plastic waste wood composite for out-door structures." Construction and Building Materials **47**: 1431-1435.

The objective of this paper is to produce an environmentally friendly artificial wood for structural application, by recycling mixed plastic waste and date palm leaves waste. Several pretreated wood plastic composites mixtures, using a 1:1 ratio of palm leaves and plastic waste, were designed and developed - namely, polycarbonate (PC-mix), polystyrene (PS-mix), and polyvinyl chloride (PVC-mix). The batch mixture of each type was extruded at different temperature profiles. The density, water absorption, hardness, modulus of elasticity (tensile and flexure), impact strength, and linear burning rate of the WPC samples produced were determined, and the results were compared with the natural hard, soft wood, and medium density fiberboard (MDF) woods. The developed wood plastic composites exhibited less water absorption, linear burning and hardness, higher density than that of natural and MDF wood, and can be used in outdoor structures.

Biniaz, S. (2019). "The UNGA Resolution on a 'Global Pact for the Environment': A chance to put the horse before the cart." Review of European Comparative & International Environmental Law **28**(1): 33-39.

While the 'Global Pact for the Environment' endorsed by France did not provide a compelling link between its approach and a particular environmental problem, United Nations General Assembly (UNGA) Resolution 72/277 sets out a linear methodological approach by asking a working group to consider whether there are possible 'gaps' in existing environmental law and policy and, if so, to discuss possible options for addressing them. This article discusses the concept of a 'gap', identifies several types of gaps that could be included in the UNGA work and points to possible ways in which such gaps may be filled. It illustrates how States could analyse gaps using four possible cases, including the domestic implementation of international commitments, climate change, substantive environmental rights and ocean plastics. Rather than jumping to pursue an overarching agreement including legally binding principles, the article argues that Resolution 72/277 offers States the opportunity to step back and methodically consider the most important missing pieces in international environmental law and policy, and the best manner and forum to address them. [ABSTRACT FROM AUTHOR]

Biozzi, G., et al. (1998). "Effect of genetic modification of acute inflammatory responsiveness on tumorigenesis in the mouse." Carcinogenesis **19**(2): 337-346.

Two distinct bidirectional selective breedings for quantitative traits were initiated from identical genetically heterogeneous mouse populations. The resulting lines are characterized by maximal or minimal acute inflammatory responsiveness (AIR): AIRmax and AIRmin lines, respectively, and by resistance or susceptibility to chemical skin tumorigenesis: Car-R and Car-S lines, respectively. The AIR response to s.c. injection of polyacrylamide microbeads, measured by cell content in the local exudate, was 10 times higher in AIRmax than in AIRmin mice. The response to selection was asymmetrical: the realized heritability was 0.26 in AIRmax and 0.008 in AIRmin, and resulted from the additive effect of 7-11 quantitative trait loci (QTL). Low responsiveness was globally dominant in F1 and 48% of F2 segregant variance was found to be due to genetic factors. These findings are the first demonstration of innate regulation of AIR by germ line genes. Susceptibility to skin tumorigenesis induced by a two-stage initiation (DMBA)-promotion (TPA) protocol was lower in AIRmax mice than in AIRmin mice, a 6-fold difference in tumor induction rate. Intense AIR was found to be associated with resistance, and low AIR with susceptibility to tumorigenesis, in F2 segregants chosen for extreme AIR phenotypes. At least some of the AIR QTLs therefore contain genes controlling tumorigenesis. Tumor phenotypes differed more in Car-R and Car-S than in AIRmax and AIRmin lines, indicating that QTLs unrelated to AIR, contribute to the host response to tumorigenesis. The extreme phenotypes/genotypes of the four selected lines and the known genetic constitution of their foundation population, offer new possibilities to discriminate the genes/mechanisms controlling two important traits: AIR and response to chemical tumorigenesis. Collaborative projects will be favorably considered. The description of tumor resistance genes in AIRmax and Car-R mice may be helpful for epidemiology and therapy of human cancer.

Bird, A. (2014). "Recycling tubs and yoghurt pots: Challenges and opportunities." Local Authority Waste & Recycling **22**(6): 14-14.

The article focuses on developments in plastics recycling all over Great Britain, as the trends emphasized more on household plastic waste. Topics covered include an Exter University research which revealed the role of food chain issues in affecting the waste management of people, the complexities over plastics as a type of recyclable waste, and the importance of events like the Plastics Recycling Expo in addressing plastics recycling issues.

Birlik, E., et al. (2006). "Preconcentration of copper using double-imprinted polymer via solid phase extraction." Analytica Chimica Acta **565**(2): 145-151.

The aim of this study is to prepare double-imprinted polymers which can be used for the selective removal of Cu(II) ions from synthetic waters. Chitosan-succinate (CS) was choosen as the metal complexing polymer. In the first step, chitosan was modified with succinic anhydrides. Modified chitosan was complexed with copper(II) ions and then reacted with 3-(2-aminoethylamino) propyltrimethoxysilane (AAPTS). In the prepared imprinted sorbent, both Cu(II) and AAPTS were used as templates. Then polymeric beads were crosslinked with tetraethoxysilane (TEOS). After that, the template (i.e., Cu(II) ions) was removed using 0.1 M HNO<inf>3</inf> solution. These Cu(II)-imprinted microbeads were used in the adsorption-desorption process. The effect of initial concentration of metal, the adsorption equilibria and the pH of the medium on adsorption capacity of Cu(II)-imprinting sorbents were studied. The maximum adsorption capacity and the relative selectivity coefficients of imprinted beads for Cu(II)/Zn(II), Cu(II)/Ni(II) and Cu(II)/Co(II) were also calculated. The double-imprinted polymers could be used many times without decreasing their adsorption capacities significantly.

Birnbaum, S., et al. (1988). "Production and release of human proinsulin by recombinant Escherichia coli immobilized in agarose microbeads." Enzyme and Microbial Technology **10**(10): 601-605.

Escherichia coli cells, releasing human proinsulin, were entrapped in 2% agarose microbeads. In order to optimize production of proinsulin in shake flask cultures, a number of parameters were evaluated, including temperature, pH, initial cell loading, bead size, agarose concentration, and bead/volume ratios. Maximum production was about 2 mg l super(-1) day super(-1). Production decreased by over 70% per day. Storage stability, t sub(0.5), was 6 and 10 days at 21 and 4 degree C, respectively, with regard to proinsulin production. Extensive protein and cell release was observed after induction.

Biswas, S. and K. H. Wan (2019). "Review of rodent hypertensive glaucoma models." Acta Ophthalmologica **97**(3): e331-e340.

Glaucoma is a neurodegenerative disease characterized by the progressive loss of retinal ganglion cells (RGCs). Elevated intraocular pressure (IOP) is a primary risk factor for the development and progression of glaucoma. Rodent models of glaucoma have greatly improved our understanding of the pathophysiology of glaucoma and served as a useful tool to investigate neuroprotective agents. An ideal glaucoma animal model should be easy to induce, reproducible, biologically plausible and predictable. Of the available animal models of glaucoma, rodents are commonly studied because they have a relatively short life span and can be genetically altered. A successful hypertensive glaucoma model should induce structural glaucomatous changes: including loss of retinal nerve fibres, retinal ganglion cells and optic-disc cupping along with IOP elevation. The level and duration of IOP elevation should be titratable depending on the targeted glaucomatous damage. This review summarizes the outcomes of induced rodent hypertensive glaucoma models including intracameral injection of microbeads, laser photocoagulation, episcleral vein cauterization, injection of hypertonic saline and hyaluronic acid. We aim to provide a detailed overview of each of the models with a focus on parameters that defines a successful glaucoma model. The induced IOP elevation and duration of elevation varied among the different models and strain of rodent; nonetheless, they all achieved a sustainable raised IOP with corresponding RGC loss. The limitations of each model are discussed. Copyright © 2018 Acta Ophthalmologica Scandinavica Foundation. Published by John Wiley & Sons Ltd

Biswas, S. B., et al. (2013). "Altered expression of A1 antigen in acute myeloid leukemia." Vox Sanguinis **2)**: 111.

Background: Loss of A, B and H antigens from red blood cells is known to occur in patients with haematological malignancies. Such events can result in blood group discrepancies as there would be disagreement between the results of forward and reverse grouping. Group discrepancy cases are usually resolved by checking for technical errors and by serologic evaluation. Occasionally, elaborate testing is necessary. Aim(s): We report a case of altered A1 expression in a case of acute myeloid leukemia, arising from MDS trisomy 8. During routine cross matching, a group discrepancy was noted and the abnormality was confirmed by molecular blood grouping. Method(s): Request for 2 units RBC was received for the correction of anemia in a 27 years old acute myeloid leukemia patient. During the forward and reverse grouping by tube technique (TT) (AABB technical manual 16th edition), a disagreement was noted. Subsequently, extended incubation at 22 and 4degreeC, and grouping by column agglutination technique (CAT) Biovue was performed. Anti A1 and anti H lectins and human O and B sera were also used. Molecular blood grouping after DNA extraction, was done with BAGene DNA SSP kit, BAG health care, GmbH, Germany. Result(s): Tube grouping showed no agglutination with anti A, anti B, and gave 4+ reaction with B reagent cells. Similar results were obtained on prolonged incubation at 22 and 4degreeC and also when 40% cell suspension was used for forward grouping. Reaction with A1 lectin was negative and anti H gave 4+ agglutination. Repeat TT using commercial antisera from another manufacturer, and CAT (micro beads) also yielded similar results. The forward grouping performed using human group O and B sera, showed 1+ and 3+ reaction by tube and CAT respectively. Though cross match with a A1 red cell unit was compatible, we issued two O packed RBC units. To resolve the discrepancy, we used the SSP kit for determination of the ABO blood group. Eight PCR mixes were used. Comparison of strength and size of bands with the given worksheet, showed the OA genotype with A phenotype.(Image is attached) In the literature, loss of ABO antigens is seen frequently in myelodysplasia, prior to the diagnosis of hematologic malignancy, and the original blood type returns on remission of the hematologic malignancy. Conclusion(s): Blood group discrepancies could be an indicator of an underlying hematologic malignancy. Molecular blood grouping may be required to resolvegroup discrepancies Whether the original blood group phenotype ie. 'A' returns after remission, remains to be seen.

Bittencourt, L. L. d. A., et al. (2018). "Blueberry residue encapsulation by ionotropic gelation." Plant Foods for Human Nutrition **73**(4): 278-286.

In the processing of fruits such as blueberry (Vaccinium sp.), that has high levels of phenolic acid, the food industry produces tons of organic waste that causes harm to the environment. Encapsulation is a technique used to take advantage of these wastes. Several methods are used to encapsulate substances, among them ionotropic gelation proves to be a simple, precise,

efficient and economical method for obtaining particles with encapsulated bioactives. In this manner, the aim of this study was to test sodium alginate as wall material to encapsulate blueberry residue by ionotropic gelation. The microbeads were characterized by scanning electron microscopy (SEM), x-ray diffraction (XRD), total phenolic compounds, antioxidant capacity and in vitro dissolution. The results showed that the microbeads had surface invagination; retention of 67.01% of the phenolic compounds after encapsulation and 68.2%, phenolic release 120 min after in vitro dissolution. The results suggest that the tested matrix was suitable for encapsulation. The produced microbeads are promising for applications in food products, once the phenolic compounds present in the blueberry residues were maintained after encapsulation.

Bittencourt, P. R. S. and F. R. Scremin (2019). "Evolved Gas Analysis of PE:PVC Systems Thermodegradation Under Inert and Oxidizing Atmosphere." Journal of Polymers & the Environment **27**(3): 612-617.

Incineration of plastic materials for the energy generation is one of the types of polymer recycling, however the composition of the atmosphere used in this process must be controlled, since the products generated during the incineration and released into the atmosphere can be harmful to environment. Combination of different polymers and the mixing of this with other municipal solid wastes can generate varied products, accentuating the toxicity of the evolved gases. Thus, in this work, mass loss, amount of main stages and the gases evolved during polyethylene (PE) and polyvinyl chloride (PVC) thermolysis, as well as the physical mixture of both polymers, were analyzed by the evolved gas analysis using hyphenated techniques Thermogravimetry and Infrared Spectroscopy. Analyzes were conducted under inert and oxidizing atmosphere and showed that the products formed in the samples thermolysis were chemically different in the two atmospheres. During the thermogravimetric analysis under oxidizing atmosphere, even O2 is present in a significant amount, the products formed are dependent on the temperature of the thermolysis process, being able to generate carbon dioxide and carbonylated, carboxylated compounds, carbon monoxide and others products. [ABSTRACT FROM AUTHOR]

Biver, T., et al. (2018). "Selective determination of poly(styrene) and polyolefin microplastics in sandy beach sediments by gel permeation chromatography coupled with fluorescence detection." Marine Pollution Bulletin **136**: 269-275.

Microplastics generated by plastics waste degradation are ubiquitous in marine and freshwater basins, posing serious environmental concerns. Raman and FTIR spectroscopies, along with techniques such as pyrolysis-GC/MS, are typically used for their identification. We present a procedure based on gel permeation chromatography (GPC) coupled with fluorescence detection for semi-quantitative selective determination of the most common microplastics found in marine shoreline sediments: poly(styrene) (PS) and partially degraded polyolefins (LDPEox). By operating the detector at either 260/280 or 370/420nm excitation/emission wavelengths PS can be distinguished from LDPEox upon GPC separation. Semi-quantitative determination of microplastics contents is also possible: dichloromethane extracts of PS and LDPEox yield linear

plots of fluorescence peak area vs concentration (0-5.0mg/mL range) and were used as reference materials for quantification of the microplastics content in sand samples collected in the winter berm and dune sectors of a Tuscany beach in Italy.

Bixler, H. J. and H. Porse (2011). "A decade of change in the seaweed hydrocolloids industry." Journal of Applied Phycology **23**(3): 321-335.

Seaweed hydrocolloid markets continue to grow, but instead of the 3-5% achieved in the 1980s and 1990s, the growth rate has fallen to 1-3% per year. This growth has been largely driven by emerging markets in China, Eastern Europe, Brazil, etc. Sales of agar, alginates and carrageenans in the US and Europe are holding up reasonably well in spite of the recession. However, price increases to offset costs in 2008 and 2009 have begun to have a dampening effect on sales, especially in markets where substitution or extension with less expensive ingredients is possible. These higher prices have been driven by higher energy, chemicals and seaweed costs. The higher seaweed costs reflect seaweed shortages, particularly for carrageenan-bearing seaweeds. The Philippines and Indonesia are the dominant producers of the farmed Kappaphycus and Eucheuma species upon which the carrageenan industry depends and both countries are experiencing factors limiting seaweed production. Similar tightening of seaweed supplies are beginning to show up in brown seaweeds used for extracting alginates, and in the red seaweeds for extracting agar. The structure of the industry is also undergoing change. Producers in China are getting stronger, and while they have not yet developed the marketing skills to compete effectively in the developed world markets, they have captured much of their home market. China does not produce the red and brown seaweeds needed for higher end food hydrocolloid production. Stocking their factories with raw material has led to the supply problems. Sales growth continues to suffer from few new product development successes in recent years; although some health care applications are showing some promise, i.e., carrageenan gel capsules and alginate micro-beads.

Blair, R. M., et al. (2019). "Average daily flow of microplastics through a tertiary wastewater treatment plant over a ten-month period." Water Research **163 (no pagination)**(114909).

Microplastics (MPs, <5 mm in size) are classified as emerging contaminants but treatment processes are not designed to remove these small particles. Wastewater treatment systems have been proposed as pathways for MPs pollution to receiving waters but quantitative and qualitative data on MP occurrence and transport remains limited, hindering risk assessment and regulation. Here, for the first time, the stepwise abundance and loading of MPs (60-2800 mum) in a tertiary wastewater treatment plant in the UK was assessed by sampling from May 2017 to February 2018. Microplastics were found in all sampling campaigns, with an average inflow of 8.1 x 10⁸ (95% CI, 3.8 x 10⁸ to 1.2 x 10⁹) items day⁻¹. Their prevalence decreased from influent to final effluent. Overall abundances decreased on average by 6%, 68%, 92%, and 96% after the pre-treatment, primary, secondary, and tertiary treatment stages respectively, although considerable variability occurred throughout the year. Sufficient particles remained in the treated effluent to generate an average discharge of 2.2 x 10⁷ (95% CI, 1.2 x 10⁷ to 3.2 x 10⁷]) particles day⁻¹ to the recipient river. Secondary MPs were predominant, while primary MP abundances were minimal. Fibres comprised 67% of all items, followed by films (18%) and fragments (15%). Chemical characterisation confirmed the presence of different types of polymers, with polypropylene fibres and fragments most abundant (23%). This research informs understanding of how wastewater effluent may channel MPs to the natural environment and their composition, and helps understand control points for optimising advanced treatment processes. Copyright © 2019 Elsevier Ltd

Blair, R. M., et al. (2019). "Microscopy and elemental analysis characterisation of microplastics in sediment of a freshwater urban river in Scotland, UK." Environmental Science & Pollution Research **26**(12): 12491-12504.

Understanding of the sources, fate, and impact of microplastics (MPs, < 5 mm) remains limited, particularly in freshwater environments, while limited comparability across available surveys hinders adequate monitoring and risk assessment of these contaminants. Here, the distribution of microscopic debris in an urban river close to the marine environment in the West of Scotland was investigated to assess concentration and distribution of primary and secondary MPs. Also, the efficiency of light and scanning electron microscopy with energy-dispersive spectroscopy (SEM-EDS) was evaluated for characterisation and quantification of MPs sized 2.8 mm-11 mum. Bank sediment samples were collected twice from the River Kelvin in Glasgow and were size-fractionated and processed for extraction of MPs by density separation. Sample MPs spiking and use of procedural blanks allowed the influence of processing on field data quality to be considered. Total abundances were 161-432 MPs kg⁻¹ dry sediment, with fibres as the dominant type, comprising > 88% of total counts. Nevertheless, fibres in blanks suggest potential contributions from atmospheric contamination. Moreover, fibres concentrated mainly in fractions < 0.09 mm suggesting that their fate may be influenced by drivers of fine sediment dynamics in rivers. While no primary MPs were observed, metallic and glass pellets were present in high abundances in settled material and could be easily misidentified by visual inspection, demonstrating that compositional analysis is needed to avoid analytical errors from MP misidentification and overestimation. SEM-EDS allowed for a quick screening of plastic vs non-plastic pellets and improved identification of smaller fragments, whereas more advanced techniques are needed for proper identification of fibres. This study is the first to report on MPs in freshwater rivers in Scotland and suggests that diffuse sources of pollution may be delivering secondary MPs to the river. Their sources, fate, and risk in these systems will thus warrant further attention.

Blanco, B., et al. (2009). "Treatment with bortezomib of human CD4+ T cells preserves natural regulatory T cells and allows the emergence of a distinct suppressor T-cell population." Haematologica **94**(7): 975-983.

BACKGROUND: In vitro depletion of alloreactive T cells using the proteasome inhibitor bortezomib is a promising approach to prevent graft-versus-host disease after allogeneic stem cell transplantation. We have previously described the ability of bortezomib to selectively eliminate alloreactive T cells in a mixed leukocyte culture, preserving non-activated T cells. Due to the role of regulatory T cells in the control of graft versus host disease, in the current manuscript we have analyzed the effect of bortezomib in regulatory T cells.

DESIGN AND METHODS: Conventional or regulatory CD4(+) T cells were isolated with immunomagnetic microbeads based on the expression of CD4 and CD25. The effect of bortezomib on T-cell viability was analyzed by flow cytometry using 7-amino-actinomycin D staining. To investigate the possibility of obtaining an enriched regulatory T-cell population in vitro with the use of bortezomib, CD4(+) T cells were cultured during four weeks in the presence of anti-CD3 and anti-CD28 antibodies, IL-2 and bortezomib. The phenotype of these long-term cultured cells was studied, analyzing the expression of CD25, CD127 and FOXP3 by flow cytometry, and mRNA levels were determined by RT-PCR. Their suppressive capacity was assessed in co-culture experiments, analyzing proliferation and IFN-gamma and CD40L expression of stimulated responder T cells by flow cytometry.

RESULTS: We observed that naturally occurring CD4(+)CD25(+) regulatory T cells are resistant to the pro-apoptotic effect of bortezomib. Furthermore, we found that long-term culture of CD4(+) T cells in the presence of bortezomib promotes the emergence of a regulatory T-cell population that significantly inhibits proliferation, IFN-gamma production and CD40L expression among stimulated effector T cells.

CONCLUSIONS: These results reinforce the proposal of using bortezomib in the prevention of graft versus host disease and, moreover, in the generation of regulatory T-cell populations, that could be used in the treatment of multiple T-cell mediated diseases.

Blanco, I., et al. (2018). "Agricultural plastic waste mapping using GIS. A case study in Italy." Resources, Conservation & Recycling **137**: 229-242.

Plastic materials used in agriculture mostly derive from synthetic petro-chemical polymers. They require at the end of their lifetime a suitable waste management system for the collection and treatment. A research was carried out in order to define a GIS methodology for mapping the agricultural plastic waste on the land. The use in agriculture of plastics in Barletta-Andria-Trani Province – Apulia Region – was investigated by applying orthophotos analysis and remote sensing survey. Besides purposed Plastic Waste Indexes were created to release land use to waste generation. The data were organized in a specific geo-database. The analysis showed that the agricultural plastic waste yearly produced from covering films was 627 kg ha −1 , from the anti-hail nets was 159 kg ha −1 , from nets for crop protection was 192 kg ha −1 , from shading nets was 131 kg ha −1 , from irrigation pipes was 104 kg ha −1 . Through GIS, the areas with high density of plastic wastes were pointed out and the suitable location of collection centres was defined. The produced maps and the GIS database can be always updatable tools, useful for monitoring and optimizing the collection of agricultural plastic waste from the farms and their transport to the recycling companies. [ABSTRACT FROM AUTHOR]

Bland, J. B. and W. T. Tse (2016). "MYC inhibition and TP53 activation synergistically suppress immune checkpoint ligand PD-L1 expression in AML cells." Blood. Conference: 58th Annual Meeting of the American Society of Hematology, ASH **128**(22).

Expression of immune checkpoint ligands is a mechanism that many tumors use to escape attack by host immune cells. PD-L1, the ligand for checkpoint receptor PD-1 on T cells, is often expressed on tumor cells. Engagement of PD-1 on T cells by PD-L1 on tumor cells attenuates T-cell receptor signaling and suppresses anti-tumor response. PD-1 and PD-L1 blocking antibodies have been implemented clinically as treatment for many cancers, but the pattern of PD-L1 expression on AML is not well characterized. To answer this question, we studied how PD-L1 expression on AML is regulated under in vitro conditions that simulate the leukemia-host microenvironment. We examined surface expression of PD-L1 by flow cytometry on 4 AML lines, THP-1, KG1, KG1a, HL60, and a CML line, K562. Under basal conditions, these lines expressed no or low levels of PDL1. The AML cells were then subjected to conditions that mimic the leukemia-host microenvironment. AML cells were stained with the green fluorescent dye CFSE and co-cultured with Ficoll-separated PMNCs from healthy donors. After a day of co-culture, expression of PD L1 was analyzed on AML cells and PD-1, CD25 and CD69 activation markers on

PMNCs. Only a small increase of PD-L1, up to 2-4 fold, was seen on AML cells under this condition. To simulate the pro-inflammatory milieu in the tumor microenvironment, anti-CD3/CD28 microbeads were then added in culture to activate T cells. We observed a marked up-regulation of PD-L1 on AML cells, up to 5-60 fold, plus prominent expression of PD-1, CD25 and CD69 on T cells. These findings were confirmed by an alternative method of T cell activation in which AML cells were first coated with an anti-CD123 antibody, linked to anti-CD3/CD28 antibodies via a biotinstreptavidin bridge, and then cultured with PMNCs. To test whether pro-inflammatory cytokines were the sole inducers of PD-L1 expression, AML cells were treated with IFN-gamma or TNF-alpha alone. IFN-gamma treatment enhanced PD-L1 expression by 2-10 fold, while TNF-alpha showed a <2-fold increase. These results show that expression of PD-L1 on AML is dynamically regulated through interaction with activated T cells, by multiple mechanisms including cytokine production and cell-cell interaction. MYC has been shown to regulate PD-L1 expression on T-ALL and solid tumors (Science 2016; 352:227). We asked whether MYC inhibition would suppress PD-L1 on AML. AML and PMNCs were co-cultured in the presence of anti-CD3/CD28 beads, with JQ1, a BET bromodomain inhibitor that blocks MYC expression. JQ1 inhibited PD-L1 expression by >90%. Dose-effect titration showed sigmoidal curves with ED50 of 0.03 to 0.1 muM for the 5 AML lines. Treatment with another MYC inhibitor, CPI-203, yielded similar results. These observations indicate that MYC inhibition can suppress PD-L1 expression on AML induced by activated T cells. TP53 has been shown to regulate PD-L1 expression on non-small cell lung cancer (JNCI 2016; 108: djv303). We asked whether TP53 activation in AML would also affect PD-L1 expression. Since the AML lines we used did not express wild-type TP53, we overexpressed TP53 in these cells by transfecting with a TP53-GFP plasmid. Expression of TP53 in the cells decreased PD-L1 levels by >80%. Treatment of the cells with pifithrin, an inhibitor that blocks trans-activating function of TP53, did not rescue PD-L1 expression, suggesting that the effect of TP53 on PDL1 expression is independent of its canonical trans-activating pathway. We asked if MYC and TP53 would synergistically affect PD-L1 expression on AML. We transfected AML cells with the TP53-GFP plasmid and co-cultured the cells with PMNCs and anti-CD3-/CD28 beads, in the presence or absence of JQ1. We found that JQ1 treatment of TP53-transfected cells further decreased PD-L1 expression by another 15%, indicating that MYC and TP53 independently and synergistically affect PD-L1 expression on AML. In summary, PD-L1 expression on AML cells is dynamically up-regulated upon interaction with activated T cells and suppressed by perturbation of the MYC and TP53 pathways. These findings have implications in the use of immune effector cell therapy against AML, since the activated effector cells could up-regulate PD-L1 expression on target cells and attenuate anti-leukemia effects. MYC inhibitors and TP53 activators could potentially be used in combination to suppress PD-L1 up-regulation and abrogate the ability of AML cells to escape host immune elimination.

Blandinieres, A., et al. (2019). "Interleukin-8 release by endothelial colony-forming cells isolated from idiopathic pulmonary fibrosis patients might contribute to their pathogenicity." American Journal of Respiratory and Critical Care Medicine. Conference **199**(9).

RATIONALE: Idiopathic pulmonary fibrosis (IPF) is a devastating lung disease characterized by obliteration of alveolar architecture, resulting in declining lung function and ultimately death. Pathogenic mechanisms involve a concomitant accumulation of scar tissue together with myofibroblasts activation and a strong abnormal vascular remodeling. We previously demonstrated that endothelial progenitor cells (Endothelial colony-forming cells (ECFC) subtype), which are post-natal vasculogenic cells in humans, are down regulated in IPF in contrast to healthy controls. We postulated here that ECFCs might behave as a liquid biopsy in IPF patients and exert modified vasculogenic properties compared to control ECFCs.

METHOD(S): ECFCs have been isolated from IPF patients (IPF-ECFCs) and controls (PBECFCs) blood samples. Endothelial phenotype was assessed by RTQ-PCR and flow cytometry assay. Functional properties of these two populations were compared (adhesion on several matrix and migration by Wound healing and Transwell assays) such as differentiation and vasculogenic properties (Matrigel assay in vitro and in vivo and 3D vasculogenic assay on microbeads-loaded fibrin gel). We also studied senescence state (BrDU incorporation, sgalactosidase staining and p16, p21, p53 expression), secretion of mediators that belong to the "senescence associated-secretory phenotype "(SASP) and apoptotic state (annexin-V staining). Last, we assessed the ability of ECFC conditioned medium to induce the migration of neutrophils in vitro and in vivo and we quantified IPF lungs infiltration by these cells. RESULT(S): IPF-ECFCs and PB-ECFCs expressed markers of the endothelial lineage and did not differ concerning adhesion, migration and differentiation properties in vitro and in vivo. However, senescent and apoptotic states were increased in ECFCs from IPF patients as shown by beta-galactosidase staining, p16 expression and annexin-V staining increase. Furthermore, conditioned medium of IPF-ECFCs had increased level of interleukin-8 (IL-8) that induced migration of neutrophils in vitro and in vivo. In addition, an infiltration by neutrophils was shown in IPF lung biopsies and we found in a prospective clinical study that a high level of neutrophils in peripheral blood of IPF patients was associated to a poor prognosis. CONCLUSION(S): To conclude, our study shows that IPF patients have a senescent ECFC phenotype associated with an increased IL-8 secretion potential that might contribute to lung neutrophils invasion during IPF.

Blank, L. M., et al. (2019). "Biotechnological upcycling of plastic waste and other non-conventional feedstocks in a circular economy." Current Opinion in Biotechnology **62**: 212-219.

The envisaged circular economy requires absolute carbon efficiency and in the long run abstinence from fossil feedstocks, and integration of industrial production with end-of-life waste management. Non-conventional feedstocks arising from industrial production and societal consumption such as CO₂ and plastic waste may soon enable manufacture of multiple products from simple bulk chemicals to pharmaceuticals using biotechnology. The change to these feedstocks could be faster than expected by many, especially if the true cost, including the carbon footprint of products, is considered. The efficiency of biotechnological processes can be improved through metabolic engineering, which can help fulfill the promises of the Paris agreement.

Blarer, P. and P. Burkhardt-Holm (2016). "Microplastics affect assimilation efficiency in the freshwater amphipod Gammarus fossarum." Environmental science and pollution research international **23**(23): 23522-23532.

An important issue in assessing microplastics is whether this newly emerging type of pollution affects freshwater invertebrates. This study was designed to examine the interactions between the amphipod Gammarus fossarum and two types of microplastics. To determine the ingestion and egestion of polyamide (PA) fibres (500 20 mu m), amphipods were exposed to four concentrations (100, 540, 2680, 13,380 PA fibres cm super(-2) base area of glass beakers) and four exposure times (0.5, 2, 8, 32 h) as well as four post-exposure times (1, 2, 4, 16 h). We demonstrate a positive correlation between concentration and ingestion of PA fibres. Fibres were found in the gut after 0.5 h of exposure. Egestion was rapid and the digestive tract was empty 16 h after exposure ended. To investigate whether polystyrene (PS) beads (1.6 mu m) can be taken up in the epithelial cells of the gut and the midgut glands, four concentrations (500, 2500, 12,500, 60,000 PS beads mL super(-1)) were tested. Cryosections exhibited fluorescent PS beads only within the gut lumen. In a 28-day feeding experiment with both, fibres and beads,

we studied the amphipod's feeding rate, assimilation efficiency and wet weight change. The exposure to PA fibres (2680 PA fibres cm super(-2) base area of glass beakers) significantly reduced the assimilation efficiency of the animals. While both tested polymer types are ingested and egested, PA fibres can impair the health and ecological functions of freshwater amphipods under continuous exposure.

Blasco, J., et al. (2015). "Particles in the oceans: Implication for a safe marine environment." Marine Environmental Research **111**: 1-4.

Strategies and technologies for the ecosafety assessment and design of engineered particles entering the marine environment are urgently needed. As the application of nanoparticles in science and technology grows, the need to understand their impact on the marine environment becomes increasingly important. This Editorial introduces a Special Issue on the topic of a sustainable and safety use of nanoparticles for protecting, recovering and supporting the oceans' environment and consequently human health. The issue focus on the impact of micro/nano-plastics and metallic nanoparticles on marine organisms, as well as some methodological aspects associated to the eco/toxicity and analytical approaches for in deep physico-chemical characterization of nanoparticles in marine waters and sediment media. Important and urgent topics are addressed in the field of nano-ecosafety in order to assess more precisely both exposure routes and environmental hazards of nanoparticles in the ocean. Ecotoxicological and toxicological data, obtained using a wide variety of organisms representative of different trophic levels and biological organization, from whole animals to macromolecules, will be useful for a better definition of cleaner and safer nanoparticles. Efforts in developing a broad understanding of target species, expected results, benchmarks and timelines, will be of primary importance.

Blasetti, N., et al. (2014). "Adipose mesenchymal stromal cells (aMSC) differentiate into neural progenitor cells (NPC) after 24 hours of co culture with effecter cells (EC) against central nervous system (CNS) proteins." Cytotherapy **4)**: S63.

Introduction: In 2006 (Cytotherapy 2006, 8:196-201) was reported that BM MSC co cultured with anti-CNS EC differentiate into NPC. To prove that aMSC share the same property and this process may be conducted under GMP rules we performed the following experiment. Method(s): Adipose tissue obtained by lipectomy and dissociated with colla-genase 4 in a GMP facility. aMSC were isolated by attachment and cultured for a week. EC were obtained from peripheral blood mononuclear cells, concentrated, were activated and expanded culturing them in DEMEM + human recombinant Insulin (Humalin), and 1% of Cerebrolysin . After 96 hours cells were harvested, washed and marked with anti CD8, CD56 and CD25. and negative selected with Clinimacs. EC and aMSC were co cultured for 24 hr to 120 hours. To test the aMSC differentiation into NPC cells were immune-fluorescent stained with anti nestin, tubulin 3, neu66, GFAP and Sox2 and MBP. and analyzed using confocal microscopy and FACS analysis. Result(s): After 24 hours most of aMSC showed positive stain to nestin . At 48, 96 and 120 hours free cells and neurosphere structures showed positive stain for the rest of cell markers. In the neurosphere was able to distinguish cells positive for neu66, GFAP and sox2 proving multiple linage differentiation of these structures. No microbial contamination, persistence of lymphocytes or immune magnetic microbeads was detected in the harvested NPC cells. Conclusion(s): aMSC may differentiate into NPC done from an adult individual without use of any cytokine, neurotropin, gene transpher, in a GMP facility.

Blasing, M. and W. Amelung (2018). "Plastics in soil: Analytical methods and possible sources." Science

of the Total Environment **612**: 422-435.

At least 300 Mio t of plastic are produced annually, from which large parts end up in the environment, where it persists over decades, harms biota and enters the food chain. Yet, almost nothing is known about plastic pollution of soil; hence, the aims of this work are to review current knowledge on i) available methods for the quantification and identification of plastic in soil, ii) the quantity and possible input pathways of plastic into soil, (including first preliminary screening of plastic in compost), and iii) its fate in soil.

Blazquez, M., et al. (1991). "[Caustic esophago-gastric and liver lesions caused by ingestion of a plastic resin hardener]." Gastroenterologie Clinique et Biologique **15**(6-7): 554-555.

Blenkharn, J. I. and C. Odd (2008). "Sharps injuries in healthcare waste handlers." Annals of Occupational Hygiene **52**(4): 281-286.

Clinical waste disposal carries with it a risk of serious and possibly life-threatening infection. Combining confidential questionnaires and structured interviews with discrete observation, the attitudes and approach to safe handling of bulk clinical wastes by staff in a specialist waste treatment facility were assessed. With particular attention to glove use and hand hygiene, observations were supplemented by review of group-wide accident and incident records, with emphasis on sharps injuries and related blood and bloodstained body fluid exposures. Deficiencies in glove selection and use, and in hand hygiene, were noted despite extensive and on-going training and supervision of waste handlers. Though ballistic puncture-resistant gloves protect against sharps injury, these were uncomfortable in use and were sometimes rejected by waste handlers who preferred thin-walled nitrile gloves that were more comfortable in use though provide no resistance to penetrating injury. Among the waste handlers working for a single specialist waste disposal company, sharps injuries (n = 40) occurred at a rate of approximately 1 per 29 000 man hours. Injuries were caused by hypodermic needles from improperly closed or overfilled sharps boxes (n = 6) or from sharps incorrectly discarded into thin-walled plastic sacks intended only for soft wastes (n = 34). Most injuries occurred to the fingers or hands. No seroconversions occurred, though two individuals suffered anxiety/stress disorder necessitating prolonged leave of absence with professional counselling and support. Glove use and hand hygiene must feature prominently in the on-going training of waste handlers. Though ballistic gloves afford protection against sharps injury, the initial segregation and safe disposal of clinical wastes by healthcare professionals must provide the primary control measure. Despite robust and unambiguous legislation and good practice guidelines, serious errors by healthcare staff that result in the disposal of hypodermic needles and other sharps to thin-walled plastic waste sacks places waste handlers at risk of bloodborne virus infection. Further improvement in the standards of waste segregation and disposal by healthcare professionals are still required to protect ancillary and support staff and waste handlers working in the disposal sector.

Blettler, M. C. M., et al. (2019). "Massive plastic pollution in a mega-river of a developing country: sediment deposition and ingestion by fish (Prochilodus lineatus)." Environmental Pollution **255**(Part 3).

The aim of this study was to determine the amount, composition and origin of plastic debris in one of the world largest river, the Parana River in Argentina (South America), focusing on the impact of urban rivers, relationships among macro, meso and microplastic, socio-political issues and microplastic ingestion by fish. We recorded a huge concentration of macroplastic debris of domestic origin (up to 5.05 macroplastic items per m²) dominated largely by bags (mainly high- and low-density polyethylene), foodwrapper (polypropylene and polystyrene),

foam plastics (expanded polystyrene) and beverage bottles (polyethylene terephthalate), particularly downstream from the confluence with an urban stream. This suggests inadequate waste collection, processing and final disposal in the region, which is regrettably recurrent in many cities of the Global South and Argentina in particular. We found an average of 4654 microplastic fragments m⁻² in shoreline sediments of the river, ranging from 131 to 12687 microplastics m⁻². In contrast to other studies from industrialized countries from Europe and North America, secondary microplastics (resulting from comminution of larger particles) were more abundant than primary ones (microbeads to cosmetics or pellets to the industry). This could be explained by differences in consumer habits and industrialization level between societies and economies. Microplastic particles (mostly fibres) were recorded in the digestive tract of 100% of the studied Prochilodus lineatus (commercial species). Contrary to recently published statements by other researchers, our results suggest neither macroplastic nor mesoplastics would serve as surrogate for microplastic items in pollution surveys, suggesting the need to consider all three size categories. The massive plastic pollution found in the Parana River is caused by an inadequate waste management. New actions are required to properly manage waste from its inception to its final disposal.

Blettler, M. C. M., et al. (2017). "Plastic pollution in freshwater ecosystems: macro-, meso-, and microplastic debris in a floodplain lake." <u>Environmental Monitoring & Assessment</u> **189**(11): 581.

Plastic pollution is considered an important environmental problem by the United Nations Environment Programme, and it is identified, alongside climate change, as an emerging issue that might affect biological diversity and human health. However, despite research efforts investigating plastics in oceans, relatively little studies have focused on freshwater systems. The aim of this study was to estimate the spatial distribution, types, and characteristics of macro-, meso-, and microplastic fragments in shoreline sediments of a freshwater lake. Food wrappers (mainly polypropylene and polystyrene), bags (high- and low-density polyethylene), bottles (polyethylene terephthalate), and disposable Styrofoam food containers (expanded polystyrene) were the dominant macroplastics recorded in this study. Contrary to other studies, herein macroplastic item surveys would not serve as surrogates for microplastic items. This is disadvantageous since macroplastic surveys are relatively easier to conduct. Otherwise, an average of 25 mesoplastics (mainly expanded polystyrene) and 704 microplastic particles (diverse resins) were recorded per square meter in sandy sediments. Comparisons with other studies from freshwater and marine beaches indicated similar relevance of plastic contamination, demonstrating for the first time that plastic pollution is a serious problem in the Parana floodplain lakes. This study is also valuable from a social/educational point of view, since plastic waste has been ignored in the Parana catchment as a pollutant problem, and therefore, the outcome of the current study is a relevant contribution for decision makers.

Blettler, M. C. M. and K. M. Wantzen (2019). "Threats Underestimated in Freshwater Plastic Pollution: Mini-Review." <u>Water, Air & Soil Pollution</u> **230**(7): N.PAG-N.PAG.

Plastic pollution is one of the most acute environmental topics of our time. While there is a great scientific effort to tackle this problem, it has not always been well-coordinated or properly targeted. In this short review, we call for scientists to get involved in three crucial topics (threats) underestimated—or ignored—in freshwater systems: (i) plastic-species entanglement, (ii) plastic as nesting material, and (iii) macroplastic debris coming from mismanaged household solid waste. Reducing the knowledge gaps between marine and freshwater environments will be crucial to solute the plastic pollution problem effectively and globally. Therefore, we make a plea here to reinforce research activities on these three issues in freshwater environments

worldwide. [ABSTRACT FROM AUTHOR]
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Blickley, L. C., et al. (2016). "Trends and drivers of debris accumulation on Maui shorelines: Implications for local mitigation strategies." Marine Pollution Bulletin **105**(1): 292-298.
Marine debris, particularly plastic, is an identified concern for coastal areas and is known to accumulate in large quantities in the North Pacific. Here we present results from the first study to quantify and compare the types and amounts of marine debris on Maui shorelines. Surveys were conducted monthly between May 2013 and December 2014, with additional daily surveys conducted on Maui's north shore during January 2015. Debris accumulation rates, loads, and sources varied between sites, with plastics being the most prevalent type of debris at all sites. Large debris loads on windward shores were attributed to the influence of the North Pacific Subtropical Gyre and northerly trade winds. Daily surveys resulted in a significantly higher rate of debris deposition than monthly surveys. The efficacy of local policy in debris mitigation showed promise, but was dependent upon the level of enforcement and consumer responsibility.

Blight, L. K. and A. E. Burger (1997). "Occurrence of Plastic Particles in Seabirds from the Eastern North Pacific." Marine Pollution Bulletin **34**(5): 323.
Researchers analyzed a total of 11 species of seabirds caught as bycatch in pelagic waters in eastern parts of the North Pacific. Particles of plastic were found in the stomaches of eight of these 11 species. All surface-feeding birds had ingested plastic particles, including two species of storm-petrel, one species of albatross, one species of petrel, and one species of fulmar. In addition, plastic particles were detected in 75% of the shearwaters examined. In certain individual petrels, shearwaters, and storm-petrels, plastic particle densities were judged sufficient to restrict digestion. In other birds, the densities were judged to be negligible. Plastic was also found in two species of puffins. The most likely sources of the plastic particles are identified.

Blockstein, D. E. (1988). "Congress tackles ocean plastic pollution." BioScience **38**(1): 19-19.
Discusses the efforts of the U.S. Congress to address the environmental problem of plastic pollution in the world's oceans. Impact of the solid waste which is discharged by ocean vessels, according to a 1975 study by the National Academy of Sciences; Way that plastic can kill ocean wildlife, after animals become entangled in plastic debris or ingest plastic; Harm which is done to sea turtles, an endangered species, by plastic; Prevalence of plastic fishing nets, which drown seabirds, fur seals, and other marine animals; Denial of permits to the Japanese salmon fishing industry to fish in Alaskan waters; Idea that there is a need to substitute biodegradable materials for plastics.

Blumenroder, J., et al. (2017). "Microplastic contamination of intertidal sediments of Scapa Flow, Orkney: A first assessment." Marine Pollution Bulletin **124**(1): 112-120.
The concentration of microplastic particles and fibres was determined in the intertidal sediments at selected sites in Scapa Flow, Orkney, using a super-saturated NaCl flotation

technique to extract the plastic and FT-IR spectroscopy to determine the polymer types. Mean concentrations were 730 and 2300kg⁻¹ sediment (DW), respectively. Detailed spatial and quantitative analysis revealed that their distribution was a function of proximity to populated areas and associated wastewater effluent, industrial installations, degree of shore exposure and complex tidal flow patterns. Sediment samples from Orkney showed similar levels of microplastic contamination as in two highly populate industrialized mainland UK areas, The Clyde and the Firth of Forth. It was concluded that relative remoteness and a comparative small island population are not predictors of lower microplastic pollution. Furthermore, a larger concerted effort across Scotland and the UK is required to establish a baseline microplastic database for the evaluation of future policy measures.

Boano, E., et al. (2012). "Catheter-related infections and the nurse. New strategies." <u>Early Human Development</u> **2)**: S102-S103.

The preterm infant is a special guest in which there is a physiological immune deficiency related to prematurity making him particularly vulnerable to infections. The existence and importance of infectious and septic disease is remarkable in Neonatology, and it is clear that, even in developed countries, infections are the main obstacle to the viability of premature infants. Premature infants are immunocompromised hosts by definition: in such patients, proper management of all the devices needed to perform cares and assistance is mandatory to reduce the risk of infection and to ultimately improve the overall clinical course and to achieve a good long-term quality of life. In this context one of the key moments is the placement and management of Central Venous Catheter (CVC), since up to 60% of nosocomial infections are, in fact, catheter related. Prolonged intravenous treatments, need for parenteral nutrition, the difficulty of finding peripheral venous access and need of alternative vessel accesses in case of emergency make the placement of a CVC in premature infants a priority, at least for the first weeks of stay in NICU. Whenever catheter-related infections occur, the clinical worsening and the overall health threats for the neonate produce a consequent prolongation of hospitalisation thus translating into higher costs. A skilled, appropriate management of all intravenous accesses, therefore, reduces the times for care, antibiotic therapy and duration of stay. The management and maintenance of the CVC are a nurse's responsibility. It is obvious that it is not possible to entirely avoid the risk of infection and eliminate catheter-related infections, thus the goal is to reduce to a minimum the presence of microorganisms able to develop in an infection in young patients, with the help of technology and care strategies. The key moments of such nursing management of CVCs are: Replacement of Administration Sets, administration of intravenous therapies and the dressing of the insertion site. The high rate of glucose typical of TPN favours the proliferation of pathogens. The lines of infusion may also be contaminated with microparticles from plastic syringes and needles, which are deposited in the catheter or into the bloodstream resulting in lung and intestinal infections. It also exists a correlation between microbial contamination and the frequency with whom infusion lines and taps are manipulated. According to the CDC guidelines, it is essential to minimise the access routes using catheters with a suitable number of lamps. A similar argument applies to the three-way taps that must not be greater than the number of infusions that the patient may have at one time. Therefore, other devices such as luer-lock caps might be helpful, as they allow the nurse to replace several times a day the infusions without opening the entire venous access. Noteworthy, it is recommended to repeatedly disinfect the site of entry of the syringe or the ramp with chlorexidine. The most appropriate frequency of infusion lines replacement is a debated issue. The latest CDC guidelines show that - in general - there is no proven additional benefit in performing replacement more frequently than one every 72 hours. The high concentrations of glucose in

the TPN infusion and the presence of lipids, however, better suggest to replace the set every 24 hours. In case of blood transfusions, the infusion's circuit should be removed within 4 hours. The catheters are also a repository for micro-plastics that can enter the bloodstream via the connections and syringes used for drug delivery. These particles can then enter the bloodstream giving rise to serious infectious and pathological phenomena for the baby such as necrotising enterocolitis (NEC), thrombophlebitis and pulmonary embolism. This can happen even in the case of incompatibility of infusions or when formation of air bubbles in the lines occurs. Several studies have shown that the use of in-line filters placed proximally to the catheter insertion site greatly reduces the risk of contamination a d flow of plastic and precipitated particles in the bloodstream, thus resulting in reduced risk of developing infections. The filters also separate the precipitates resulting from the combinations of infusions that may be not compatible. For the dressing of the insertion site, it is recommended the use of non-alcoholic chlorexidine gluconate, because povidone-iodine may be detrimental to the neonate as it is active on the thyroid of immature infants, and also because the presence of alcoholic disinfectants may produce skin burns. The dressing should be performed at the time of the insertion of the CVC and every time it looks dirty or bloody at inspection. It is advisable to secure the catheter with a transparent film that will be replaced only in case of deterioration or if it looks dirty and polluted at visual inspection. This is because the risk of rupture and dislodging of the catheter in premature infants is greater than the benefit of a more frequent disinfection. The catheter-related infections are one of a major problem of neonatal intensive care units, and in such area the nurses play a key role in the related risk-management. Simple but rigorous steps and bundles to be implemented in the daily practice, along with the use of equipments such as filters, valves and three-way connector clubs can help reducing the risk of infection while concomitantly reducing duration of the hospitalisation, related costs and related poor outcomes. Conflict of Interest: None declared.

Bochenska-Marciniak, M., et al. (2004). "The effect of recombinant Il-8 on eosinophils' migration in vitro and in vivo." Journal of Allergy and Clinical Immunology **113**(2).

Rationale Il-8 is a chemokine which causes chemotaxis of neutrophils, eosinophils and lymphocytes in vitro, however its role as a chemoatractant in allergic inflammation is unclear. The aim of this study was to investigate the in vitro Il-8 induced chemotaxis of eosinophils and the effect of nasal lavage of Il-8 solution on the influx of eosinophils. Methods Twelve patients (5 women and 7 men) suffering from seasonal allergic rhinitis with average age 30,1 ± 2,67 years were included into the study. Eosinophils from peripheral blood were isolated using the CD16 MicroBeads (MACS, Miltenyi Biotec®) and chemotaxis to Il-8, FMLP, RANTES, Il-5 and C5a were determined. Patients were challenged with Il-8 solution and diluent for Il-8 during the pollen season. The nasal lavage fluids were collected before, during Il-8 or placebo challenge and 30 minutes, 2 hours and 3 hours after the challenge. The number of eosinophils in the lavages was determined. Results The optimal concentration of Il-8 for eosinophils chemotaxis was 10-9M, the chemotactic index was 2,03 ± 0,6. The chemotactic index for FMLP (10-7M), RANTES (10-8M), Il-5 (10-7M) and C5a (10-8M) was: 3,24 ± 0,83; 3,51 ± 0,7; 4,02 ± 0,68 and 2,5 ± 0,77, respectively. After the challenge with Il-8 of nasal mucosa we observed a peak of eosinophil influx at 3 hours after challenge reaching the number of 3050 ± 760 cell/ml, but the number of eosinophils after the Il-8 challenge in comparison with diluent was not significantly higher (p>0,05). Conclusion Il-8, which is a chemoatractant for eosinophils in vitro, does not provoke a significant influx of eosinophils into the allergen primed nasal mucosa.

Boehm, A. B., et al. (2017). "Oceans in Peril: Grand Challenges in Applied Water Quality Research for the

21st Century." Environmental Engineering Science **34**(1): 3-15.
Oceans cover most of the planet and 60% of the world's population lives near the coast. Anthropogenic activities along coastlines and in the open ocean have placed the oceans in peril. According to a Pew Oceans Commission Report, among the greatest threats to the ocean are land-based runoff from coastal development, nutrient pollution, overfishing, and invasive species. Here, we describe threats due to microbial, nutrient, chemical, and plastic pollution in addition to declining biodiversity and describe fundamental and applied research needed to mitigate the threats. While the research needs are diverse, we identify several research foci that transcend individual threats: monitoring, fate and transport studies, modeling, innovative natural and engineered treatment systems, and toxicity and health studies. Research within the environmental engineering and science community that addresses these needs will contribute to improving ocean health. © Copyright 2017, Mary Ann Liebert, Inc. 2017.

Boerger, C. M., et al. (2010). "Plastic ingestion by planktivorous fishes in the North Pacific Central Gyre." Marine Pollution Bulletin **60**(12): 2275-2278.
A significant amount of marine debris has accumulated in the North Pacific Central Gyre (NPCG). The effects on larger marine organisms have been documented through cases of entanglement and ingestion; however, little is known about the effects on lower trophic level marine organisms. This study is the first to document ingestion and quantify the amount of plastic found in the gut of common planktivorous fish in the NPCG. From February 11 to 14, 2008, 11 neuston samples were collected by manta trawl in the NPCG. Plastic from each trawl and fish stomach was counted and weighed and categorized by type, size class and color. Approximately 35% of the fish studied had ingested plastic, averaging 2.1 pieces per fish. Additional studies are needed to determine the residence time of ingested plastics and their effects on fish health and the food chain implications. © 2010 Elsevier Ltd.

Boffi, A., et al. (2015). "Amine oxidase-based biosensors for spermine and spermidine determination." Analytical and bioanalytical chemistry **407**(4): 1131-1137.
Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis The present work describes the development and optimization of electrochemical biosensors for specific determination of the biogenic polyamine spermine (Spm) and spermidine (Spmd) whose assessment represents a novel important analytical tool in food analysis and human diagnostics. These biosensors have been prepared using novel engineered enzymes: polyamine oxidase (PAO) endowed with selectivity towards Spm and Spmd and spermine oxidase (SMO) characterized by strict specificity towards Spm. The current design entails biosensors in which the enzymes were entrapped in poly(vinyl alcohol) bearing styrylpyridinium groups (PVA-SbQ), a photocrosslinkable gel, onto an electrode surface. Screen-printed electrodes (SPEs) were used as electrochemical transducers for enzymatically produced hydrogen peroxide, operating at different potential vs Ag/AgCl according to the material of the working electrode (WE): +700 mV for graphite (GP) or -100 mV for Prussian blue (PB)-modified SPE, respectively. Biosensor performances were evaluated by means of flow injection amperometric (FIA) measurements. The modified electrodes showed good sensitivity, long-term stability and reproducibility. Under optimal conditions, the PAO biosensor showed a linear range 0.003-0.3 mM for Spm and 0.01-0.4 mM for Spmd, while with the SMO biosensor, a linear range of 0.004-0.5 mM for Spm has been obtained. The main kinetic parameters apparent Michaelis constant (K ^sub M^), turnover number (K ^sub cat^) and steady-state current (I ^sub max^) were determined. The

proposed device was then applied to the determination of biogenic amines in blood samples. The results obtained were in good agreement with those obtained with the GC-MS reference method.

Bogen, D. C. (1968). "Rapid determination of strontium-90 in urine." Health Physics **14**(2): 131-133.

Reverse-phase partition chromatography has been adapted for rapid determination of Sr^{9O} in large urine samples. A column is prepared containing the ligand, di(2-ethylhexyl) phosphoric acid which is coated onto the inert support, glass micro beads. The Y⁹⁰ daughter of Sr ⁹⁰ is selectively absorbed by the column and subsequently eluted. The Y⁹⁰ is precipitated as the oxalate, beta counted, and the sample activity level obtained by computer data reduction. The chemical recoveries are better than 80%, precision of analysis is better than 5% and no overall bias is observed. The procedure is rapid, large sample sizes can be used for good sensitivity, and decontamination factors are satisfactory.

Boissel, L., et al. (2008). "Umbilical cord mesenchymal stem cells increase expansion of cord blood natural killer cells." Biology of Blood & Marrow Transplantation **14**(9): 1031-1038.

Natural killer (NK) cell-mediated cytotoxicity can control leukemia relapse while protecting patients from graft-versus-host disease (GVHD) after allogeneic stem cell transplant. Cord blood (CB) is rich in NK cell progenitors with similar properties of proliferation and cytotoxicity as adult blood NK cells. Hence, it is attractive to expand and potentially utilize these cells for adoptive immunotherapy. In this study, CB mononuclear cells were CD3-depleted by immunomagnetic microbead selection to remove T cells. This CD3(dep) CB-MNC fraction was then plated for ex vivo expansion, with or without a feeder layer of irradiated umbilical cord mesenchymal stem cells (UC-MSC), with or without cytokines that have been shown to be critical for NK expansion: IL-2, IL-15, IL-3, and FLT-3L. At an average of 2 weeks of culture, there was significantly higher expansion (64.7 +/- 8.4-fold) of CD56(+)/CD3(-) NK cells in the presence of the UC-MSC feeder layer and cytokines compared to controls (no increase with feeder layer only and 6.4 +/- 1.5-fold increase with cytokines only, P < .05). Contact between CD3(dep) CB-MNC cells and UC-MSC augmented NK expansion. The combination of all 4 cytokines was superior to IL-2 alone or 2 cytokines combinations: mean 64.7 +/- 8.4-fold expansion with 4 cytokines combination versus IL-2 alone, IL-2 + FLT-3L, IL-2 + IL-15 or IL-2 + IL-3 (12.2 +/- 2.0, 14.4 +/- 2.4, 10.4 +/- 4.1, 25.2 +/- 8.1 respectively). We also observed that only fresh CD3(dep) CB-MNC preparations could be expanded reliably, whereas frozen and thawed CD3(dep) CB-MNC cells did not expand consistently (mean fold increase 6.5 +/- 3.2). Cytotoxicity of expanded NK cells was compared with NK cells from fresh and overnight IL-2 activated CD3(dep) CB-MNC. Whereas fresh cells displayed no discernible killing, strong cytotoxicity against K562, Raji, REH, and SUP-B15 cells lines was noted after overnight activation in IL-2. Cytotoxicity of expanded NK cells against Raji, REH, and SUP-B15 was lower, which, however, correlated with a predominant expansion of CD56(+)/CD16(-) cells known to have less cytolytic activity than CD56(+)/CD16(+). To test the transfection efficiency in NK cells, fresh or expanded CD3(dep) CB-MNC cells were electroporated with either DNA or mRNA constructs for GFP. DNA had a low transfection efficiency (<10%), whereas the one for mRNA reached 52%, but at the cost of significant cell death. Our results suggest that CB NK cell progenitors can be expanded to obtain large numbers by using an irradiated feeder of UC-MSC. They maintain an elevated cytotoxic profile, and may be genetically manipulated-all characteristics that make them suitable for cellular therapies.

Bollain Pastor, C. and D. Vicente Agullo (2019). "[Presence of microplastics in water and the potential

impact on public health]." Revista Espanola de Salud Publica **93**: 28.
The use of plastics has increased exponentially over recent years. Difficulties in their recycling and their low degradability result in their accumulation in the environment. Despite their great stability, they are subject to physical and chemical erosion resulting in smaller fragments. Although there is no standard definition of microplastics, the maximum limit of 5 mm has been accepted as a criterion. Plastics, in addition to the consequences on the environment, have a direct effect on living beings, either by ingestion or toxicity. They may also act as a vehicle for invasive species and adsorb other contaminants on their surface such as PCBs, PAHs or DDT. This, increases the toxic effect of their own components such as plasticizers, additives, heavy metals, etc. There is disparity in the published results regarding the presence of microplastics in both water supplies and drinking water and bottled water. There are no standard analytical methods, nor a consensus in the definition and description of microplastics that allow an appropriate comparison of results. In the absence of scientific evidence, it is necessary to study in depth the presence of microplastics in water and the potential effects on health, in order to be able to consider microplastics as a monitoring parameter in drinking water.

Bollmann, U. E., et al. (2019). "Assessment of input of organic micropollutants and microplastics into the Baltic Sea by urban waters." Marine Pollution Bulletin **148**: 149-155.
We assess how different micropollutants and microplastics, connected to wastewater are introduced into the Baltic Sea. The relevance of untreated wastewater, treated wastewater, treated and untreated rain runoff, as well as combined sewer overflow (CSO), is assessed in respect to mass balance, as well as relative inflows of micropollutants and -plastics into the Baltic Sea. To achieve this, modelling based on data on exemplary sewer systems and measured micropollutant concentrations in the single sources were used. Most compounds reach the receiving Baltic Sea via treated wastewater. A few exceptions are compounds that are removed to a very high extent in wastewater treatment plants. For these compounds, the emissions with stormwater (e.g., terbutryn) or untreated wastewater (e.g., triclosan) are dominating. Additionally, compounds that are discharged with the water that is running off urban surfaces are introduced into marine areas via rain runoff. These data are used to forecast a total mass load and concentrations that can be expected in the Baltic Sea. Massloads are expected to be between 0.1 and 5.9 t/a for triclosan and TCPP (tris (2-chloropropyl) phosphate) and 0.2 t/a for microplastic particles. The expected concentrations in open Baltic Sea waters range from 0.01 to 26 ng/L. Copyright © 2019 Elsevier Ltd

Bolto, B. A., et al. (1975). "The use of magnetic polymers in water treatment." J.Polymer Sci.Symp **49 (49)**: 211-219.
Magnetic polymers, originally conceived in ion exchange form as a means of handling microbeads in a thermally regenerable desalination process, have now been prepared in a variety of configurations for use in a number of water purification procedures. Processes have been devised which employ magnetic polymers in filtration, in oil slick removal, and in the adsorption of metal ions. Suitably shaped particles, when magnetized, form a filter bed of high voidage volume. Tests have been run on a variety of turbid waters. The particles give considerably better performance as filter aids than the diatomaceous earth normally used. An extremely important advantage is that the magnetic filter aids can be recovered and reused after washing. Vesicular forms of magnetic hydrophobic polymers float on water and have application in the removal of oil spills from water surfaces. The oil becomes trapped in the voids between the particles; the resulting mass is readily removed from the water by magnetic means, after which the oil is separated from the particles simply by centrifugation. The particles and

residual oil are then recycled. Magnetic ion exchangers, smaller in size than conventional resins, can be employed in continuous contacting systems, such as fluidized and semifluidized beds. When compared with normal continuous ion exchange systems, the same removal of ions can be accomplished using considerably less resin in a plant which is smaller, simpler, and much cheaper to construct. Magnetic polymers, originally conceived in ion-exchange form as a means of handling microbeads in a thermally regenerable desalination process, have now been prepared in a variety of configurations for use in a number of water purification procedures. Processes have been devised which employ magnetic polymers in filtration, in oil slick removal, and in the adsorption of metal ions. Suitably shaped particles, when magnetized, form a filter bed of high voidage volume. Tests have been run on a variety of turbid waters. Vesicular forms of magnetic hydrophobic polymers float on water and have application in the removal of oil spills from water surfaces. The oil becomes trapped in the voids between the particles; the resulting mass is readily removed from the water by magnetic means. Magnetic ion exchangers, smaller in size than conventional resins, can be employed in continuous contacting systems, such as fluidized and semifluidized beds.

Bolto, B. A., et al. (1982). "Desalination by continuous ion exchange based on thermally regenerable magnetic microresins." Water Science and Technology **14 (6-7 /7)**: 523-534.

This paper describes the unique hydrodynamic and kinetic properties of Sirotherm thermally regenerable desalting resins when made in the form of magnetic microbeads, and the development of continuous contacting systems which exploit these properties. A novel multistage contactor has been evaluated on laboratory and pilot-plant scales. A prototype plant is to be installed near Perth, Western Australia, in order to demonstrate the process. It is truly continuous, simple and economic, and does not require preclarification of the raw water. The removal of small quantities of salt at the 500 to 2000 mg/L level is becoming increasingly necessary to counter one of the most widespread forms of water pollution encountered throughout the world. Ion-exchange resins which can be regenerated with hot water have been used previously in a batch mode for the desalting of both natural waters, and municipal and industrial wastewaters. Continuous operation would offer many advantages, especially for productivity, heat economy and ease of control. Unfortunately existing continuous ion-exchange contactors are intermittent in operation and somewhat complex. This paper describes the unique hydrodynamic and kinetic properties of 'Sirotherm' thermally regenerable desalting resins when made in the form of magnetic microbeads, and the development of continuous contacting systems which exploit these properties. A novel multistage contactor has been evaluated on laboratory and pilot-plant scales. A prototype plant, with a throughput of 1 ML/day, is to be installed near Perth, Western Australia, in order to demonstrate the process. It is truly continuous, simple and economic, and does not require preclarification of the raw water.

Bolzoni, M., et al. (2014). "Transcriptional and proteomic profiles of bone marrow CD14+ cells in multiple myeloma (MM) compared to smoldering mm and MGUS: Overexpression of interleukin (IL)-21 receptor and its involvement in mm-induced osteoclastogenesis." Haematologica **2)**: S23.

Introduction. Multiple myeloma (MM) patients are characterized by bone marrow (BM) microenvironment alterations, as compared to patients affected by smoldering MM (SMM) and monoclonal gammopathy of uncertain significance (MGUS). The aim of this study was to analyze the transcriptional and proteomic profiles of the BM CD14+ cells across different types of monoclonal gammopathies, based on their primarily involvement in osteoclastogenesis, vasculogenesis and immune system. Methods. CD14+ monocytes were purified from a total cohort of 59 patients including 30 patients with symptomatic MM, 16 patients with SMM and 13 patients with MGUS. CD14+ cells were isolated from the CD138 negative fraction of patient BM samples by an immunomagnetic method with anti-CD14 mAb conjugated with microbeads (purity >94%). CD14+ gene expression profiles (GEPs) were evaluated by GeneChip HG-U133Plus 2.0 arrays (Affymetrix) in 25 MM, 11 SMM and 8 MGUS. The proteomic analysis was performed on CD14+ cells of 5 MM, 5 SMM and 5 MGUS. Samples were run on Q Exactive Hybrid Quadrupole-Orbitrap Mass Spectrometer (Thermo Scientific) after labeling with tandem mass tags and data analyzed with Proteome Discoverer software. Results. Different types of GEP analysis were conducted. A multiclass analysis identified 18 differentially expressed genes in MGUS, SMM and MM. The comparison of MM with both SMM and MGUS samples identified 61 genes differentially expressed in CD14+ cells (37 up-regulated and 24 down-regulated). Interestingly, we found that CD14+ of MM patients, as compared to SMM and MGUS, over-expressed some cytokine receptors (IL21R and IL-15R), pro-osteoclastogenic chemokines (CXCL10 and CXCL11), interferon-inducible proteins (IFI27 and IFI44) and SLAMF7. By a proteomic approach, different CD14+ monocyte expression profiles were found comparing MM patients with MGUS and SMM ones. Interestingly, MM monocytes over-expressed proteins involved in cell adhesion and inflammation and down-regulated molecules implicated in antimicrobial functions. Further we investigated the potential role of IL-21R up-regulation in CD14+ cells. Firstly, any significant difference was not observed in the BM IL-21 levels between MM, SMM and MGUS in a large cohort of 160 patients. On the other hand, we confirmed that IL- 21R was up-regulated at protein level in CD14+ of MM patients as compared to both SMM and MGUS; the conditioned media of MM cells up-regulated IL21R mRNA in CD14+ cells. The treatment with rhIL-21, at the concentration observed in BM plasma (30pg/ml), stimulated CD14+-derived in vitro osteoclastogenesis increasing number and size of osteoclasts, in MM patients but not in SMM and MGUS. Conclusions. Our results indicate that different expression fingerprints characterize BM CD14+ monocytes of patients with MM as compared to those with SMM and MGUS, including over-expression of IL-21R possibly involved in MM-induced osteoclast activation through an increased sensitivity to IL-21.

Bolzoni, M., et al. (2014). "Bone marrow CD14⁺ cells show different transcriptional profiles in multiple myeloma (MM) as compared to smoldering MM and MGUS: Overexpression of IL-21R and its involvement in osteoclastogenesis." Haematologica **1)**: 94-95.

Background: Bone marrow (BM) microenvironment alterations characterize patients with multiple myeloma (MM), as compared to smoldering MM (SMM) and monoclonal gammopathy of uncertain significance (MGUS). Studies focusing on the presence of potential molecular alterations in the BM microenvironment cells are ongoing. Aim(s): This study was aimed at analyzing the transcriptional profile of the BM CD14⁺ cells across different types of monoclonal gammopathies, based on their primarily involvement in osteoclastogenesis that is typically increased in MM patients. Method(s): CD14⁺ monocytes were purified from a total cohort of 36 patients including 21 patients with symptomatic MM, 8 patients with SMM and 7 patients with MGUS. CD14⁺, cells were isolated from the CD138 negative fraction of BM samples of patients by immunomagnetic method with anti-CD14 monoclonal antibody conjugated with microbeads. The presence of potential hemopoietic and CD138⁺ contaminating cells was excluded by FACS analysis. Only samples with CD14 purity greater than 95% were profiled on GeneChip HGU133Plus 2.0 arrays (Affymetrix). Selected genes were then validated by Real-Time quantitative PCR. Result(s): A multiclass analysis identified 14 differentially expressed genes in MGUS, SMM and symptomatic MM. The comparison of symptomatic MM with both SMM and MGUS samples identified 101 genes differentially expressed in CD14⁺ (58 up-regulated and 43 down-regulated genes in

MM). Interestingly, among the differentially expressed genes we found cytokine receptors (IL21R and IL-15R), chemokines with pro-osteoclastogenic properties (CXCL10 and CXCL11), interferon-inducible proteins (IFI27 and IFI44) and SLAM7 that were up-regulated in CD14⁺ of MM patients as compared to SMM and MGUS. Because recent data indicate that IL-21 is a growth factor for MM cells and may promote osteoclastogenesis in pathophysiological conditions such as rheumatoid arthritis, we further investigate the potential role of IL-21R over-expression in CD14⁺, cells. Firstly, by western blot analysis we confirmed that IL-21 receptor was up-regulated at protein level in CD14⁺, of MM patients as compared to both SMM and MGUS; whereas the BM IL-21 levels detected by ELISA in a proprietary larger cohort of 77 newly diagnosed MM, 42 SMM and 41 MGUS patients did not showed any statistically significant difference across the three groups of patients (IL-21 median levels: 34, 30.6, and 33.71 pg/ml, respectively). On the other hand, the treatment with rhIL-21 at the concentration levels detected into the BM (30 pg/ml) stimulated BM CD14⁺-derived in vitro osteoclastogenesis and increased the number and the size of osteoclasts, in the presence of RANKL (20-30 ng/ml), in BM samples of MM patients; conversely, this was not observed in samples obtained from SMM and MGUS. Finally, we showed that rhIL-21 stimulated the expression of the RANKL receptor RANK in CD14⁺, indicating that IL-21 increased the sensitivity of CD14⁺ cells to the pro-osteoclastogenic effect of RANKL. Summary and Conclusion(s): Overall, our results indicate that a different transcriptional signature may be identified in BM CD14⁺ cells of patients with MM as compared to those with SMM and MGUS, including the overexpression of IL-21R. Consequently the involvement of IL-21/IL-21R axis has been demonstrated in the increased CD14⁺-derived osteoclastogenesis that characterizes MM patients.

Bommer, J., et al. (1984). "Plastic filing from dialysis tubing induces prostanoid release from macrophages." Kidney International **26**(3): 331-337.

Multiorgan abnormalities in dialysis patients (for example, hepatosplenomegaly, granulomatous hepatitis, cytopenia from hypersplenism) have recently been ascribed to the loading of macrophages (M) with silicone particles released from the pump segment of dialysis tubing. In the present study, the effect of chronic intravenous or intraperitoneal loading of rats with silicone, polyvinylchloride (PVC) and polyurethane (PU) particles on arachidonic acid metabolism of peritoneal M and splenic cells was examined in vitro. Intravenous injections of silicone, PVC, or PU particles caused accumulation of the material within the lysosomes of M of spleen, liver, and lung. Spontaneous release of prostaglandin E<inf>2</inf> (PGE<inf>2</inf>) and thromboxane B<inf>2</inf> (TXB<inf>2</inf>) was significantly increased in peritoneal M of rats injected with silicone, PVC, or PU (Control: 4.27 +/- 0.85 ng PGE<inf>2</inf>/ml/24 hr; silicone 51.9 +/- 13.2; PVC 57.5 +/- 10.6; PU 28.8 +/- 2.3). Zymosan or LPS stimulated PGE<inf>2</inf> release from control M, but caused no consistent further elevation of high basal PGE<inf>2</inf> release from M after particle loading. Furthermore, increased spontaneous and stimulated TXB<inf>2</inf> release was also observed in spleen cells of rats given intravenous injection of silicone particles. It is concluded that storage of plastic particles (silicone, PVC, and PU) by macrophages stimulates arachidonic acid metabolism.

Bonanno, G., et al. (2007). "Human cord blood CD133+ cells immunoselected by a clinical-grade apparatus differentiate in vitro into endothelial- and cardiomyocyte-like cells." Transfusion **47**(2): 280-289.

BACKGROUND: Recent findings on human hematopoietic stem cell (HSC) properties suggest a

possible therapeutic role of human umbilical cord blood (UCB) HSC-based cellular therapies in the treatment of myocardial infarction.
STUDY DESIGN AND METHODS: Nine UCB units were subjected to sequential red cell removal, freezing, and postthawing CD133+ HSC immunoselection by a clinical-grade, CE-approved, magnetic apparatus and microbead-coated anti-CD133 monoclonal antibody. Selected UCB CD133+ cells were cultured in vitro in medium supporting either endothelial or cardiomyocytic differentiation in parallel experiments.
RESULTS: Immunoselection allowed recovery of 79 percent of initial CD133+ cells with a CD133+ cell purity of 81 percent, on average. Parallel cultures showed the appearance of endothelial markers (VE-cadherin, CD146, and KDR and bright expression of CD105), morphofunctional features of endothelium in endothelial-supporting cultures, of cardiac muscle proteins (troponin I and myosin ventricular heavy chain alpha/beta; MYHC) and specific gene expression (GATA4, NKX2.5, troponin I, and MYHC) in cardiomyocyte-oriented cultures.
CONCLUSIONS: The appearance of both endothelial- and cardiomyocyte-like cells from parallel cultures of frozen-thawed-immunoselected UCB CD133+ cells by a clinical-grade method and previously reported data on lack of major signs of rejection of these cells in immunocompetent rats subjected to experimental liver damage suggest a possible role of these allogeneic HSCs in cell therapies designed for regenerative treatments of ischemic diseases of human myocardium.

Bonanno, G. and M. Orlando-Bonaca (2018). "Perspectives on using marine species as bioindicators of plastic pollution." Marine Pollution Bulletin **137**: 209-221.
The ever-increasing level of marine pollution due to plastic debris is a globally recognized threat that needs effective actions of control and mitigation. Using marine organisms as bioindicators of plastic pollution can provide crucial information that would better integrate the spatial and temporal presence of plastic debris in the sea. Given their long and frequent migrations, numerous marine species that ingest plastics can provide information on the presence of plastic debris but only on large spatial and temporal scales, thus making it difficult to identify quantitative correlations of ingested plastics within well-defined spatio-temporal patterns. Given the complex dynamics of plastics in the sea, the biomonitoring of marine plastic debris should rely on the combination of several bioindicator species with different characteristics that complement each other. Other critical aspects include the standardization of sampling protocols, analytical detection methods and metrics to evaluate the effects of ingested plastics in marine species.

Bonanno, G. and M. Orlando-Bonaca (2018). "Ten inconvenient questions about plastics in the sea." Environmental Science & Policy **85**: 146-154.
This paper aims to investigate some of the hottest issues that concern the increasing presence of plastics in the sea. In an attempt to identify the main knowledge gaps and to suggest future research, we discuss priority topics on marine plastic pollution through ten thought-provoking questions on the current knowledge of multiple consequences of plastics on the marine ecosystem. Our investigation found that the majority of knowledge gaps include not only intrinsic aspects of plastics (e.g. quantification, typology, fate), but also biological, ecological and legislative implications (e.g. ingestion rate by wildlife, biomagnification across food webs, spread of alien species, consequences for human nutrition, mitigation measures). The current scenario shows that science is still far from assessing the real magnitude of the impact that plastics have on the sea. In particular, the transfer of plastics across marine trophic levels emerged as one of the most critical knowledge gaps. Current regulations seem not sufficient to tackle the massive release of plastics into the sea. Within this complex picture, a positive note is

the ever-increasing public awareness. The release of plastics into the sea is certainly a serious environmental issue that can be effectively addressed only through the combined efforts of the three main stakeholders: ordinary citizens through more eco-friendly behaviours, scientists by filling knowledge gaps, and policymakers by passing conservation laws relying on prevention and scientific evidence. [ABSTRACT FROM AUTHOR]

Bond, A. L. (2016). "Diet changes in breeding Herring Gulls (Larus argentatus) in Witless Bay, Newfoundland and Labrador, Canada, over 40 years." Waterbirds **39**(sp1): 152-158.

The diets of gulls (Laridae) can have consequences for reproductive success, chick growth, and survival, yet there have been no quantitative assessments in eastern Newfoundland since the early 1970 s. The diet of Herring Gulls (Larus argentatus) was examined through regurgitated prey items and pellets on Gull Island, Witless Bay, Newfoundland and Labrador, Canada, in 2012, and compared with similar data from 1970-1971. There was a significant shift in Herring Gull diet composition from blue mussels (Mytilus edulis) and capelin (Mallotus villosus) in the 1970 s to garbage and Common Murre (Uria aalge) eggs in 2012. Delays in capelin spawning and the large increase in breeding Common Murres on Gull Island are likely factors influencing Herring Gull diet. Garbage, which includes human food scraps as well as plastic debris, now constitutes the single largest diet item for Herring Gulls, corresponding with a global increase in plastic pollution. The consistently low contribution of fisheries discards suggests that changes in fishing practices and availability of discards are only one possible factor in the Herring Gull decline in Witless Bay.

Bond, A. L., et al. (2014). "Plastic ingestion by fulmars and shearwaters at Sable Island, Nova Scotia, Canada." Marine Pollution Bulletin **87**(1/2): 68-75.

Plastic pollution is widespread in the marine environment, and plastic ingestion by seabirds is now widely reported for dozens of species. Beached Northern Fulmars, Great Shearwaters, Sooty Shearwaters and Cory's Shearwaters are found on Sable Island, Nova Scotia, Canada regularly, and they can be used to assess plastic pollution. All species except Cory's Shearwaters contained plastic debris in their gastrointestinal tracts. Northern Fulmars, Sooty Shearwaters and Great Shearwaters all showed high prevalence of plastic ingestion (>72%), with Northern Fulmars having the highest number and mass of plastics among the species examined. There was no difference in plastic ingestion between sexes or age classes. In all species user plastics made up the majority of the pieces found, with industrial pellets representing only a small proportion in the samples. Sable Island could be an important monitoring site for plastic pollution in Atlantic Canada.

Bond, W. S., et al. (2016). "Virus-mediated EpoR76E Therapy Slows Optic Nerve Axonopathy in Experimental Glaucoma." Molecular Therapy: the Journal of the American Society of Gene Therapy **24**(2): 230-239.

Glaucoma, a common cause of blindness, is currently treated by intraocular pressure (IOP)-lowering interventions. However, this approach is insufficient to completely prevent vision loss. Here, we evaluate an IOP-independent gene therapy strategy using a modified erythropoietin, EPO-R76E, which has reduced erythropoietic function. We used two models of glaucoma, the murine microbead occlusion model and the DBA/2J mouse. Systemic recombinant adeno-associated virus-mediated gene delivery of EpoR76E (rAAV.EpoR76E) was performed concurrent with elevation of IOP. Axon structure and active anterograde transport were preserved in both models. Vision, as determined by the flash visual evoked potential, was preserved in the DBA/2J. These results show that systemic EpoR76E gene therapy protects retinal ganglion cells from glaucomatous degeneration in two different models. This suggests that EPO targets a component of the neurodegenerative pathway that is common to both models. The efficacy of rAAV.EpoR76E delivered at onset of IOP elevation supports clinical relevance of this treatment.

Bone, C. (2017). "Supermarkets criticised over black food trays." Materials Recycling World: 1-1.

Bonello, G., et al. (2018). "First evaluation of microplastic content in benthic filter-feeders of the Gulf of La Spezia (Ligurian Sea)." Journal of Aquatic Food Product Technology **27**(3): 284-291.

The ingestion and retention of microplastics of filter-feeder organisms represent a risk for the final consumers and the environment. Biomonitoring is necessary to deal with the effects of plastic material pollution. The selection of the monitored organisms strongly affects the relevance of the results and the understanding of the environmental conditions. The results discussed in this paper highlight the differences in the estimate of microplastic pollution depending on the species subject of study. Ascidia spp. specimens retained a value five-fold higher (0.62 MP/g) than bivalve species (Crassostrea gigas 0.11 MP/g; Mytilus galloprovincialis 0.05 MP/g; Anomia ephippium 0.12 MP/g).

Bonifacio, A., et al. (2015). "Application of R-mode analysis to Raman maps: a different way of looking at vibrational hyperspectral data." Analytical and bioanalytical chemistry **407**(4): 1089-1095.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Hierarchical cluster analysis (HCA) is extensively used for the analysis of hyperspectral data. In this work, hyperspectral data sets obtained from Raman maps were analyzed using an alternative mode of cluster analysis, clustering "images" instead of spectra, under the assumption that images showing similar spatial distributions are related to the same chemical species. Such an approach was tested with two Raman maps: one simple "test map" of micro-crystals of four different compounds for a proof of principle and a map of a biological tissue (i.e., cartilage) as an example of chemically complex sample. In both cases, the "image-clustering" approach gave similar results as the traditional HCA, but at lower computational effort. The alternative approach proved to be particularly helpful in cases, as for the cartilage tissue, where concentration gradients of chemical composition are present. Moreover, with this approach, yielded information about correlation between bands in the average spectrum makes band assignment and spectral interpretation easier.

Bonifazi, G., et al. (2009). "INNOVATIVE SENSING TECHNOLOGIES APPLIED TO POST-CONSUMER POLYOLEFINS RECOVERY." Metalurgia International: 5-10.

Polyolefins can be considered as one of the most important polymers for consumer goods being polyethylene (PE) and polypropylene (PP) the most commonly utilized. Even if post-consumer wastes could be considered as a good resource ofpolyolefins, their recovery and recycling is very low. The reason can be mainly attributed to the complexity of these wastes according to different polymers (rubber, foam. etc.) and polluting (not polymers) materials (wood, aluminium, copper, stones, glass. etc.) commonly present in plastic waste streams. In this paper two innovative sensing technologies, and related detection architectures, in order to develop new sorting strategies for pure PP and PE recovery from mixed waste, are presented and discussed. The first one based is on an hyperspectral imaging (HSI) approach and the second one is based on differential melting point (DMP) approach. HSI was investigated to evaluate the possibilities of this technology to determine the quality of waste plastic fred (in terms of presence and characteristics of polyolefin and contaminants). The DMP technology was developed to utilize the different PE and PP particles melting characteristics to perform their quality control as resulting from magnetic density separation (MDS). Results showed as both the approaches can be profitably utilized to develop reliable detection and/or processing architectures and related quality control strategies to implement inside the different sections of a plastic waste recycling plant. [ABSTRACT FROM AUTHOR]

Bonifazi, G., et al. (2017). "Gravity packaging final waste recovery based on gravity separation and chemical imaging control." Waste Management **60**: 50-55.

Plastic polymers are characterized by a high calorific value. Post-consumer plastic waste can be thus considered, in many cases, as a typical secondary solid fuels according to the European Commission directive on End of Waste (EoW). In Europe the practice of incineration is considered one of the solutions for waste disposal waste, for energy recovery and, as a consequence, for the reduction of waste sent to landfill. A full characterization of these products represents the first step to profitably and correctly utilize them. Several techniques have been investigated in this paper in order to separate and characterize post-consumer plastic packaging waste fulfilling the previous goals, that is: gravity separation (i.e. Reflux Classifier), FT-IR spectroscopy, NIR HyperSpectralImaging (HSI) based techniques and calorimetric test. The study demonstrated as the proposed separation technique and the HyperSpectral NIR Imaging approach allow to separate and recognize the different polymers (i.e. PolyVinyl Chloride (PVC), PolyStyrene (PS), PolyEthylene (PE), PoliEtilene Tereftalato (PET), PolyPropylene (PP)) in order to maximize the removal of the PVC fraction from plastic waste and to perform the full quality control of the resulting products, can be profitably utilized to set up analytical/control strategies finalized to obtain a low content of PVC in the final Solid Recovered Fuel (SRF), thus enhancing SRF quality, increasing its value and reducing the "final waste".

Bontinck, W. J. (1979). "Prospects for recycling of plastics in Belgian industry. [Dutch]." Extern Tijdschrift voor Omgevingswetenschappen **8**(5): 273-292.

A general survey of macro-economic data of plastics production and consumption in western Europe as well as the principal areas of use are given. Figures of actual known amounts of plastic waste from industrial and household origin are also discussed. When the recycling of homogeneous plastic industrial waste of a well defined polymer type gives no technical problems, the revalorisation of mixed polymer waste is technically much more complicated. An industrial experiment performed on mixed plastics from the urban waste of the city of Ghent is described. A rough cost price calculation is made. Actually the recycling of selected

homogeneous plastic waste can have an economic justification. A question remains unanswered: what is the public's attitude towards recycled plastic objects of inferior quality?

Booth, A. M., et al. (2016). "Uptake and toxicity of methylmethacrylate-based nanoplastic particles in aquatic organisms." Environmental Toxicology & Chemistry **35**(7): 1641-1649.

The uptake and toxicity of 2 poly(methylmethacrylate)-based plastic nanoparticles (PNPs) with different surface chemistries (medium and hydrophobic) were assessed using aquatic organisms selected for their relevance based on the environmental behavior of the PNPs. Pure poly(methylmethacrylate) (medium; PMMA PNPs) and poly(methylmethacrylate-co-stearylmethacrylate) copolymer (hydrophobic; PMMA-PSMA PNPs) of 86 nm to 125 nm were synthesized using a miniemulsion polymerization method. Fluorescent analogs of each PNP were also synthesized using monomer 7-[4-(trifluoromethyl)coumarin]acrylamide and studied. Daphnia magna, Corophium volutator, and Vibrio fischeri were employed in a series of standard acute ecotoxicity tests, being exposed to the PNPs at 3 different environmentally realistic concentrations (0.01 mg/L, 0.1 mg/L, and 1.0 mg/L) and a high concentration 500 mg/L to 1000 mg/L. In addition, sublethal effects of PNPs in C. volutator were determined using a sediment reburial test, and the uptake and depuration of fluorescent PNPs was studied in D. magna. The PNPs and fluorescent PNPs did not exhibit any observable toxicity at concentrations up to 500 mg/L to 1000 mg/L in any of the tests except for PMMA-PSMA PNPs and fluorescent PNPs following 48-h exposure to D. magna (median lethal concentration values of 879 mg/L and 887 mg/L, respectively). No significant differences were observed between labeled and nonlabeled PNPs, indicating the suitability of using fluorescent labeling. Significant uptake and rapid excretion of the fluorescent PNPs was observed in D. magna. Environ Toxicol Chem 2016;35:1641-1649. © 2015 SETAC [ABSTRACT FROM AUTHOR]

Boots, B., et al. (2019). "Effects of Microplastics in Soil Ecosystems: Above and Below Ground." Environmental Science & Technology **53**(19): 11496.

Environmental contamination by microplastics is now considered an emerging threat to biodiversity and ecosystem functioning. Soil ecosystems, particularly agricultural land, have been recognized as a major sink of microplastics, but the impacts of microplastics on soil ecosystems (e.g., above and below ground) remain largely unknown. In this study, different types of microplastics [biodegradable polylactic acid (PLA)], conventional high-density polyethylene (HDPE), and microplastic clothing fibers were added to soil containing the endogeic Aporrectodea rosea (rosy-tipped earthworm) and planted with Lolium perenne (perennial ryegrass) to assess the biophysical soil response in a mesocosm experiment. When exposed to fibers or PLA microplastics, fewer seeds germinated. There was also a reduction in shoot height with PLA. The biomass of A. rosea exposed to HDPE was significantly reduced compared to control samples. Furthermore, with HDPE present there was a decrease in soil pH. The size distribution of water-stable soil aggregates was altered when microplastics were present, suggesting potential alterations of soil stability. This study provides evidence that microplastics manufactured of HDPE and PLA, and synthetic fibers can affect the development of L. perenne, health of A. rosea and basic, but crucial soil properties, with potential further

impacts on soil ecosystem functioning.

Boppana, R., et al. (2010). "Carboxymethylcellulose - aluminum hydrogel microbeads for prolonged release of simvastatin." Acta Pharmaceutica Sciencia **52**(2): 137-143.

Carboxymethylcellulose based hydrogel microbeads loaded with simvastatin were prepared using ionotropic gelation method. The beads were characterized by differential scanning calorimetric (DSC) analysis, and scanning electron microscopy (SEM). DSC studies confirmed the amorphous dispersion of the drug in the hydrogel matrix. The effect of crosslinking agent and polymer concentration on drug release was studied. Increase in concentration of crosslinking agent and polymers decreased the release rate of simvastatin. The release data were fitted to an empirical equation to determine the transport mechanism. Drug release followed anomalous/non-Fickian transport mechanism.

Borchers, M. T., et al. (2019). "NK cell activation is increased in lymphangioleiomyomatosis." American Journal of Respiratory and Critical Care Medicine. Conference **199**(9).

Rationale: Lymphangioleiomyomatosis (LAM) is a rare lung disease almost exclusively affecting women. Neoplastic smooth muscle-like cells (LAM cells) of unknown origin metastasize to the lung leading to the formation of nodules, progressive cyst formation, and destructive remodeling. Natural Killer (NK) cells are important components of immune function due to their roles in detecting and destroying transformed cells and their involvement in tissue remodeling. To begin to define the potential role of NK cells in LAM pathogenesis, we examined the effector functions of NK cells in the peripheral blood and lung tissue of LAM patients. Method(s): Peripheral blood mononuclear cells (PBMC) were obtained from fresh blood from LAM patients and healthy controls after informed consent (IRB 2013-8157). NK cells were isolated by positive selection using CD56 microbeads (Miltenyi). NK cells were used in multiple assays to define effector functions including; cytotoxicity assays, IFNg elaboration (ELISA) and intracellular signaling (phosphorylation status of ERK and STAT4) in response to cytokine (IL12 and IL18), and growth factor stimulation (VEGF-D). NK cell activation in lung tissue was defined by single cell RNA sequencing derived from explanted lungs from LAM patients undergoing transplantation. Result(s): In all assays examined, NK cells from LAM patients exhibited increased responsiveness compared to healthy control patients. LAM NK cells were ~40% more effective at killing labelled target cells in in vitro cytotoxicity assays. LAM NK cells were hypersensitive to stimulation by multiple cytokines including IL12 and IL18 which was accompanied by increased activation of both the ERK and STAT4 signaling pathways compared to controls. Moreover, we report the novel finding that NK cells respond to VEGF stimulation by producing large quantities of IFNg and this effect is increased in LAM patients with a concomitant increase in ERK/STAT4 activation. Finally, single cell sequencing analyses of NK cells from the lungs of LAM patients show significant upregulation of multiple effector function pathways including those involved in cytotoxicity and degranulation. Conclusion(s): Taken together, these data reveal that NK cells from multiple tissue compartments in LAM patients exist in a state of hyperresponsiveness to multiple stimuli including a newly defined pathway of VEGF receptor signaling. This suggests that functional alterations in NK cells contribute to LAM progression and pathogenesis.

Bordós, G., et al. (2019). "Identification of microplastics in fish ponds and natural freshwater environments of the Carpathian basin, Europe." Chemosphere **216**: 110-116.

In the past few years, there has been a significant development in freshwater microplastic research. Pollution has been detected in lakes and rivers of several continents, but the number of papers is still marginal compared to the ones investigating marine environments. In this

study, we present the first detection of microplastics (MPs) in Central and Eastern European (CEE) surface waters and, globally, the first detection in fish ponds. Samples were taken from different types of fish ponds and natural water bodies along a novel concept down to a particle size of 100 µm, then, after sample preparation, MPs were characterized using an FTIR microscope. 92% of the water samples contained MPs ranging from 3.52 to 32.05 particles/m3. MPs were detected in 69% of the sediment samples ranging from 0.46 to 1.62 particles/kg. Dominant abundance of polypropylene (PP) and polyethylene was shown in water and PP and polystyrene in sediment samples. First results also indicate that fish ponds may act as a deposition area for MPs. Highlights • First detection of microplastics in fish ponds and in Central and Eastern Europe. • New sampling system was developed, collecting particles down to 100 µm. • Concentrations of MPs in pond outlets were always lower compared to the inlets. • Dominance of polyethylene, polypropylene and polystyrene was confirmed by FTIR. • Microplastic concentrations of sediments were much below the international results. [ABSTRACT FROM AUTHOR]

Borges Ramirez, M. M., et al. (2019). "Occurrence and seasonal distribution of microplastics and phthalates in sediments from the urban channel of the Ria and coast of Campeche, Mexico." Science of the Total Environment **672**: 97-105.

Microplastics (MPs) are part of a global problem affecting all countries including those with smaller populations. Coastal sediments are a reservoir of pollutants generated in basins. Phthalate esters (PAEs) are used as additives to make plastics stronger and more flexible. Urban ecosystems are the most susceptible to receive and transport pollutants. In this study, we determined the presence of MPs and PAEs in coastal sediments and in an urban and natural drainage system, known as the "Ria" in San Francisco de Campeche city. Plastics were detected in all samples taken from both regions, with plastics ranging in size from 0.3 to 5mm in diameter. This indicates that they are particles of plastics, paints, and fibers, which may come from boats and nylon nets or synthetic products. The greatest abundance of MPs was detected on the coast with quantities of 1392 items/m² (dry weight), which is double than that seen in the urban channel. As for PAEs, the highest concentrations were determined in two sites: M7A with 18.292mugg⁻¹ dw and PE with 21.702mugg⁻¹ dw, with the Ria channel being the area with the highest concentration of PAEs totaling 49.315mugg⁻¹ dw. The amounts of MPs detected in the sediments of the coast and the Ria vary significantly among the sites (p=0.001) and seasons (p=0.001), with the rainy season being the season where the greatest amount of MPs were detected. Likewise, the concentrations of PAEs varied significantly among seasons (p=0.0002) and sampling sites (p=0.0001), with the west sub-basin being the site where the greatest concentration of PAEs was detected. A strong correlation was found between the PAEs and MPs, which indicates that the conditions of the system favor the release and extended presence of PAEs on the coast.

Borisenko, G. G., et al. (2003). "Macrophage recognition of externalized phosphatidylserine and phagocytosis of apoptotic Jurkat cells--existence of a threshold." Archives of Biochemistry & Biophysics **413**(1): 41-52.

Phosphatidylserine (PS) is predominantly confined to the inner leaflet of plasma membrane in cells, but it is externalized on the cell surface during apoptosis. This externalized PS is required for effective phagocytosis of apoptotic cells by macrophages. Because PS trans-bilayer asymmetry is not absolute in different types of nonapoptotic cells, we hypothesized that the amounts of externalized PS may be critical for macrophage discrimination between apoptotic and nonapoptotic cells. We developed a sensitive electron paramagnetic resonance method to quantify the amounts of externalized PS based on specific binding of paramagnetic annexin V-microbead conjugates with PS on cell surfaces. Using this technique, we found that nonapoptotic Jurkat cells externalize 0.9 pmol of endogenous PS/10(6) Jurkat cells. For cells with different amounts of integrated exogenous PS on their surface, no phagocytic response was observed at PS levels <5 pmol/10(6) Jurkat cells; at higher PS concentrations, phagocytosis increased in a concentration-dependent manner. Apoptosis in Jurkat cells caused externalization of approximately 240 pmol PS/10(6) Jurkat cells; these amounts of externalized PS are manyfold higher than the threshold amounts of PS required for phagocytosis. Thus, macrophages have a sensitivity threshold for PS externalized on the cell surface that provides for reliable recognition and distinction between normal cells with low contents of externalized PS and apoptotic cells with remarkably elevated PS levels.

Borisov, S. M. and O. S. Wolfbeis (2006). "Temperature-sensitive europium(III) probes and their use for simultaneous luminescent sensing of temperature and oxygen." Analytical Chemistry **78**(14): 5094-5101.

Highly photostable and strongly luminescent europium(III) beta-diketonate complexes are presented that can act as new probes for optical sensing of temperature. They can be excited with the light of a 405-nm LED and possess strong brightnesses. The decay times of the probes contained in a poly(vinyl methyl ketone) film and in poly(tert-butyl styrene) microparticles are highly temperature-dependent between 0 and 70 degrees C. The temperature-sensitive microparticles were dispersed, along with oxygen-sensitive microbeads consisting of a palladium porphyrin oxygen indicator in poly(styrene-co-acrylonitrile), in a thin layer of a hydrogel to give a dually sensing material which is excitable by a single light source. The two emissions can be separated by appropriate optical filters. The response to oxygen and temperature is described by 3D plots, and unbiased values can be obtained for temperature and oxygen, respectively, from the two luminescence signals if refined in an iteration step. The sensing scheme is intended for use in temperature-compensated sensing of oxygen, in contactless sensing of oxygen and temperature in (micro)biological and medical applications, in high-resolution oxygen profiling, and for simultaneous imaging of air pressure and temperature in wind tunnels.

Borja, A. and M. Elliott (2019). "So when will we have enough papers on microplastics and ocean litter?" Marine Pollution Bulletin **146**: 312-316.

Bornscheuer, U. T. (2016). "Feeding on plastic. (Special Issue: Forensics.)." Science **351**(6278): 1154-1155.

An estimated 311 million tons of plastics are produced annually worldwide; 90% of these are derived from petrol. A considerable portion of these plastics is used for packaging (such as drinking bottles), but only ~14% is collected for recycling (1). Most plastics degrade extremely slowly, thus constituting a major environmental hazard (2), especially in the oceans, where microplastics are a matter of major concern (3). One potential solution for this problem is the synthesis of degradable plastics from renewable resources (4). This approach provides hope for the future but does not help to get rid of the plastics already in the environment. On page 1196 of this issue, Yoshida et al. (5) address this problem by reporting an organism that can fully degrade a widely used plastic.

Borrelle, S. B., et al. (2017). "Why we need an international agreement on marine plastic pollution." Proceedings of the National Academy of Sciences of the United States of America **114**(38): 9994-9997.

Borrero-Lopez, O., et al. (2019). "Wear of ceramic-based dental materials." Journal of the Mechanical Behavior of Biomedical Materials **92**: 144-151.

An investigation is made of wear mechanisms in a suite of dental materials with a ceramic component and tooth enamel using a laboratory test that simulates clinically observable wear facets. A ball-on-3-specimen wear tester in a tetrahedral configuration with a rotating hard antagonist zirconia sphere is used to produce circular wear scars on polished surfaces of dental materials in artificial saliva. Images of the wear scars enable interpretation of wear mechanisms, and measurements of scar dimensions quantify wear rates. Rates are lowest for zirconia ceramics, highest for lithium disilicate, with feldspathic ceramic and ceramic-polymer composite intermediate. Examination of wear scars reveals surface debris, indicative of a mechanism of material removal at the microstructural level. Microplasticity and microcracking models account for mild and severe wear regions. Wear models are used to evaluate potential longevity for each dental material. It is demonstrated that controlled laboratory testing can identify and quantify wear susceptibility under conditions that reflect the essence of basic occlusal contact. In addition to causing severe material loss, wear damage can lead to premature tooth or prosthetic failure. Copyright © 2019 Elsevier Ltd

Borrero-Lopez, O., et al. (2014). "A model for predicting wear rates in tooth enamel." Journal of the Mechanical Behavior of Biomedical Materials **37**: 226-234.

It is hypothesized that wear of enamel is sensitive to the presence of sharp particulates in oral fluids and masticated foods. To this end, a generic model for predicting wear rates in brittle materials is developed, with specific application to tooth enamel. Wear is assumed to result from an accumulation of elastic-plastic micro-asperity events. Integration over all such events leads to a wear rate relation analogous to Archard's law, but with allowance for variation in asperity angle and compliance. The coefficient K in this relation quantifies the wear severity, with an arbitrary distinction between 'mild' wear (low K) and 'severe' wear (high K). Data from the literature and in-house wear-test experiments on enamel specimens in lubricant media (water, oil) with and without sharp third-body particulates (silica, diamond) are used to validate the model. Measured wear rates can vary over several orders of magnitude, depending on contact asperity conditions, accounting for the occurrence of severe enamel removal in some human patients (bruxing). Expressions for the depth removal rate and number of cycles to wear down occlusal enamel in the low-crowned tooth forms of some mammals are derived, with tooth size and enamel thickness as key variables. The role of 'hard' versus 'soft' food diets in determining evolutionary paths in different hominin species is briefly considered. A feature of the model is that it does not require recourse to specific material removal mechanisms, although processes involving microplastic extrusion and microcrack coalescence are indicated.

Borrero-Lopez, O., et al. (2015). "Mechanics of microwear traces in tooth enamel." Acta Biomaterialia **14**: 146-153.

It is hypothesized that microwear traces in natural tooth enamel can be simulated and quantified using microindentation mechanics. Microcontacts associated with particulates in the oral wear medium are modeled as sharp indenters with fixed semi-apical angle. Distinction is made between markings from static contacts (pits) and translational contacts (scratches).

Relations for the forces required to produce contacts of given dimensions are derived, with particle angularity and compliance specifically taken into account so as to distinguish between different abrasives in food sources. Images of patterns made on human enamel with sharp indenters in axial and sliding loading are correlated with theoretical predictions. Special attention is given to threshold conditions for transition from a microplasticity to a microcracking mode, corresponding to mild and severe wear domains. It is demonstrated that the typical microwear trace is generated at loads on the order of 1N - i.e. much less than the forces exerted in normal biting - attesting to the susceptibility of teeth to wear in everyday mastication, especially in diets with sharp, hard and large inclusive intrinsic or extraneous particulates.

Bos, U., et al. (2008). "Life Cycle Assessment of common used agricultural plastic products in the EU." Acta Horticulturae **801**(Vol 1): 341-350.

Agriculture plastic wastes (APW) generate about 615 000 tonnes of waste per year in Europe. This presents a serious challenge concerning the production of the plastic as well as the disposal or recycling of the materials. To address the specific issues of APW, the European Commission funds a project called LABELAGRIWASTE, labelling agricultural plastic waste to valorise the waste stream. In the consortium, partners from Belgium, Cyprus, Finland, France, Germany, Greece, Italy and Spain are working together on developing a labelling scheme for European APW. To identify the environmental impact of the main agricultural plastic products, a life cycle assessment (LCA) is performed. The LCA is done before the development of a labelling scheme starts to examine the different life cycles of the most commonly used agricultural products in Europe. The study includes the LCA of mulch films, pipes, and greenhouse films, each with two different plastics and different end-of-life options. Also, differences in four countries and the whole European Union were investigated. The LCA includes the production of the plastics and the following different end-of-life scenarios: mechanical recycling, landfill and incineration. As a result the environmental profiles of different materials with various end-of-life options are generated. The environmental categories global warming potential, acidification potential, eutrophication potential, photochemical ozone creation potential and the primary energy consumption are shown. The results varied depending on the end-of-life option, the country and the material studied. This paper presents the results for the life cycle of mulch film including the production and different end-of-life options for the global warming potential.

Bosker, T., et al. (2019). "Microplastics accumulate on pores in seed capsule and delay germination and root growth of the terrestrial vascular plant Lepidium sativum." Chemosphere **226**: 774-781.

The impacts of nano- and microplastics (<100nm and <5mm, respectively) on terrestrial systems is to the present largely unexplored. Plastic particles are likely to accumulate in these systems primarily by the application of sewage sludge. The aim of the current study was to investigate the effects of three sizes of plastic particles (50, 500, and 4800nm) on a terrestrial plant (cress; Lepidium sativum), using a standardized 72h bioassay. Cress seeds were exposed to five different concentrations of plastics, ranging from 10³ to 10⁷ particles mL⁻¹. Germination rate was significantly reduced after 8h of exposure for all three sizes of plastics, with increased adverse effect with increasing plastic sizes. Seeds exposed to 4800nm microplastics showed a germination rate decline from 78% in control to 17% in the highest exposure. No difference in germination rate occurred after 24h of exposure, regardless of the size of the plastic used. Significant differences in root growth were observed after 24h, but not after 48 or 72h of exposure. Impacts on germination are likely due to physical blockage of the pores in the seed capsule by microplastics as shown by confocal microscopy of fluorescent microplastics. In later stages, the microplastics particularly accumulated on the root

hairs. This is the first detailed study on the effect of nano- and microplastics on a vascular, terrestrial plant, and our results indicate short-term and transient adverse effects.

Bosker, T., et al. (2018). "Microplastic pollution on Caribbean beaches in the Lesser Antilles." Marine Pollution Bulletin **133**: 442-447.

Here we investigate microplastics contamination on beaches of four islands of the Lesser Antilles (Anguilla, St. Barthelemy, St. Eustatius and St. Martin/Maarten). These islands are close to the North Atlantic subtropical gyre, which contains high levels of microplastics. On average 261+/-6microplastics/kg of dry sand were found, with a maximum of 620+/-96 microplastics on Grandes Cayes, Saint Martin. The vast majority of these microplastics (>95%) were fibers. Levels of microplastics differed among islands, with significantly lower levels found in St. Eustatius compared to the other Islands. No difference in microplastic levels was found between windward and leeward beaches. Our research provides a detailed study on microplastics on beaches in the Lesser Antilles. These results are important in developing a deeper understanding of the extent of the microplastic challenge within the Caribbean region, a hotspot of biodiversity.

Bosker, T., et al. (2019). "Significant decline of Daphnia magna population biomass due to microplastic exposure." Environmental Pollution **250**: 669-675.

Even though microplastics are intensively studied, the focus of the research is mainly on relatively short term effects at high doses. Therefore there is a need to shift the focus toward more realistic, longer-term endpoints. Studies with a range of chemicals have shown that the response of populations often differs from studies in which a single organism is exposed in an individual container (as often described within standard ecotox screening assays). Here we investigate the impact of primary microplastics (1-5 micro m in size) on a population of Daphnia magna. We first allowed a stable population of D. magna to develop over 29 d, after which the populations were exposed to microplastics for three weeks (concentrations ranging from 10² to 10⁵ particles mL⁻¹ and a control). We found a significant impact of microplastics on the total population of D. magna, with a reduction in the amount of adult daphnids. Importantly, when expressed as total biomass, exposure to 10⁵ microplastics mL⁻¹ resulted in a 21% reduction in total biomass compared to control. These results indicate that exposure to microplastics can result in significant adverse effects on the population of D. magna, including a reduction in the number of individuals as well as total biomass. Given the importance of D. magna in freshwater food webs, both as a grazer as well as a food source, this can potentially impact the functioning of the ecosystem.

Bottari, T., et al. (2019). "Plastics occurrence in the gastrointestinal tract of Zeus faber and Lepidopus caudatus from the Tyrrhenian Sea." Marine Pollution Bulletin **146**: 408-416.

The present study investigates the occurrence of plastic pollution in two commercially important marine teleosts (Zeus faber and Lepidopus caudatus) from the northern coasts of Sicily (Tyrrhenian Sea). Plastics occurrence in the gastrointestinal tract was higher in Lepidopus caudatus (78.1%) than Zeus faber (51.4%). Debris characterization, carried out by micro-Raman spectroscopy, allowed identified the main types of found polymers as: polypropylene (PP), polyamide (PA), nylon and, to a lesser extent, polyethylene (PE). Of the two fish species studied, the silver scabbardfish appeared to be the more vulnerable to plastic ingestion. Our study represents a starting point that may pave the way for future investigation of the fate, accumulation and transfer of plastic debris to upper trophic levels, to verify their potential toxicity and to better understand strategies to mitigate this phenomenon.

Botterell, Z. L. R., et al. (2019). "Bioavailability and effects of microplastics on marine zooplankton: A review." Environmental Pollution **245**: 98-110.

Microplastics are abundant and widespread in the marine environment. They are a contaminant of global environmental and economic concern. Due to their small size a wide range of marine species, including zooplankton can ingest them. Research has shown that microplastics are readily ingested by several zooplankton taxa, with associated negative impacts on biological processes. Zooplankton is a crucial food source for many secondary consumers, consequently this represents a route whereby microplastic could enter the food web and transfer up the trophic levels. In this review we aim to: 1) evaluate the current knowledge base regarding microplastic ingestion by zooplankton in both the laboratory and the field; and 2) summarise the factors which contribute to the bioavailability of microplastics to zooplankton. Current literature shows that microplastic ingestion has been recorded in 39 zooplankton species from 28 taxonomic orders including holo- and meroplanktonic species. The majority of studies occurred under laboratory conditions and negative effects were reported in ten studies (45%) demonstrating effects on feeding behaviour, growth, development, reproduction and lifespan. In contrast, three studies (14%) reported no negative effects from microplastic ingestion. Several physical and biological factors can influence the bioavailability of microplastics to zooplankton, such as size, shape, age and abundance. We identified that microplastics used in experiments are often different to those quantified in the marine environment, particularly in terms of concentration, shape, type and age. We therefore suggest that future research should include microplastics that are more representative of those found in the marine environment at relevant concentrations. Additionally, investigating the effects of microplastic ingestion on a broader range of zooplankton species and life stages, will help to answer key knowledge gaps regarding the effect of microplastic on recruitment, species populations and ultimately broader economic consequences such as impacts on shell- and finfish stocks. Review of the current knowledge regarding microplastic ingestion by zooplankton and summary of factors which contribute to the bioavailability of microplastics to zooplankton. Copyright © 2018 The Authors

Bottier, M., et al. (2015). "Characterization of upper airway ciliary beat by coupling isolated and collective cilia motion analysis." Cilia **(SUPPLEMENT 1) (no pagination)**(P86).

Bottier, M., et al. (2017). "A new index for characterizing micro-bead motion in a flow induced by ciliary beating: Part I, experimental analysis." PLoS Computational Biology **13**(7): e1005605.

Mucociliary clearance is one of the major lines of defense of the respiratory system. The mucus layer coating the pulmonary airways is moved along and out of the lung by the activity of motile cilia, thus expelling the particles trapped in it. Here we compare ex vivo measurements of a Newtonian flow induced by cilia beating (using micro-beads as tracers) and a mathematical model of this fluid flow, presented in greater detail in a second companion article. Samples of nasal epithelial cells placed in water are recorded by high-speed video-microscopy and ciliary beat pattern is inferred. Automatic tracking of micro-beads, used as markers of the flow generated by cilia motion, enables us also to assess the velocity profile as a function of the distance above the cilia. This profile is shown to be essentially parabolic. The obtained experimental data are used to feed a 2D mathematical and numerical model of the coupling between cilia, fluid, and micro-bead motion. From the model and the experimental measurements, the shear stress exerted by the cilia is deduced. Finally, this shear stress, which can easily be measured in the clinical setting, is proposed as a new index for characterizing the efficiency of ciliary beating.

Bottier, M., et al. (2017). "A new index for characterizing micro-bead motion in a flow induced by ciliary beating: Part II, modeling." PLoS Computational Biology **13**(7): e1005552.

Mucociliary clearance is one of the major lines of defense of the human respiratory system. The mucus layer coating the airways is constantly moved along and out of the lung by the activity of motile cilia, expelling at the same time particles trapped in it. The efficiency of the cilia motion can experimentally be assessed by measuring the velocity of micro-beads traveling through the fluid surrounding the cilia. Here we present a mathematical model of the fluid flow and of the micro-beads motion. The coordinated movement of the ciliated edge is represented as a continuous envelope imposing a periodic moving velocity boundary condition on the surrounding fluid. Vanishing velocity and vanishing shear stress boundary conditions are applied to the fluid at a finite distance above the ciliated edge. The flow field is expanded in powers of the amplitude of the individual cilium movement. It is found that the continuous component of the horizontal velocity at the ciliated edge generates a 2D fluid velocity field with a parabolic profile in the vertical direction, in agreement with the experimental measurements. Conversely, we show than this model can be used to extract microscopic properties of the cilia motion by extrapolating the micro-bead velocity measurement at the ciliated edge. Finally, we derive from these measurements a scalar index providing a direct assessment of the cilia beating efficiency. This index can easily be measured in patients without any modification of the current clinical procedures.

Boudy, V., et al. (2002). "Adsorption of an ionizable drug onto microspheres: experimental and modeling studies." International Journal of Pharmaceutics **239**(1-2): 13-22.

The purpose of this work was to study the in vitro equilibria and the adsorption kinetics of an ionizable drug, indomethacin, onto commercially available cationic polymeric microspheres: DEAE Trisacryl LS and QA Trisacryl LS. Isotherms were fitted to theoretical equations allowing accurate predictions of drug loading at different salt concentrations. Isotherm measurements were quickly obtained by simple column breakthrough experiments. The nature of the ion exchange group of the microspheres was observed to be preponderant for adsorption, as the tertiary amine derivative exhibited 53% more capacity than its quaternary amine counterpart. The maximum equilibrium uptake capacity in a 5 mM Tris-HCl buffer at pH 7.4 is 303 mmol/ml of particle volume, for DEAE microspheres. Transport properties of indomethacin into the tertiary amine microspheres were obtained in agitated contactor. Microbeads loading was completed in a 1-6 min range and was found to be controlled by pore diffusion mechanism. Equilibrium uptake data was fitted to the Langmuir and the mass action law models. Adsorption kinetics were fitted to a pore diffusion model. Good correlation was obtained between the theoretical models and the experimental data. The methodology outlined in this work provided a simple approach of estimating adsorption behavior of drugs onto ion-exchange macroporous microspheres. Although significant indomethacin loading was obtained onto the DEAE microspheres, the rapid rate of diffusion is not compatible with sustained release properties sought for this type of microspheres.

Boueri, M., et al. (2011). "Identification of polymer materials using laser-induced breakdown spectroscopy combined with artificial neural networks." Applied Spectroscopy **65**(3): 307-314.

A combination of laser-induced breakdown spectroscopy (LIBS) and artificial neural networks (ANNs) has been used for the identification of polymer materials, including polypropylene (PP), polyvinyl chloride (PVC), polytetrafluoroethylene (PTFE), polyoxymethylene (POM), polyethylene

(PE), polyamide or nylon (PA), polycarbonate (PC) and poly(methyl methacrylate) (PMMA). After optimization of the experimental setup and the spectrum acquisition protocol, successful identification rates between 81 and 100% were achieved using spectral features gathered from single spectra without averaging (1 second acquisition time) over a wide spectral range (240-820 nm). Furthermore, ten different materials based on PVC were tested using the identification procedure. Correct identifications were obtained as well. Sorting of the materials into sub-categories of PVC materials according to their charges (concentration in trace elements such as Ca) was performed. The demonstrated capacities fit, in practice, the needs of plastic-waste sorting and of producing high-grade recycled plastic materials.

Bour, A., et al. (2018). "Presence of microplastics in benthic and epibenthic organisms: Influence of habitat, feeding mode and trophic level." <u>Environmental Pollution</u> **243**: 1217-1225.

The exponential production and use of plastics has generated increasing environmental release over the past decades, and microplastics (MPs) have been reported across all the oceans. Field studies have documented the occurrence of MPs in several species, but important knowledge gaps still remain. In the present study, we characterized the distribution of MPs in ten sediment-dwelling and epibenthic species representative of different habitat, feeding modes and trophic levels within the inner Oslofjord (Oslo, Norway), an area subjected to moderate anthropogenic pressures. Analysed species included fish, bivalves, echinoderms, crustaceans and polychaetes. MPs were present in all the species with a frequency up to 65% of positive individuals for some species. In most cases, 1 or 2 MPs were found per individual, but some organisms contained up to 7 particles. A total of 8 polymer typologies were identified, with PE and PP being the most common according to our extraction protocol. MP sizes ranged from 41 µm to lines as long as 9 mm. Our results indicate that occurrence of MPs in analysed biota is not influenced by organism habitat or trophic level, while characteristics and typology of polymers might be significantly affected by feeding mode of organisms. Graphical abstract Image 1 Highlights • The presence of microplastics (MPs) was analysed in biota from a Norwegian fjord. • MPs were found in all species sampled. • PE and PP are the polymers most found. • MPs smaller than 200 µm account for more than 58% of the total extracted MPs. • Presence of MPs is influenced by feeding mode, but not habitat or trophic level. This field study investigates the influence of three major parameters, habitat, feeding mode and trophic level, on the presence of microplastics in benthic and epibenthic organisms. [ABSTRACT FROM AUTHOR]

Bour, A., et al. (2018). "Environmentally relevant microplastic exposure affects sediment-dwelling bivalves." <u>Environmental Pollution</u> **236**: 652-660.

Most microplastics are expected to sink and end up in marine sediments. However, very little is known concerning their potential impact on sediment-dwelling organisms. We studied the long-term impact of microplastic exposure on two sediment-dwelling bivalve species. Ennucula tenuis and Abra nitida were exposed to polyethylene microparticles at three concentrations (1; 10 and 25 mg/kg of sediment) for four weeks. Three size classes (4-6; 20-25 and 125-500 micro m) were used to study the influence of size on microplastic ecotoxicity. Microplastic exposure did not affect survival, condition index or burrowing behaviour in either bivalve species.

However, significant changes in energy reserves were observed. No changes were observed in protein, carbohydrate or lipid contents in E. tenuis, with the exception of a decrease in lipid content for one condition. However, total energy decreased in a dose-dependent manner for bivalves exposed to the largest particles. To the contrary, no significant changes in total energy were observed for A. nitida, although a significant decrease of protein content was observed for individuals exposed to the largest particles, at all concentrations. Concentration and particle size significantly influenced microplastic impacts on bivalves, the largest particles and higher concentrations leading to more severe effects. Several hypotheses are presented to explain the observed modulation of energy reserves, including the influence of microplastic size and concentration. Our results suggest that long-term exposure to microplastics at environmentally relevant concentrations can impact marine benthic biota.

Bourdages, M. P. T., et al. (2020). "No plastics detected in seal (Phocidae) stomachs harvested in the eastern Canadian Arctic." Marine Pollution Bulletin **150**: 110772.

Through collaboration with Inuit hunters, we examined the stomach contents of 142 seals (ringed seals [Phoca hispida; n = 135], bearded seals [Erignathus barbatus; n = 6], and one harbour seal [Phoca vitualina; n = 1]) hunted between 2007 and 2019 from communities around Nunavut to assess whether seals in the eastern Canadian Arctic ingest and retain plastics in their stomachs. The seals in this study ranged from juveniles to adults of up to 30 years of age, and 55% of the seals were males. We found no evidence of plastic ingestion in any of the seals suggesting that seals in Nunavut are not accumulating plastics (>425 mum) in their stomachs. These data provide important baseline information for future plastic pollution monitoring programs in the Arctic.

Bour-Dill, C., et al. (2000). "Determination of intracellular organelles implicated in daunorubicin cytoplasmic sequestration in multidrug-resistant MCF-7 cells using fluorescence microscopy image analysis." Cytometry **39**(1): 16-25.

Background: Anthracycline resistance is known to be mediated by P- glycoprotein (P-gp) or multidrug-resistance related protein (MRP) as well as intracellular sequestration of drugs. Method(s): The resistance phenotype of doxorubicin-selected MCF-7(DXR) human breast adenocarcinoma cell line was characterized by cellular and nuclear daunorubicin efflux, P-gp and MRP expression and apoptosis induction. Daunorubicin sequestration was investigated through organelle markers (lysosomes, endoplasmic reticulum and Golgi apparatus) and daunorubicin co-localization by dual-color image analysis fluorescence microscopy using high numerical aperture objective lenses to achieve the smallest field depth and the best lateral resolution. Signal to noise and specificity ratios were optimized for daunorubicin and organelle fluorescent probes labeling. Result(s): An original image analysis procedure was developed to investigate daunorubicin and organelles co- localization. The reliability of the image analysis was controlled through chromatic shift and intensity linearity measurement using calibrated microbeads. The main contribution (65%) of Golgi vesicles in daunorubicin sequestration was demonstrated. Although no rational relationship could be established between daunorubicin sequestration and apoptosis induction, no apoptosis was observed in MCF-7(DXR) cells. Conclusion(s): In addition to P- glycoprotein mediated drug efflux and without MRP overexpression, MCF-7(DXR) daunorubicin resistance phenotype involves drug sequestration within intracellular vesicles identified as Golgi vesicles and resistance to apoptosis induction.

Bouwmeester, H., et al. (2015). "Potential Health Impact of Environmentally Released Micro- and Nanoplastics in the Human Food Production Chain: Experiences from Nanotoxicology." Environmental

Science & Technology **49**(15): 8932-8947.
High concentrations of plastic debris have been observed in the oceans. Much of the recent concern has focused on microplastics in the marine environment. Recent studies of the size distribution of the plastic debris suggested that continued fragmenting of microplastics into nanosized particles may occur. In this review we assess the current literature on the occurrence of environmentally released micro- and nanoplastics in the human food production chain and their potential health impact. The currently used analytical techniques introduce a great bias in the knowledge, since they are only able to detect plastic particles well above the nanorange. We discuss the potential use of the very sensitive analytical techniques that have been developed for the detection and quantification of engineered nanoparticles. We recognize three possible toxic effects of plastic particles: first due to the plastic particles themselves, second to the release of persistent organic pollutant adsorbed to the plastics, and third to the leaching of additives of the plastics. The limited data on microplastics in foods do not predict adverse effect of these pollutants or additives. Potential toxic effects of microplastic particles will be confined to the gut. The potential human toxicity of nanoplastics is poorly studied. Based on our experiences in nanotoxicology we prioritized future research questions.

Bowles, K. S., et al. (2002). "A novel model for equine recurrent airway obstruction." Veterinary Immunology and Immunopathology **87**(3/4): 385-389.
Equine recurrent airway obstruction (RAO; a term combining both chronic obstructive pulmonary disease (COPD) and summer pasture associated obstructive pulmonary disease (SPAOPD)) is one of the most common equine respiratory diseases with up to 50% of horses affected worldwide. The etiopathogenesis of RAO is unknown although pulmonary hypersensitivity to inhaled mold antigens may be involved. Recent work in our laboratory demonstrating elevated levels of IL-4 and IL-13 mRNA in the airways and peripheral blood of horses with RAO is consistent with an atopic component to RAO. Little is known regarding the earliest phases of RAO in horses. Here we describe the development of a novel airway model for equine RAO that utilizes ovalbumin-coated polystyrene beads for airway sensitization and challenge. Aerosol challenge of sensitized ponies with OVA-coated microbeads resulted in decreased airway compliance, increased percentage of lymphocytes and neutrophils in the bronchoalveolar lavage fluid, and evidence of a Th2 cytokine response in the bronchoalveolar cells. These results suggest that this approach may be useful in describing the initial stages of RAO development in the horse.

Boyaci, I. H., et al. (2005). "Amperometric determination of live Escherichia coli using antibody-coated paramagnetic beads." Analytical & Bioanalytical Chemistry **382**(5): 1234-1241.
Detecting and enumerating fecal coliforms, especially Escherichia coli, as indicators of fecal contamination, are essential for the quality control of supplied and recreational waters. We have developed a sensitive, inexpensive, and small-volume amperometric detection method for E. coli beta-galactosidase by bead-based immunoassay. The technique uses biotin-labeled capture antibodies (Ab) immobilized on paramagnetic microbeads that have been functionalized with streptavidin (bead-Ab). The bead-Ab conjugate captures E. coli from solution. The captured E. coli is incubated in Luria Bertani (LB) broth medium with the added inducer isopropyl beta-D: -thiogalactopyranoside (IPTG). The induced beta-galactosidase converts p-aminophenyl beta-D: -galactopyranoside (PAPG) into p-aminophenol (PAP), which is measured by amperometry using a gold rotating disc electrode. A good linear correlation (R2 = 0.989) was obtained between log cfu mL(-1) E. coli and the time necessary to product a specific concentration of PAP. Amperometric detection enabled determination of 2x10(6) cfu mL(-1) E. coli within a 30 min

incubation period, and the total analysis time was less than 1 h. It was also possible to determine as few as 20 cfu mL(-1) E. coli under optimized conditions within 6-7 h. This process may be easily adapted as an automated portable bioanalytical device for the rapid detection of live E. coli.

Boyero, L., et al. (2019). "Microplastics impair amphibian survival, body condition and function." Chemosphere **244**: 125500.

Microplastics (MPs) are contaminants of increasing concern; they are abundant, ubiquitous and persistent over time, representing potential risks for organisms and ecosystems. However, such risks are still virtually unknown for amphibians, despite the particular attention that these organisms often receive because of their global decline. We examined the effects of MPs (fluorescent, 10-mum polystyrene microspheres) at different concentrations (from 0 to 10³ particles mL⁻¹) on tadpoles of the common midwife toad, Alytes obstetricans, using a microcosm experiment. We assessed MP effects on tadpole feeding, growth and body condition, as well as their ingestion and egestion of MPs (estimated through fluorescence). Additionally, we explored whether MPs became attached to periphyton (the main food source for these tadpoles, thus potentially representing a major way of MP ingestion), and the effect of MPs on periphyton growth (which may translate into altered freshwater ecosystem functioning). Our results showed significant effects on all the examined variables, and caused tadpole mortality at the highest concentration; also, fluorescence indicated the presence of MPs in tadpoles, tadpole faeces and periphyton. This suggests that MPs can be an important source of stress for amphibians in addition to other pollutants, climate change, habitat loss or chytrid infections, and that amphibians can be a major transfer path for MPs from freshwater to terrestrial ecosystems.

Boyko, A., et al. (2016). "The role of dopamine in regulating interactions of the immune and nervous system in multiple sclerosis." Multiple Sclerosis **22 (Supplement 3)**: 177-178.

Introduction: Multiple sclerosis (MS) - chronic autoimmune disease of the CNS predominantly mediated by T-cells. Dopamine (DA) can participate in MS pathogenesis modulating immune cells activity and cytokine production. Objective(s): To study the relationship between clinical impairment, DA concentration in the serum, quantitative characteristics of Th17-cells, and to clarify the influence of DA on the function of Th17 cells. Material(s) and Method(s): Data from 43 patients with relapsingremitting MS and 20 healthy controls were included. Fourteen patients were examined during relapses, 29 during clinical remission. The DA concentration in the serum was measured by ELISA. Circulating Th17-cells were determined by flow cytometry (CD4+CD26+CD161+CD196+). The levels of interleukin-17 (IL-17) and interferon-gamma (IFN-gamma) were studied by ELISA in supernatants of peripheral blood mononuclear cells (PBMC) stimulated with microbeads coated with anti-CD3 and anti-CD28 antibodies in the absence and in the presence of DA and antagonists of DA-receptors at a concentration of 10-5 M. Result(s): The level of DA was lower in MS patients during relapse than in patients during remission and in healthy subjects ($p< 0.05$). The percentages of Th17-cells and production of IL-17 and IFN-gamma by PBMC were higher in patients in relapse compared to patients in remission or to the control group ($p< 0.01$). DA reduced IL-17 and IFN-gamma production in all groups ($p< 0.05$). Blockade of D1-like receptors enhanced the inhibitory effect of DA on IL-17 production ($p< 0.05$) while blockade of D2-like receptors abolished the suppressive effect of DA in all groups. Blockade of D1-like receptors without the subsequent addition of DA reduced the production of IL-17 ($p< 0.05$) while blockade of D2-like receptors stimulated production of IL-17 in all groups ($p< 0.05$). Conclusion(s): These data suggest an anti-inflammatory role for DA in MS

which is mediated by D2-receptors.

Boyko, A., et al. (2016). "The Role of Biogenic Amines in the Regulation of Interaction between the Immune and Nervous Systems in Multiple Sclerosis." Neuroimmunomodulation **23**(4): 217-223.
OBJECTIVE: Multiple sclerosis (MS) is a demyelinating, presumably autoimmune disease of the central nervous system. Biogenic amines may participate in MS pathogenesis modulating immune cell activity and cytokine production.
METHODS: Forty-three patients with relapsing-remitting MS were examined. Serotonin (SE), norepinephrine (NE) and epinephrine (EPI) concentrations in sera were measured by ELISA. The functional activity of Th17 and Th1 cells was assessed by the ability of peripheral blood mononuclear cells (PBMCs) to produce interferon-gamma (IFN-gamma) and interleukin-17 (IL-17) and cell proliferation upon stimulation with microbeads coated with anti-CD3 and anti-CD28 antibodies. To evaluate the effect of biogenic amines on Th17 and Th1 cells, PBMCs were cultured in the presence of SE and NE. Statistical analysis was performed using Prism 6 software.
RESULTS: Concentrations of SE and EPI in sera were not different between the groups. Concentrations of NE in sera from MS patients were lower than those in the healthy control group. The production of IL-17 and IFN-gamma in MS patients in relapse was higher than that in patients in remission or in the control group. SE at a concentration of 10-4M suppressed IL-17 production. NE at a concentration of 10-4M suppressed both IL-17 and IFN-gamma production.
CONCLUSIONS: These data suggest an anti-inflammatory role for biogenic amines in MS.

Bożek, M., et al. (2017). The studies on waste biodegradation by <i>Tenebrio molitor</i>. Les Ulis, EDP Sciences. **17**.
As cities are growing in size with a rise in the population, the amount of plastic waste generated is increasing and becoming unmanageable. The treatment and disposal of plastic waste is an urgent need of our present and future. It has been proved recently that mealworms, the larvae of Tenebrio molitor Linnaeus, are able eat styrofoam, a common polystyrene product. Polystyrene is one of the most widely used plastics, the scale of its production being several million tons per year. Tenebrio molitor is one of the largest pests found in stored-grain products. The insect is indigenous to Europe, but is currently cosmopolitan in distribution. The styrofoam is efficiently degraded in the larval gut by microorganisms. We have used the larvae of T. molitor to biodegrade three types of food packaging plastics: polystyrene (PS), polyvinyl chloride (PVC) and polylactide (PLA). PVC is a thermoplastic made of 57% chlorine (derived from industrial grade salt) and 43% carbon (derived predominantly from oil /gas via ethylene). It is the world's third-most widely produced synthetic plastic polymer, which is not biodegradable easily. On the other hand, PLA is an easily biodegradable and bioactive thermoplastic aliphatic polyester derived from corn and tapioca starch or sugarcane. Three groups of larvae were fed selected types of polymers as an only food, while a control population was fed on oatmeal. The mass loss, dry matter content and biochemical composition of mealworms were assessed in the performed laboratory experiments. The protein concentration in homogenates of the larvae was determined by the Bradford method. To determine the level of hydrolized carbohydrates we used anthrone method. The classical sulfo-phospho-vanillin assay (SPVA) was used to quantitate total lipids in mealworms. The results allowed to compare the decomposition efficiency of selected polymer materials by mealworms and to recognize the mechanism of decomposition contributing to the future use of these animals for the treatment and disposal of plastic waste.

Bozhinova, D., et al. (2004). "Evaluation of magnetic polymer micro-beads as carriers of immobilised

biocatalysts for selective and stereoselective transformations." Biotechnology Letters **26**(4): 343-350.
The kinetic, selective and stereoselective properties of enzyme immobilised on magnetic polymer beads with diameters in the range 1 microm was studied with penicillin amidase from E. coli. The enzyme was immobilised on epoxy and glutaraldehyde-activated poly(vinyl alcohol), poly(methylmetacrylate) and poly(vinyl acetate-divinylbenzene) magnetic beads. The amount of covalently bound active protein was dependent on the chemical modification of the matrix and increased at higher ionic strength of the immobilisation buffer. The small size of the magnetic beads, that reduces mass transfer limitations, and the decreased charge density in the electric double layer resulted in lower apparent Km values and higher efficiency for benzylpenicillin hydrolysis, higher stereoselectivity in condensation of R-phenylglycine amide with S- and R-Phe and in hydrolysis of racemic phenylacetyl-Phe and higher selectivity in kinetically controlled synthesis of cephalexin compared to the enzyme immobilised on larger and porous carriers.

Bozza, F. A., et al. (2008). "Multiplex cytokine profile from dengue patients: MIP-1beta and IFN-gamma as predictive factors for severity." BMC Infectious Diseases **8**: 86.
BACKGROUND: Dengue virus pathogenesis is not yet fully understood and the identification of patients at high risk for developing severe disease forms is still a great challenge in dengue patient care. During the present study, we evaluated prospectively the potential of cytokines present in plasma from patients with dengue in stratifying disease severity.
METHODS: Seventeen-cytokine multiplex fluorescent microbead immunoassay was used for the simultaneous detection in 59 dengue patients. GLM models using bimodal or Gaussian family were determined in order to associate cytokines with clinical manifestations and laboratory diagnosis.
RESULTS: IL-1beta, IFN-gamma, IL-4, IL-6, IL-13, IL-7 and GM-CSF were significantly increased in patients with severe clinical manifestations (severe dengue) when compared to mild disease forms (mild dengue). In contrast, increased MIP-1beta levels were observed in patients with mild dengue. MIP-1beta was also associated with CD56+NK cell circulating rates. IL-1beta, IL-8, TNF-alpha and MCP-1 were associated with marked thrombocytopenia. Increased MCP-1 and GM-CSF levels correlated with hypotension. Moreover, MIP-1beta and IFN-gamma were independently associated with both dengue severity and disease outcome.
CONCLUSION: Our data demonstrated that the use of a multiple cytokine assay platform was suitable for identifying distinct cytokine profiles associated with the dengue clinical manifestations and severity. MIP-beta is indicated for the first time as a good prognostic marker in contrast to IFN-gamma that was associated with disease severity.

Brach, L., et al. (2018). "Anticyclonic eddies increase accumulation of microplastic in the North Atlantic subtropical gyre." Marine Pollution Bulletin **126**: 191.
There are fundamental gaps in our understanding of the fates of microplastics in the ocean, which must be overcome if the severity of this pollution is to be fully assessed. The predominant pattern is high accumulation of microplastic in subtropical gyres. Using in situ measurements from the 7th Continent expedition in the North Atlantic subtropical gyre, data from satellite observations and models, we show how microplastic concentrations were up to 9.4 times higher in an anticyclonic eddy explored, compared to the cyclonic eddy. Although our sample size is small, this is the first suggestive evidence that mesoscale eddies might trap, concentrate and potentially transport microplastics. As eddies are known to congregate nutrients and organisms, this phenomenon should be considered with regards to the potential impact of plastic pollution on the ecosystem in the open ocean.

Bradley, M., et al. (2017). "Tracking Microplastics in the Environment via FT-IR Microscopy." Spectroscopy **32**(s8): 17-23.

Microplastics are particulates, roughly 20-1000 µm in size, originating from materials such as clothing, abrasive action on plastics, or engineered microbeads as found in some exfoliating cosmetics. The microplastics enter aquifers where the particles can be consumed by filter feeders. Microplastics are chemically stable, giving them a long lifetime in the environment and making excretion or digestion difficult. Analytically, the size and polymeric nature of microplastics makes Fourier transform infrared (FT-IR) microscopy an ideal tool for detection and identification. Standard analyses typically start with a filtration step, extracting the material from the matrix. The analysis can proceed directly on the dried filter without further sample preparation. This simplicity in both sampling and analysis enables the rapid assessment of microplastic encroachment and can assist in the development of remediation techniques. We show examples from both prepared and field samples using microattenuated total reflection (ATR) FT-IR.

Bradney, L., et al. (2019). "Particulate plastics as a vector for toxic trace-element uptake by aquatic and terrestrial organisms and human health risk." Environment International **131**: 104937.

Particulate plastics in the terrestrial and aquatic environments are small plastic fragments or beads (i.e., 5mm down to the nanometre range). They have been frequently referred to as 'micro-plastics' or 'nano-plastics'. Research has identified particulate plastics as a vector for toxic trace elements in the environment. The adsorption of toxic trace elements by particulate plastics may be facilitated by their high surface area and functionalized surfaces (e.g., through the attachment of natural organic matter). Other factors, such as environmental conditions (e.g., pH and water salinity), surface charge, and trace element oxidation status, also influence the adsorption of trace elements onto particulate plastics. Because of their small size and persistence, particulate plastics and the associated toxic trace elements are readily ingested and accumulated in many terrestrial and aquatic organisms. Thus, these plastics can have severe environmental consequences, such as the development of metal toxicity, within aquatic and terrestrial organisms. Humans could also become exposed to particulate plastics through food chain contamination and airborne ingestion. This review provides an overview of the sources of particulate plastics in the environment. To this end, we describe particulate plastics made of synthetic polymers, their origin, and characteristics with emphasis on how particulate plastics and associated toxic trace elements contaminate terrestrial and aquatic ecosystems. Future research needs and strategies are discussed to help reduce the environmental risks of particulate plastics as a potent vector for the transportation of toxic trace elements.

Braeth, S., et al. (2015). "Novel assay of TSH receptor stimulating autoantibodies using paramagnetic micro beads as solid phase." Clinical Chemistry and Laboratory Medicine **1)**: S231.

BACKGROUND-AIM Graves' disease (GD) is caused by thyroid stimulating immunoglobulins (TSI) directed against the thyrotropin receptor (TSHR). Assays for the diagnosis of GD are practised by detecting TSI indirectly by competition with TSH or monoclonal antibodies. Herewith a Bridge Assay is presented for direct detection of TSI by TSHR chimera. The main object to anchor the capture TSHR on paramagnetic micro beads (PMB) is a challenge but when working enables high through-put on automates. METHODS The capture receptor is constructed as a chimeric human TSHR (CTR) where in the extra cellular domain (ECD) aa residues 261-330 are replaced with residues 261-329 from rat LH/CG receptor and fused with a serum protein. (Patent filed). Fixed to PMB this CTR construct binds one arm of the TSI. The second arm bridges to a detection CTR constructed from aa 21-261 and fused with secretory alkaline phosphatase. All experiments were performed manually with simple lab scale equipment and a 12-tube magnet. RESULTS ROC analysis of 184 samples (134 GD positive, 50 GD negative) showed a sensitivity of 94.8%, a specificity of 98.0% and a cut-off of 1.5 U/L with an AUC of 0.985. Analytical and functional sensitivity were determined at 1.1 U/L, with a working range up to 50 U/L, a mean between-run precision of 15.8% and a within-run precision of 4.0%. Due to manual assay performance, all data were tested for outliers (generalized ESD test with alpha =0.05 and Tukey). Two patients with hypothyroidism and positive TRAb had negative results. Both receptors are secreted in cell culture supernatant realizing comfortable production. The new capture receptor yielded very good stability data (functionality and half life) at 4degreeC (up to 12d / up to 15d) and at 37degreeC (3h / 4.5h) as well as after drying (at least 4 weeks). The lyophilized detection receptor has a proven stability for >2 years. CONCLUSION The assay shows excellent sensitivity and specificity and a cut-off comparable to current high through-put TRAb assays. Further improvement of technical statistics (sensitivity and specificity) are expected by means of establishment of this prototype on fully automated machines. Together with the good stability data, these results suggest interesting possibilities for high through-put systems.

Braeuning, A. (2019). "Uptake of microplastics and related health effects: a critical discussion of Deng et al., Scientific reports 7:46687, 2017." Archives of Toxicology **93**(1): 219-220.

Brander, S. M., et al. (2011). "The Ecotoxicology of Plastic Marine Debris." American Biology Teacher (University of California Press) **73**(8): 474-478.

The accumulation of plastic in the oceans is an ever-growing environmental concern. Plastic debris is a choking and entanglement hazard for wildlife; plastics also leach toxic compounds into organisms and ecosystems. Educating students about the marine debris problem introduces fundamental concepts in toxicology, ecology, and oceanography. Students will learn about the toxicity of plastics, collect and analyze data on plastic debris, and put their new knowledge to work by writing a congressional bill that addresses the problem of marine debris. [ABSTRACT FROM AUTHOR]

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Brando, B., et al. (2001). "The "vanishing counting bead" phenomenon: effect on absolute CD34+ cell counting in phosphate-buffered saline-diluted leukapheresis samples." Cytometry **43**(2): 154-160.

BACKGROUND: Using a single-platform protocol to count absolute CD34+ hematopoietic precursor cell (HPC) levels with different reference microbeads, we recorded occasionally artifactually high CD34+ HPC counts in some leukapheresis bags, whereas dual-platform calculations were always consistent. Abnormal countings were observed only when phosphate-buffered saline (PBS)-diluted leukapheresis samples were vortexed before analysis. A large series of blood samples analyzed similarly for CD34+ and CD4+ absolute counts did not show any sample or vortexing effect. With the volumetric absolute counting cytometer Partec-PAS, lower counts were also observed when different reference beads were vortexed before the instrument checking procedures. The counting abnormality was caused by a drop in microbead concentration (the "vanishing bead phenomenon"). This phenomenon reduced the total and relative bead event number in experimental and routine samples and in calibration

procedures. This altered the bead denominator used to calculate absolute CD34+ HPC levels and it also reduced the concentration of standard calibration beads.
METHODS: Using the Partec-PAS to measure volumetrically the actual bead concentration, we studied the vanishing bead phenomenon. Different types of counting and reference microbeads were resuspended in media with or without proteins or cells. Replicates were submitted either to gentle manual mixing or to vortexing before counting.
RESULTS: Vortex agitation almost invariably induced the vanishing bead phenomenon when beads were resuspended in saline media or when an insufficient protein concentration was present, such as in diluted leukapheresis samples. Different bead types showed various degrees of sensitivity to vortexing. The bead disappearance was not caused by bubble formation or disruption. The addition of small amounts of protein completely prevented the vanishing bead phenomenon. The causative effect of the electrostatic charging of tube induced by vortexing is hypothesized.
CONCLUSIONS: Sample suspensions containing counting beads for single-platform analysis must be resuspended in media with protein supplements to prevent the vanishing bead phenomenon and to ensure accurate counting.

Brandon, A. M., et al. (2019). "Fate of Hexabromocyclododecane (HBCD), A Common Flame Retardant, In Polystyrene-Degrading Mealworms: Elevated HBCD Levels in Egested Polymer but No Bioaccumulation." Environmental Science & Technology **19**: 19.

As awareness of the ubiquity and magnitude of plastic pollution has increased, so has interest in the long term fate of plastics. To date, however, the fate of potentially toxic plastic additives has received comparatively little attention. In this study, we investigated the fate of the flame retardant hexabromocyclododecane (HBCD) in polystyrene (PS)-degrading mealworms and in mealworm-fed shrimp. Most of the commercial HBCD consumed by the mealworms was egested in frass within 24 h (1-log removal) with nearly a 3-log removal after 48 h. In mealworms fed PS containing high HBCD levels, only 0.27 +/- 0.10%, of the ingested HBCD remained in the mealworm body tissue. This value did not increase over the course of the experiment, indicating little or no bioaccumulation. Additionally, no evidence of higher trophic level bioaccumulation or toxicity was observed when L. vannamei (Pacific whiteleg shrimp) were fed mealworm biomass grown with PS containing HBCD. Differences in shrimp survival were attributable to the fraction of mealworm biomass incorporated into the diet, not HBCD. We conclude that the environmental effects of PS ingestion need further evaluation as the generation of smaller, more contaminated particles is possible, and may contribute to toxicity at nanoscale.

Brandon, J., et al. (2016). "Long-term aging and degradation of microplastic particles: Comparing in situ oceanic and experimental weathering patterns." Marine Pollution Bulletin **110**(1): 299-308.

Polypropylene, low-density polyethylene, and high-density polyethylene pre-production plastic pellets were weathered for three years in three experimental treatments: dry/sunlight, seawater/sunlight, and seawater/darkness. Changes in chemical bond structures (hydroxyl, carbonyl groups and carbon-oxygen) with weathering were measured via Fourier Transform Infrared (FTIR) spectroscopy. These indices from experimentally weathered particles were compared to microplastic particles collected from oceanic surface waters in the California Current, the North Pacific Subtropical Gyre, and the transition region between the two, in order to estimate the exposure time of the oceanic plastics. Although chemical bonds exhibited some nonlinear changes with environmental exposure, they can potentially approximate the weathering time of some plastics, especially high-density polyethylene. The majority of the North Pacific Subtropical Gyre polyethylene particles we measured have inferred exposure times>18months, with some >30months. Inferred particle weathering times are consistent with ocean circulation models suggesting a long residence time in the open ocean.

Brandon, J. A., et al. (2019). "Multidecadal increase in plastic particles in coastal ocean sediments." Science Advances **5**(9): eaax0587.

We analyzed coastal sediments of the Santa Barbara Basin, California, for historical changes in microplastic deposition using a box core that spanned 1834-2009. The sediment was visually sorted for plastic, and a subset was confirmed as plastic polymers via FTIR (Fourier transform infrared) spectroscopy. After correcting for contamination introduced during sample processing, we found an exponential increase in plastic deposition from 1945 to 2009 with a doubling time of 15 years. This increase correlated closely with worldwide plastic production and southern California coastal population increases over the same period. Increased plastic loading in sediments has unknown consequences for deposit-feeding benthic organisms. This increase in plastic deposition in the post-World War II years can be used as a geological proxy for the Great Acceleration of the Anthropocene in the sedimentary record.

Brandt, B. H., et al. (2001). "Predictive laboratory diagnostics in oncology utilizing blood-borne cancer cells--current best practice and unmet needs." Cancer Letters **162 Suppl**: S11-S16.

The aim of laboratory diagnostics in oncology is to improve the clinical outcome of cancer by allowing earlier detection. Molecular knowledge of cancer should increase the number of risk and prognostic factors and will allow development of methods for detection and elimination of even very small tumors. Thus, the race for the specific tumor antigen in peripheral blood and the race for the blood-borne cancer cell happened simultaneously. The direct detection of the cells which have the highest probability to harbor all the properties mandatory to be life-threatening, conceivably metastatic, would be the most promising way to find the target structure of malignancy.

Brandts, I., et al. (2018). "Effects of nanoplastics on Mytilus galloprovincialis after individual and combined exposure with carbamazepine." Science of the Total Environment **643**: 775-784.

Plastic pollution is a worldwide problem, highlighted by the fact that plastic materials degrade into nano-size particles (<100 nm), potentially becoming more bioavailable as well as a source of entry of other contaminants into organisms. The present study aimed to assess the effects of polystyrene nanoplastics (PS), individually or combined with carbamazepine (Cbz), on the Mediterranean mussel, Mytilus galloprovincialis. For this purpose, mussels were exposed for 96 h to a concentration range of PS (from 0.05 up to 50 mg L⁻¹), to Cbz (6.3 micro g L⁻¹) alone and to the mixture of PS+Cbz (0.05 mg L⁻¹+ 6.3 micro g L⁻¹). Molecular and biochemical biomarkers were assessed in the digestive glands, gills and haemolymph. The abundance of mRNA in the digestive glands and gills revealed significant alterations in the expression of genes associated with biotransformation, DNA repair, cell stress-response and innate immunity. Combined exposure of PS+Cbz induced significant downregulation in gene expression (e.g., hsp70) when compared to individual exposure. Total oxidant status increased in digestive glands after exposure to 0.5 mg L⁻¹ PS. Moreover, increased total antioxidant capacity and esterase activity were observed for PS 50 mg L⁻¹, in digestive glands and gills, respectively. The PS induced effects on neurotransmission, measured as inhibition of cholinesterase activity in haemolymph. Genotoxicity was found in haemocytes after exposure to PS, Cbz and their mixture. Moreover, lipid peroxidation was observed for 0.05 mg L⁻¹ PS exposure, showing that nanoplastics can induce oxidative damage. The present study demonstrated that PS, even at low concentrations, led to alterations on the assessed mussels' endpoints.

Bras, E. J. S., et al. (2019). "Microfluidic device for the point of need detection of a pathogen infection biomarker in grapes." Analyst **144**(16): 4871-4879.

Bacterial, fungal and viral infections in plant systems are on the rise, most of which tend to spread quickly amongst crops. These pathogens are also gaining resistance to known treatments, which makes their early detection a priority to avoid extensive loss of crops and the spreading of disease to animal systems. In this work, we propose a microfluidic platform coupled with integrated thin-film silicon photosensors for the detection of pathogen infections in grapes. This detection was achieved by monitoring the concentration of Azelaic Acid (AzA). This small organic acid plays a significant role in the defense mechanism in plant systems. In this platform, the enzyme tyrosinase was immobilized on microbeads inside a microfluidic system. By colorimetric monitoring of the inhibitory effect of AzA on the enzyme tyrosinase in real time, it was possible, in under 10 minutes, to detect different concentrations of AzA in both buffer and spiked solutions of grape juice, in both cases with limits of detection in the 5-10 nM range. In addition, with this microfluidic device, it was possible to clearly distinguish infected from healthy grape samples at three different grape maturation points. Healthy grape samples showed AzA concentrations in the range of 10-20 nM (post-dilution) while infected samples have an estimated increase of AzA of 10-30x, results which were confirmed using HPLC. In both juice and grape samples an integrated sample preparation stage that decreases the phenol content of the solutions was required to achieve fit-for-purpose sensitivities to AzA.

Brate, I. L. N., et al. (2018). "Weathering impacts the uptake of polyethylene microparticles from toothpaste in Mediterranean mussels (M. galloprovincialis)." Science of the Total Environment **626**: 1310-1318.

Mediterranean mussels (Mytilus galloprovincialis) were exposed over 21 days to polyethylene (PE) particles (0.01 mg ml⁻¹; 50-570 micro m) isolated from toothpaste. PE was deployed in the Outer Oslofjord (Norway) for 21 days, before exposing the mussels to both virgin (PE-V) and weathered PE (PE-W) particles. The mussels ingested both types of particles, but significantly more weathered particles were ingested than virgin (p=.0317), based on PE dosed by weight (mg ml⁻¹) but not when considering particle number (PE-V: 1.18+or-0.16 particles ml⁻¹; PE-W 1.86+or-0.66 particles ml^{-1;}). PE particle ingestion resulted in structural changes to the gills and digestive gland, as well as necrosis in other tissues such as the mantle. No differences were found regarding the degree of tissue alteration between PE-virgin and PE-weathered exposures. This current study illustrates the importance of using weathered particles in microplastic exposure studies to reflect the behaviour of plastic particles after entering the marine environment. The observed tissue alterations demonstrate the potential adverse effects to mussels exposed to microplastic particles.

Brate, I. L. N., et al. (2016). "Plastic ingestion by Atlantic cod (Gadus morhua) from the Norwegian coast." Marine Pollution Bulletin **112**(1/2): 105-110.

This study documents the occurrence of microplastic (<5 mm), mesoplastics (5-20 mm) and macroplastic (>20 mm) in Atlantic cod (Gadus morhua), a common and economically important species of marine fish in Norway. Fish stomachs (n=302) were examined from six different locations along the coast of Norway. Three percent of the individual stomachs contained items identified by Fourier transform infrared spectroscopy (FTIR) as synthetic polymers. Bergen City Harbour was a hotspot with 27% of the cod examined found to contain plastic. Polyester was

the most frequently detected polymer. All bar one of the stomachs that contained plastic were full of organic stomach content, suggesting a plastic gut clearance rate similar to the ingested food. It is proposed that stomach fullness is an important metric in order to avoid underestimations when assessing the levels of microplastic ingested by fish.

Brate, I. L. N., et al. (2018). "Mytilus spp. as sentinels for monitoring microplastic pollution in Norwegian coastal waters: a qualitative and quantitative study." Environmental Pollution **243**(Part A): 383-393.

Microplastic (MP) contamination is ubiquitous in the environment and many species worldwide have been shown to contain MP. The ecological impact of MP pollution is still unknown, thus there is an urgent need for more knowledge. One key task is to identify species suitable as sentinels for monitoring in key eco-compartments, such as coastal waters. In Norway, mussels (Mytilus spp.) have been monitored for hazardous contaminants through OSPAR since 1981. Norway has the longest coastline in Europe and adding MP to the Norwegian Mussel Watch is therefore important in a European and global context. The present study reports MP data in mussels (332 specimens) collected from multiple sites (n=15) spanning the whole Norwegian coastline. MPs were detected at all locations, except at one site on the west coast. Among the most surprising findings, mussels from the Barents Sea coastline in the Finnmark region, contained significantly more MPs than mussels from most of the southern part of the country, despite the latter sites being located much closer to major urban areas. Only mussels from a site located very close to Oslo, the capital, contained levels similar to those observed in the remote site in Finnmark. In total an average of 1.5 (+or-2.3) particles ind⁻¹ and 0.97 (+or-2.61) particles w.w. g⁻¹ was found. The most common MPs were <1 mm in size, and fibres accounted for 83% of particles identified, although there was inter-site variability. Thirteen different polymeric groups were identified; cellulosic being the most common and black rubbery particles being the second. This study suggests Mytilus spp. are suitable for semi-quantitative and qualitatively monitoring of MPs in coastal waters. However, some uncertainties remain including mussel size as a confounding factor that may influence ingestion, the role of depuration and other fate related processes, and this call for further research.

Braune, B. M. (1987). "Seasonal aspects of the diet of Bonaparte's gulls (Larus philadelphia) in the Quoddy region, New Brunswick, Canada." Auk **104**(2): 167-172.

During July-December 1978-1984, Bonaparte's Gulls (Larus philadelphia) on annual migration through the Quoddy region off New Brunswick, Canada, fed on fish, euphausiids, insects, and other marine invertebrates (mainly polychaetes and amphipods) in varying proportions as the summer and autumn progressed. The seasonal variation in the diet was related directly to food availability, which, in turn, was dictated by natural cycles of prey in the region. The frequency with which plastic particles were found in the stomachs also had a statistically significant seasonal trend. Fish provided the largest energy contribution (75-91%) to the diet at all times in the region. There was no significant difference between diets of juvenile and adult birds.

Bray, L., et al. (2019). "Determining suitable fish to monitor plastic ingestion trends in the Mediterranean Sea." Environmental Pollution **247**: 1071-1077.

The presence of marine litter is a complex, yet persistent, threat to the health and biodiversity of the marine environment, and plastic is the most abundant, and ubiquitous type of marine litter. To monitor the level of plastic waste in an area, and the prospect of it entering the food chain, bioindicator species are used extensively throughout Northern European Seas, however due to their distribution ranges many are not applicable to the Mediterranean Sea. Guidance

published for the Marine Strategy Framework Directive suggests that the contents of fish stomachs may be analyzed to determine trends of marine plastic ingestion. In order to equate transnational trends in marine plastic ingestion, the use of standardized fish species that widely occur throughout the basin is favoured, however for the Mediterranean Sea, specific species are not listed. Here we propose a methodology to assess how effective Mediterranean fish species, that are known to have ingested marine plastic, are as bioindicators. A new Bioindicator Index (BI) was established by incorporating several parameters considered important for bioindicators. These parameters included species distribution throughout the Mediterranean basin, several life history traits, the commercial value of each species, and the occurrence of marine litter in their gut contents. By collecting existing data for Mediterranean fish, ranked scores were assigned to each trait and an average value (BI value) was calculated for each species. Based on their habitat preferences, Engraulis encrasicolus (pelagic), Boops boops (benthopelagic), three species of Myctophidae (Hygophum benoiti, Myctophum punctatum and Electrona risso) (mesopelagic), Mullus barbatus barbartus (demersal) and Chelidonichthys lucerna (benthic), were identified as currently, the most suitable fish for monitoring the ingestion of marine plastics throughout the Mediterranean basin. The use of standardized indicator species will ensure coherence in the reporting of marine litter ingestion trends throughout the Mediterranean Sea.

Brazhnik, K., et al. (2015). "Quantum dot-based lab-on-a-bead system for multiplexed detection of free and total prostate-specific antigens in clinical human serum samples." Nanomedicine **11**(5): 1065-1075.

UNLABELLED: An immunodiagnostic lab-on-a-bead suspension microarray based on microbeads encoded with quantum dots (QDs) has been developed and preclinically validated for multiplexed quantitative detection of prostate cancer markers in human serum samples. The sensitivity and specificity of the microarray are similar to those of "gold-standard" single-analyte ELISA. Moreover, the array has an improved immunoassay capacity, ensures quantitative detection of multiple cancer biomarkers and may be operational in a considerably wider dynamic range of concentrations. The array is characterized by reduced time and cost of analysis and is compatible with classical flow cytometers. Proof-of-concept preclinical tests ensured simultaneous quantitative determination of free and total prostate-specific antigens in human serum, with clear discrimination between the control and clinical samples. The proposed approach is flexible and paves the way to development of a wide variety of immunodiagnostic assays for multiplexed early diagnosis of various diseases.

FROM THE CLINICAL EDITOR: Early diagnosis of cancer can result in better prognosis for patients. Thus, the use of specific tumor markers is widely employed in clinical practice. Traditional screening methods only employ single markers. The authors here developed a microarray system based on microbeads encoded with quantum dots (QDs), which can be used for multiplexed quantitative detection. The validated results on patient samples should lead to the development of a wider variety of assays for other diseases.

Breitburg, D., et al. (2018). "Declining oxygen in the global ocean and coastal waters." Science **359**(6371).

Beneath the waves, oxygen disappearsAs plastic waste pollutes the oceans and fish stocks decline, unseen below the surface another problem grows: deoxygenation. Breitburg et al. review the evidence for the downward trajectory of oxygen levels in increasing areas of the open ocean and coastal waters. Rising nutrient loads coupled with climate change—each resulting from human activities—are changing ocean biogeochemistry and increasing oxygen consumption. This results in destabilization of sediments and fundamental shifts in the availability of key nutrients. In the short term, some compensatory effects may result in

improvements in local fisheries, such as in cases where stocks are squeezed between the surface and elevated oxygen minimum zones. In the longer term, these conditions are unsustainable and may result in ecosystem collapses, which ultimately will cause societal and economic harm.Science, this issue p. eaam7240BACKGROUNDOxygen concentrations in both the open ocean and coastal waters have been declining since at least the middle of the 20th century. This oxygen loss, or deoxygenation, is one of the most important changes occurring in an ocean increasingly modified by human activities that have raised temperatures, CO2 levels, and nutrient inputs and have altered the abundances and distributions of marine species. Oxygen is fundamental to biological and biogeochemical processes in the ocean. Its decline can cause major changes in ocean productivity, biodiversity, and biogeochemical cycles. Analyses of direct measurements at sites around the world indicate that oxygen-minimum zones in the open ocean have expanded by several million square kilometers and that hundreds of coastal sites now have oxygen concentrations low enough to limit the distribution and abundance of animal populations and alter the cycling of important nutrients.ADVANCESIn the open ocean, global warming, which is primarily caused by increased greenhouse gas emissions, is considered the primary cause of ongoing deoxygenation. Numerical models project further oxygen declines during the 21st century, even with ambitious emission reductions. Rising global temperatures decrease oxygen solubility in water, increase the rate of oxygen consumption via respiration, and are predicted to reduce the introduction of oxygen from the atmosphere and surface waters into the ocean interior by increasing stratification and weakening ocean overturning circulation.In estuaries and other coastal systems strongly influenced by their watershed, oxygen declines have been caused by increased loadings of nutrients (nitrogen and phosphorus) and organic matter, primarily from agriculture; sewage; and the combustion of fossil fuels. In many regions, further increases in nitrogen discharges to coastal waters are projected as human populations and agricultural production rise. Climate change exacerbates oxygen decline in coastal systems through similar mechanisms as those in the open ocean, as well as by increasing nutrient delivery from watersheds that will experience increased precipitation.Expansion of low-oxygen zones can increase production of N2O, a potent greenhouse gas; reduce eukaryote biodiversity; alter the structure of food webs; and negatively affect food security and livelihoods. Both acidification and increasing temperature are mechanistically linked with the process of deoxygenation and combine with low-oxygen conditions to affect biogeochemical, physiological, and ecological processes. However, an important paradox to consider in predicting large-scale effects of future deoxygenation is that high levels of productivity in nutrient-enriched coastal systems and upwelling areas associated with oxygen-minimum zones also support some of the world’s most prolific fisheries.OUTLOOKMajor advances have been made toward understanding patterns, drivers, and consequences of ocean deoxygenation, but there is a need to improve predictions at large spatial and temporal scales important to ecosystem services provided by the ocean. Improved numerical models of ocean graphic processes that control oxygen depletion and the large-scale influence of altered biogeochemical cycles are needed to better predict the magnitude and spatial patterns of deoxygenation in the open ocean, as well as feedbacks to climate. Developing and verifying the next generation of these models will require increased in situ observations and improved mechanistic understanding on a variety of scales. Models useful for managing nutrient loads can simulate oxygen loss in coastal waters with some skill, but their ability to project future oxygen loss is often hampered by insufficient data and climate model projections on drivers at appropriate temporal and spatial scales. Predicting deoxygenation-induced changes in ecosystem services and human welfare requires scaling effects that are measured on individual organisms to populations, food webs, and fisheries stocks; considering combined effects of deoxygenation

and other ocean stressors; and placing an increased research emphasis on developing nations. Reducing the impacts of other stressors may provide some protection to species negatively affected by low-oxygen conditions. Ultimately, though, limiting deoxygenation and its negative effects will necessitate a substantial global decrease in greenhouse gas emissions, as well as reductions in nutrient discharges to coastal waters.Oxygen is fundamental to life. Not only is it essential for the survival of individual animals, but it regulates global cycles of major nutrients and carbon. The oxygen content of the open ocean and coastal waters has been declining for at least the past half-century, largely because of human activities that have increased global temperatures and nutrients discharged to coastal waters. These changes have accelerated consumption of oxygen by microbial respiration, reduced solubility of oxygen in water, and reduced the rate of oxygen resupply from the atmosphere to the ocean interior, with a wide range of biological and ecological consequences. Further research is needed to understand and predict long-term, global- and regional-scale oxygen changes and their effects on marine and estuarine fisheries and ecosystems.

Breithaupt, A., et al. (2016). "Profiles of growth factors and neurotrophins in normal and neuroinflammatory cerebrospinal fluid." Neurology. Conference: 68th American Academy of Neurology Annual Meeting, AAN **86**(16 SUPPL. 1).

Objective: To determine the profiles of growth factors (GFs) and neurotrophins (NTs) in the cerebrospinal fluid (CSF) of subjects with neuroinflammatory disorders, neurodegenerative disorders and normal controls. Background(s): CSF provides reliable insight into the central nervous system environment and metabolism. GFs and NTs are critical elements for growth, development, synaptogenesis and modulation of neurological function. Method(s): The prevalence and profiles of 41 GFs and NTs were evaluated in CSF of normal controls (n=4) and subjects with meningitis (n=4) to determine the effect of inflammatory responses using slide-coated protein arrays. The panel of growth factors included the insulin-like growth factor binding protein (IGFBP) family, hematopoeitin family, platelet-derived growth factor (PDGF) family, transforming growth factor (TGF) family, neurotrophins, and others. We then established a quantitative assessment of the most common GFs and NTs in 29 subjects with neurodegenerative and neuroinflammatory disorders as well as controls by using microbead multiplexed array assays. Result(s): IGFBPs were the most prevalent GFs in the CSF of normal subjects and patients affected by neuroinflammatory disorders. Among IGFBPs, IGFBP-2, -3, -4, -6 and -7 were the most prevalent proteins in the CSF and, with exception of IGFBP-7, appeared to be further increased in inflammatory conditions. Conclusion(s): Among GFs and NTs, IGFBPs are the most prevalent growth factors present in the CSF. Measures of GFs may provide clues to biological pathways associated with neurodevelopment and pathological conditions such as inflammation and neurodegeneration.

Brekkan, A., et al. (1975). "Glass fragments and other particles contaminating contrast media." Acta Radiologica - Series Diagnosis **16**(6): 600-608.

Microscopy of filtrates made from contrast media of routinely opened glass ampoules substantiates previous assumptions that small fragments of glass may enter into the ampoule and the medium with considerable frequency. Such glass fragments may cause embolic lesions on intraarterial injections of the medium; the lesions, however, are histologically non specific consisting of proliferation of intima and small granulomas associated with dilated nephrons in a ray like arrangement. A significant amount of plastic particles may be added to injectable fluids on usage of disposable syringes.

Brems, A., et al. (2012). "RECYCLING AND RECOVERY OF POST-CONSUMER PLASTIC SOLID WASTE IN A EUROPEAN CONTEXT." Thermal Science **16**(3): 669-685.

The disposal of waste plastics has become a major worldwide environmental problem. The USA, Europe and Japan generate annually about 50 million tons of post-consumer plastic waste, previously landfilled, generally considered as a non-sustainable and environmentally questionable option. Landfill sites and their capacity are, moreover, decreasing rapidly, and legislation is stringent. Several European directives and US legislation concern plastic wastes and the required management. They are briefly discussed in this paper. New processes have emerged, i. e., advanced mechanical recycling of plastic waste as virgin or second grade plastic feedstock, and thermal treatments to recycle the waste as virgin monomer, as synthetic fuel gas, or as heat source (incineration with energy recovery). These processes avoid land filling, where the non-biodegradable plastics remain a lasting environmental burden. The paper reviews these alternative options through mostly thermal processing (pyrolysis, gasification, and waste-to-energy). Additional research is, however, still needed to confirm the potential on pilot and commercial scale.

Brems, A., et al. (2013). "Gasification of plastic waste as waste-to-energy or waste-to-syngas recovery route." Natural Science **5**(6): 695-704.

The disposal of plastic solid waste (PSW) has become a major worldwide environmental problem. New sustainable processes have emerged, i.e. either advanced mechanical recycling of PSW as virgin or second grade plastic feedstock, or thermal treatments to recycle the waste as virgin monomer, as synthetic fuel gas, or as heat source (incineration with energy recovery). These processes avoid land filling, where the non-biodegradable plastics remain a lasting environmental burden. Within the thermal treatments, gasification and pyrolysis gain increased interest. Gasification has been widely studied and applied for biomass and coal, with results reported and published in literature. The application to the treatment of PSW is less documented. Gasification is commonly operated at high temperatures (> 600 to 800) in an air-lean environment (or oxygen-deficient in some applications): the air factor is generally between 20% and 40% of the amount of air needed for the combustion of the PSW. Gasification produces mostly a gas phase and a solid residue (char and ashes). The use of air introduces N2 in the product gases, thus considerably reducing the calorific value of the syngas, because of the dilution. The paper will review the existing literature data on PSW gasification, both as the result of laboratory and pilot-scale research. Processes developed in the past will be illustrated. Recently, the use of a sequential gasification and combustion system (at very high temperatures) has been applied to various plastic-containing wastes, with atmospheric emissions shown to be invariably below the legal limits. Operating results and conditions will be reviewed in the paper, and completed with recent own lab-scale experimental results. These results demonstrate that gasification of PSW can be considered as a first order reaction, with values of the activation energy in the order of 187 to 289 kJ/mol as a function of the PSW nature.

Brennan, E., et al. (2018). "Connecting flux, deposition and resuspension in coastal debris surveys." Science of the Total Environment **644**: 1019-1026.

For decades, community groups and scientists have sampled coastal waste along shorelines to understand the distribution of debris. However, when debris is washed ashore or locally deposited, it may be washed away before it is removed or recorded. Using statistical models to understand the movement of debris in coastal processes may identify potential sinks of anthropogenic debris. We modelled arrival and departure of debris using data from repeated removal and marking experiments. Both the arrival and departure of debris were affected by the substrate of the shoreline and by seasonal changes (e.g. autumn and winter). Different substrates accumulated different types of debris. The backshore, coastal shape and wind exposure had all affected the departure but not the arrival of debris. Our findings suggest that areas with high accumulation have lower departure, rather than higher arrival of debris. The implication is that counting debris in dirty locations, as when cleanup activities are used for monitoring, will provide a misleading measure of the actual debris in adjoining waters. We found that onshore winds and lower profile backshore vegetation increase the departure of debris. Debris may be moving inland and accumulating in the backshore vegetation, suggesting the backshore vegetation could be a substantial sink of missing marine debris. Overall, inferring the state of plastic pollution in the ocean using one "snapshot" on shore may underestimate the output of debris from land-based sources, whilst overestimating ocean loads near sites that retain or accumulate high levels of debris.

Brennecke, D., et al. (2016). "Microplastics as vector for heavy metal contamination from the marine environment." Estuarine, Coastal and Shelf Science **178**: 189-195.

The permanent presence of microplastics in the marine environment is considered a global threat to several marine animals. Heavy metals and microplastics are typically included in two different classes of pollutants but the interaction between these two stressors is poorly understood. During 14 days of experimental manipulation, we examined the adsorption of two heavy metals, copper (Cu) and zinc (Zn), leached from an antifouling paint to virgin polystyrene (PS) beads and aged polyvinyl chloride (PVC) fragments in seawater. We demonstrated that heavy metals were released from the antifouling paint to the water and both microplastic types adsorbed the two heavy metals. This adsorption kinetics was described using partition coefficients and mathematical models. Partition coefficients between pellets and water ranged between 650 and 850 for Cu on PS and PVC, respectively. The adsorption of Cu was significantly greater in PVC fragments than in PS, probably due to higher surface area and polarity of PVC. Concentrations of Cu and Zn increased significantly on PVC and PS over the course of the experiment with the exception of Zn on PS. As a result, we show a significant interaction between these types of microplastics and heavy metals, which can have implications for marine life and the environment. These results strongly support recent findings where plastics can play a key role as vectors for heavy metal ions in the marine system. Finally, our findings highlight the importance of monitoring marine litter and heavy metals, mainly associated with antifouling paints, particularly in the framework of the Marine Strategy Framework Directive (MSFD).

Brennecke, D., et al. (2015). "Ingested microplastics (>100 mu m) are translocated to organs of the tropical fiddler crab Uca rapax." Marine Pollution Bulletin **96**(1-2): 491-495.

Microplastics, which are accumulating in marine sediments, are assumed to pose a risk for deposit feeding invertebrates. We tested whether the fiddler crab Uca rapax ingests and retains microplastics in its body. Furthermore, we investigated whether retention rates depend on (a) the quality of the marine environment in which the plastics were pre-weathered and on (b) their abundance. For this, polystyrene pellets were submersed at a polluted and a pristine site near Niteroi, Brazil, for 2weeks. Then specimens of U. rapax were, in laboratory experiments, exposed to fragments (180-250 mu m) derived from these pellets for 2months. After this period, microplastics were observed in the gills, stomach and hepatopancreas of the animals. However, fragment retention was not influenced by the two factors that we manipulated. The presence of microplastics in different organs of the crab supports the assumption that these particles have the potential to harm marine invertebrates.

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Brenner, S., et al. (2000). "In vitro cloning of complex mixtures of DNA on microbeads: physical separation of differentially expressed cDNAs." Proceedings of the National Academy of Sciences of the United States of America **97**(4): 1665-1670.
We describe a method for cloning nucleic acid molecules onto the surfaces of 5-micrometer microbeads rather than in biological hosts. A unique tag sequence is attached to each molecule, and the tagged library is amplified. Unique tagging of the molecules is achieved by sampling a small fraction (1%) of a very large repertoire of tag sequences. The resulting library is hybridized to microbeads that each carry approximately 10(6) strands complementary to one of the tags. About 10(5) copies of each molecule are collected on each microbead. Because such clones are segregated on microbeads, they can be operated on simultaneously and then assayed separately. To demonstrate the utility of this approach, we show how to label and extract microbeads bearing clones differentially expressed between two libraries by using a fluorescence-activated cell sorter (FACS). Because no prior information about the cloned molecules is required, this process is obviously useful where sequence databases are incomplete or nonexistent. More importantly, the process also permits the isolation of clones that are expressed only in given tissues or that are differentially expressed between normal and diseased states. Such clones then may be spotted on much more cost-effective, tissue- or disease-directed, low-density planar microarrays.

Bretas Alvim, C., et al. (2020). "Wastewater treatment plant as microplastics release source - Quantification and identification techniques." Journal of Environmental Management **255 (no pagination)**(109739).
The high presence of microplastics (MPs) in different sizes, materials and concentrations in the aquatic environment is a global concern due to their potential physically and chemically harm to aquatic organisms including mammals. Furthermore, the bioaccumulation of these compounds is leading to their ingestion by humans through the consumption of sea food and even through the terrestrial food chain. Even though conventional wastewater treatment plants are capable of eliminating more than 90% of the influent MPs, these systems are still the main source of MPs introduction in the environment due to the high volumes of effluents generated and returned to the environment. The amount of MPs dumped by WWTP is influenced by the configuration of the WWTP, population served and influent flow. Thus, the average of MP/L disposed vary widely depending on the region. In addition to MPs disposed in water bodies, more than 80% of these emerging contaminants, which enter the WWTP, are retained in

biosolids that can be applied as fertilizers, representing a potential source of soil contamination. Due to the continuous disposal of MPs in the environment by effluent treatment systems and their polluting potential, separation and identification techniques have been assessed by several researchers, but unfortunately, there are no standard protocols for them. Aiming to provide insight about the relevance of studying the WWTP as source of MPs, this review summarizes the currently methodologies used to classify and identify them. Copyright © 2019 Elsevier Ltd

Briassoulis, D., et al. (2008). "Correlation of key agricultural plastic waste parameters with the quality of the resulting waste stream." Acta Horticulturae **801**(Vol 1): 333-340.
The mechanical and chemical degradation of the agricultural plastic waste as well as its soil/moisture contamination, may affect its quality with regards to its exploitation for recycling or for energy recovery. These critical parameters were investigated in an effort to assess and control the quality of the agricultural plastic waste streams in the framework of the European research project Labelagriwaste. Samples of agricultural plastics from greenhouses, low-medium tunnels, mulching films, bale wrapping films, etc. (from various cultivations, across Greece and Europe) were collected before and after use as well as after storage in the field, and were tested in the laboratory for mechanical properties, degradation and moisture-soil contamination. The results obtained indicate that the degree of mechanical degradation of the agricultural plastic waste is highly dependent on a combination of application and material characteristics. Among the dominant factors affecting the quality of the agricultural plastic waste included are the thickness of the film versus the period of exposure, the material composition and additives, the use of agrochemicals and the exposure of the material to contamination by soil during use and handling after the removal. The duration and conditions (location, exposure to the open field conditions) of the storage affect greatly the soil contamination and moisture level. The mechanical degradation tests will be combined with on-going chemical and thermal analysis tests to establish the technical requirements the agricultural plastic waste should fulfil for disposal (mechanical recycling, energy recovery, composting etc).

Briassoulis, D., et al. (2015). "Degradation in soil behavior of artificially aged polyethylene films with pro-oxidants." Journal of Applied Polymer Science **132**(30).
Bio-based, biodegradable in soil, as well as degradable polyethylene mulching films with pro-oxidants, have been introduced in the market in an effort to deal with the serious problem of managing plastic waste streams generated from conventional mulching films. In a previous experimental investigation, a series of naturally degraded under water melon cultivation conditions linear low density polyethylene (LLDPE) mulching films with pro-oxidants, buried in the field for 8.5 years, were recovered intact even though undergoing a continuous slow abiotic degradation in soil. The aim of the present article was to simulate the behavior of the LLDPE mulching films with pro-oxidants under a much longer time-scale (e.g. some decades). Toward this purpose, samples of LLDPE with pro-oxidants film were artificially degraded to simulate severe degradation/fragmentation of these films while been buried in the soil for many years, following the end of the cultivation season. Further degradation of these severely degraded samples was investigated by burying them in the soil over a period of seven years. During this burial period, all degradation parameters and their evolution with time were measured. The artificially degraded LLDPE film samples with pro-oxidants, in contrast to the naturally degraded film that remained intact for 8.5 years, were gradually transformed into tiny micro-fragments in the soil. These fragments, through a continuing abiotic degradation process under natural soil conditions are eventually transformed into invisible micro-fragments. The fate of these micro-fragments and their long-term impact to the environment and human health is

unpredictable. 2015 Wiley Periodicals, Inc. J. Appl. Polym. Sci. 2015, 132, 42289. 2015 Wiley Periodicals, Inc.

Briassoulis, D., et al. (2013). "Review, mapping and analysis of the agricultural plastic waste generation and consolidation in Europe." Waste Management & Research **31**(12): 1262-1278.
A review of agricultural plastic waste generation and consolidation in Europe is presented. A detailed geographical mapping of the agricultural plastic use and waste generation in Europe was conducted focusing on areas of high concentration of agricultural plastics. Quantitative data and analysis of the agricultural plastic waste generation by category, geographical distribution and compositional range, and physical characteristics of the agricultural plastic waste per use and the temporal distribution of the waste generation are presented. Data were collected and cross-checked from a variety of sources, including European, national and regional services and organizations, local agronomists, retailers and farmers, importers and converters. Missing data were estimated indirectly based on the recorded cultivated areas and the characteristics of the agricultural plastics commonly used in the particular regions. The temporal distribution, the composition and physical characteristics of the agricultural plastic waste streams were mapped by category and by application. This study represents the first systematic effort to map and analyse agricultural plastic waste generation and consolidation in Europe.

Briassoulis, D. and C. Dejean (2010). "Critical Review of Norms and Standards for Biodegradable Agricultural Plastics Part I. Biodegradation in Soil." Journal of Polymers & the Environment **18**(3): 384-400.
critical review of norms and standards and corresponding tests to determine the biodegradability in soil for biodegradable plastics, possibly applicable also to biodegradable agricultural plastics, is presented. There are only a few norms available at the international level about biodegradable plastics in soil. The criteria, parameters and testing methodologies for the characterization, labelling and validation of the agricultural plastic waste streams with respect to possible biodegradation in soil according to existing international standards are analysed while the relevant controversies are identified. To derive the best suited for agricultural plastics specs and testing methods, the possible developments or adaptation of available specs, is investigated. Considering the existing types of biodegradable plastic products in agriculture and their effective life management at the agricultural field, only a few norms appear to provide suitable tests that could be adapted, following appropriate research work, for testing biodegradability in soil under real field conditions. It is shown that some major revisions are needed, with the support of systematic research work, before a new universal norm and standard testing methods become available for testing agricultural plastics for biodegradation under real, and highly variable, soil conditions. Based on the analysis of the different norms and their content it appears necessary to incorporate provisions for transferability of results to different soils and climates, validation of tests through a positive reference and also, set prerequisites for soil media. Long term biodegradation in soil prediction is another open issue. [ABSTRACT FROM AUTHOR]

Briassoulis, D., et al. (2008). "Biodegradable irrigation systems for protected cultivation." Acta Horticulturae **801**(Vol 1): 373-380.

New environmental regulations, societal concerns, and a growing environmental awareness throughout the world have triggered the search for new products and processes that are compatible with the environment. This paper presents the results of a research project carried out by the Agricultural University of Athens (Greece) with the cooperation of Eurodrip S.A. investigating the possibilities and limitations in developing biodegradable irrigation pipes for agriculture. Biodegradable drip irrigation systems are especially needed in protected cultivation systems using biodegradable mulching and low tunnel films. The aim is that all biodegradable materials, films and irrigation system are roto-tilled into the soil following the end of the cultivation period to eliminate the agricultural plastic waste management problem. The first ever experimental biodegradable irrigation tapes and pipes with drippers were produced using 'Mater Bi'. The processing conditions were investigated thoroughly and optimized under the constraint of the available conventional equipment. The mechanical and irrigation performance and degradation behaviour of the pipes produced were evaluated under laboratory and real field conditions. The results obtained are promising concerning the feasibility to develop in the future optimised commercial products.

Briassoulis, D., et al. (2013). "Technical specifications for mechanical recycling of agricultural plastic waste." Waste Management **33**(6): 1516-1530.

Technical specifications appropriate for the recycling of agricultural plastic wastes (APWs), widely accepted by the recycling industry were developed. The specifications establish quality standards to be met by the agricultural plastics producers, users and the agricultural plastic waste management chain. They constitute the base for the best economical and environmental valorisation of the APW. The analysis of the APW streams conducted across Europe in the framework of the European project "LabelAgriWaste" revealed the inherent characteristics of the APW streams and the inherent constraints (technical or economical) of the APW. The APW stream properties related to its recycling potential and measured during pilot trials are presented and a subsequent universally accepted simplified and expanded list of APW recycling technical specifications is proposed and justified. The list includes two sets of specifications, applied to two different quality categories of recyclable APW: one for pellet production process ("Quality I") and another one for plastic profile production process ("Quality II"). Parameters that are taken into consideration in the specifications include the APW physical characteristics, contamination, composition and degradation. The proposed specifications are focused on polyethylene based APW that represents the vast majority of the APW stream. However, the specifications can be adjusted to cover also APW of different materials (e.g. PP or PVC) that are found in very small quantities in protected cultivations in Europe. The adoption of the proposed specifications could transform this waste stream into a labelled commodity traded freely in the market and will constitute the base for the best economical and environmental valorisation of the APW.

Briassoulis, D., et al. (2012). "Experimental investigation of the quality characteristics of agricultural plastic wastes regarding their recycling and energy recovery potential." Waste Management **32**(6): 1075-1090.

A holistic environmentally sound waste management scheme that transforms agricultural plastic waste (APW) streams into labelled guaranteed quality commodities freely traded in open market has been developed by the European research project LabelAgriWaste. The APW quality is defined by the APW material requirements, translated to technical specifications, for recycling or energy recovery. The present work investigates the characteristics of the APW quality and the key factors affecting it from the introduction of the virgin product to the market to the APW stream reaching the disposer. Samples of APW from different countries were traced from their application to the field through their storage phase and transportation to the final destination. The test results showed that the majority of APW retained their mechanical properties after their use preserving a "very good quality" for recycling in terms of degradation. The degree of soil contamination concerning the APW recycling and energy recovery potential fluctuates depending on the agricultural plastic category and application. The chlorine and heavy metal content of the tested APW materials was much lower than the maximum acceptable limits for their potential use in cement industries.

Briassoulis, D., et al. (2019). "End-of-waste life: Inventory of alternative end-of-use recirculation routes of bio-based plastics in the European Union context." Critical Reviews in Environmental Science and Technology **49**(20): 1835-1892.

The bio-based products market is currently limited resulting in relatively small quantities of waste streams, viewed as contaminants of conventional waste streams. The steady growth of bio-based products however, drives the need to investigate their End-of-Use (EoU)/End-of-Life (EoL) alternatives. A critical review of the inventory of targeted valorization options for bio-based plastic waste is presented with limitations and opportunities. Impacts on the conventional waste management routes and the environment are considered. The provisions of the circular economy package, the targets and objectives set by the relevant EU environmental legislation, are used as key drivers for developing the inventory of the alternative EoU/EoL routes. Optimal alternative EoU/EoL routes are defined for the bio-based products in such a way that they are turned into valuable resources for the circular economy. This is a prerequisite to promote recirculation of bio-based by-products and waste streams along the whole chain of their production and use. The expected impacts include reduction of public health and environmental pollution problems, preservation of natural resources, reduction of GHG emissions, avoidance of landscape deterioration and land and marine littering. Copyright © 2019, © 2019 Taylor & Francis Group, LLC.

Bridson, J. H., et al. (2020). "Microplastic contamination in Auckland (New Zealand) beach sediments." Marine Pollution Bulletin **151 (no pagination)**(110867).

We report the first large-scale investigation of microplastic contamination in beach sediments across Auckland, New Zealand's most populous region. Sediment samples were taken from the high tide and intertidal zones at 39 sites across estuary, harbour and ocean environments of the East and West Coasts. Microplastic contamination was present at the majority of beaches studied with a mean abundance of 459 particles.m⁻ ² ranging from 0 to 2615 particles.m⁻ ². High variability was observed between the sites, indicating the importance of small-scale factors on microplastic contamination. Samples from high and intertidal zones showed no significant difference in microplastic contamination (p = 0.225). The West Coast beaches exhibited higher microplastic contamination compared with East Coast beaches (p = 0.004). Microplastics were predominately fibres (88%), with lower proportions of fragments (8%) and films (4%). The majority of the microplastics analysed were regenerated cellulose (34%), polyethylene terephthalate (22%) and polyethylene (15%). Copyright © 2020 Elsevier Ltd

Brignac, K. C., et al. (2019). "Marine Debris Polymers on Main Hawaiian Island Beaches, Sea Surface, and Seafloor." Environmental Science & Technology **53**(21): 12218-12226.

Polymeric differences of plastic debris were assessed across four compartments of the Main Hawaiian Islands (sea surface, windward beaches, leeward beaches, and seafloor) to better describe sources and fate. Plastic debris pieces (n = 4671) were collected from 11 beaches, three sea surface tows, and three seafloor dives. Fourier transform infrared spectroscopy identified the polymers of 3551 pieces. Significant differences ($p < 0.05$) in concentration, types, polymer composition, and weathering were found among four compartments. Windward beaches had 1-2 orders of magnitude more plastic pollution (g/m²) than leeward beaches, despite smaller human populations on windward sides. Sea surface and windward beaches were dominated by severely weathered, less dense floating polymers (polyethylene and polypropylene comprised 92.7 and 93.5% on average, respectively, of the total debris mass), while leeward beaches and the seafloor debris consisted of less weathered and more dense sinking polymers (e.g., 41.0 and 44.7% of total mass consisted of the sum of polystyrene, nylon, cellulose acetate, polyethylene terephthalate, and additive-masked debris). These results are some of the first to provide evidence of polymeric stratification in the marine environment and emphasize that the majority of marine debris in Hawaii is floating in from distant sources rather than from Hawaii's residents or tourists.

Brizgys, M. V., et al. (1988). "Characterization of monoclonal antidigoxin antibodies immobilized to a solid support." Biotechnology and Applied Biochemistry **10**(4): 373-384.

A high-affinity monoclonal antidigoxin antibody, produced by somatic cell fusion, was amplified by the formation of ascites. purification from ascites was accomplished by affinity chromatography by passing the ascites over a digitoxin-amine-agarose column. Affinity-purified antidigoxin antibody was coupled to a pellicular microbead at concentrations of 10, 25, 50, and 100 mg/g bead. The immobilized antibody was characterized for binding affinity, for specificity to other cardiac glycosides, and for binding capacity. The data demonstrate that antidrug antibodies immobilized on solid supports remain functional and may have the capability of removing drug from biological fluids passed over the support.

Brockhoff, G., et al. (1994). "Flow cytometric detection and quantitation of the epidermal growth factor receptor in comparison to Scatchard analysis in human bladder carcinoma cell lines." Cytometry **17**(1): 75-83.

The epidermal growth factor receptor (EGFR) is considered a tumor-related marker with potential diagnostic and prognostic value. In order to assess the sensitivity of flow cytometry to detect EGFR and to quantify receptors objectively, two human bladder carcinoma cell lines with different urothelial differentiation, RT4 and J82, were grown in vitro, and their membrane EGFR content was measured by flow cytometry. Exponential monolayers showed decrease of EGFR content after 20 min pulses with 10 ng/ml EGF in medium, as detected with the antibody EGFR1 in a double staining technique with propidium iodide for DNA evaluation. Further decrease of green fluorescence intensity was seen in cells constantly exposed to EGF. Absolute receptor numbers were determined by Scatchard analysis with radioactive EGF and resulted in relatively low receptor numbers for both cell lines (approximately 3-4 x 10(4) EGFR/cell), as well as one affinity class. These findings could be matched by absolute receptor quantification by flow cytometry, adding beads with defined antigenic sites (Quantum Simply Cellular, Microbead Corporation) to the cell suspension for staining. Our data suggest that flow cytometric EGFR detection and quantitation may be supplied to in vivo tumor samples and that measurements by multiparameter analysis may define subpopulations valuable for tumor diagnosis and judgment on tumor progression.

Brodhagen, M., et al. (2017). "Policy considerations for limiting unintended residual plastic in agricultural soils." Environmental Science and Policy **69**: 81-84.

Growing crops under high-intensity agriculture entails the use of numerous plastic products, especially polyethylene plastic films used as crop mulches. As a result, some of the world's most productive agricultural soils are now being affected by plastic pollution, seriously threatening soil health and food security. Plastic film mulches designed to biodegrade in soil provide an appealing alternative to polyethylene films. What may be surprising, however, is that biodegradable plastic films do not necessarily represent a long-term solution to the problem of contaminating soil with plastic residues. Transformative science and policies are needed to mitigate uncertainty of biodegradable plastic residue accumulation in agricultural soils. Copyright © 2016 Elsevier Ltd

Broggini, T., et al. (2016). "Passive Entrapment of Tumor Cells Determines Metastatic Dissemination to Spinal Bone and Other Osseous Tissues." PLoS ONE [Electronic Resource] **11**(9): e0162540.

During the metastatic process tumor cells circulate in the blood stream and are carried to various organs. In order to spread to different organs tumor cell-endothelial cell interactions are crucial for extravasation mechanisms. It remains unclear if tumor cell dissemination to the spinal bone occurs by passive entrapment of circulating tumor cells or by active cellular mechanisms mediated by cell surface molecules or secreted factors. We investigated the seeding of three different tumor cell lines (melanoma, lung and prostate carcinoma) to the microvasculature of different organs. Their dissemination was compared to biologically passive microbeads. The spine and other organs were resected three hours after intraarterial injection of tumor cells or microbeads. Ex vivo homogenization and fluorescence analysis allowed quantification of tumor cells or microbeads in different organs. Interestingly, tumor cell distribution to the spinal bone was comparable to dissemination of microbeads independent of the tumor cell type (melanoma: 5.646% +/- 7.614%, lung: 6.007% +/- 1.785%, prostate: 3.469% +/- 0.602%, 7 mum beads: 9.884% +/- 7.379%, 16 mum beads: 7.23% +/- 1.488%). Tumor cell seeding differed significantly between tumor cells and microbeads in all soft tissue organs. Moreover, there were significant differences between the different tumor cell lines in their dissemination behaviour to soft tissue organs only. These findings demonstrate that metastatic dissemination of tumor cells to spinal bone and other osseous organs is mediated by passive entrapment of tumor cells similar to passive plugging of microvasculature observed after intraarterial microbeads injection.

Bronge, M., et al. (2019). "Sensitive detection of antigen-specific T-cells using bead-bound antigen for in vitro re-stimulation." MethodsX **6**: 1635-1641.

Reliable and sensitive detection of antigen specific cells is essential in several fields of research, whether it concerns monitoring responses to infectious agents or exploring the auto-antigen repertoire in autoimmune diseases. Identification of these cells is however difficult, especially when the cells often are rare and methods not sensitive, specific or practical enough. We propose a novel method of processing antigens before stimulation of cells which consists of covalently binding protein antigen to superparamagnetic micro-beads and using denaturing washes to remove contaminants. Peripheral blood mononuclear cells (PBMCs) from healthy donors were stimulated using both cytomegalovirus and tetanus-diphtheria antigen-beads as well as non-antigenic protein-beads as negative control in an IFNgamma FluoroSpot assay in order to detect Th1 and CD8⁺ responses. The responses toward the antigen beads were both antigen specific and sensitive, with a detection threshold of 1 IFNgamma producing T-cell per 18,000 PBMCs. *Covalently binding antigen to paramagnetic beads allows for harsh denaturing washes without loss of antigen.*Microbeads are phagocytosed by antigen presenting cells, resulting in efficient uptake, processing and presentation of the antigens.*The method allows the usage of relatively impure starting antigen material and whole PBMC samples without high background levels in follow up cellular assays.

Brookson, C. B., et al. (2019). "Microplastics in the diet of nestling double-crested cormorants (Phalacrocorax auritus), an obligate piscivore in a freshwater ecosystem." Canadian Journal of Fisheries and Aquatic Sciences **76**(11): 2156-2163.

Anthropogenic debris, namely plastic, is a concern across aquatic ecosystems worldwide, with freshwater systems being understudied relative to marine systems. In this study, we quantified and characterized debris in the diet of double-crested cormorant chicks (Phalacrocorax auritus) from three sites in two of the Laurentian Great Lakes to (i) determine whether or not the diet of double-crested cormorants in the Laurentian Great Lakes includes anthropogenic debris, (ii) characterize the size, shape, and type of debris incorporated, and (iii) examine relationships between the amount of debris ingested and their proximity to industrial–urban centres. Overall, >86% of cormorants in our study had anthropogenic debris (mostly fibers) in their digestive tracts with no correlation between site and the amount of debris ingested. The ingested debris includes microplastics, natural fibres from textiles, and other anthropogenic materials (e.g., glass). To the best of our knowledge, this is one of the first studies to examine anthropogenic debris in a diving bird in the Laurentian Great Lakes and one of few studies investigating this in freshwater birds.La présence de débris d’origine humaine, notamment de plastique, dans les écosystèmes aquatiques du monde entier est préoccupante, les systèmes d’eau douce étant sous-étudiés à cet égard par rapport aux systèmes marins. Nous avons quantifié et caractérisé les débris dans le régime alimentaire de bébés cormorans à aigrettes (Phalacrocorax auritus) de trois sites dans deux des Grands Lacs laurentiens afin de (i) déterminer si le régime alimentaire des cormorans à aigrettes dans les Grands Lacs laurentiens comprend des débris d’origine humaine et (ii) caractériser la taille, la forme et le type des débris incorporés et (iii) examiner les relations entre la quantité de débris ingérés et la proximité de centres industriels ou urbains. Globalement, il y avait des débris d’origine humaine (principalement des fibres) dans le tube digestif de >86 % des cormorans étudiés et il n’y avait pas de corrélation entre le site et la quantité de débris ingérés. Les débris ingérés comprenaient des microplastiques, de fibres naturelles provenant de textiles et d’autres matières d’origine humaine (p. ex. du verre). À notre connaissance, il s’agit d’une des premières études à examiner les débris d’origine humaine dans un oiseau plongeur dans les Grands Lacs laurentiens et une des rares études à examiner ce phénomène chez des oiseaux d’eau douce. [Traduit par la Rédaction]

Brossault, D. F. F. and A. F. Routh (2020). "Salt-driven assembly of magnetic silica microbeads with tunable porosity." Journal of Colloid & Interface Science **562**: 381-390.

HYPOTHESIS: Porous magnetic silica beads are promising materials for biological and environmental applications due to their enhanced adsorption and ease of recovery. This work aims to develop a new, inexpensive and environmentally friendly approach based on agglomeration of nanoparticles in aqueous droplets. The use of an emulsion as a geometrical constraint is expected to result in the formation of spherical beads with tunable composition depending on the aqueous phase content.

EXPERIMENTS: Magnetic silica beads are produced at room temperature by colloidal destabilization induced by addition of CaCl₂ to a water-in-oil emulsion containing SiO₂ and Fe₃O₄ nanoparticles. The impact of the salt concentration, emulsification method, concentration of hydrophobic surfactant as well as silica content is presented in this paper.

FINDINGS: This method enables the production of spherical beads with diameters between 1 and 9 micro m. The incorporation of magnetic nanoparticles inside the bead's structure is confirmed using Energy Dispersive X-ray spectrometry (EDX) and Scanning Transmission Electron Microscopy (STEM) and results in the production of magnetic responsive beads with a preparation yield up to 84%. By incorporating the surfactant Span 80 in the oil phase it is possible to tune the roughness and porosity of the beads.

Brown, S. (2019). "Connections." BioCycle **60**(8): 47-47.
The article suggests ways by incorporating which one can contribute to the sustainable environment. Topics include carrying reusable bag to the grocery store for shopping, reducing your meat consumption by choosing vegan or being vegetarian, and making the community aware of home and community composting..

Brown, T. and H. Takada (2017). "Indicators of Marine Pollution in the North Pacific Ocean." Archives of Environmental Contamination & Toxicology **73**(2): 171-175.
The complex nature of ocean pollution underscores the utility in identifying and characterizing a limited number of 'indicators' that enables scientists and managers to track trends over space and time. This paper introduces a special issue on indicators of marine pollution in the North Pacific Ocean and builds on a scientific session that was held at the North Pacific Marine Science Organization. The special issue highlights studies using a variety of indicators to provide insight into the identification of legacy and emerging contaminants, the ranking of priority pollutants from various sources, and the effects of contaminants on ecosystem health in the North Pacific Ocean. Examples include the use of mussels to illustrate spatial and temporal trends of a number of contaminants following the 2011 tsunami in Japan, the use of molecular marker (linear alkylbenzenes, hopanes, and polycyclic aromatic hydrocarbons) profiles to identify pollution sources, and the use of plastic resin pellets to illustrate spatial trends of petroleum pollution around the world. Stable isotopes were used to strengthen the utility of the Glaucous-winged gull (Larus glaucescens) as an indicator of marine pollution. Examples also demonstrate the development and application of biomarker approaches, including gene transcripts, oxidative stress, estradiol, hatchability, and respiration and swimming behavior abnormalities, as a function of exposure to polychlorinated biphenyls, sulfur-diesel, Pinghu crude oil, galaxolide and antifouling biocides. We provide a brief review of indicators of marine pollution, identify research gaps, and summarize key findings from the articles published within the issue. This special issue represents the first compilation of research pertaining to marine pollution indicators in the North Pacific Ocean and provides guidance to inform mitigation and monitoring efforts of contaminants in the region. [ABSTRACT FROM AUTHOR]
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Brown, T. M. and H. Takada (2017). "Indicators of marine pollution in the North Pacific Ocean. (Special Issue: Indicators of ocean pollution.)." Archives of Environmental Contamination and Toxicology **73**(2): 171-175.
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and time. This paper introduces a special issue on indicators of marine pollution in the North Pacific Ocean and builds on a scientific session that was held at the North Pacific Marine Science Organization. The special issue highlights studies using a variety of indicators to provide insight into the identification of legacy and emerging contaminants, the ranking of priority pollutants from various sources, and the effects of contaminants on ecosystem health in the North Pacific Ocean. Examples include the use of mussels to illustrate spatial and temporal trends of a number of contaminants following the 2011 tsunami in Japan, the use of molecular marker (linear alkylbenzenes, hopanes, and polycyclic aromatic hydrocarbons) profiles to identify pollution sources, and the use of plastic resin pellets to illustrate spatial trends of petroleum pollution around the world. Stable isotopes were used to strengthen the utility of the Glaucous-winged gull (Larus glaucescens) as an indicator of marine pollution. Examples also demonstrate the development and application of biomarker approaches, including gene transcripts, oxidative stress, estradiol, hatchability, and respiration and swimming behavior abnormalities, as a function of exposure to polychlorinated biphenyls, sulfur-diesel, Pinghu crude oil, galaxolide and antifouling biocides. We provide a brief review of indicators of marine pollution, identify research gaps, and summarize key findings from the articles published within the issue. This special issue represents the first compilation of research pertaining to marine pollution indicators in the North Pacific Ocean and provides guidance to inform mitigation and monitoring efforts of contaminants in the region.

Brown, T. P., et al. (2013). "Histamine reduces GPIbalpha-mediated adhesion of platelets to TNF-alpha-activated vascular endothelium." Thrombosis Research **131**(2): 150-157.

Histamine and tumor necrosis factor-alpha (TNF-alpha) are critical mediators of acute and chronic inflammation that are generated by mast cells and macrophages in atherosclerotic lesions or systemically during allergic attacks. Both of them induce activation of vascular endothelium and thus may play a role in thrombosis. Here we studied the interplay between histamine and TNF-alpha in glycoprotein (GP) Ibalpha-mediated platelet adhesion to cultured human vascular endothelial cells under static and shear flow conditions. The stimulation of endothelial cells with histamine or TNF-alpha increased the number of adherent or slow rolling GP Ibalpha-coated microbeads or washed human platelets. However, the application of histamine to endothelium pre-activated by TNF-alpha inhibited GP Ibalpha-mediated platelet adhesion. These effects were found to be associated with changes in the concentration of ultra large von Willebrand factor (ULVWF) strings anchored to endothelium. The results of this study indicate that histamine released during mast cell degranulation may cause or inhibit thrombosis, depending on whether it acts on resting endothelial cells or on cells pre-activated by other inflammatory stimuli.

Browne, M. A., et al. (2011). "Accumulation of microplastic on shorelines woldwide: sources and sinks." Environmental Science & Technology **45**(21): 9175-9179.

Plastic debris <1 mm (defined here as microplastic) is accumulating in marine habitats. Ingestion of microplastic provides a potential pathway for the transfer of pollutants, monomers, and plastic-additives to organisms with uncertain consequences for their health. Here, we show that microplastic contaminates the shorelines at 18 sites worldwide representing six continents from the poles to the equator, with more material in densely populated areas, but no clear relationship between the abundance of miocroplastics and the mean size-distribution of natural particulates. An important source of microplastic appears to be through sewage contaminated by fibers from washing clothes. Forensic evaluation of microplastic from sediments showed that the proportions of polyester and acrylic fibers used in clothing resembled those found in

habitats that receive sewage-discharges and sewage-effluent itself. Experiments sampling wastewater from domestic washing machines demonstrated that a single garment can produce >1900 fibers per wash. This suggests that a large proportion of microplastic fibers found in the marine environment may be derived from sewage as a consequence of washing of clothes. As the human population grows and people use more synthetic textiles, contamination of habitats and animals by microplastic is likely to increase.

Browne, M. A., et al. (2008). "Ingested microscopic plastic translocates to the circulatory system of the mussel, Mytilus edulis (L.)." Environmental Science & Technology **42**(13): 5026-5031.

Plastics debris is accumulating in the environment and is fragmenting into smaller pieces; as it does, the potential for ingestion by animals increases. The consequences of macroplastic debris for wildlife are well documented, however the impacts of microplastic (<1 mm) are poorly understood. The mussel, Mytilus edulis, was used to investigate ingestion, translocation, and accumulation of this debris. Initial experiments showed that upon ingestion, microplastic accumulated in the gut. Mussels were subsequently exposed to treatments containing seawater and microplastic (3.0 or 9.6 micro m). After transfer to clean conditions, microplastic was tracked in the hemolymph. Particles translocated from the gut to the circulatory system within 3 days and persisted for over 48 days. Abundance of microplastic was greatest after 12 days and declined thereafter. Smaller particles were more abundant than larger particles and our data indicate as plastic fragments into smaller particles, the potential for accumulation in the tissues of an organism increases. The short-term pulse exposure used here did not result in significant biological effects. However, plastics are exceedingly durable and so further work using a wider range of organisms, polymers, and periods of exposure will be required to establish the biological consequences of this debris.

Browne, M. A., et al. (2007). "MICROPLASTIC--AN EMERGING CONTAMINANT OF POTENTIAL CONCERN?" Integrated Environmental Assessment & Management **3**(4): 559-561.

The article examines the potential environmental impacts of microscopic plastic debris. Microplastic comes from fragmentation of larger plastic items and the use of small particles of plastic as abrasive scrubbers in cleaning products. These plastics fragment in the environment as a result of photolytic, mechanical and biological degradation. Plastics also fragment within the marine environment through the combined effects of wave action and abrasion from sediment particles. There is a greater potential for microplastics to be ingested by a wide range of animals.

Browne, M. A., et al. (2010). "Spatial patterns of plastic debris along Estuarine shorelines." Environmental Science & Technology **44**(9): 3404-3409.

The human population generates vast quantities of waste material. Macro (>1 mm) and microscopic (<1 mm) fragments of plastic debris represent a substantial contamination problem. Here, we test hypotheses about the influence of wind and depositional regime on spatial patterns of micro- and macro-plastic debris within the Tamar Estuary, UK. Debris was identified to the type of polymer using Fourier-transform infrared spectroscopy (FT-IR) and categorized according to density. In terms of abundance, microplastic accounted for 65% of debris recorded and mainly comprised polyvinylchloride, polyester, and polyamide. Generally, there were greater quantities of plastic at downwind sites. For macroplastic, there were clear patterns of distribution for less dense items, while for microplastic debris, clear patterns were for denser material. Small particles of sediment and plastic are both likely to settle slowly from the water-column and are likely to be transported by the flow of water and be deposited in areas where the movements of water are slower. There was, however, no relationship between the abundance of microplastic and the proportion of clay in sediments from the strandline. These results illustrate how FT-IR spectroscopy can be used to identify the different types of plastic and in this case was used to indicate spatial patterns, demonstrating habitats that are downwind acting as potential sinks for the accumulation of debris.

Browne, M. A., et al. (2013). "Microplastic moves pollutants and additives to worms, reducing functions linked to health and biodiversity." Current Biology **23**(23): 2388-2392.

Inadequate products, waste management, and policy are struggling to prevent plastic waste from infiltrating ecosystems. Disintegration into smaller pieces means that the abundance of micrometer-sized plastic (microplastic) in habitats has increased and outnumbers larger debris. When ingested by animals, plastic provides a feasible pathway to transfer attached pollutants and additive chemicals into their tissues. Despite positive correlations between concentrations of ingested plastic and pollutants in tissues of animals, few, if any, controlled experiments have examined whether ingested plastic transfers pollutants and additives to animals. We exposed lugworms (Arenicola marina) to sand with 5% microplastic that was presorbed with pollutants (nonylphenol and phenanthrene) and additive chemicals (Triclosan and PBDE-47). Microplastic transferred pollutants and additive chemicals into gut tissues of lugworms, causing some biological effects, although clean sand transferred larger concentrations of pollutants into their tissues. Uptake of nonylphenol from PVC or sand reduced the ability of coelomocytes to remove pathogenic bacteria by >60%. Uptake of Triclosan from PVC diminished the ability of worms to engineer sediments and caused mortality, each by >55%, while PVC alone made worms >30% more susceptible to oxidative stress. As global microplastic contamination accelerates, our findings indicate that large concentrations of microplastic and additives can harm ecophysiological functions performed by organisms.

Browne, M. A., et al. (2015). "Linking effects of anthropogenic debris to ecological impacts." Proceedings of the Royal Society of London, Series B: Biological Sciences **282**(1807): 20142929.

Accelerated contamination of habitats with debris has caused increased effort to determine ecological impacts. Strikingly, most work on organisms focuses on sublethal responses to plastic debris. This is controversial because (i) researchers have ignored medical insights about the mechanisms that link effects of debris across lower levels of biological organization to disease and mortality, and (ii) debris is considered non-hazardous by policy-makers, possibly because individuals can be injured or removed from populations and assemblages without ecological impacts. We reviewed the mechanisms that link effects of debris across lower levels of biological organization to assemblages and populations. Using plastic, we show microplastics reduce the 'health', feeding, growth and survival of ecosystem engineers. Larger debris alters assemblages because fishing-gear and tyres kill animals and damage habitat-forming plants, and because floating bottles facilitate recruitment and survival of novel taxa. Where ecological linkages are not known, we show how to establish hypothetical links by synthesizing studies to assess the likelihood of impacts. We also consider how population models examine ecological linkages and guide management of ecological impacts. We show that by focusing on linkages to ecological impacts rather than the presence of debris and its sublethal impacts, we could reduce threats posed by debris.

Bruce, S., et al. (2014). "Anti-aging proof of concept study: results and summary." Journal of Drugs in Dermatology: JDD **13**(9): 1074-1081.

BACKGROUND AND OBJECTIVES: The etiology of aging human skin includes intrinsic physiologic

changes greatly accelerated by photoaging, predominantly through exposure to UV light. Consumer interest and demand for anti-aging skin care products is extremely high especially in light of aging populations. Prenatal (fetal) tissue has been shown to possess healing characteristics and regenerative effects. A proprietary tissue engineering technology has been developed to produce a soluble human extracellular matrix material with growth factors and proteins. Neonatal cells are cultured on microbeads under conditions of low oxygen tension. This human cell-conditioned media (hCCM) contains a variety of growth factors and cytokines similar to those found in fetal cells and has been incorporated into a topical preparation for use in facial wound healing (after laser resurfacing procedures) and improving the appearance of aging skin. The objective of this study was to observe the effects of an MRCxTM-containing topical skincare regimen on subjects with demonstrated aging skin damage (photodamage) when used consistently over a 3 month time period.

METHODS: Female subjects age 35-65 with Fitzpatrick Skin Type I-IV and mild to moderate amounts of photodamage, fine lines, and wrinkles used Regenica Replenishing Creme and Regenica Renew SPF 15 for 3 months. At each visit, photos were taken of subjects while investigators completed skin grading assessments and subjects completed self-assessments. Investigator assessments included evaluation of tactile roughness, visual texture, wrinkles, blotchiness, skin tone evenness, radiance, and translucence on a 5-point scale. Subjects' self-assessments included assessment of fine lines and wrinkles, firmness, evenness of skin tone, brightness, resilience, clarity, and radiance. Changes from baseline were evaluated for each parameter and P values for changes from baseline to each study visit for investigator's assessments and to end-of-study for self-assessments were calculated.

RESULTS: Eighteen of 21 enrolled female subjects completed the study. Three subjects chose to drop from the study. Statistically significant improvements in investigator assessments of tactile roughness, visual texture, wrinkles, blotchiness, skin tone evenness, radiance and translucency compared to baseline were observed at weeks 4, 8, and 12 after initiating treatments. Progressive improvement was seen through the last study visit (visit 5, week 12). Similar statistically significant improvements in subjects' self-assessments were seen comparing the first post-baseline visit (visit 2, week 2) to subsequent visits. 93.5 % subjects agreed (somewhat or strongly) with all of the positive subject assessment statements at week 12. Importantly, 100 % of subjects indicated at the end of the study that they would recommend the product to a friend and would want to purchase the product. No treatment-related adverse events were recorded during the study.

CONCLUSIONS: Regenica was safe and clinically effective in reducing anti-aging effects in this group of female subjects aged 35-65 years as measured by both investigator assessments and subjects' self-assessments.

Bruce-Vanderpuije, P., et al. (2019). "The state of POPs in Ghana- A review on persistent organic pollutants: Environmental and human exposure." Environmental Pollution **245**: 331-342.

Ghana is one of the top pesticide users and highest persistent organic pollutant (POP) emitters in sub-saharan Africa. Despite recent increases in published data, there is limited information on how POP concentrations have changed, post ratification of the Stockholm Convention. As a result, this review aims to address these knowledge gaps by collating available data that reported POPs in Ghanaian environmental matrices, identify spatial and temporal trends, and establish potential health risks. It is worth noting that Ghana has not developed its own regulatory standards for POPs, but adapts United States Environmental Protection Agency (USEPA) standards. Results obtained showed concentrations in excess of USEPA regulatory standards for per- and poly-fluoroalkyl sulphonates (PFASs) and dichlorodiphenyldichloroethane

(DDD) in water, polychlorinated and polybrominated dibenzo-p-dioxins and furans (PCDD/Fs and PBDD/Fs) in e-waste soils, and polybrominated diphenyl ethers in aquatic organisms and dairy products. The published studies do not cover major regions nationwide. The inconsistency in methods and analytes measured, along with data scarcity in some regions, makes it challenging to identify temporal trends. However, the data did indicate decreasing concentrations of some legacy POPs in soil/sediment and aquatic organisms, with increasing concentrations of some POPs in water, fish, fruits and vegetables. Studies that performed health risks assessments were limited although the data indicated risks to e-waste workers, some farmers and vulnerable sub-populations. This review identified potential human health risks from POPs in the Ghanaian environment and the need for more consistent and widespread monitoring program. This paper provides a critical review of studies of POPs in Ghana which can be used as a reference for all of Africa, as well as other developing countries, for compliance with the requirements for POPs monitoring in the e-waste, food and environmental sectors to inform the mitigation of health risks. Copyright © 2018 Elsevier Ltd

Bruck, F., et al. (2009). "I.P. Co-transplantation of mesenchymal stem cells (MSC) failed to prevent acute GVHD in a humanized MICE model." Experimental Hematology **1)**: S87-S88.

Background. Graft-versus-host disease (GVHD) is a life-threatening complication of allogeneic hematopoietic cell transplantation caused by donor T-cells reacting against host tissues. Previous studies have shown that mesenchymal stem cells (MSC) could exert a potent immunosuppressive effect in vitro and in vivo. Aim. The aim of the current study was first to establish a humanized model of GVHD in NOD/SCID/gammaC null mice, secondly to assess MSC ability to prevent GVHD. Methods. 30x106 human peripheral blood mononuclear cells (PBMC) were injected intraperitonealy (i.p.) into NOD/SCID/gammaC null mice. MSC ability to suppress in vitro CD3T-cell proliferation induced by PHA or anti-alphaCD3/CD28 microbeads was assessed by the ³[H]-thymidine test and by FACS cell cycle analysis. In vivo, 3x106 MSC were injected in i.p. into NOD/SCID/gammaC null mice not only at time of PBMC injection but also subsequently at weekly intervals for four administrations. Results. 30x106 PBMCT into NOD/SCID/gammaC null mice recipients (n=15) induced a weight decrease >20% (n=15), these mice presented severe hunching, ruffled fur, tachypnea, anaemia, and decrease of locomotion. CD3Tcells percentages in the mice were 68,83+/-13,83% in the spleen (n=11), 28,11+/-19,79% in the BM (n=11), and 56,93+/-15,84% in the blood (n=11). Repeat injection of 3x106 MSC with PBMC in i.p. into NOD/SCID/gammaC null mice (n=10) failed to prevent GVHD. Mice present clinical and pathologic signs of GVHD with a weight loss >20% in all of these mice. CD3T-cells percentages in these mice were 58,42+/-14,84% in the spleen (n=6), 35,33+/-14,15% in the BM (n=6), and 57,71+/-13,25% in the blood (n=6). We have also analysed the percentage of human CD3+CD4+Foxp3+ in these mice. We have observed an increase of human CD3+CD4+Foxp3+ in blood of mice injected with MSC (3,88+/-1,37%) (n=5) compared with controls mice (1,85+/-1,25%) (n=7). Conclusion. Although MSC exhibited potent immunosuppressive properties in vitro, MSC in i.p. injection failed to prevent GVHD in that model.

Bruck, S. and A. T. Ford (2018). "Chronic ingestion of polystyrene microparticles in low doses has no effect on food consumption and growth to the intertidal amphipod Echinogammarus marinus?" Environmental Pollution **233**: 1125-1130.

The ingestion of microplastics (plastic particles <5 mm) has been observed in a range of marine organisms, and adverse effects have been reported in several species after high concentration exposure. However, the long-term effects of low-dose ingestion remains unclear. The aim of this study was thus to assess the chronic effects of low concentrations of polystyrene microparticles

to the intertidal amphipod Echinogammarus marinus, using food consumption, growth, and moulting as endpoints. Amphipods were fed a gelatinous algal feed spiked with microbeads (8 micro m) in concentrations of ~0.9, 9 and 99 microplastics/g for 35 days. E. marinus was also analysed for retention of microplastics, and egestion rate was calculated in a separate high-dose feeding experiment. No significant effects were found in the food consumption or growth assays. There was no accumulation of microplastics in the gut, with only one microbead recorded internally in three (8%) of the exposed amphipods. The low number is likely linked to gastrointestinal functions, allowing for easy egestion of indigestible items. This assumption was supported by the observation that after high-dose exposure, 60% of E. marinus egested all microbeads within 24 h. This study suggests that ingesting low concentrations of 8 micro m microplastics do not impair the feeding or growth of amphipods along the exposure period. We hope that negative results such as these may further assist in assessing the impact posed by microplastics to marine organisms.

Bruckner-Lea, C. J., et al. (2002). "Renewable microcolumns for automated DNA purification and flow-through amplification: From sediment samples through polymerase chain reaction." Analytica Chimica Acta **469**(1): 129-140.

There is an increasing need for field-portable systems for the detection and characterization of microorganisms in the environment. Nucleic acids analysis is frequently the method of choice for discriminating between bacteria in complex systems, but standard protocols are difficult to automate and current microfluidic devices are not configured specifically for environmental sample analysis. In this report, we describe the development of an integrated DNA purification and polymerase chain reaction (PCR) amplification system and demonstrate its use for the automated purification and amplification of Geobacter chapellei DNA (genomic DNA or plasmid targets) from sediments. The system includes renewable separation columns for the automated capture and release of microparticle purification matrices, and can be easily reprogrammed for new separation chemistries and sample types. The DNA extraction efficiency for the automated system ranged from 3 to 25%, depending on the length and concentration of the DNA target. The system was more efficient than batch capture methods for the recovery of dilute genomic DNA even though the reagent volumes were smaller than required for the batch procedure. The automated DNA concentration and purification module was coupled to a flow-through, Peltier-controlled DNA amplification chamber, and used to successfully purify and amplify genomic and plasmid DNA from sediment extracts. Cleaning protocols were also developed to allow reuse of the integrated sample preparation system, including the flow-through PCR tube. © 2002 Elsevier Science B.V.

Brunner, K., et al. (2015). "Passive buoyant tracers in the ocean surface boundary layer: 2. Observations and simulations of microplastic marine debris." Journal of Geophysical Research: Oceans **120**(11): 7559-7573.

This paper is the second of a two-part series that investigates passive buoyant tracers in the ocean surface boundary layer (OSBL). The first part examines the influence of equilibrium wind-waves on vertical tracer distributions, based on large eddy simulations (LESs) of the wave-averaged Navier-Stokes equation. Motivated by observations of buoyant microplastic marine debris (MPMD), this study applies the LES model and the parametric one-dimensional column model from part one to examine the vertical distributions of MPMD. MPMD is widely distributed in vast regions of the subtropical gyres and has emerged as a major open ocean pollutant whose distribution is subject to upper ocean turbulence. The models capture shear-driven turbulence, Langmuir turbulence (LT), and enhanced turbulent kinetic energy input due to breaking waves (BWs). Model results are only consistent with observations of MPMD profiles and the relationship between surface concentrations and wind speed if LT effects are included. Neither BW nor shear-driven turbulence is capable of deeply submerging MPMD, suggesting that the observed vertical MPMD distributions are a characteristic signature of wave-driven LT. Thus, this study demonstrates that LT substantially increases turbulent transport in the OSBL, resulting in deep submergence of buoyant tracers. The parametric model is applied to 11 years of observations in the North Atlantic and North Pacific subtropical gyres to show that surface measurements substantially underestimate MPMD concentrations by a factor of 3-13. Key Points: * Langmuir turbulence deeply submerges microplastic marine debris * Microplastic marine debris content is underestimated by surface measurements * Sea state and rise velocity are key parameters for marine debris distributions

Brus, J., et al. (2017). "Structure and Dynamics of Alginate Gels Cross-Linked by Polyvalent Ions Probed via Solid State NMR Spectroscopy." Biomacromolecules **18**(8): 2478-2488.

Alginate gels are an outstanding biomaterial widely applicable in tissue engineering, medicine, and pharmacy for cell transplantation, wound healing and efficient bioactive agent delivery, respectively. This contribution provides new and comprehensive insight into the atomic-resolution structure and dynamics of polyvalent ion-cross-linked alginate gels in microbead formulations. By applying various advanced solid-state NMR (ssNMR) spectroscopy techniques, we verified the homogeneous distribution of the cross-linking ions in the alginate gels and the high degree of ion exchange. We also established that the two-component character of the alginate gels arises from the concentration fluctuations of residual water molecules that are preferentially localized along polymer chains containing abundant mannuronic acid (M) residues. These hydrated M-rich blocks tend to self-aggregate into subnanometer domains. The resulting coexistence of two types of alginate chains differing in segmental dynamics was revealed by ¹H-¹³C dipolar profile analysis, which indicated that the average fluctuation angles of the stiff and mobile alginate segments were about 5-9degree or 30degree, respectively. Next, the ¹³C CP/MAS NMR spectra indicated that the alginate polymer microstructure was strongly dependent on the type of cross-linking ion. The polymer chain regularity was determined to systematically decrease as the cross-linking ion radius decreased. Consistent with the ¹H-¹H correlation spectra, regular structures were found for the gels cross-linked by relatively large alkaline earth cations (Ba²⁺, Sr²⁺, or Ca²⁺), whereas the alginate chains cross-linked by bivalent transition metal ions (Zn²⁺) and trivalent metal cations (Al³⁺) exhibited significant irregularities. Notably, however, the observed disordering of the alginate chains was exclusively attributed to the M residues, whereas the structurally well-defined gels all contained guluronic acid (G) residues. Therefore, a key role of the units in M-rich blocks as mediators promoting the self-assembly of alginate chains was experimentally confirmed. Finally, combining 2D ²⁷Al 3Q/MAS NMR spectroscopy with density functional theory (DFT) calculations provided previously unreported insight into the structure of the Al³⁺ cross-linking centers. Notably, even with a low residual amount of water, these cross-linking units adopt exclusively 6-fold octahedral coordination and exhibit significant motion, which considerably reduces quadrupolar coupling constants. Thus, the experimental strategy presented in this study provides a new perspective on cross-linked alginate structure and dynamics for which high-quality diffraction data at the atomic resolution level are inherently unavailable.

Bruyere, D., et al. (2016). "Cryogenic ball milling: A key for elemental analysis of plastic-rich automotive shedder residue." Powder Technology **294**: 454-462.

End-of-life vehicles have become an environmental and sustainability issue in most developed countries, and require sophisticated organic- and inorganic-elemental analyses to evaluate the efficiency of post-shredder technologies applied to automotive shredder residue. The difficulties of milling such heterogeneous material, especially when plastic-rich, have to be overcome to allow such chemical analyses. To tackle this aspect, plastic-rich fluff sampled from the process line of an industrial waste management centre was subjected to pilot-float separation (d = 1.34) and cryogenic ball milling at BRGM. The cryogenic milling, tested in terms of plastic-rich fluff density, grinding time and feed size, was found to reach an acceptable final particle size (81-98% of particles at <. 250 mum) to allow total digestion and accurate and repeatable elemental analyses after a grinding time of between 27 min and 2 x 27 min (iterative two-step process). The results are contrasted, the milling being more efficient with the heavier fractions of plastic-rich fluff and a finer feed size. The varied grindability of the different fractions could result from a combination of one or more of the following effects: (i) a dilution of the plastics by more cryo-grindable rubber, (ii) the action of remnant minerals and non-ferrous metals as milling agents, (iii) the inherent cryo-grindability of various types of plastics, and (iv) the potential action of mineral and metallic fillers as weakening agents. The elemental analyses of our case study allowed us to determine a mass balance and show, in particular, that the pilot-float separation (i) recovers most of the organochlorine plastics, and (ii) concentrates Cu, Pb, Ba and B in the heavier fraction with respective ratios of 100:1, 8:1, 6:1 and 5:1. The high elemental recovery (95.8% up to 99.7%) and good repeatability of the C and Cl analyses on small test portions (100 mg to 3 g) represent a technical progress that could benefit other types of heterogeneous plastic-rich matrix samples such as waste electrical and electronic equipment (WEEE). Copyright © 2016 Elsevier B.V.

Bryant, J. A., et al. (2016). "Diversity and Activity of Communities Inhabiting Plastic Debris in the North Pacific Gyre." Msystems **1**(3): May-Jun.

Marine plastic debris has become a significant concern in ocean ecosystems worldwide. Little is known, however, about its influence on microbial community structure and function. In 2008, we surveyed microbial communities and metabolic activities in seawater and on plastic on an oceanographic expedition through the "great Pacific garbage patch." The concentration of plastic particles in surface seawater within different size classes (2 to 5 mm and >5 mm) ranged from 0.35 to 3.7 particles m⁻³ across sampling stations. These densities and the particle size distribution were consistent with previous values reported in the North Pacific Ocean. Net community oxygen production (NCP = gross primary production - community respiration) on plastic debris was positive and so net autotrophic, whereas NCP in bulk seawater was close to zero. Scanning electron microscopy and metagenomic sequencing of plastic-attached communities revealed the dominance of a few metazoan taxa and a diverse assemblage of photoautotrophic and heterotrophic protists and bacteria. Bryozoa, Cyanobacteria, Alphaproteobacteria, and Bacteroidetes dominated all plastic particles, regardless of particle size. Bacteria inhabiting plastic were taxonomically distinct from the surrounding picoplankton and appeared well adapted to a surface-associated lifestyle. Genes with significantly higher abundances among plastic-attached bacteria included che genes, secretion system genes, and nifH genes, suggesting enrichment for chemotaxis, frequent cell-to-cell interactions, and nitrogen fixation. In aggregate, our findings suggest that plastic debris forms a habitat for complex microbial assemblages that have lifestyles, metabolic pathways, and biogeochemical activities that are distinct from those of free-living planktonic microbial communities. IMPORTANCE Marine plastic debris is a growing concern that

has captured the general public's attention. While the negative impacts of plastic debris on oceanic macrobiota, including mammals and birds, are well documented, little is known about its influence on smaller marine residents, including microbes that have key roles in ocean biogeochemistry. Our work provides a new perspective on microbial communities inhabiting microplastics that includes its effect on microbial biogeochemical activities and a description of the cross-domain communities inhabiting plastic particles. This study is among the first molecular ecology, plastic debris biota surveys in the North Pacific Subtropical Gyre. It has identified fundamental differences in the functional potential and taxonomic composition of plastic-associated microbes versus planktonic microbes found in the surrounding open-ocean habitat. Author Video: An author video summary of this article is available.

Bryk, J. A., et al. (2010). "Nature of myeloid cells expressing arginase 1 in peripheral blood after trauma." <u>Journal of Trauma-Injury Infection & Critical Care</u> **68**(4): 843-852.

BACKGROUND: Myeloid cells that express arginase 1 are upregulated by different stimuli, including trauma, and are capable of depleting arginine from the surrounding environment. Through arginine depletion, myeloid cells are capable of regulating T-cell function. We have previously reported increased arginase 1 expression in the peripheral blood mononuclear cells (PBMCs) after injury. The nature of the cells expressing arginase in humans after trauma is unknown and is the focus of this article.

METHODS: PBMCs were isolated using a Ficoll-Hypaque gradient. Arginase activity was measured by conversion of arginine to ornithine, and arginase 1 protein expression was measured by Western blot. The percent CD16 granulocytes and phenotypical analysis of the cells present in PBMCs were determined by flow cytometry. Magnetic microbeads were used for isolation and exclusion of specific cell subpopulations.

RESULTS: Trauma patients exhibited a dramatic increase in arginase activity ($p < 0.05$) and an increased percentage of CD16 granulocytes in the PBMC layer ($p < 0.05$) compared with control volunteers. Increased arginase activity in the PBMC layer was due to the contamination of this layer by granulocytes, as their exclusion decreased arginase activity back to baseline ($p < 0.05$). Granulocytes isolated from the PBMC layer expressed increased CD11b ($p < 0.05$) and CD66b ($p < 0.05$), markers of granulocyte activation. Furthermore, these granulocytes were significantly more swollen and degranulated compared with noncontaminating granulocytes.

CONCLUSION: In humans, increased arginase 1 expression after trauma observed in the PBMC layer seems to be exclusively the result of an increased number of activated granulocytes.

Bucci, K., et al. (2019). "What is known and unknown about the effects of plastic pollution: A meta-analysis and systematic review." <u>Ecological Applications</u>: e02044.

As a consequence of the global ubiquity of plastic pollution, scientists, decision-makers, and the public often ask whether macroplastics (>5 mm) and microplastics (<5 mm) have a realized ecological threat. In 2016, we conducted a systematic review of the literature and made a call for further research testing hypotheses about ecological effects. In the subsequent years, the amount of relevant research has risen tremendously. Here, we reassess the literature to determine the current weight of evidence about the effects of plastic pollution across all levels of biological organization. Our data spans marine, freshwater, and terrestrial environments. We extracted data from 139 lab and field studies testing 577 independent effects across a variety of taxa and with various types, sizes, and shapes of plastic. Overall, 59% of the tested effects were detected. Of these, 58% were due to microplastics and 42% were due to macroplastics. Of the effects that were not detected, 94% were from microplastics and 6% were from macroplastics. We found evidence that whether or not an effect is detected, as well as the severity and

direction of the effect, is driven by dose, particle shape, polymer type, and particle size. Based on our analyses, there is no doubt that macroplastics are causing ecological effects, however, the effects of microplastics are much more complex. We also assessed the environmental relevancy of experimental studies by comparing the doses used in each exposure to the concentrations and sizes of microplastics found in the environment. We determined that only 17% of the concentrations used in experimental studies have been found in nature, and that 80% of particle sizes used in experiments fall below the size range of the majority of environmental sampling. Based on our systematic review and meta-analysis, we make a call for future work that recognizes the complexity of microplastics and designs tests to better understand how different types, sizes, shapes, doses, and exposure durations affect wildlife. We also call for more ecologically and environmentally relevant studies, particularly in freshwater and terrestrial environments.

Bucio, L., et al. (2016). "Phenotype characterization of exosomes derived from bone marrow dendritic cells treated with different stimuli." Tissue Engineering - Part A **22 (Supplement 1)**: S149.

Introduction: Exosomes produced by dendritic cells, DCs, are vesicles able to present antigen to T cells. According to the levels of molecules expressed on the exosomes membrane, such as CD80, CD86, CD274, CD273, MHC I and MHC II, the immune response developed by exosomes may be stimulatory or tolerogenic. Since DCs-derived exosomes could be used as a novel cell-free cancer vaccine, it is important to know the expression of the molecules mentioned above. So, the aim of this investigation was determinate the immunological phenotype of exosomes derived of DCs treated with different stimuli. Material(s) and Method(s): we produced bone marrow dendritic cells (BMDCs) treated with different stimuli: BMDCs immature differentiated for 4 or 7 days with GM-CSF; and DCs treated with two different concentration of IFN-gamma (500 and 10, 000Uml); TNFalpha (1mgml) or LPS (1mgml). Then, the DCs-derived exosomes were isolated with CD11c-alpha microbeads and the levels of molecules CD80, CD86, CD274, CD273, MHC I and MHC II on the exosomes were evaluated by flow cytometry. Results and Discussion: As result, the immature 4 and 7 days- DCs, the DCs treated with 500 Uml and the exosomes derived of all these cells exhibited a tolerogenic phenotype. While the DCs treated with IFN-gamma in 10, 000Uml, 1mgml of TNF-alpha, 1mgml of LPS and the exosomes released by all these cells, showed an activator phenotype. So, the exosomes, depending the stimuli used, may be used in immunotherapy for developing a stimulatory or a tolerogenic immune response.

Buckley, J., et al. (2006). "Embryonic exposure to the fungicide vinclozolin causes virilization of females and alteration of progesterone receptor expression in vivo: An experimental study in mice." Environmental Health: A Global Access Science Source **5 (no pagination)**(4).

Background: Vinclozolin is a fungicide that has been reported to have anti-androgenic effects in rats. We have found that in utero exposure to natural or synthetic progesterones can induce hypospadias in mice, and that the synthetic progesterone medroxyprogesterone acetate (MPA) feminizes male and virilizes female genital tubercles. In the current work, we selected a relatively low dose of vinclozolin to examine its in utero effects on the development of the genital tubercle, both at the morphological and molecular levels. Method(s): We gave pregnant dams vinclozolin by oral gavage from gestational days 13 through 17. We assessed the fetal genital tubercles from exposed fetuses at E19 to determine location of the urethral opening. After determination of gonadal sex, either genital tubercles were harvested for mRNA quantitation, or urethras were injected with a plastic resin for casting. We analyzed quantified mRNA levels between treated and untreated animals for mRNA levels of estrogen receptors alpha and beta, progesterone receptor, and androgen receptor using nonparametric tests or ANOVA. To determine effects on urethral length (males have long urethras compared to females), we measured the lengths of the casts and performed ANOVA analysis on these data. Result(s): Our morphological results indicated that vinclozolin has morphological effects similar to those of MPA, feminizing males (hypospadias) and masculinizing females (longer urethras). Because these results reflected our MPA results, we investigated the effects of in utero vinclozolin exposure on the mRNA expression levels of androgen, estrogen alpha and beta, and progesterone receptors. At the molecular level, vinclozolin down-regulated estrogen receptor alpha mRNA in females and up-regulated progesterone receptor mRNA. Vinclozolin-exposed males exhibited up-regulated estrogen receptor alpha and progesterone receptor mRNA, effects we have also seen with exposure to the synthetic estrogen, ethinyl estradiol. Conclusion(s): The results suggest that vinclozolin virilizes females and directly or indirectly affects progesterone receptor expression. It also affects estrogen receptor expression in a sex-based manner. We found no in vivo effect of vinclozolin on androgen receptor expression. We propose that vinclozolin, which has been designated an anti-androgen, may also exert its effects by involving additional steroid-signaling pathways. © 2006 Buckley et al; licensee BioMed Central Ltd.

Bucol, L. A., et al. (2020). "Microplastics in marine sediments and rabbitfish (Siganus fuscescens) from selected coastal areas of Negros Oriental, Philippines." Marine Pollution Bulletin **150**: 110685.

The Philippines is currently ranked as the third top producer of plastic wastes, yet little research has been conducted on marine plastic pollution in this fishery-dependent, developing country. This study is the first in the nation to quantify and characterize microplastics ingested by a commercially important fish, the rabbitfish (Siganus fuscescens), in the coastal areas of Negros Oriental, central Philippines. Across all sites, the diversity of microplastic polymer types was highest in the guts of S. fuscescens from Dumaguete, a densely populated city. Microplastic particles extracted from subtidal sediment samples from Silliman Beach in Dumaguete were dominated by semi-synthetic microfibers (rayon), probably from clothing and textiles. However, these microplastic types were absent in the guts of fish, likely due to the different location and character of their feeding habitats. This study confirms for the first time the presence and diversity of microplastics in an edible finfish in the Philippines.

Bueno-Delgado, M. V., et al. (2019). "Optimal Path Planning for Selective Waste Collection in Smart Cities." Sensors **19**(9): 27.

Waste collection is one of the targets of smart cities. It is a daily task in urban areas and it entails the planning of waste truck routes, taking into account environmental, economic and social factors. In this work, an optimal path planning algorithm has been developed together with a practical software platform for smart and sustainable cities that enables computing the optimal waste collection routes, minimizing the impact, both environmental (CO₂ emissions and acoustic damage) and socioeconomic (number of trucks to be used and fuel consumption). The algorithm is executed in Net2Plan, an open-source planning tool, typically used for modeling and planning communication networks. Net2Plan facilitates the introduction of the city layout input information to the algorithm, automatically importing it from geographical information system (GIS) databases using the so-called Net2Plan-GIS library, which can also include positions of smart bins. The algorithm, Net2Plan tool and its extension are open-source, available in a public repository. A practical case in the city of Cartagena (Spain) is presented, where the optimal path planning for plastic waste collection is addressed. This work contributes to the urban mobility plans of smart cities and could be extended to other smart cities scenarios with requests of optimal path planning.

Bui, N. K., et al. (2018). "Recycling woven plastic sack waste and PET bottle waste as fiber in recycled aggregate concrete: An experimental study." Waste Management **78**: 79-93.

The objective of this study was to investigate the potential engineering of Recycled PET Bottles Waste (RPET) and Recycled Woven Plastic Sack Waste (RWS) fiber reinforced Recycled Aggregate Concrete (RAC). Currently, the amount of Construction and Demolition Waste (CDW) and plastic waste are rapidly increasing and becoming a burden for many nations. The present research is an effort to reduce the amount of solid waste as a good solution for waste management and preserve the environment. The effects of RWS and RPET fibers on RAC were evaluated based on mechanical properties and durability of concrete. The experimental results indicated that RPET and RWS fibers have high alkali resistance in alkaline environments and showed no detectable degradation in RAC at 90 days. The combination of Silica Fume (SF) and RPET fiber increased 3.6-9% compressive strength, 16.9-21.5% elastic modulus, 11.8-20.3% splitting tensile strength, 7-15% shear strength of RAC in comparison with RAC samples without fiber, while these values in RWS fiber reinforced RAC were lower. RWS and RPET fiber enhanced the post-cracking behavior of RAC. The contribution of RPET in the improvement of the RAC properties was better than that of RWS fiber although the RWS fiber has higher tensile strength than that of RPET fiber. Furthermore, SF and the proposed mixing technique increased the performance of RAC with 100% coarse RCA and compensated the loss of the compressive strength due to RPET and RWS fiber. Copyright © 2018 Elsevier Ltd

Bukkarapu, K. R., et al. (2018). "Management, conversion, and utilization of waste plastic as a source of sustainable energy to run automotive: a review." Energy Sources Part A: Recovery, Utilization & Environmental Effects **40**(14): 1681-1692.

Increased usage of plastic and absence of an efficient system to address its non-degradability has become a serious issue threatening the human life. On the other hand, increased fossil fuel consumption which led to their depletion necessitates the search for an alternative that could replace the conventional fuels and alongside abate the emissions. Both the nondegradability of plastic and need for an alternative fuel can be addressed by converting the waste plastic to useful energy. The present article reviews about pyrolysis, a chemical treatment to convert waste plastic to energy. It also focuses on its functional feasibility as a fuel in a compression ignition engine. Reportedly, waste plastic oil when used in a diesel engine yields lesser thermal efficiency, higher brake specific fuel consumption, increased emissions of carbon monoxides, and oxides of nitrogen and unburnt hydrocarbons. Irrespective of its disadvantages, it is worthwhile to note that it is waste plastic which is converted to useful energy. However, not much work on the technical feasibility and functional efficacy of waste plastic oil as a fuel in a diesel engine is reported, and hence, research in this application seems to gain its focus in near future. [ABSTRACT FROM AUTHOR]

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Buldur, P. M. and F. N. Kok (2011). "Encapsulation of food flavors via coacervation method." Current Opinion in Biotechnology **1)**: S96.

Flavors are used in many areas, such as food, cosmetic, pharmaceutical and detergent industries to increase taste and/or odor. These highly valuable compounds lose their effect beginning from the production step due to their volatile and oxidation labile nature. The decreases in properties continue during the transfer and storage of the product. Encapsulation of flavors into different materials (e.g. gelatin, gum arabic, whey proteins, and pectin) is a well known method to solve this problem. In this study, the potential of coacervation method in the efficient encapsulation of food flavors were studied. The model flavors, d-limonene and 2-phenylethanol, were encapsulated into different ratio of gum arabic/gelatin mixtures. Prepared microcapsules were crosslinked by a natural, non-toxic agent, namely genipin. The microbeads were then collected and dried by lyophilization. Preparation conditions and different crosslinking agent concentrations were studied for their effect on coacervation properties and flavor retention during drying and storage. Microbeads were visualized in fluorescence microscopy using nile red as lipid staining dye. It was seen that increasing the gelatin and gum arabic concentration in the medium to more than 40% and 50%, respectively, caused aggregation of the newly formed microbeads. Optimum ratio was found to be 2:3 for gum arabic/gelatin.

Bulmus, V., et al. (1997). "Modified PMMA monosize microbeads for glucose oxidase immobilization." Chemical Engineering Journal **65**(1): 71-76.

Glucose oxidase (GOD) was immobilized onto modified polymethylmethacrylate (PMMA) microspheres by covalent bonding. Monosize PMMA microbeads with 1.5 mu m diameter were produced by dispersion polymerization of methylmethacrylate by using polyvinyl alcohol as a stabilizer. Hydroxyl groups on the microbeads were first converted to aldehyde groups by periodate oxidation. Three amino compounds, namely ammonium hydroxide, ethylene diamine and hexamethylene diamine were incorporated through the aldehyde groups. Then, GOD molecules were immobilized through the spacer-arms by using glutaraldehyde. The highest amount of immobilization and activity were obtained in which hexamethylene diamine was used as the spacer-arm with 14 atom length, and were 2.1 mg g super(-1) polymer and 129 IU g super(-1) polymer, respectively. The optimal conditions for GOD immobilization were obtained as follows: pH, 6.0; temperature, 30 degree C; immobilization time, 60 min; and GOD initial concentration, 0.10 mg ml super(-1). The optimal conditions for the GOD-immobilized PMMA microbeads were at pH 6.0 and at a temperature of 30 degree C. The K sub(m) and V sub(max) values of the GOD-immobilized PMMA microbeads were, 13.79 mM and 26.31 mM min super(-1) calculated by non-linear regression, respectively.

Bunce, C., et al. (1992). "Murine model of cutaneous infection with gram-positive cocci." Infection and Immunity **60**(7): 2636-2640.

Staphylococcus aureus has remained an important cause of nosocomial wound infections, but standardized or reproducible systems for analyzing cutaneous infections caused by S. aureus do not exist. A variety of foreign materials, variable inocula, and skin traumas have been used to promote infection. To minimize these variables and ensure reproducibility, we chose a model using subcutaneous injections of a fixed quantity of dextran microbeads (Cytodex) as the foreign material added to standardized broth suspensions of S. aureus. Suspensions (0.2 ml) injected into an outbred strain of immunocompetent hairless mice generated reproducible, measurable lesions. With S. aureus Smith Diffuse, fluctuant, erythematous lesions with a peak diameter of 15 mm were observed; these lesions yielded purulent material containing gram-positive cocci and neutrophils and yielded growth of S. aureus on culture. Lesion size was proportional to the bacterial inoculum size. Histologic examination of excised lesions revealed typical abscesses. A second strain of S. aureus (SLC3) produced dermonecrosis instead of abscesses at an inoculum size of 10 super(7) CFU. Control injections with a sterile Cytodex suspension regularly produced nondraining, nonerythematous nodules with maximum diameters of less than or equal to 5 mm. Streptococcus pyogenes produced late-onset necrotic lesions and abscesses. Using a foreign substance, this model generates easily observed and reproducible cutaneous infection with S. aureus and streptococci that can potentially discriminate between inter- and intrastrain differences. Such a model could be used to test the pathogenicity of isogeneic strains of these bacterial species and to evaluate the efficacy of antimicrobial agents.

Burange, A. S., et al. (2015). "Heterogeneously catalyzed strategies for the deconstruction of high density polyethylene: plastic waste valorisation to fuels." Green Chemistry **17**(1): 146-156.
The plastic industry generates enormous quantities of plastics at projected rates (both production and consumption) which can significantly threaten our environment in terms of plastic waste generation. High density polyethylene (HDPE) is one of the main fractions of municipal solid waste which has a remarkable potential to be valorised into fuels (e.g. bio-oils). Catalytic degradation is an innovative alternative process to transform plastic waste into such value added products. This mini review was aimed to discuss the most relevant and recent catalysts developed for the catalytic degradation of HDPE including metal oxides, sulphated metal oxides, zeolites, nanostructured zeolites, molecular sieves, fluid catalytic cracking (FCC) catalysts, metal carbonates and mesoporous materials for the production of chemicals and fuels (e.g. diesel and gasolines). Activities and selectivities as well as important effects of additives, particle size, catalyst to polymer ratios and also recent approaches for waste management will be discussed.

Burbank, F. (2010). "Placental formation, childbirth, and fibroid treatment: An integration and review of the circulation of the placenta and the uterus during a woman's life-cycle.(1)." Placenta **31 (9)**: A106.
During pregnancy, mother's blood prepares for an enormous hemostatic event that is 9 months away: the delivery of the placenta - the fetal organ that is the vascular link between mother and child. At childbirth, 1/10th of mother's cardiac output flows through the placenta. When the placenta is sheared from the uterus, 200 large, uteroplacental arteries are ripped apart and bleed profusely into the uterine cavity. For hours following delivery, uterine contractions slow blood flow within the uterus, which then allows the high concentration of clotting factors in mother's blood to solidify throughout the uterus and stop blood loss. Hours later, the tide reverses and most of these blood clots dissolve and blood flow returns to the uterus. For many hours following delivery, the uterus is ischemic and hypoxic. Unlike brain and heart, which can only survive minutes of decreased blood flow, the uterus can withstand dramatically diminished blood flow for hours. In fact, not only can the uterus tolerate low blood flow, it is evolutionally programmed to experience very low blood flow every few years. Uterine ischemia and hypoxia are a natural part of every woman's genetic past and are necessary for uterine health. In 1995 a group of French physicians discovered that it was possible to emulate the vascular physiology of childbirth by stopping blood flow to the uterus with small, plastic particles. Initially, they injected these particles to diminish blood loss duringmyomectomy. However, they soon learned that the injection of these particles was therapeutic in-and-of-itself for women with symptomatic fibroids. Unbeknownst to this French group, earlier, in 1964, an American physician surgically occluded the uterine arteries to treat women without fibroids who had excessive monthly menstrual blood loss. Subsequent physicians have occluded the uterine arteries in various ways to treat a third common disorder, adenomyosis. Finally, these clinical successes suggest that future episodes of endometriosis may be preventable in some women treated with uterine artery closure.

Burdett, B. C. (1996). "DYESTUFFS, TILE MYTHS EXPLODED, THE PROBLEMS AIRED." Recycling Textile & Plastic Waste: 165-171.

The article focuses on the impact of dyestuffs consumption particularly of the textile industries in Great Britain on the environment. The use of coloring agents to merchandise such as apparel, furnishings or household led to the consumption of an excess of about 700,000 tons of dyes annually. The application to textile materials is not at all beneficial to the environment but increasing changes are occurring through the excellent work of dye manufacturers, research organizations and the coming of dye application technology. Disposal of the textile products through recycling, reuse or safe burning without air pollution should be addressed. Unless there will be changes in human behavior, the demand will continue.

Burger, L. M. and S. B. Chandor (1971). "Fatal ingestion of plastic resin catalyst." Archives of Environmental Health **23**(5): 402-404.

Burgess, R. M. and K. T. Ho (2017). "Microplastics in the aquatic environment-Perspectives on the scope of the problem." Environmental Toxicology and Chemistry **36**(9): 2259-2265.

Burkhardt-Holm, P. and A. N'Guyen (2019). "Ingestion of microplastics by fish and other prey organisms of cetaceans, exemplified for two large baleen whale species." Marine Pollution Bulletin **144**: 224-234.

Knowledge on microplastic (MP) ingestion by cetaceans is difficult to obtain. We infer the potential for MP uptake by cetaceans from the occurrence of MP in prey species. First, we reviewed information on whale prey species, focussing on common minke (Balaenoptera acutorostrata) and sei whale (B. borealis), for which the most comprehensive quantitative datasets exist. Second, evidence of MP ingestion by their prey species was reviewed. We found common minke whales forage opportunistically on fish from various families: Ammodytidae, Clupeidae, Gadidae, Engraulidae and Osmeridae. Sei whales mostly feed on copepods, Engraulidae, Clupeidae and Scombridae. High levels of MP contamination are reported for Scombridae in the Atlantic and Engraulidae in the Northwest Pacific Ocean. Copepods exhibit low levels of MP ingestion in the Northeast Pacific Ocean. Species-specific prey preferences and feeding strategies imply different cetaceans have varied potential for MP uptake, even if they feed in similar geographic areas.

Burns, E. E. and A. B. A. Boxall (2018). "Microplastics in the aquatic environment: Evidence for or against adverse impacts and major knowledge gaps." Environmental Toxicology & Chemistry **37**(11): 2776-2796.

There is increasing scientific and public concern over the presence of microplastics in the natural environment. We present the results of a systematic review of the literature to assess the weight of evidence for microplastics causing environmental harm. We conclude that microplastics do occur in surface water and sediments. Fragments and fibers predominate, with beads making up only a small proportion of the detected microplastic types. Concentrations detected are orders of magnitude lower than those reported to affect endpoints such as biochemistry, feeding, reproduction, growth, tissue inflammation and mortality in organisms. The evidence for microplastics acting as a vector for hydrophobic organic compounds to accumulate in organisms is also weak. The available data therefore suggest that these materials are not causing harm to the environment. There is, however, a mismatch between the particle types, size ranges, and concentrations of microplastics used in laboratory tests and those measured in the environment. Select environmental compartments have also received limited attention. There is an urgent need for studies that address this mismatch by performing high quality and more holistic monitoring studies alongside more environmentally realistic effects studies. Only then will we be able to fully characterize risks of microplastics to the environment to support the introduction of regulatory controls that can make a real positive difference to environmental quality. Environ Toxicol Chem 2018;37:2776–2796. © 2018 SETAC Number of scientific studies identified over the past 8 yr with the word "microplastic" in the title, abstract, or keywords (extracted from the Scopus and Web of Science databases). Word clouds containing the 50 most frequently occurring words in abstracts from 2008 to 2011, from 2012 to 2014, and from 2015 to 2016 are overlaid. [ABSTRACT FROM AUTHOR]

Bursac, P., et al. (2007). "Cytoskeleton dynamics: Fluctuations within the network." Biochemical and Biophysical Research Communications **355**(2): 324-330.

Out-of-equilibrium systems, such as the dynamics of a living cytoskeleton (CSK), are inherently noisy with fluctuations arising from the stochastic nature of the underlying biochemical and molecular events. Recently, such fluctuations within the cell were characterized by observing spontaneous nano-scale motions of an RGD-coated microbead bound to the cell surface [Bursac et al., Nat. Mater. 4 (2005) 557-561]. While these reported anomalous bead motions represent a molecular level reorganization (remodeling) of microstructures in contact with the bead, a precise nature of these cytoskeletal constituents and forces that drive their remodeling dynamics are largely unclear. Here, we focused upon spontaneous motions of an RGD-coated bead and, in particular, assessed to what extent these motions are attributable to (i) bulk cell movement (cell crawling), (ii) dynamics of focal adhesions, (iii) dynamics of lipid membrane, and/or (iv) dynamics of the underlying actin CSK driven by myosin motors. © 2007 Elsevier Inc. All rights reserved.

Burton, G. A. (2015). "Losing sight of science in the regulatory push to ban microbeads from consumer products and industrial use." Integrated Environmental Assessment & Management **11**(3): 346-347.

Burton, G. A., Jr. (2017). "Stressor Exposures Determine Risk: So, Why Do Fellow Scientists Continue To Focus on Superficial Microplastics Risk?" Environmental Science & Technology **51**(23): 13515-13516.

Burylo, A. M., et al. (2017). "Enrichment of Circulating Endothelial Cells by CD34 Microbeads Followed by Enumeration Using Flow Cytometry." Thrombosis and Haemostasis **117**(12): 2356-2368.

Background Circulating endothelial cells (CECs) are a potential biomarker of angiogenesis. CECs increase in numbers after vessel injury. Higher CEC numbers are reported in cancer patients. Most methods for CEC detection and enumeration rely on flow cytometry (FCM); however, there is no agreement on CEC phenotype and the detection method to be used. This leads to uncertainty about the clinical applicability and variation between studies on CEC numbers reported. Objective To develop a selective and accurate method for CEC enumeration in peripheral blood by enrichment, followed by FCM in healthy volunteers (HV) and cancer patients. Methods Samples were enriched using CD34 microbeads, stained with nuclear dye and anti-CD14, CD15, CD45, CD34 and CD146 antibodies. Putative CECs were examined for Weibel-Palade bodies (WPBs) using anti-von Willebrand factor (vWF) antibody and fluorescence microscopy. Linear range of detection (R ²), recovery and precision (coefficient of

variation percentage [CV%]) were defined in three experiments by spiking a known number (range 12-12,800 CECs/4 mL) of surrogate endothelial cells in peripheral blood. Sample storage was determined at -80degreeC for up to 2 months. Results Sorted CECs showed vWF in the WPBs. The relationship between spiked and detected surrogate cells was R ² = 1.0, recovery of 94.0 to 101.4% and CV% of 1.0 to 18.4%. Recovery +/- standard deviation (within-run days 1, 2 and 3) were, respectively, 102.5% +/- 8.2, 97.8% +/- 4.6, 99.1% +/- 7.7, and after 2 months 94.3% +/- 15.3. The median CECs/mL in patients was 24.1 versus 14.4 in HVs. Conclusion This method for selective, sensitive and reliable CEC analysis by FCM allows for investigation of CECs as a biomarker in clinical research. Copyright © 2017 Schattauer.

Busetti, F., et al. (2016). "To anticoagulate or not to anticoagulate?" Italian Journal of Medicine **10 (Supplement 2)**: 16-17.

Atrial fibrillation (AF) affects at least 9% of octogenarian patients. The choice of anti-coagulation depends on CHADS-VASC, HAS-BLED, patient's comorbidities. Nevertheless, rare conditions may contraindicate the treatment and have to be taken into account before starting anticoagulation. A 88 year-old woman was admitted for acute dyspnoea; a new onset AF was detected. The patient had recently been discharged from the Neurology ward for recurrent and stereotyped transient ischemic attacks (TIAs) presenting with dysartria. The clinical presentation was suggestive for heart failure (HF) probably due to new onset AF. Thus, after treatment of HF, we started anticoagulation (CHADSVASC 7, HAS-BLED 2), but brain MRI revealed sulcal hemosiderin deposits and microbeads (CHADS-VASC2 5, HASBLED 3). These findings were highly suggestive for cerebral amyloid angiopathy (CAA), an absolute contraindication to anticoagulation due to the increased risk of major hemorrhages. Thus, even though chronic AF, balancing the risks, we decided to stop anticoagulation. Prevalence of CAA is about 12% in over 85 year-old subjects and represents an important cause of primary lobar intracerebral hemorrhage; this risk is increased mostly by anticoagulants. Monomorphic recurrent TIAs are the main clinical presentation of CAA. Diagnosis requires 2 or more lobar microhemorrhages or/and sulcal haemosiderin deposition at cerebral MRI. CAA is a common, underestimated pathology in the elderly. It should be investigated in patients with monomorphic recurrent TIAs before starting a chronic anticoagulant treatment.

Busnach, G., et al. (1989). "Polymorphonuclear cell phagocytosis and surface receptor modulation after extracorporeal circulation." ASAIO Transactions **35**(3): 361-364.

Polymorphonuclear cells (PMN) from patients treated with hemodialysis (HD) or plasma exchange (PE) were analyzed by flow cytometry to determine modulation in phagocytic capacity and Fc-gamma and C3bi receptor expression following extracorporeal circulation (EC). Fluorescent microbeads (phi 2.02 m) were used in the evaluation of phagocytosis, and phycoerythrin conjugated Leu11c and Leu15 monoclonals identified Fc-gamma and C3bi receptors respectively. The percentage of positive cells and mean receptor density on PMN surfaces were calculated for each antibody before and after the procedures. Fc-gamma receptor expression was reduced overall in HD and PE cases, but unaffected after EC even with specific paraprotein removal. C3bi receptor was normally expressed on PMNs before and after EC, but receptor density on the cell surface increased, and phagocytosis was qualitatively and quantitatively depressed after EC. The resulting effect of EC on PMNs was therefore a temporary increase in C3bi receptor density after the procedure, which was independent of HD or PE technique, of the primary disease, and of the quality of the PE reinfusion solutions, suggesting a procedure-related effect, and a down-regulation of PMN phagocytic activity. Both effects may be related to membrane biocompatibility.

Busquets, R., et al. (2016). "Carbon-cryogel hierarchical composites as effective and scalable filters for removal of trace organic pollutants from water." Journal of Environmental Management **182**: 141-148.

Effective technologies are required to remove organic micropollutants from large fluid volumes to overcome present and future challenges in water and effluent treatment. A novel hierarchical composite filter material for rapid and effective removal of polar organic contaminants from water was developed. The composite is fabricated from phenolic resin-derived carbon microbeads with controllable porous structure and specific surface area embedded in a monolithic, flow permeable, poly(vinyl alcohol) cryogel. The bead-embedded monolithic composite filter retains the bulk of the high adsorptive capacity of the carbon microbeads while improving pore diffusion rates of organic pollutants. Water spiked with organic contaminants, both at environmentally relevant concentrations and at high levels of contamination, was used to determine the purification limits of the filter. Flow through tests using water spiked with the pesticides atrazine (32 mg/L) and malathion (16 mg/L) indicated maximum adsorptive capacities of 641 and 591 mg pollutant/g carbon, respectively. Over 400 bed volumes of water contaminated with 32 mg atrazine/L, and over 27,400 bed volumes of water contaminated with 2 mug atrazine/L, were treated before pesticide guideline values of 0.1 mug/L were exceeded. High adsorptive capacity was maintained when using water with high total organic carbon (TOC) levels and high salinity. The toxicity of water filtrates was tested in vitro with human epithelial cells with no evidence of cytotoxicity after initial washing.

Buss, D. (2019). "Taming the Tsunami of Plastic Waste." Food Technology **73**(7): 20.

In the annals of photographs that changed history, the 2015 photo of an olive ridley sea turtle may not be the Hindenburg dirigible blowing up in 1939, Neil Armstrong on the moon in 1969, or the man holding off a tank column in Tiananmen Square in 1989. But the image of a turtle captured off the coast of Costa Rica with a plastic straw up its nose accelerated a global movement against plastic disposables and packaging--and now is rippling through the consumer packaged goods and foodservice industries. Indeed, plastic waste has become Public Enemy No. 1 in the food and beverage business these days. As a result, traditional packaged goods giants, huge restaurant chains, and startups in both businesses--and their packaging suppliers--are scrambling to create new single-use plastic packages that are recyclable or biodegradable--or, preferably, are reusable or eliminate plastic altogether. As part of this ethos, in fact, many companies are performing thorough reexaminations of their approach to all their packaging.

Bussolaro, D., et al. (2019). "Co-exposure to polystyrene plastic beads and polycyclic aromatic hydrocarbon contaminants in fish gill (RTgill-W1) and intestinal (RTgutGC) epithelial cells derived from rainbow trout (Oncorhynchus mykiss)." Environmental Pollution **248**: 706-714.

Microscopic plastic (MP) particles are a ubiquitous contaminant in aquatic environments, which may bind hydrophobic chemicals, such as polycyclic aromatic hydrocarbons (PAHs), altering their environmental fate and interactions with biota. Using rainbow trout gill (RTgill-W1) and intestinal (RTgutGC) epithelial cells we investigated the effects of polystyrene microbeads (PS-MBs; 220 nm) on the cyto- and genotoxicity of the environmental pollutants benzo[a]pyrene (BaP) and 3-nitrobenzanthrone (3-NBA) over 48 h (0, 0.1, 1 and 10 micro M). The Alamar Blue bioassay, used to assess cytotoxicity, showed that both pollutants significantly decreased cell viability by 10-20% at 10 micro M in both cell lines after 48 h whereas PS-MBs (5 or 50 micro g mL⁻¹) were non-toxic. Cytotoxicity in cells treated with PS-MBs together with BaP or 3-NBA were similar to those observed after exposure to BaP or 3-NBA alone. Using the formamidopyrimidine-DNA glycosylase (FPG)-modified comet assay 3-NBA, but not BaP, induced

DNA damage in RTgutGC cells at 10 micro M (~10% tail DNA in the absence and ~15% tail DNA in the presence of FPG versus ~1% in controls), whereas PS-MBs alone showed no detrimental effects. Interestingly, comet formation was substantially increased (~4-fold) when RTgutGC cells were exposed to PS-MBs (50 micro g mL⁻¹) and 10 micro M 3-NBA compared to cells treated with 3-NBA alone. Further, using ³²P-postlabelling we observed strong DNA adduct formation in 3-NBA-exposed RTgutGC cells (~900 adducts/10⁸ nucleotides). 3-NBA-derived DNA adduct formation was significantly decreased (~20%) when RTgutGC cells were exposed to MB and 3-NBA compared to cells treated with 3-NBA alone. Our results show that PS-MBs impact on the genotoxicity of 3-NBA, causing a significant increase in DNA damage as measured by the comet assay in the intestinal cell line, providing proof of principle that MPs may alter the genotoxic potential of PAHs in fish cells.

Butcher, J. T., et al. (2006). "Equibiaxial strain stimulates fibroblastic phenotype shift in smooth muscle cells in an engineered tissue model of the aortic wall." Biomaterials **27**(30): 5252-5258.

Many cells in the body reside in a complex three-dimensional (3D) environment stimulated by mechanical force. In vitro bioreactor systems have greatly improved our understanding of the mechanisms behind cell mechanotransduction. Current systems to impose strain in vitro are limited either by the lack of uniform strain profile or inability to strain 3D engineered tissues. In this study, we present a system capable of generating cyclic equibiaxial strain to an engineered vascular wall model. Type I collagen hydrogels populated with rat aortic smooth muscle cells (RASMCs) were created either as a compacting disk or constrained hemisphere. Both models were adhered to silicone membranes precoated with collagen I, fibronectin, or Cell-Tak and assayed for adhesion characteristics. The best performing model was then exposed to 48 h of 10% strain at 1 Hz to simulate wall strain profiles found in vascular aneurysms, with static cultures serving as controls. The finite strain profile at the level of the membrane and the free surface of the construct was quantified using microbeads. The results indicate that the hemisphere model adhered with Cell-Tak had the most stable adhesion, followed by fibronectin and collagen I. Disk models did not adhere well under any coating condition. Uniform strain propagation was possible up to a maximum area strain of 20% with this system. RASMC responded to 10% equibiaxial strain by becoming less elongated, and immunohistochemistry suggested that stretched RASMC shifted to a more synthetic phenotype in comparison to static controls. These results suggest that equibiaxial strain may induce smooth muscle cell differentiation. We conclude that this system is effective in stimulating cells with cyclic equibiaxial strain in 3D cultures, and can be applied to a variety of biomaterial and tissue engineering applications.

Buxton, R. T., et al. (2013). "Incidence of plastic fragments among burrow-nesting seabird colonies on offshore islands in northern New Zealand." Marine Pollution Bulletin **74**(1): 420-424.

Marine plastic pollution is ubiquitous throughout the world's oceans, and has been found in high concentrations in oceanic gyres of both the northern and southern hemispheres. The number of studies demonstrating plastic debris at seabird colonies and plastic ingestion by adult seabirds has increased over the past few decades. Despite the recent discovery of a large aggregation of plastic debris in the South Pacific subtropical gyre, the incidence of plastics at seabird colonies in New Zealand is unknown. Between 2011 and 2012 we surveyed six offshore islands on the northeast coast of New Zealand's North Island for burrow-nesting seabird colonies and the presence of plastic fragments. We found non-research related plastic fragments (0.031 pieces/m²) on one island only, Ohinau, within dense flesh-footed shearwater (Puffinus carneipes) colonies. On Ohinau, we found a linear relationship between burrow

density and plastic density, with 3.5 times more breeding burrows in areas with plastic fragments found. From these data we conclude that plastic ingestion is a potentially a serious issue for flesh-footed shearwaters in New Zealand. Although these results do not rule out plastic ingestion by other species, they suggest the need for further research on the relationship between New Zealand's pelagic seabirds and marine plastic pollution.

Buyuktuncel, E., et al. (2008). "Adsorption and on-line preconcentration of Cu(II), Cd(II) and Pb(II) ions from aqueous solution using Procion Red MX-3B immobilized poly(EGDMA-HEMA) microbeads." Fresenius Environmental Bulletin **17**(4): 467-477.

The adsorption and preconcentration studies of Cu(II), Pb(II) and Cd(II) were investigated on Procion Red MX-3B attached poly(ethylene glycol dimethacrylate-hydroxy-ethyl methacrylate) [poly(EGDMA-HEMA)] microbeads. The effects of various experimental parameters were investigated using a batch and column technique. The adsorption data followed Langmuir, Freundlich and Dubinin-Radushkevich (D-R) isotherms, but the Langmuir model is better to represent the adsorption process. Procion Red MX-3B-poly(EGDMA-HEMA) microbeads were used as packing material for the minicolumn in an on-line preconcentration system for Cu(II), Pb(II) and Cd(II) determination. Metal ions were sorbed in the minicolumn, from which it could be eluted directly to the nebulizer-burner system of the flame atomic absorption spectrometer (FAAS). Elution of all metal ions from minicolumn can be made with 0.2 mol L⁻¹ HNO₃. For a preconcentration time of 2 min, the preconcentration factors were 51, 55 and 48, and the detection limits 1.25, 0.5 and 10 micro g L⁻¹, for Cu(II), Cd(II) and Pb(II), respectively. When using 10 min preconcentration time for Pb(II), the preconcentration factor and detection limit were found to be 273 and 1.1 micro g L⁻¹, respectively. The influence of diverse ions on the microbeads performance was also investigated. The accuracy of the method was tested by analyzing certified reference water (SPS-SW2 - Surface Water and LGC 6010 - Hard Drinking Water) and spiked tap water samples. These results proved that the procedure can be applied satisfactorily for lead, copper and cadmium determination in water samples.

Cabernard, L., et al. (2018). "Comparison of Raman and Fourier Transform Infrared Spectroscopy for the Quantification of Microplastics in the Aquatic Environment." Environmental Science & Technology **52**(22): 13279-13288.

Microplastics (MPs, <5 mm) have been reported as emerging environmental contaminants, but reliable data are still lacking. We compared the two most promising techniques for MP analysis, namely, Raman and Fourier transform infrared (FTIR) spectroscopy, by analyzing MPs extracted from North Sea surface waters. Microplastics >500 mum were visually sorted and manually analyzed by mu-Raman and attenuated total reflection (ATR)-FTIR spectroscopy. Microplastics <=500 mum were concentrated on gold-coated filters and analyzed by automated single-particle exploration coupled to mu-Raman (ASPEx-mu-Raman) and FTIR imaging (reflection mode). The number of identified MPs >500 mum was slightly higher for mu-Raman (+23%) than ATR-FTIR analysis. Concerning MPs <=500 mum, ASPEx-mu-Raman quantified two-times higher MP numbers but required a four-times higher analysis time compared to FTIR imaging. Because ASPEx-mu-Raman revealed far higher MP concentrations (38-2621 particles m⁻³) compared to the results of previous water studies (0-559 particles m⁻³), the environmental concentration of MPs <=500 mum may have been underestimated until now. This may be attributed to the exceptional increase in concentration with decreasing MP size found in this work. Our results demonstrate the need for further research to enable time-efficient routine application of ASPEx-mu-Raman for reliable MP counting down to 1 mum.

Caberoy, N. B., et al. (2010). "Identification of tubby and tubby-like protein 1 as eat-me signals by phage display." Experimental Cell Research **316**(2): 245-257.

Phagocytosis is an important process for the removal of apoptotic cells or cellular debris. Eat-me signals control the initiation of phagocytosis and hold the key for in-depth understanding of its molecular mechanisms. However, because of difficulties to identify unknown eat-me signals, only a limited number of them have been identified and characterized. Using a newly developed functional cloning strategy of open reading frame (ORF) phage display, we identified nine putative eat-me signals, including tubby-like protein 1 (Tulp1). This further led to the elucidation of tubby as the second eat-me signal in the same protein family. Both proteins stimulated phagocytosis of retinal pigment epithelium (RPE) cells and macrophages. Tubby-conjugated fluorescent microbeads facilitated RPE phagocytosis. Tubby and Tulp1, but not other family members, enhanced the uptake of membrane vesicles by RPE cells in synergy. Retinal membrane vesicles of Tubby mice and Tulp1(-/-) mice showed reduced activities for RPE phagocytosis, which were compensated by purified tubby and Tulp1, respectively. These data reveal a novel activity of tubby and Tulp1, and demonstrate that unbiased identification of eat-me signals by the broadly applicable strategy of ORF phage display can provide detailed insights into phagocyte biology.

Cabezudo, E., et al. (1999). "Quantitative analysis of CD79b, CD5 and CD19 in mature B-cell lymphoproliferative disorders." Haematologica **84**(5): 413-418.

BACKGROUND AND OBJECTIVE: Distinction between B-cell chronic leukemias can be difficult due to overlap in cell morphology and immunologic features. We investigated, by quantitative flow cytometry, the expression of CD79b, CD5 and CD19 in cells from a variety of B-cell disorders to see whether this analysis adds further information useful to the diagnosis and characterization of these diseases.

DESIGN AND METHODS: Peripheral blood cells from 6 normal individuals were used as reference controls. The diseases of the 63 patients investigated comprised: 29 chronic lymphocytic leukemia (CLL), six of them with atypical morphology, 6 B-cell prolymphocytic leukemia (PLL), 12 splenic lymphoma with villous lymphocytes (SLVL) and 16 mantle-cell (Mc) lymphoma in leukemic phase. The study was carried out by triple immunostaining with directly conjugated monoclonal antibodies (MoAb) against CD79b, CD5 and CD19 and quantitative estimation of the antigens per cell assessed with standard microbeads (Quantum Simply Cellular).

RESULTS: Compared to normal B-cells, the number of CD19 molecules was significantly lower in cells from all of the B-cell disorders except PLL. The intensity of CD5 in leukemic B-cells was significantly higher in CLL cells, including atypical cases, and Mc lymphoma than in normal B-cells, whilst PLL and SLVL had values similar to those of normal B-lymphocytes. CD79b was expressed at lower levels in all types of leukemic cells compared to normal B-lymphocytes but differences were statistically significant in CLL, Mc lymphoma and SLVL. The number of CD79b molecules per cell was significantly lower in typical CLL than in the remaining B-cell diseases whilst the comparison of CD5 and CD19 intensity between CLL and non-CLL samples failed to show any statistically significant difference.

INTERPRETATION AND CONCLUSIONS: Distinct antigen density patterns for the various conditions emerged from this analysis: Typical CLL was characterized by moderate CD5 and weak or negative CD79b expression. Mc lymphoma showed an homogeneous pattern, characterized by similar expression of CD5 than CLL but significantly stronger expression of CD79b whilst PLL and SLVL had weak CD5 and moderate CD79b expression. Atypical CLL had an intermediate pattern of CD79b antigen expression ranging from weak to moderate with bright CD5. Unlike CD5 and

CD79b, CD19 did not discriminate the various B-cell disorders but only between normal and leukemic cells.

Cabezudo, E., et al. (1997). "Analysis of residual disease in chronic lymphocytic leukemia by flow cytometry." Leukemia **11**(11): 1909-1914.

We have investigated the value of both conventional and quantitative flow cytometry to detect minimal residual disease in 21 CLL patients in remission including bone marrow histology: eight in complete remission (CR), 11 in nodular partial remission (nPR) and two in PR. The techniques used were double immunostaining with CD5 and CD19 and quantitative estimation of the number of both antigens with standard microbeads. Reference values were established on normal peripheral blood and bone marrow controls. Patients were considered in 'immunological' remission when the percentage of CD5+ CD19+/total CD19+ cells was <25% in PB and <15% in BM. In six of the eight patients in CR, CLL cells were still detectable by flow cytometry. Only two patients, that underwent allogeneic bone marrow transplant, achieved immunological remission. CLL samples showed significantly higher CD5 and lower CD19 antigen density than normal controls (P < 0.001). Persistence of residual disease was a predictor of time to progression. None of the two patients in immunological remission relapsed within a period of 13 and 33 months, whilst two of the six patients in CR with positive flow cytometry relapsed 3 and 6 months after achieving CR. This study demonstrates that flow cytometry contributes to increase the sensitivity of the clinicohematological criteria to detect residual malignant cells in CLL patients and may be useful to monitor disease status following treatment.

Cable, R. N., et al. (2017). "Distribution and Modeled Transport of Plastic Pollution in the Great Lakes, the World's Largest Freshwater Resource." Frontiers in Environmental Science.

Most plastic pollution originates on land. As such, freshwater bodies serve as conduits for the transport of plastic litter to the ocean. Understanding the concentrations and fluxes of plastic litter in freshwater ecosystems is critical to our understanding of the global plastic litter budget and underpins the success of future management strategies. We conducted a replicated field survey of surface plastic concentrations in four lakes in the North American Great Lakes system, the largest contiguous freshwater system on the planet. We then modeled plastic transport to resolve spatial and temporal variability of plastic distribution in one of the Great Lakes, Lake Erie. Triplicate surface samples were collected at 38 stations in mid-summer of 2014. Plastic particles >106 µm in size were quantified. Concentrations were highest near populated urban areas and their water infrastructure. In the highest concentration trawl, nearly 2 million fragments km-2 were found in the Detroit River—dwarfing previous reports of Great Lakes plastic abundances by over 4-fold. Yet, the accuracy of single trawl counts was challenged: within-station plastic abundances varied 0- to 3-fold between replicate trawls. In the smallest size class (106-1000 µm), false positive rates of 12-24% were determined analytically for plastic versus non-plastic, while false negative rates averaged ~18%. Though predicted to form in summer by the existing Lake Erie circulation model, our transport model did not predict a permanent surface “Lake Erie Garbage Patch” in its central basin—a trend supported by field survey data. Rather, general eastward transport with recirculation in the major basins was predicted. Further, modeled plastic residence times were drastically influenced by plastic buoyancy. Neutrally buoyant plastics—those with the same density as the ambient water—were flushed several times slower than plastics floating at the water’s surface and exceeded the hydraulic residence time of the lake. It is likely that the ecosystem impacts of plastic litter persist in the Great Lakes longer than assumed based on lake flushing rates. This study furthers our understanding of plastic pollution in the Great Lakes, a model freshwater system to study the

movement of plastic from anthropogenic sources to environmental sinks.

Cabrera, C., et al. (2015). "Fully automated digital immunoassay for p24 on the Simoa HD-1 Analyzer with the sensitivity of nucleic acid amplification fo acute HIV infection." Clinical Chemistry **1)**: S143-S144.

Background: Nucleic acid amplificationtechniques such as PCR have become the mainstay for ultimate sensitivity for detecting low levels of virus, including human immunodeficiencyvirus (HIV). As a sophisticated technology with relative expensive reagents and instrumentation, adoption of nucleic acid testing (NAT) can be inhibited in settings in which access to extreme sensitivity could be clinically advantageous for early detection of HIV infection. We report a simple low cost digital immunoassay for the p24 capsid protein of HIV based single molecule array (Simoa) technology. The assay exhibited over three logs greater sensitivity than conventional immunoassays, and comparable sensitivity to NAT for early detection of HIV infection. Method(s): Reagents were developed for a paramagnetic bead-based ELISA for use in the Simoa HD-1 Analyzer. Anti-p24 capture beads were prepared by covalent coupling of antibody to carboxy paramagnetic microbeads, detector antibody was biotinylated by standard methods, and an enzyme conjugate was prepared by covalent coupling of streptavidin and [[Unsupported Character - Symbol Font]]-galactosidase. The HD-1 Analyzer firstperforms a 2-step sandwich immunoassay using 144 muL of serum or plasma sample, then transfers washed and labeled capture beads to a Simoa disc where the beads are singulated in 50-femtoliter microwells, sealed in the presence of substrate, and interrogated for presence of enzyme label. A single labeled p24 molecule provides sufficientfluorescentsignal in 30 seconds to be counted by the HD-1 optical system. At low p24 concentration, the percentage of bead-containing wells in the array with a positive signal is proportional to the amount of p24 present in the sample. At higher p24 concentration, the total fluorescencesignal is proportional to the amount of p24 in the sample. The concentration of p24 is then interpolated from a standard curve (range 0-30 pg/mL). Time to firstresult is 69 minutes. The assay was evaluated for sensitivity, specificit, precision, recovery, linearity, and correlation to a NAT method across 24 early HIV infection serum samples (prior to seroconversion). Result(s): Limit of detection (2.5 SD) was 0.0025 pg/mL across 10 runs. This corresponds to ~60 RNA copies/mL equivalents by NAT. Limit of quantification(20% dose CV of diluted serum samples) was 0.0076 pg/mL across 11 runs and 58 determinations. Specificitywas 95.1% across 139 normal serum and plasma samples. Recovery of p24 spiked into normal serum averaged 84.1%. Linearity per CLSI EP6-A guideline averaged 102.2%. Precision per EP5-A guideline included three serum-based panels and two p24 controls assayed in replicates of three at two separate times per day for fivedays using a single calibration curve. ANOVA gave CV's <10% for all levels. Method comparison to NAT yielded 100% concordance with a R of 0.961. Samples ranged from 40 to 10 million RNA copies/mL as reported by NAT, most of which were non-reactive by 4th generation HIV combo immunoassay. Conclusion(s): The results show the digital Simoa p24 assay exhibited comparable sensitivity to NAT, as well as good general analytical properties. The assay represents a potential alternative to NAT for early detection of HIV infection.

Cadic, C., et al. (1992). "In vitro culture of hybridoma cells in agarose beads producing antibody secretion for two weeks." Biotechnology and Bioengineering **39**(1): 108-112.

A new process for embedding cells in agarose is described. Beads were obtained by extruding an ultralow gelling temperature agarose solution in a capillary containing a hydrophobic medium flowthrough. The toxicity of the procedure has been evaluated by monitoring the energy status of agarose-embedded C(6) glioma cells with (31)P nuclear magnetic resonance (NMR). Suspension and microbead cultures of hybridoma cell line were compared. In suspension culture

the number of cells and the antibody concentrations increased for 5 days before the stationary phase began, when the cultures were stopped. In agarose bead cultures, the gel provided an enormous support surface area (50 m(2)/ mL of gel). It was possible to seed 20-fold more cells. The gel pressure modified the proliferative process and antibody pattern secretion. In particular, the antibodies could be harvested for two weeks.

Cadic-Amadeuf, C., et al. (1993). "Modified antibody secretions by embedding hybridoma cell lines in agarose gels." Colloids and Surfaces B: Biointerfaces **1**(2): 91-96.

A new process for embedding cells in agarose is described. Beads were obtained by extruding an ultra-low gelling temperature agarose solution in a capillary containing a hydrophobic medium flowthrough. The toxicity of the procedure has been evaluated by monitoring the energy status of agarose embedded C sub(6) glioma cells with super(31)P NMR. Suspension and microbead cultures of hybridoma cell line were compared. In suspension culture the number of cells and the antibody concentrations increased for 5 days before the stationary phase began, when the cultures were stopped. In agarose bead cultures, the gel provided an enormous support surface area (50 m super(2) ml super(-1) of gel). It was possible to seed 20-fold more cells per unit volume. The gel pressure modified the proliferative process and antibody pattern secretion. In particular, the antibodies could be harvested for 2 weeks.

Caffier, D. and J. M. Expert (2001). "Soil-based plant pathogenic bacteria, a complex study. Their detection is difficult and uncertain." Phytoma **542**: 13-16.

The diagnosis of plant pathogenic bacteria living in soil is extremely difficult, owing to the fact that these bacteria are found in random quantities within an environment which is rich in a wide variety of other microorganisms. Traditional microbiological analysis (identification of bacteria colonies cultivated in Petri boxes) is possible in a few cases on semi-selective media (e.g. SMSA medium used in the detection of Ralstonia solanacearum). Another technique which is used is that of trapping plants (i.e. young sensitive plants planted out in a soil sample which is to be tested). This technique provides reliable results but is slow and not particularly sensitive. It should also be noted that trials are ongoing to extract bacteria from soil samples (in order to be subsequently able to use traditional bacteriological techniques such as immunofluoroscence, ELISA, PCR, etc.) For the moment however, nothing is yet ready to be put into practice. Elsewhere, magnetic capturing (using polymer microbeads) would seem to be promising, as would microarrays.

Cai, L., et al. (2019). "Influence of titanium dioxide nanoparticles on the transport and deposition of microplastics in quartz sand." Environmental Pollution **253**: 351-357.

The influence of titanium dioxide nanoparticles (nTiO₂) on the transport and deposition of polystyrene microplastics (MPs) in saturated quartz sand was investigated in NaCl solutions with ionic strengths from 0.1 to 10mMat two pH conditions (pH 5 and 7). Three different-sized polystyrene (PS) MPs (diameter of 0.2, 1, and 2mum) were concerned in present study. We found that for all three different-sized MPs in NaCl solutions (0.1, 1 and 10mM) at both pH 5 and 7, lower breakthrough curves and higher retained profiles of MPs with nTiO₂ copresent in suspensions relative to those without nTiO₂ were obtained, demonstrating that the copresence of nTiO₂ in MPs suspensions decreased MPs transport and increased their deposition in quartz sand under all examined conditions. The mechanisms contributing to the increased MPs deposition with nTiO₂ in suspensions at two pH conditions were different. The formation of MPs-nTiO₂ heteroaggregates and additional deposition sites provided by previously deposited nTiO₂ were found to drive to the increased MPs deposition with nTiO₂ in suspensions at pH 5, while the formation of MPs-nTiO₂ aggregates, additional deposition sites and increased surface roughness induced by the pre-deposited nTiO₂ on quartz sand surfaces were responsible for the enhanced MPs deposition at pH 7. The results give insights to predict the fate and transport of different-sized MPs in porous media in the copresence of engineered nanoparticles.

Cai, L., et al. (2018). "Effects of inorganic ions and natural organic matter on the aggregation of nanoplastics." Chemosphere **197**: 142-151.

The aggregation of nanoplastics (NPs) is a key issue in understanding the dynamic nature of NPs in the environment. The aggregation of NPs under various environmental conditions has not yet been studied. We investigated the influences of inorganic ions and natural organic matter (NOM) on polystyrene (PS) NPs aggregation in solutions.

Cai, L., et al. (2017). "Characteristic of microplastics in the atmospheric fallout from Dongguan city, China: preliminary research and first evidence." Environmental science and pollution research international **24**(32): 24928-24935.

Microplastic pollution has exhibited a global distribution, including seas, lakes, rivers, and terrestrial environment in recent years. However, little attention was paid on the atmospheric environment, though the fact that plastic debris can escape as wind-blown debris was previously reported. Thus, characteristics of microplastics in the atmospheric fallout from Dongguan city were preliminarily studied. Microplastics of three different polymers, i.e., PE, PP, and PS, were identified. Diverse shapes of microplastics including fiber, foam, fragment, and film were found, and fiber was the dominant shape of the microplastics. SEM images illustrated that adhering particles, grooves, pits, fractures, and flakes were the common patterns of degradation. The concentrations of non-fibrous microplastics and fibers ranged from 175 to 313 particles/m2/day in the atmospheric fallout. Thus, dust emission and deposition between atmosphere, land surface, and aquatic environment were associated with the transportation of microplastics.

Cai, L., et al. (2018). "Observation of the degradation of three types of plastic pellets exposed to UV irradiation in three different environments." Science of the Total Environment **628-629**: 740-747.

Plastic debris represents one of the most prevalent and persistent pollution problems in the marine environment. In particular, microplastics that are mainly degraded from larger plastic debris have become a growing environmental concern. However, studies on the degradation of plastics in the aquatic environment that hydrobios reside in have been limited, while several studies regarding the degradation of plastics have been conducted under outdoor or accelerated weathering conditions. Thus, observation of the degradation of three types of virgin plastic pellets exposed to UV irradiation in three different environments (i.e., simulated seawater, ultrapure water, and a waterless (air) condition) was carried out. Data on the changes in physical and chemical properties were collected. The FTIR spectra showed that hydroxyl groups and carbonyl groups developed in three types of weathered plastic pellets under the air and ultrapure water environmental conditions after 3months of UV irradiation, while only carbonyl groups were found in plastic pellets in the simulated seawater environment. In contrast, the Raman spectra showed no significant changes in the weathered plastic pellets, but there were different intensities of characteristic peaks after exposure to UV irradiation. In addition, SEM images illustrated that granular oxidation, cracks and flakes were common patterns during degradation, and the plastic pellets in the three different environments experienced different levels of chemical weathering. We suggest that further studies on the degradation processes of plastic debris are needed to predict the fate of plastic debris in the environment.

Cai, N., et al. (2019). "A new method for the preparation of iron and nitrogen co-doped carbon nanotubes from waste plastics pyrolysis for oxygen reduction reaction." ChemSusChem **28**: 28.

A novel method to prepare iron and nitrogen co-doped carbon nanotubes (Fe-N-CNT) is proposed, based on catalytic pyrolysis of waste plastics. At first carbon nanotubes are produced from pyrolysis of plastic waste over $Fe-Al_2O_3$; then Fe-CNT and melamine are heated together in inert atmosphere. Different co-pyroysis temperatures are tested to optimize the electrocatalyst production. Working at a high doping temperature improved the degree of graphite formation and promoted the conversion of nitrogen to a more stable form. Compared with commercial platinum on carbon, the electrocatalyst obtained from pyrolysis at 850 degreeC, showed remarkable properties, with onset potential of 0.943 V vs RHE and half-wave potential of 0.811 V vs RHE and even better stability and anti-poisoning. In addition, zinc-air batteries tests were also carried out and the optimized catalyst exhibited high maximum power density.

Calderon, E. A., et al. (2019). "Microplastics in the Digestive Tracts of Four Fish Species from the Cienaga Grande de Santa Marta Estuary in Colombia." Water, Air, and Soil Pollution **230 (11) (no pagination)**(257).

This study investigated the presence of microplastics (MPs) in the gastrointestinal tracts of four fish species from the estuarine Cienaga Grande de Santa Marta (CGSM) in northern Colombia. Of the 140 fish purchased at a local market, 17 (12.1%) were found to contain MPs as confirmed by FT-IR analysis. Among the four different species, Mugil incilis (mullet) showed the highest MP prevalence with just over a fifth of the individuals containing MPs in their gastrointestinal tracts (10 out of 46 (frequency of MP occurrence in %) FO% = 21.7%). This was followed by Caranx hippos (crevalle jack, 2 out of 19 (FO% = 10.5%)), Caquetaia kraussii (yellow mojarra, 3 out of 35 (FO% = 8.6%)), and Eugerres plumieri (striped mojarra, 2 out of 40 (FO% = 5.0%)). From the 17 fish, only 19 MPs were found of which 17 (89.5% were fibers) and 2 (10.5%) were fragments. While polyester and polyethylene were the most common fibers, nylon, acrylic, polyethylene, and modacrylic were also identified suggesting a wide variety of origins and sources. These finding provide the first evidence of MP ingestion by resident fish species in Colombian estuarine waters. Since the region has been variously recognized as being of regional and international importance (i.e., RAMSAR site in 1998 and UNESCO Biosphere Reserve in 2000), we advocate the ongoing investigation of MP pollution in both the environment and biota. Copyright © 2019, Springer Nature Switzerland AG.

Calderon, E. A., et al. (2019). "Microplastics in the Digestive Tracts of Four Fish Species from the Ciénaga Grande de Santa Marta Estuary in Colombia." Water, Air & Soil Pollution **230**(11): N.PAG-N.PAG.

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Caldwell, J., et al. (2019). "Assessing meso- and microplastic pollution in the Ligurian and Tyrrhenian Seas." Marine Pollution Bulletin **149 (no pagination)**(110572).

As the production of plastic products continues to increase, determining the fate of plastic waste in the environment is of high importance. Densely populated areas, such as Mediterranean coastlines, represent locations of high pollution risk for surrounding environments. Thus, this study aims to assess the abundance, size, and composition of floating meso- and microplastics collected during four weeks in 2018 in the Ligurian and Tyrrhenian Seas. The results show average meso- and microplastic particle concentrations of 28,376 +/- 28,917 particles km⁻ ², and an average mass of 268.61 +/- 421.18 g km⁻ ². The particle shape ratio was 65% fragments, 19% films, 10% lines, 4% foams, and 2% pellets. Microplastic particles comprised 65% of the sample. Analysis with attenuated total reflection Fourier transform infrared spectroscopy showed predominant polymer types included polyethylene, polypropylene, polystyrene, and polyamide. These data are an important starting point for long-term monitoring of plastic pollution levels within this region. Copyright © 2019 Elsevier Ltd

Calero, C., et al. (2014). "Differential expression of C-reactive protein and serum amyloid A in different cell types in the lung tissue of chronic obstructive pulmonary disease patients." BMC Pulmonary Medicine **14**: 95.

BACKGROUND: Chronic systemic inflammatory syndrome has been implicated in the pathobiology of extrapulmonary manifestations of chronic obstructive pulmonary disease (COPD). We aimed to investigate which cell types within lung tissue are responsible for expressing major acute-phase reactants in COPD patients and disease-free ("resistant") smokers.

METHODS: An observational case-control study was performed to investigate three different cell types in surgical lung samples of COPD patients and resistant smokers via expression of the C-reactive protein (CRP) and serum amyloid A (SAA1, SAA2 and SAA4) genes. Epithelial cells, macrophages and fibroblasts from the lung parenchyma were separated by magnetic microbeads (CD326, CD14 and anti-fibroblast), and gene expression was evaluated by RT-PCR.

RESULTS: The sample consisted of 74 subjects, including 40 COPD patients and 34 smokers without disease. All three cell types were capable of synthesizing these biomarkers to some extent. In fibroblasts, gene expression analysis of the studied biomarkers demonstrated increased SAA2 and decreased SAA1 in patients with COPD. In epithelial cells, there was a marked increase in CRP, which was not observed in fibroblasts or macrophages. In macrophages, however, gene expression of these markers was decreased in COPD patients compared to controls.

CONCLUSIONS: These results provide novel information regarding the gene expression of CRP and SAA in different cell types in the lung parenchyma. This study revealed differences in the expression of these markers according to cell type and disease status and contributes to the identification of cell types that are responsible for the secretion of these molecules.

Calero, C., et al. (2012). "Differences in cellular expression of Creactive protein and serum amyloid A in lung tissue in patients with chronic obstructive pulmonary disease." European Respiratory Journal. Conference: European Respiratory Society Annual Congress **40**(SUPPL. 56).

Introduction and Objectives: The lung bronchial and parenchyma tissues are a potential source of acute phase reactants in Chronic Obstructive Pulmonary Disease (COPD) patients as compared with resistant smokers. The aim of this study was to determinate the expression of C-Reactive Protein (CRP) and Serum Amyloid A (SAA) in epithelial cells, macrophages and lung fibroblasts between COPD and resistant smokers. This expression was also studied according to the different grades of COPD. Method.This report is based on a cross sectional analysis of a case-control study. These patients included were consecutively recruited, in elective lung surgery.Epithelial cells, macrophages and fibroblasts were obtained by magnetic separation microbeadsand CRP and SAA1, 2 and 4 expression was analysed by real time PCR. Results. The sample was formed by 19 COPD and 27 resistant smokers. Although all cell types were able to synthesize the biomarkers, fibroblasts of COPD patients had a significantly higher expression (5 folds, p=0,015) of SAA1 than resistant smokers. Our results also showed significant differences in the expression of SAA between macrophages from COPD in different stage of the disease, being higher in patients in GOLD II (25 folds higher for SAA1, p=0,021; 9 folds for SAA2, p=0,05 and 30 for SAA4, p=0,014). Conclusions.There are differences in the synthesis of SAA-1 in fibroblasts of COPD and controls. The pattern of expression in macrophages is different for SAA according to stage of disease.These findings could be useful to elucidate the contribution of each cellular compartment in the inflammatory component of the disease.

Camacho, M., et al. (2019). "Organic pollutants in marine plastic debris from Canary Islands beaches." Science of the Total Environment **662**: 22-31.

Given their capacity to adsorb chemical pollutants, microplastics represent a growing environmental concern in the oceans. The levels of 81 chemical compounds in two types of beached microplastic (pellets and fragments) were monitored across the Canary Islands (Spain). The highest concentrations were found for polycyclic aromatic hydrocarbons (PAH) (52.1-17,023.6ng/g and 35.1-8725.8ng/g for pooled pellets and fragments, respectively). The polychlorinated biphenyl (PCB) concentrations were 0.9-2285.8 and 1.6-772.5ng/g for pooled pellets and fragments, respectively, whereas organochlorine pesticides (OCP) ranged from 0.4-13,488.7 and 0.4-3778.8ng/g, respectively. The sum of polychlorinated biphenyls and diphenyl-dichloro-ethane (DDT) metabolites was significantly higher in beaches on Gran Canaria, which is the most populated and industrialized island. The sum of ultraviolet filters (UV-filters) was higher in those beaches more frequented by tourists (Famara and Las Canteras), than in occasionally or very rarely visited beaches (Cuervitos and Lambra), with values ranging from 0 to 37,740.3ng/g and 3.7-2169.3ng/g for pellets and fragments, respectively. Furthermore, the sum of brominated diphenyl ethers (BDE) (0-180.58ng/g for pooled pellets and 0.06-3923.9ng/g for pooled fragments) and organophosphorus flame retardants (OPFR) (20.0-378.0ng/g for pooled pellets, and 22.6-7013.9ng/g for pooled fragments) was significantly higher in an urban beach (Las Canteras) than in the rest of the studied beaches. Finally, the concentrations of the pesticide chlorpyrifos were much higher on Gran Canaria beaches than in the rest. In this research we provide further evidence of the important role of plastic debris in the adsorption of a wide range of marine pollutants. The regional pattern of chemical contamination of plastics reveals that the sorption of many compounds probably occurs in coastal waters. Further investigation is necessary to understand the relationship between plastic types and adsorption of different pollutants, especially for emerging pollutants.

Camins, E., et al. (2020). "Paddle surfing for science on microplastic pollution." Science of the Total Environment **709 (no pagination)**(136178).

Microplastics have pervaded all oceans on Earth and their impact on marine ecosystems is a matter of debate. However, there is a lack of information from a few meters from the coastline even though monitoring the nearshore is absolutely needed to fully understand the paths and magnitude of microplastic pollution, including its implications for coastal management and water quality. Traditional scientific data acquisition using conventional platforms such as research vessels or small boats is expensive and hampered by numerous limitations in the nearshore zone, ranging from too shallow (and risky) depths to the presence of swimmers. Here, we provide the scientific community with an affordable and easy to use manta trawl called paddle trawl to be attached to a paddle surf board to acquire scientific samples in the nearshore within the frame of a citizen science monitoring project with the Spanish delegation of the non-governmental organization Surfrider Foundation Europe. Our results show, as a proof of concept, that a lightweight and low-cost paddle trawl towed behind paddle surfers allows obtaining samples for microplastic characterization and quantification while raising awareness of pollution by the allochtonous particles. An average of 11.7 x 10⁴ items km⁻ ² was found in the nearshore, similar to those found offshore in the Mediterranean Sea. However, a comparison with offshore data obtained with a standard manta trawl shows differences in plastic size distributions. Whereas microplastics dominated in offshore waters mesoplastics and macroplastics prevailed in the nearshore. A larger variety of polymers, including high-density ones and higher average lengths nearshore shows that this area is likely to produce and export microplastics towards offshore waters. Copyright © 2018 Elsevier B.V.

Campbell, P. E., et al. (2000). "Coal and plastic waste in a PF boiler." Energy Policy **28**(4): 223.

Plastics wastes from a municipal solid waste (MSW) plant have a high-energy content and are suitable for co-processing with coal. The addition of 5% plastic waste to a coal-fired PF power station reduces its efficiency slightly from 44.0 to 43.7% due to the high moisture content of the plastics. The overall economics however can be favourable. For the cost of electricity to be the same as the coal only case, the plastic waste could have a value of up to 23 €/dry tonne to the power station, assuming that it had been prepared for use. Therefore the maximum amount that the power station can afford to spend on preparing the plastic waste for use is 23 €/dry tonne plus the avoided landfill cost, less the transport cost. The location of the power station plays a key role, since this does not only have an effect on the transport costs of the waste but also on the landfill charges. The sensitivity of the economics of co-processing plastic waste with coal for a variety of power station operational parameters is presented. [ABSTRACT FROM AUTHOR]

Campillo, J. A., et al. (2015). "Mica variability in patients with cutaneous malignant melanoma." Tissue Antigens **85 (5)**: 392.

A limited number of studies have been performed so far on the polymorphism in the transmembrane region (exon 5) of the major histocompatibility complex class I chain-related gene A (MICA) in patients with melanoma. However, the influence of MICA polymorphism in extracellular domains (exons 2, 3 and 4) has not been investigated on melanoma disease. This study aims to characterize the influence of extracellular MICA polymorphism, and its previously described linkage disequilibrium with HLA-B locus, on patients with cutaneous melanoma from southeastern Spain. MICA and HLA-B genotyping was performed in 233 melanoma patients and 200 ethnically matched controls by microbeads array luminex technology. Patients were classified according to the presence of methionine or valine at codon 129 of MICA gene. We found a high frequency ofMICA*009 in melanoma patients compared with controls (P=0.002, Pc=0.03). Additionally, our results also showed an association between MICA*009 and HLA-B*51 alleles both in patients and controls. This association was stronger in patients than in the control group (P=0.015). However, a multivariate logistic regression model showed that neither MICA*009, nor the combination MICA*009/HLA-B*51 were associated with melanoma susceptibility. No relationship was observed between MICA-129 dimorphism and melanoma susceptibility. The study of MICA polymorphism in the extracellular domains shows a lack of association between MICA gene and cutaneous malignant melanoma in our population.

Campisano, S., et al. (2013). "Anti-melanoma vaccinal capacity of CD11c-positive and -negative cell populations present in GM-CSF cultures derived from murine bone marrow precursors." Vaccine **31**(2): 354-361.

We have initially shown that DC/ApoNec vaccine can induce protection against the poorly immunogenic B16F1 melanoma in mice. The population of DC obtained for vaccination after 7 days culture with murine GM-CSF is heterogeneous and presents about 60% of CD11c+DC. Therefore, our purpose was to identify the phenotype of the cells obtained after differentiation and its immunogenicity once injected. DC were separated with anti-CD11c microbeads and the two populations identified in terms of CD11c positivity (DC+ and DC-) were also studied. Approximately 26.6% of the cells in DC+ fraction co-expressed CD11c+ and F4/80 markers and 75.4% were double positive for CD11c and CD11b markers. DC+ fraction also expressed Ly6G. DC- fraction was richer in CD11c-/F4/80+ macrophages (44.7%), some of which co-expressed Ly6G (41.8%), and F4/80-/Ly6-G+ neutrophils (34.6%). Both DC+ and DC- fractions displayed similar capacity to phagocyte and endocyte antigens and even expressed levels of MHC Class II and CD80, CD83 and CD86 costimulatory molecules similar to those in the DC fraction. However, only DC/ApoNec vaccine was capable to induce protection in mice (p<0.01). After 24 h co-culture, no detectable level of IL-12 was recorded in DC/ApoNec vaccine, either in supernatant or intracellularly. Therefore, the protection obtained with DC/ApoNec vaccine seemed to be independent of the vaccine's ability to secrete this inflammatory cytokine at the time of injection. In conclusion, we demonstrated that all cell types derived from the culture of mouse bone marrow with GM-CSF are necessary to induce antitumor protection in vivo.

Can, H. K. and A. Gner (2012). "Experimental approaches to adsorption-desorption dynamism of human serum albumin (HSA) onto crosslinked N,N-diethylaminoethyl (DEAE) dextran microbeads." Journal of Macromolecular Science, Part A: Pure and Applied Chemistry **49**(11): 986-996.

Crosslinked N,N-Diethylaminoethyl (DEAE) groups containing dextran microbeads have been used in human serum albumin (HSA) adsorption-desorption studies. For the HSA adsorption onto positively charged hydrophilic DEAE dextran microbeads, the adsorption kinetic was slightly decreased by the changing concentration of the protein solution. Adsorption kinetics and equilibrium isotherms for the adsorption of HSA on crosslinked DEAE dextran have been determined experimentally. Modeling of the adsorption processes on DEAE dextran microbeads were realized by applying different adsorption isotherms. Among the several isotherm equations, Langmuir and Freundlich adsorption isotherms were investigated depending on the two temperatures. These were only slightly dependent on the initial concentration of HSA but were considerably affected by the pH of the medium. The HSA adsorption capacity factor and the adsorption equilibrium constant were obtained and mathematical modeling of adsorption, adsorption rate constants and maximum adsorption were determined. Besides the adsorption mechanism, optimum ionic strength and optimum pH also were investigated. Desorption studies and desorption ratio of the system were determined for optimum medium conditions. It was been proved both experimentally and theoretically that human HSA is adsorbed by electrostatic attraction, ion-exchange, hydrophobic interaction and/or hydrogen bonding. Copyright © Taylor and Francis Group, LLC.

Can, H. K. and A. Guener (2006). "Investigation of adsorption-desorption dynamism of bovine serum albumin on crosslinked N,N[prime]-diethylaminoethyl dextran microbeads: Solution phase." Journal of Applied Polymer Science **99**(5): 2288-2299.

New hydrogel microspheres based on crosslinked dextran containing N,N[prime]-diethylaminoethyl (DEAE) groups with different chemical structures have been used in adsorption-desorption studies. Bovine serum albumin (BSA) is frequently used in biophysical and biochemical studies. BSA has a well- known primary structure that has been associated with binding of many different categories of small molecules. Both adsorption kinetics and equilibrium isotherms for the adsorption of BSA on crosslinked DEAE dextran have been determined experimentally. These were only slightly dependent on the initial concentration of BSA but were considerably affected by the pH of the medium. The results fitted the Freundlich-Langmuir isotherm model for pH 6.9. The adsorption capacity factor and the adsorption equilibrium constant were obtained and mathematical modeling of adsorption, adsorption rate constants, and maximum adsorption were determined. Swelling kinetics of crosslinked DEAE dextran and optimum ionic strength, pH, and mass of hydrogel were also investigated. Desorption studies were finally determined under optimum medium conditions. J Appl Polym Sci, 2006

Can, H. K. and A. Güner (2006). "A thermodynamic study of the binding of human serum albumin onto N,N′-diethylaminoethyl dextran microbeads." Journal of Applied Polymer Science **101**(6): 3942-3947.

Adsorption of proteins on solid surfaces is widely studied because of its importance in various biotechnological, medical, and technical applications, e.g., biosensors, cardiovascular implants, and chromatography. Adsorption thermodynamics has been studied on the microbeads of N,N′-diethylaminoethyl (DEAE) Dextran anion exchanger for the human serum albumin (HSA) at 25, 30, 35, 40, and 45°C. As a result, some thermodynamic parameters like Freundlich constants, thermodynamic equilibrium constant (K D), standard free energy changes (ΔGassoc), standard entropy changes (ΔSassoc), and standard enthalpy change (ΔHassoc) have been evaluated. Using the linear Van't Hoff plot, ΔHassoc value of the system for the interaction of bovine serum albumin (BSA)-adsorbed crosslinked DEAE dextran microbeads was determined as 20,650 kJ/mol. © 2006 Wiley Periodicals, Inc.

Candido, V., et al. (2006). "Mulching studies in greenhouse by using eco-compatible plastic films on fresh tomato crop." Acta Horticulturae **710**: 415-420.

A high employment of plastics in agriculture causes the production of enormous quantities of waste, whose inappropriate management might have negative effects on the whole agro-ecosystem. To reduce the amount of plastic waste and to facilitate its disposal, one of the most interesting approaches, from an environmental point of view, lies in the use of innovative materials for crop mulching such as co-extrused ultrathin films which are able to reduce the plastic quantity to be managed; and biodegradable laminates, which after the first use, will spontaneously start to degrade. This paper reports the results of a research carried out from March to July of 2002 in southern Italy on mulching of tomato (Lycopersicon esculentum cv. Tomito F₁) using 2 co-extrused ultrathin plastic, 2 biodegradable plastics and a traditional film (LDPE). Coextrused films have spectroradio-metrics and mechanical characteristics able to ensure an anti-weed barrier, thus allowing a good thermal level in the soil. They also gave better yield results than black LDPE. Besides, biodegradable films exhibited an agronomic behaviour equal to LDPE and their degradation times were compatible with the protected tomato crop cycle.

Canesi, L., et al. (2015). "Evidence for immunomodulation and apoptotic processes induced by cationic polystyrene nanoparticles in the hemocytes of the marine bivalve Mytilus." Marine Environmental Research **111**: 34-40.

Polymeric nanoparticles can reach the marine environment from different sources as weathering of plastic debris and nanowaste. Nevertheless, few data are available on their fate and impact on marine biota. Polystyrene nanoparticles (PS NPs) can be considered as a model for studying the effects of nanoplastics in marine organisms: recent data on amino-modified PS NPs (PS-NH₂) toxicity in sea urchin embryos underlined that marine invertebrates can be biological targets of nanoplastics. Cationic PS NPs have been shown to be toxic to mammalian cells, where they can induce apoptotic processes; however, no information is available on their effects and mechanisms of action in the cells of marine organisms. In this work, the effects of 50 nm PS-NH₂ were investigated in the hemocytes of the marine bivalve Mytilus galloprovincialis. Hemocytes were exposed to different concentrations (1, 5, 50 micro g/ml) of PS-NH₂ suspension in ASW. Clear signs of cytoxicity were evident only at the highest concentrations (50 micro g/ml). On the other hand, a dose dependent decrease in phagocytic activity and increase in lysozyme activity were observed. PS-NH₂ NPs also stimulated increase in extracellular ROS (reactive oxygen species) and NO (nitric oxide) production, with maximal effects at lower concentrations. Moreover, at the highest concentration tested, PS-NH₂ NPs induced apoptotic process, as evaluated by Flow cytometry (Annexin V binding and mitochondrial parameters). The results demonstrate that in marine invertebrates the immune function can represent a significant target for PS-NPs. Moreover, in Mytilus hemocytes, PS-NH₂ NPs can act through mechanisms similar to those observed in mammalian cells. Further research is necessary on specific mechanisms of toxicity and cellular uptake of nanoplastics in order to assess their impact on marine biota.

Canesi, L., et al. (2016). "Interactions of cationic polystyrene nanoparticles with marine bivalve hemocytes in a physiological environment: Role of soluble hemolymph proteins." Environmental Research **150**: 73-81.

The bivalve Mytilus galloprovincialis has proven as a suitable model invertebrate for evaluating the potential impact of nanoparticles (NPs) in the marine environment. In particular, in mussels, the immune system represents a sensitive target for different types of NPs. In environmental

conditions, both NP intrinsic properties and those of the receiving medium will affect particle behavior and consequent bioavailability/uptake/toxicity. However, the evaluation of the biological effects of NPs requires additional understanding of how, once within the organism, NPs interact at the molecular level with cells in a physiological environment. In mammalian systems, different NPs associate with serum soluble components, organized into a “protein corona”, which affects particle interactions with target cells. However, no information is available so far on the interactions of NPs with biological fluids of aquatic organisms. In this work, the influence of hemolymph serum (HS) on the in vitro effects of amino modified polystyrene NPs (PS-NH 2) on Mytilus hemocytes was investigated. Hemocytes were incubated with PS-NH 2 suspensions in HS (1, 5 and 50 µg/mL) and the results were compared with those obtained in ASW medium. Cell functional parameters (lysosomal membrane stability, oxyradical production, phagocytosis) were evaluated, and morphological changes were investigated by TEM. The activation state of the signalling components involved in Mytilus immune response (p38 MAPK and PKC) was determined. The results show that in the presence of HS, PS-NH 2 increased cellular damage and ROS production with respect to ASW medium. The effects were apparently mediated by disregulation of p38 MAPK signalling. The formation of a PS-NH 2 -protein corona in HS was investigated by centrifugation, and 1D- gel electrophoresis and nano-HPLC-ESI-MS/MS. The results identified the Putative C1q domain containing protein (MgC1q6) as the only component of the PS-NH 2 hard protein corona in Mytilus hemolymph. These data represent the first evidence for the formation of a NP bio-corona in aquatic organisms and underline the importance of the recognizable biological identity of NPs in physiological exposure medium when testing their potential impact environmental model organisms. Although the results obtained in vitro do not entirely reflect a realistic exposure scenario and the more complex formation of a bio-corona that is likely to occur in vivo , these data will contribute to a better understanding of the effects of NPs in marine invertebrates. [ABSTRACT FROM AUTHOR]

Canniff, P. M. and T. C. Hoang (2018). "Microplastic ingestion by Daphnia magna and its enhancement on algal growth." Science of the Total Environment **633**: 500-507.

The rapid increase in plastic use over the last few decades has resulted in plastic pollution in freshwater and marine ecosystems. However, more attention has been paid to plastic pollution in marine ecosystems than to freshwater ecosystems. This research determined microplastic ingestion by Daphnia magna and the potential effect of microplastics on the organism's survival and reproduction. The study also examined the potential of microplastics to enhance algal growth in support of understanding effects of microplastic ingestion on the organism. When exposed to 25, 50, and 100 mg/L fluorescent green polyethylene microbeads at size of 63-75 micro m, D. magna ingested significant amount of plastic microbeads. The number of ingested beads increased with increasing particle concentration and exposure time. However, no significant effect on survival and reproduction was observed although the gut of D. magna was filled with plastic microbeads. In the algal experiment, Raphidocelis subcapitata grew more in the exposure media with the present of plastic microbeads than without plastic microbeads. This result suggests that plastic microbeads could serve as substrates for R. subcapitata to grow.

Raphidocelis subcapitata then could be transferred to the organism's gut and provided energy for survival and reproduction. Results of the present study add to the literature of microplastic ingestion by aquatic organisms. Caution should be taken when interpreting hazards of microplastics based on ingestion, such as the measurement unit and the presence of algae in the environment.

Cannon, S. M. E., et al. (2016). "Plastic ingestion by fish in the Southern Hemisphere: a baseline study and review of methods." Marine Pollution Bulletin **107**(1): 286-291.

Plastic ingestion is well documented among marine birds and sea turtles but fewer studies have investigated ingestion in fish, particularly in the Southern Hemisphere. We investigated the frequency of plastic ingestion in 21 species of fish and one species of cephalopod. The overall occurrence of plastic ingestion was 0.3%. Two micro-plastic items were recovered from the gastrointestinal tract of a single Antarctic toothfish (Dissostichus mawsoni). Ingestion rates were similar to other studies of fish conducted in both the Northern and Southern Hemispheres, however comparisons across species and locations are challenging due to the lack of consistency in the identification and classification of plastic debris. In response, we propose a standardised sampling protocol based on the available literature to provide a stronger basis for comparisons among existing and future studies of plastic ingestion in fish.

Canopoli, L., et al. (2020). "Degradation of excavated polyethylene and polypropylene waste from landfill." Science of the Total Environment **698 (no pagination)**(134125).

In 2016, it was estimated that 7.4 million tonnes of plastic waste have been disposed in landfill in Europe. This waste represents an important opportunity for resource recovery through enhanced landfill mining consistent with recent Circular Economy initiatives. However, a recent review found a lack of data describing the degradation of excavated plastic waste and the potential impact on recycling products such as pyrolysis oil. In this study, the physicochemical characteristics of the main plastic types found in landfills and their implications for recovery and recycling were investigated using a combination of scanning electron microscopy energy dispersive spectroscopy (SEM-EDS), attenuated total reflectance Fourier transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC). Loss of gloss was visually detected for the buried plastic waste samples (polyethylene (PE) and polypropylene (PP)) compared to fresh plastic samples. The SEM-EDS analysis further showed that oxygen was the main element related to the plastic surface alteration. The carbonyl index (CI) of plastic samples buried for >10 years was between 1.5 and 2 times higher than <10 years and fresh materials. Similarly, the degree crystallinity of the old samples (>10 years) was 2 times higher than the fresh and < 10 years samples. Based on these findings, tertiary recycling, such as pyrolysis, seems to be a convenient route for upcycling of recovered plastics from municipal solid waste landfills. Copyright © 2019

Canopoli, L., et al. (2018). "Physico-chemical properties of excavated plastic from landfill mining and current recycling routes." Waste Management **76**: 55-67.

In Europe over 5.25 billion tonnes of waste has been landfilled between 1995 and 2015. Among this large amount of waste, plastic represents typically 5-25wt% which is significant and has the potential to be recycled and reintroduced into the circular economy. To date there is still however little information available of the opportunities and challenges in recovering plastics from landfill sites. In this review, the impacts of landfill chemistry on the degradation and/or contamination of excavated plastic waste are analysed. The feasibility of using excavated plastic waste as feedstock for upcycling to valuable chemicals or liquid fuels through thermochemical

conversion is also critically discussed. The limited degradation that is experienced by many plastics in landfills (>20years) which guarantee that large amount is still available is largely due to thermooxidative degradation and the anaerobic conditions. However, excavated plastic waste cannot be conventionally recycled due to high level of ash, impurities and heavy metals. Recent studies demonstrated that pyrolysis offers a cost effective alternative option to conventional recycling. The produced pyrolysis oil is expected to have similar characteristics to petroleum diesel oil. The production of valuable product from excavated plastic waste will also increase the feasibility of enhanced landfill mining projects. However, further studies are needed to investigate the uncertainties about the contamination level and degradation of excavated plastic waste and address their viability for being processed through pyrolysis.

Cao, L., et al. (2007). "Purification and characterization of alginate lyase from streptomyces species strain A5 isolated from banana rhizosphere." Journal of Agricultural & Food Chemistry **55**(13): 5113-5117.

To characterize the alginate lyase produced by rhizosphere Streptomyces, Streptomyces sp. A5 was isolated from banana rhizosphere, and its extracellular lyase was purified to an electrophoretically homogeneous state. The lyase has a molecular mass of 32 kDa by sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). The optimum temperature and pH were 37 degrees C and pH 7.5, respectively. Ninety-two percent of the activity was lost after incubation at 70 degrees C and pH 7.5 for 20 min. The enzyme was inhibited by 0.05 M SDS and 2 mM Hg2+, Cu2+, and Fe3+, but EDTA enhanced the enzyme activity. The Km value of the lyase was 0.13 mg mL-1 with the substrate sodium alginate. The lyase had substrate specificity for polyguluronate units in the alginate molecules. The alginate oligomers prepared by the lyase show growth-promoting activity on the roots of banana plantlets. These results indicated that the encapsulation method using alginate microbeads to inoculate beneficial streptomycete strains might be beneficial to the root growth of banana plantlets.

Cao, L. Y., et al. (2009). "Hand/face/neck localized pattern: sticky problems--resins." Dermatologic Clinics **27**(3): 227-249, v.

Plastic resin systems have an increasingly diverse array of applications but also induce health hazards, the most common of which are allergic and irritant contact dermatitis. Contact urticaria, pigmentary changes, and photoallergic contact dermatitis may occasionally occur. Other health effects, especially respiratory and neurologic signs and symptoms, have also been reported. These resin systems include epoxies, the most frequent synthetic resin systems to cause contact dermatitis, (meth)acrylics, polyurethanes, phenol-formaldehydes, polyesters, amino resins (melamine-formaldehydes, urea-formaldehydes), polyvinyls, polystyrenes, polyolefins, polyamides and polycarbonates. Contact dermatitis usually occurs as a result of exposure to the monomers and additives in the occupational setting, although reports from consumers, using the raw materials or end products periodically surface. Resin- and additive-induced direct contact dermatitis usually presents on the hands, fingers, and forearms, while facial, eyelid, and neck involvement may occur through indirect contact, eg, via the hands, or from airborne exposure. Patch testing with commercially available materials, and in some cases the patient's own resins, is important for diagnosis. Industrial hygiene prevention techniques are essential to reduce contact dermatitis when handling these resin systems. [References: 184]

Cao, M., et al. (2011). "Different radiosensitivity of CD4(+)CD25(+) regulatory T cells and effector T cells to low dose gamma irradiation in vitro." International Journal of Radiation Biology **87**(1): 71-80.

PURPOSE: To determine the radiosensitivity difference of human Cluster of Differentiation (CD)4(+)CD25(+) regulatory T cells (Treg) and effector T cells to low dose gamma ray and elucidate the underlying mechanisms in vitro.

MATERIALS AND METHODS: Blood samples were collected from five health subjects and five patients with advanced hepatocellular carcinoma (HCC). Treg and CD4(+)CD25- T cells were selected using magnetic microbeads. The proliferative profiles, cytokine secretion, and differential expressions of apoptosis-related proteins in Treg and CD4(+)CD25- T cells were compared using [3H]-thymidine incorporation, Luminex assay and flow cytometry when treated with various low doses of gamma-ray.

RESULTS: A dose-dependent reduction of proliferation in response to irradiation which paralleled the induction of apoptosis existed in Treg and CD4(+)CD25- T cells. Treg were more radiosensitive to low-dose irradiation (0.94 Gray [Gy]) than effector T cells. The interferon-gamma (IFNgamma) was significantly upregulated and interleukin 10 (IL-10) was significantly downregulated in irradiated Treg. An enhanced immune response to low dose gamma ray existed in the peripheral blood in patients with advanced HCC. Higher levels of active caspase-3, CD95, B cell lymphoma 2 (Bcl-2)-associated X protein (Bax) expression were observed in Treg compared to CD4(+)CD25- T cells. In addition, gamma irradiation activated CD4(+)CD25- T cells to express CD25.

CONCLUSIONS: These studies revealed that Treg were more radiosensitive than CD4(+)CD25- T cells to low dose irradiation. Higher expressions of apoptosis-related proteins such as caspase-3, CD95 and Bax were observed in Treg when compared to CD4(+)CD25- T cells. Our results suggest that treatment with low doses of gamma irradiation may be a viable strategy to enhance immune response in patients with advanced HCC.

Capillo, G., et al. (2020). "Quali-quantitative analysis of plastics and synthetic microfibers found in demersal species from Southern Tyrrhenian Sea (Central Mediterranean)." Marine Pollution Bulletin **150**: 110596.

This study highlights plastics occurrence in five demersal fish species from the Southern Tyrrhenian Sea: the Red mullet Mullus barbatus barbatus, the Piper gurnard Trigla lyra, the Blackmouth catshark Galeus melastomus, the Lesser spotted dogfish Scyliorhinus canicula and the Brown ray Raja miraletus. Overall, 125 fish were examined: 21 Red mullets, 16 Piper gurnards, 75 Blackmouth catsharks, 72 Dogfish and 1 Brown ray. The percentage of fish with ingested plastics was 14.4% with 0.24 items per specimen. The majority of the debris were fibers and the application of infrared and Raman spectroscopy allowed the identification and discrimination of plastic and non-plastic fibers. The plastic debris isolated were mainly microplastics (94.1%), while macroplastics occurrence was very low (5.9%). The plastics were identified as polypropylene, Teflon, nylon, kraton G (triblock copolymer) and polyethylene. Also cellulose was detected. S. canicula was the species with the highest number of plastic pollutants.

Capolupo, M., et al. (2018). "Uptake and transcriptional effects of polystyrene microplastics in larval stages of the Mediterranean mussel Mytilus galloprovincialis." Environmental Pollution **241**: 1038-1047.

The widespread occurrence of microplastics (MP) in the marine environment is cause of increasing concerns about the safety of the exposed ecosystems. Although the effects associated to the MP uptake have been studied in most marine taxa, the knowledge about their sub-lethal impacts on early life stages of marine species is still limited. Here, we investigated the uptake/retention of 3- micro m polystyrene MP by early stages of the Mediterranean mussel Mytilus galloprovincialis, and the related effects on gut clearance, feeding efficiency, morphological and transcriptional parameters involved in embryo-larval development. Uptake measurements were performed on larvae at 48 h, 3, 6 and 9 days post fertilization (pf) after

exposure to a range of 50-10,000 particles mL⁻¹. At all tested pf periods, treatments resulted in a significant and linear increase of MP uptake with increasing concentrations, though levels measured at 48 h pf were significantly lower compared to 3-9 d pf. Ingested MP were retained up to 192 h in larvae's gut, suggesting a physical impact on digestive functions. No change was noted between the consumption of microalgae Nannochloropsis oculata by larvae when administered alone or in the presence of an identical concentration (2000 items mL⁻¹) of MP. The exposure to 50-10,000 MP mL⁻¹ did not alter the morphological development of mussel embryos; however, transcriptional alterations were observed at 50 and 500 MP mL⁻¹, including the up-regulation of genes involved in shell biogenesis (extrapallial protein; carbonic anhydrase; chitin synthase) and immunomodulation (myticin C; mytilin B), and the inhibition of those coding for lysosomal enzymes (hexosaminidase; beta -glucorinidase; catepsin-L). In conclusion, though not highlighting morphological or feeding abnormalities, data from this study revealed the onset of physical and transcriptional impairments induced by MP in mussel larvae, indicating sub-lethal impacts which could increase their vulnerability toward further environmental stressors.

Capozzi, F., et al. (2018). "Evidence on the effectiveness of mosses for biomonitoring of microplastics in fresh water environment." Chemosphere **205**: 1-7.

Mosses are well known as biomonitors of fresh water for metal pollutants, but no studies were reported so far about their ability to intercept plastic particles, although this kind of pollution has become an urgent issue worldwide. In the present work, the interaction between the moss Sphagnum palustre L. cultured in vitro and polystyrene nanoparticles (NPs) was studied for the first time in a laboratory experiment, in the view of using moss transplants for detecting microplastics in fresh water environments. The ability of S. palustre to intercept and retain polystyrene, and the effects of vitality and post-exposure washing on NP retention by moss were tested. Fluorescence microscope observations showed that polystyrene NPs were retained by moss leaves in form of small (the most abundant fraction) and large aggregates. Particle count analysis highlighted that the number of particles increased while increasing the exposure time. Moreover, moss devitalization favored NP accumulation, likely because of cell membrane damages occurred in dead moss material. Post-exposure washing induced a loss of larger aggregates, suggesting that exposure time is a key point to be carefully evaluated in field conditions. These results encourage the use of S. palustre transplants for monitoring microplastics contamination of fresh water environments.

Captur, G., et al. (2016). "A T1 and ECV phantom for global T1 mapping quality assurance: The T1 mapping and ECV standardisation in CMR (T1MES) program." Journal of Cardiovascular Magnetic Resonance. Conference: 19th Annual SCMR Scientific Sessions. Los Angeles, CA United States. Conference Publication: **18**(SUPPL. 1).

Background: Myocardial T1 and extracellular volume (ECV) estimates have applications in a range of myocardial diseases. Factors responsible for systematic inaccuracies in T1 mapping are beginning to be known1-4 but little is known about its delivery at 'health-care system' scale and there is no global quality assurance (QA) system. Agarose phantoms are common in MRI and nickel ions preferred for lower temperature sensitivity5. This program aims to. 1 Create a partnership to design 1.5/3T phantoms for any manufacturer/ sequence reflecting myocardial/blood T1 pre/post-contrast. 2 Test and mass produce phantoms to regulatory standards. 3 Distribute globally. 4 Analyse serial scans to understand T1 mapping at scale. 5 Publish recipes. 6 Explore delivery of a 'T1/ECV Standard' via local calibration. We report results

of steps 1-3. Method(s): A design collaboration was created (clinicians/physicists/ regulatory bodies/SME). After identifying critical design factors (Fig 1A) and discarding models with excessive B<inf>0</inf>/B<inf>1</inf> distortion, the layout in Fig 1B was adopted. 9 tubes with differently doped agarose were embedded in a gel matrix and high-density polyethylene (HDPE) macrobeads added for B<inf>1</inf> homogeneity. Tube diameter >20 mm was needed for regions of interest to exclude Gibbs artifacts. B<inf>0</inf>/B<inf>1</inf> homogeneity was mapped to evaluate distortion. We hypothesised that dilution of dielectric permittivity by HDPE beads would reduce B<inf>1</inf> inhomogeneity. This design was compared to ones using sodium chloride (NaCl) for increased conductivity, sucrose for reduced permittivity or poly methyl-methacrylate (PMMA) microbeads. Tubes with T1 = 250-1900 ms and T2 = 45-250 ms were reproducibly manufactured and separate ranges adopted for 1.5/3T (Fig 1C). 10 Prototypes were fabricated (5 each for 1.5/3T) for gold standard measurements: T1 by inversion-recovery spin echo(IRSE, 8 inversion times, 25>3200 ms); T2 by SE(8 echo times, 10>640 ms). Prototypes were then distributed to 9 experienced/regulatory centres for further testing. Result(s): T1 maps were free from off-resonance artifacts (Fig 1D). The bottle geometry, coaxial with z and imaged transversely, showed < +/- 0.3 ppm B<inf>0</inf> uniformity (Fig 2A). HDPE beads flattened the B<inf>1</inf> field at 3T (Fig 2B) especially compared to NaCl, sucrose and PMMA beads. T1 increased with temperature (0.19-1.54% change/degreeC) while T2 decreased(-0.93-1.45% change/degreeC). Comparison of gold standard values (Fig 2C,D) between prototypes confirmed reproducible manufacturing(coefficients of variation T1 0.97/1.35%, T2 1.25/2.73% for 1.5T/3T). Recipes were submitted for regulatory approval and manufacture will be complete by Sep'15. Conclusion(s): We created a collaboration to develop CE/FDA-approved phantoms for QA of T1 and ECV protocols. 70 revised phantoms with a multi-vendor user manual are now being distributed to centres worldwide for a 1-year academic exploration of T1 mapping sequences, platform performance and stability. (Figure Presented).

Capuani, S., et al. (2013). "Spatio-temporal anomalous diffusion imaging: Results in controlled phantoms and in excised human meningiomas." Magnetic Resonance Imaging **31**(3): 359-365.

Recently, we measured two anomalous diffusion (AD) parameters: the spatial and the temporal AD indices, called gamma and alpha, respectively, by using spectroscopic pulse gradient field methods. We showed that gamma quantifies pseudo-superdiffusion processes, while alpha quantifies subdiffusion processes. Here, we propose gamma and alpha maps obtained in a controlled heterogeneous phantom, comprised of packed micro-beads in water and in excised human meningiomas. In few words, alpha maps represent the multi-scale spatial distribution of the disorder degree in the system, while gamma maps are influenced by local internal gradients, thus highlighting the interface between compartments characterized by different magnetic susceptibility. gamma maps were already obtained by means of AD stretched exponential imaging and alpha-type maps have been recently achieved for fixed rat brain with the aim of highlighting the fractal dimension of specific brain regions. However, to our knowledge, the maps representative of the spatial distribution of alpha and gamma obtained on the same controlled sample and in the same excised tissue have never been compared. Moreover, we show here, for the first time, that alpha maps are representative of the spatial distribution of the disorder degree of the system.In a first phase, gamma and alpha maps of controlled phantom characterized by an ordered and a disordered rearrangement of packed micro-beads of different sizes in water and by different magnetic susceptibility (deltachi) between beads and water were obtained. In a second phase, we investigated excised human meningiomas of different consistency.Results reported here, obtained at 9.4. T, show that alpha and gamma maps are characterized by a different image contrast. Indeed, unlike gamma maps, alpha maps are insensible to (deltachi) and they are sensible to the disorder degree of the microstructural rearrangement. These observations strongly suggest that AD indices alpha and gamma reflect some additional microstructural information which cannot be obtained using conventional diffusion methods based on Gaussian diffusion. Moreover, alpha and gamma maps obtained in excised meningiomas seem to provide more microstructural details above those obtained with conventional DTI analysis, which could be used to improve the classification of meningiomas based on their consistency. © 2013 Elsevier Inc.

Carbajal, S. (2019). "The Fight to Protect Our National Marine Sanctuaries." Sea Technology **60**(1): 14-15.

Ocean waters have helped us curb climate change impacts by absorbing harmful heat-trapping gases like carbon dioxide emissions and generating half the oxygen we breathe. However, if we do not act quickly to protect our ocean's ecosystem, we are risking the health of our entire planet. From climate change to increased plastic pollution to renewed threats of new offshore oil and gas drilling, our oceans face unprecedented challenges. Many of our oceans are experiencing rising sea levels, changes in water temperature, acidification, loss of marine mammal life and fishery declines due to increasing global temperatures. California's marine sanctuaries were the product of years of public engagement with local communities and enjoy wide support throughout California. In supporting our marine sanctuaries, we recognize that healthy sustainable ecosystems and economic growth are not mutually exclusive.

Carbery, M., et al. (2018). "Trophic transfer of microplastics and mixed contaminants in the marine food web and implications for human health." Environment International **115**: 400-409.

Plastic litter has become one of the most serious threats to the marine environment. Over 690 marine species have been impacted by plastic debris with small plastic particles being observed in the digestive tract of organisms from different trophic levels. The physical and chemical properties of microplastics facilitate the sorption of contaminants to the particle surface, serving as a vector of contaminants to organisms following ingestion. Bioaccumulation factors for higher trophic organisms and impacts on wider marine food webs remain unknown. The main objectives of this review were to discuss the factors influencing microplastic ingestion; describe the biological impacts of associated chemical contaminants; highlight evidence for the trophic transfer of microplastics and contaminants within marine food webs and outline the future research priorities to address potential human health concerns. Controlled laboratory studies looking at the effects of microplastics and contaminants on model organisms employ nominal concentrations and consequently have little relevance to the real environment. Few studies have attempted to track the fate of microplastics and mixed contaminants through a complex marine food web using environmentally relevant concentrations to identify the real level of risk. To our knowledge, there has been no attempt to understand the transfer of microplastics and associated contaminants from seafood to humans and the implications for human health. Research is needed to determine bioaccumulation factors for popular seafood items in order to identify the potential impacts on human health.

Cardozo, D. M., et al. (2011). "Immunoglobulin-like receptors (KIR) assessment on bone marrow donor and host." Bone Marrow Transplantation **1)**: S359.

The natural killer (NK) cells are one kind of lymphocytes and have a special function on immunological response. There are two principal paths: missingself and missingligand, both are used to induce alloreactivity in NK cells. Aim(s): to evaluate the alloreactivity response of NK cells based on presence or not of KIR (immunoglobulin-like receptors) and HLA genes in bone marrow donor and host. Method(s): From March 2009 to February 2010 in the Hemocentro of

University of Campinas 20 pts (patients) were assessed based on NK alloreactivity. A sample of 150 mul total blood was taken by donors' and hosts' genomic DNA, using EDTA tubes and extract by EZ-DNA Kit. The PCRSSO technique was used for genotyping HLA-A, B, C, DR, DQ, 14 KIR genes and 2 pseudogenes, besides that an agarose gel was performed to confirm the reaction. The product was hybridized with microbeads specifically designed to genes and alleles of KIR and HLA, the flow citometry technique was used to detect the beads binding on PCR product. Result(s): 20 pairs were analyzed of identical HLA, 17 AML (Acute Myeloid Leukemia) pts, 2 CML (Chronic Myeloid Leukemia) and one ALL (acute lymphoid leukemia). None of pairs had significant NK alloreactivity. However, 4 showed an haplotype KIR host type B and donor type A, HLA-C group 1 with the presence of ligands KIR2DL2/3, two had severe chronic Graft versus Host disease (GVHD) and 2 did not; 10 pts had haplotype host and donor B, HLA-C group 1 and 2 and the presence of ligands KIR2DL2/3 and KIR2DL1, 7 had severe chronic GVHD, 2 acute GVHD and 1 died for relapse; 2 pts showed haplotype host and donor B, HLA-C group 2 in the presence ligands of KIR2DL1 and one pt died for relapse; 2 pts presented haplotype donor and host B, HLA-C group 1 with ligands KIR2DL2 and had chronic GVHD; 2 pts had haplotype host B and donor A, HLA-C group 2 with ligands KIR2DL1 and the occurrence of severe chronic GVHD. Conclusion(s): More tests will be conducted to establish a correlation between KIR/HLA of donors and hosts of allogeneic bone marrow and with haploidentical donors and hosts to elucidate which influence KIR can have on the response after bone marrow transplantation.

Carey, M. J. (2011). "Intergenerational transfer of plastic debris by Short-tailed Shearwaters (Ardenna tenuirostris)." Emu Austral Ornithology **111**(3): 229-234.

Pollution of the world's oceans affects a wide variety of marine organisms and raises major conservation concerns. Ingestion of plastic debris has increased since the 1970s, particularly among the Procellariiformes, resulting in a range of lethal and sub-lethal side effects. Plastic loads (grams of plastic per bird) of adult Short-tailed Shearwaters (Ardenna tenuirostris) are well known from research in the northern hemisphere, but the amount of plastic ingested by their offspring has yet to be quantified. In this study, the stomach contents of fledgling Short-tailed Shearwaters on Phillip Island, Victoria, were analysed for plastic particles. All birds sampled contained plastic, averaging 7.6 particles per bird. The mean mass of plastic per bird was 113 mg. The most common type of plastic was user plastic, followed by industrial pellets. The birds contained a small proportion of other refuse, such as polystyrene and plastic bag. Plastics were primarily light in colour, though red and grey-black materials were also recorded. Despite a weak trend, no clear influence of ingested plastic on body condition could be demonstrated, although there was some evidence of physical damage to the gizzard. Accumulation of plastic objects in the digestive tract over time may indirectly affect the life cycle of species and their reproductive success, with long-term harm caused to populations. Data suggests that an assessment of the effect of this type of pollution on seabird welfare is urgently required.

Carlini, G. and K. Kleine (2018). "Advancing the international regulation of plastic pollution beyond the United Nations Environment Assembly resolution on marine litter and microplastics." Review of European Comparative & International Environmental Law **27**(3): 234-244.

Plastic pollution has received growing recognition as an issue of global concern, including the question of how to regulate it at the international level. Despite the existence of many instruments relevant to marine plastic litter, there is no international agreement that focuses primarily on combating plastic pollution. While the annual global rate of plastic production is growing, no international instrument is addressing plastic across its full life cycle, from production to consumption to disposal. This article describes the role of the United Nations

Environment Assembly (UNEA) and the evolution of its resolutions on marine plastic pollution. UNEA's latest resolution on marine litter and microplastics is paving the way for the global community to improve the current international framework and address the 'plastic crisis'. This opens questions on the approach and scope of a new framework. The article suggests that framing the problem as one of 'marine litter' limits the scope of possible solutions to waste management. Reframing the subject from a marine litter problem to a broader plastic pollution issue presents an opportunity to develop a comprehensive approach and, therefore, a more effective global framework that encompasses not only plastic litter, but also the reduction of plastic production and consumption. [ABSTRACT FROM AUTHOR]

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Carnes, R. M. (1989). "Robotics and plastic media, the ultimate way to remove coatings from aerospace vehicles." Technical Paper - Society of Manufacturing Engineers. MS: var paging MS89-131.

Previously, chemicals were the only method to strip coatings from aircraft. They have posed environmental, health, facility and aircraft (hydrogen embrittlement and accelerated corrosion) problems. Plastic media stripping was developed by the U.S.A. Air Force and has now eliminated the chemical negatives. This process of ejecting small angular inert plastic particles against painted surfaces to micro-fracture and remove coatings is very operator sensitive and dependent. Thus, damage to thin skins (.040 and below) from media induced energy saturation is possible. Robotics with vision control of the plastic media parameters eliminates potential damage and is more cost-effective than laborers.

Carney, M. J. and J. H. Fearncombe (1998). "Opportunities and Challenges for Reusable Plastic Containers." Resource Recycling **17**(10): 17.

Although reusable plastic shipping containers (RPSCs) have been considered by many shippers, most are hesitant to replace their current shipping practices, given the absence of information on costs and performance. A marketing study commissioned by the American Plastics Council examined market opportunities and hurdles within four sectors. These sectors: automotives, fresh poultry, fresh produce, and plastic resin, were selected because they are considered conducive to using RPSCs. Almost 100 million RPSCs would be required to meet the needs of these four markets, with a 25% annual replacement rate. This would consume 240 million pounds of resin. The use of RPSCs would divert 1.35 million tons of waste annually. The relative acceptance of RPSCs in each of these markets is reviewed.

Carol, D., et al. (2012). "Synergistic effect of calcium stearate and photo treatment on the rate of biodegradation of low density polyethylene spent saline vials." Indian Journal of Experimental Biology **50**(7): 497-501.

The biodegradation of spent saline bottles, a low density polyethylene product (LDPE) by two selected Arthrobacter sp. under in vitro conditions is reported. Chemical and UV pretreatment play a vital role in enhancing the rate of biodegradation. Treated LDPE film exhibits a higher weight loss and density when compared to untreated films. Arthrobacter oxydans and Arthrobacter globiformis grew better in medium containing pretreated film than in medium containing untreated film. The decrease in density and weight loss of LDPE was also more for

pretreated film when compared to untreated film indicating the affect of abiotic treatment on mechanical properties of LDPE. The decrease in the absorbance corresponding to carbonyl groups and double bonds that were generated during pretreatment suggest that some of the double bonds were cut by Arthrobacter species. Since Arthrobacter sp. are capable of degrading urea, splitting of urea group were also seen in FTIR spectrum indicating the evidence of biodegradation after microbial incubation. The results indicated that biodegradation rate could be enhanced by exposing LDPE to calcium stearate (a pro-oxidant) which acts as an initiator for the oxidation of the polymers leading to a decrease of molecular weight and formation of hydrophilic group. Therefore, the initial step for biodegradation of many inert polymers depends on a photo-oxidation of those polymers. The application in sufficient details with improved procedures utilizing recombinant microorganism with polymer degradation capacity can lead to a better plastic waste management in biomedical field. The present plastic disposal trend of waste accumulation can be minimized with this promising eco-friendly technique.

Caron, A. G. M., et al. (2018). "Ingestion of microplastic debris by green sea turtles (Chelonia mydas) in the Great Barrier Reef: Validation of a sequential extraction protocol." Marine Pollution Bulletin **127**: 743.

Ocean contamination by plastics is a global issue. Although ingestion of plastic debris by sea turtles has been widely documented, contamination by microplastics (< 5 mm) is poorly known and likely to be under-reported. We developed a microplastic extraction protocol for examining green turtle (Chelonia mydos) chyme, which is multifarious in nature, by modifying and combining pre-established methods used to separate microplastics from organic matter and sediments. This protocol consists of visual inspection, nitric acid digestion, emulsification of residual fat, density separation, and chemical identification by Fourier transform infrared spectroscopy. This protocol enables the extraction of polyethylene, high-density polyethylene, (aminoethyl) polystyrene, polypropylene, and polyvinyl chloride microplastics > 100 \im. Two macroplastics and seven microplastics (two plastic paint chips and five synthetic fabric particles) were isolated from subsamples of two green turtles. Our results highlight the need for more research towards understanding the impact of microplastics on these threatened marine reptiles.

Caron, A. G. M., et al. (2018). "Validation of an optimised protocol for quantification of microplastics in heterogenous samples: A case study using green turtle chyme." MethodsX **5**: 812-823.

Quantifying the extent of microplastic (<5mm) contamination in the marine environment is an emerging field of study. Reliable extraction of microplastics from the gastro-intestinal content of marine organisms is crucial to evaluate microplastic contamination in marine fauna. Extraction protocols and variations thereof have been reported, however, these have mostly focussed on relatively homogenous samples (i.e. water, sediment, etc.). Here, we present a microplastic extraction protocol for examining green turtle (Chelonia mydas) chyme (i.e. ingested material and digestive tract fluid), which is a heterogeneous composite of various organic dietary items (e.g. seagrass, jellyfish) and incidentally-ingested inorganic materials (sediment). Established extraction methods were modified and combined. This protocol consists of acid digestion of organic matter, emulsification of residual fat, density separation from sediment, and chemical identification by Fourier transform-infrared spectroscopy. This protocol enables the extraction of the most common microplastic contaminants>100mum: polyethylene, high-density polyethylene, (aminoethyl) polystyrene, polypropylene, and polyvinyl chloride, with 100% efficiency. This validated protocol will enable researchers worldwide to quantify microplastic contamination in turtles in a reliable and comparable way. *Optimization of microplastic

extraction from multifarious tissues by applying established methods in a sequential manner.*Effective for heterogenous samples comprising organic and inorganic material.

Carpenter, E. J. and K. L. Smith, Jr. (1972). "Plastics on the Sargasso sea surface." Science **175**(4027): 1240-1241.

Plastic particles, in concentrations averaging 3500 pieces and 290 grams per square kilometer, are widespread in the western Sargasso Sea. Pieces are brittle, apparently due to the weathering of the plasticizers, and many are in a pellet shape about 0.25 to 0.5 centimeters in diameter. The particles are surfaces for the attachment of diatoms and hydroids. Increasing production of plastics, combined with present waste-disposal practices, will undoubtedly lead to increases in the concentration of these particles. Plastics could be a source of some of the polychlorinated biphenyls recently observed in oceanic organisms.

Carpentier, B., et al. (2008). (OP 234) Production of Bone Substitutes Within Bioreactor-Based Systems: Modeling and Culture of Preosteoblastic Cells, Mary Ann Liebert, Inc. Publishers, 140 Huguenot St 3rd Fl New Rochelle NY 10801 USA. **14:** 770.

Aim: Our project aims at developing a bioreactor-based device dedicated to the production of bone substitutes ex vivo, by combining bone marrow stem cells and biomaterials. The goal of this study is to better characterize the flow and the mechanical stimuli to which the cells are exposed within such systems by means of computational fluid dynamics software, and to identify the appropriate configuration for culturing bone cells on micro-particles. Methods: Modeling software (Gambit, TGrid and Fluent) was used to determine fluid velocity, static pressure and shear stresses, parameters that may greatly impact cell proliferation and differentiation. In parallel, preosteoblastic cells (MC3T3-E1) were seeded and cultured dynamically on glass microbeads. Three bio-reactor configurations were investigated: vertically and horizontally positioned packed beds, fluidized beds as well as monolayers of beads within plane-parallel chambers. Cell survival and proliferation rates were determined by cell counting. Cell distribution and morphology were evaluated using ESEM and methylene blue staining. The experimental data were subsequently correlated to the numerical simulations. Results: The fluidic environment could be investigated. A patent effect of bioreactor configuration was observed on both survival and proliferation of preosteoblastic cells. Horizontally positioned packed beds and monolayers of beads lead to the best results in terms of cell survival and proliferation. Conclusion: Computational fluid dynamics is a valuable tool to better comprehend the effect of dynamic culture on cells and to determine the optimal experimental conditions required to produce bone substitutes. Monolayers seem to represent an appropriate configuration for culturing bone cells on micro-particles.

Carpino, G., et al. (2014). "Evidence for multipotent endodermal stem/progenitor cell populations in human gallbladder." Journal of Hepatology **60**(6): 1194-1202.

BACKGROUND & AIMS: Multipotent stem/progenitor cells are found in peribiliary glands throughout human biliary trees and are able to generate mature cells of hepato-biliary and pancreatic endocrine lineages. The presence of endodermal stem/progenitors in human gallbladder was explored.

METHODS: Gallbladders were obtained from organ donors and laparoscopic surgery for symptomatic cholelithiasis. Tissues or isolated cells were characterized by immunohistochemistry and flow cytometry. EpCAM+ (Epithelial Cell Adhesion Molecule) cells were immunoselected by magnetic microbeads, plated onto plastic in self-replication conditions and subsequently transferred to distinct serum-free, hormonally defined media tailored for differentiation to specific adult fates.

In vivo studies were conducted in an experimental model of liver cirrhosis.
RESULTS: The gallbladder does not have peribiliary glands, but it has stem/progenitors organized instead in mucosal crypts. Most of these can be isolated by immune-selection for EpCAM. Approximately 10% of EpCAM+ cells in situ and of immunoselected EpCAM+ cells co-expressed multiple pluripotency genes and various stem cell markers; other EpCAM+ cells qualified as progenitors. Single EpCAM+ cells demonstrated clonogenic expansion ex vivo with maintenance of stemness in self-replication conditions. Freshly isolated or cultured EpCAM+ cells could be differentiated to multiple, distinct adult fates: cords of albumin-secreting hepatocytes, branching ducts of secretin receptor+ cholangiocytes, or glucose-responsive, insulin/glucagon-secreting neoislets. EpCAM+ cells transplanted in vivo in immune-compromised hosts gave rise to human albumin-producing hepatocytes and to human Cytokeratin7+ cholangiocytes occurring in higher numbers when transplanted in cirrhotic mice.
CONCLUSIONS: Human gallbladders contain easily isolatable cells with phenotypic and biological properties of multipotent, endodermal stem cells.

Carr, S. A., et al. (2016). "Transport and fate of microplastic particles in wastewater treatment plants." Water Research **91**: 174-182.
Municipal wastewater treatment plants (WWTPs) are frequently suspected as significant point sources or conduits of microplastics to the environment. To directly investigate these suspicions, effluent discharges from seven tertiary plants and one secondary plant in Southern California were studied. The study also looked at influent loads, particle size/type, conveyance, and removal at these wastewater treatment facilities. Over 0.189 million liters of effluent at each of the seven tertiary plants were filtered using an assembled stack of sieves with mesh sizes between 400 and 45 mum. Additionally, the surface of 28.4 million liters of final effluent at three tertiary plants was skimmed using a 125 mum filtering assembly. The results suggest that tertiary effluent is not a significant source of microplastics and that these plastic pollutants are effectively removed during the skimming and settling treatment processes. However, at a downstream secondary plant, an average of one micro-particle in every 1.14 thousand liters of final effluent was counted. The majority of microplastics identified in this study had a profile (color, shape, and size) similar to the blue polyethylene particles present in toothpaste formulations. Existing treatment processes were determined to be very effective for removal of microplastic contaminants entering typical municipal WWTPs.

Carrasco, A., et al. (2019). "The influence of microplastics pollution on the feeding behavior of a prominent sandy beach amphipod, Orchestoidea tuberculata (Nicolet, 1849)." Marine Pollution Bulletin **145**: 23-27.
Pollution by microplastics has become a global threat affecting coastal habitats such as sandy beaches and their resident macrofauna. The goal of this study was to assess the influence of microplastics on the feeding behavior and growth rate of a widespread sandy beach amphipod, Orchestoidea tuberculata. These organisms were exposed to artificial food prepared with Poly(styrene-co-divinylbenzene) microspheres (8 micro m particle size) at 3 different concentrations (0%, 5% and 10%). The amphipods consumed significantly more food when the concentration of microplastics was 0% and significantly less when the concentration was 10%, both in trials in which they had a choice (preference experiments) and those in which they did not have a food choice. In contrast to this, the amphipod's absorption efficiency and estimated growth rates were not significantly affected by the concentration of microplastics. Combined, these results indicate that high microplastics concentrations (e.g. 10%) cause a reduction in the amphipod's consumption rates and, indirectly, may affect the role of this species as a main

consumer of stranded seaweeds in sandy beaches ecosystems.

Carreras-Colom, E., et al. (2018). "Spatial occurrence and effects of microplastic ingestion on the deep-water shrimp Aristeus antennatus." Marine Pollution Bulletin **133**: 44-52.

Microplastic (MP) ingestion has been reported in a wide variety of organisms, however, its spatial occurrence and effects on wild populations remain quite unknown. The present study targets an economically and ecologically key species in the Mediterranean Sea, the shrimp Aristeus antennatus. 39.2% of the individuals sampled had MP in their stomachs, albeit in areas close to Barcelona city the percentage reached values of 100%. Overall, MP ingestion was confirmed in a wide spatial and depth (630-1870 m) range, pointing out the great dispersion of this pollutant. The benthophagous diet and close relationship with the sea bottom of A. antennatus might enhance MP exposure and ultimately lead to accidental ingestion. Detailed analysis of shrimps' diet revealed that individuals with MP had a higher presence of endobenthic prey. Microplastic fibers are probably retained for long periods due to stomach's morphology, but no negative effects on shrimp's biological condition were observed.

Carrère-Kremer, S., et al. (2016). "High IFN-γ Release and Impaired Capacity of Multi-Cytokine Secretion in IGRA Supernatants Are Associated with Active Tuberculosis." PLoS ONE **11**(9).

Interferon gamma (IFN-γ) release assays (IGRAs) detect Mycobacterium tuberculosis (Mtb) infection regardless of the active (ATB) or latent (LTBI) forms of tuberculosis (TB). In this study, Mtb-specific T cell response against region of deletion 1 (RD1) antigens were explored by a microbead multiplex assay performed in T-SPOT TB assay (T-SPOT) supernatants from 35 patients with ATB and 115 patients with LTBI. T-SPOT is positive when over 7 IFN-γ secreting cells (SC)/250 000 peripheral blood mononuclear cells (PBMC) are enumerated. However, over 100 IFN-γ SC /250 000 PBMC were more frequently observed in the ATB group compared to the LTBI group. By contrast, lower cytokine concentrations and lower cytokine productions relative to IFN-γ secretion were observed for IL 4, IL-12, TNF-α, GM-CSF, Eotaxin and IFN-α when compared to LTBI. Thus, high IFN-γ release and low cytokine secretions in relation with IFN-γ production appeared as signatures of ATB, corroborating that multicytokine Mtb-specific response against RD1 antigens reflects host capacity to contain TB reactivation. In this way, testing cytokine profile in IGRA supernatants would be helpful to improve ATB screening strategy including immunologic tests.

Carrieri, C., et al. (2012). "Red blood cells stimulate fibrinolysis." Blood Transfusion **4)**: s140.

Background It has recently been shown that red blood cells (RBC) confer lytic resistance to clots derived from purified fibrinogen, which is in contrast with some older studies. Here, we investigated the effect of RBC on fibrinolysis under more physiological conditions. Materials and Methods Washed RBC (10-40% v/v) were added to plasminogen-containing fibrinogen (3 mg/mL) or autologous plasma. Following t-PA addition (20-150 ng per mL of extracellular volume) clotting was induced by $CaCl_2$- thrombin or $CaCl_2$-tissue factor (TF). Fibrinolysis was evaluated by thromboelastography (lysis time) or by the release of FITC-labeled FDPs (% lysis). Results When clots were prepared from purified fibrinogen, RBC inhibited fibrinolysis in a concentration-dependent manner (33% lysis time prolongation at 40% RBC). The effect disappeared in the presence of the GPIIb/IIIa inhibitor abciximab but not when the TAFIa inhibitor PTCI was added. On the contrary, when clots were prepared from plasma, RBC accelerated fibrinolysis (21% lysis time reduction at 40% RBC). The effect of RBC on clot lysis was: 1) concentration-dependent; 2) maintained in the presence of platelets (3x105/uL); 3) insensitive to abciximab; 4) abolished by PTCI, suggesting a TAFI-mediated mechanism.

Replacement of RBC with 40% (v/v) polystyrene microbeads (6 um diameter) did not appreciably influence clot lysis, ruling out an effect due to volume occupancy. Qualitatively similar results were obtained with FITC-fibrinogen clot lysis model. Thrombin generation (two-stage clotting assay) and accumulation of TAFIa (ELISA) in defibrinated plasma activated with TF-Ca++ were 63% and 27% higher in the presence of 40% RBC. However, by functional assay (using fibrin as substrate) the amount of TAFIa activity detected in RBC-containing plasma was 30% lower than in cell-free plasma, suggesting that RBC inhibit TAFIa activity (towards fibrin). Conclusions These data unveil a new function of RBC and underscore the potential role of these cells in fibrinolysis modulation.

Carroll, A. D., et al. (2002). "Label dilution method: a novel tool for bioligand interaction studies using bead injection in the lab-on-valve format." Analyst **127**(9): 1228-1232.

This work introduces a novel method, label dilution, which is analogous to the well-established isotope dilution method. The principle is tested on a model system of commercially available antibodies and protein-coated Sepharose beads and implemented using micro-bead injection in the lab-on-valve format. This micro-scale method uses a labeled form of the target molecule as an internal standard. Label dilution employs ratiometric measurements using the absorbance signals from the label and the target molecules for quantitative determination of an analyte. The label dilution method is shown to discriminate between selective and non-selective binding and provides a means for monitoring bioligand interactions in real time. With a detection limit of 470 ng of IgG, this method provides a sensitive, automated technique for the determination of low-level analytes in complex samples. This technique has been developed with the aim of using it to facilitate diabetes research in which the interactions between autoantibodies and the molecules they target are a central focus.

Carson, H. S. (2013). "The incidence of plastic ingestion by fishes: from the prey's perspective." Marine Pollution Bulletin **74**(1): 170-174.

One of the primary threats to ocean ecosystems from plastic pollution is ingestion by marine organisms. Well-documented in seabirds, turtles, and marine mammals, ingestion by fish and sharks has received less attention until recently. We suggest that fishes of a variety of sizes attack drifting plastic with high frequency, as evidenced by the apparent bite marks commonly left behind. We examined 5518 plastic items from random plots on Kamilo Point, Hawai'i Island, and found 15.8% to have obvious signs of attack. Extrapolated to the entire amount of debris removed from the 15 km area, over 1.3 tons of plastic is attacked each year. Items with a bottle shape, or those blue or yellow in color, were attacked with a higher frequency. The triangular edges or punctures left by teeth ranged from 1 to 20 mm in width suggesting a variety of species attack plastic items. More research is needed to document the specific fishes and rates of plastic ingestion.

Carson, H. S., et al. (2011). "Small plastic debris changes water movement and heat transfer through beach sediments." Marine Pollution Bulletin **62**(8): 1708-1713.

We investigated the physical properties of beaches contaminated with plastic fragments. We compared sediment cores from Hawai'i Island's Kamilo Beach, notable for plastic accumulation, to cores from a nearby beach. Compared to the nearby beach, Kamilo sediments contained more plastics (up to 30.2% by weight), were coarser-grained, and were more permeable (t-test, $p < 0.0001$). 85% of the fragments were polyethylene, and 95% were concentrated in the top 15 cm of the cores. We constructed artificial cores of standardized grain size and varying plastic-to-sediment ratios. Adding plastic significantly increased the permeability (ANOVA, p=

0.002), which was partially attributed to the fragments increasing the mean grain size. Sediments with plastic warmed more slowly (16% maximum decrease in thermal diffusivity), and reached lower maximum temperatures (21% maximum increase in heat capacity). These changes have a variety of potential effects on beach organisms, including those with temperature-dependent sex-determination such as sea turtle eggs. © 2011 Elsevier Ltd.

Carson, H. S., et al. (2013). "The plastic-associated microorganisms of the North Pacific Gyre." Marine Pollution Bulletin **75**(1-2): 126-132.

Microorganisms likely mediate processes affecting the fate and impacts of marine plastic pollution, including degradation, chemical adsorption, and colonization or ingestion by macroorganisms. We investigated the relationship between plastic-associated microorganism communities and factors such as location, temperature, salinity, plankton abundance, plastic concentration, item size, surface roughness, and polymer type. Small plastic items from the surface of the North Pacific Gyre in 2011 were examined using scanning electron microscopy. Bacillus bacteria (mean 1664 +/- 247 individuals mm(-2)) and pennate diatoms (1097 +/- 154 mm(-2)) were most abundant, with coccoid bacteria, centric diatoms, dinoflagellates, coccolithophores, and radiolarians present. Bacterial abundance was patchy, but increased on foamed polystyrene. Diatom abundance increased on items with rough surfaces and at sites with high plastic concentrations. Morphotype richness increased slightly on larger fragments, and a biogeographic transition occurred between pennate diatom groups. Better characterizing this community will aid in understanding how it interacts with plastic pollution.

Carter, J. A. (2006). "The reuse of breathing systems in anesthesia." Respiratory Care Clinics of North America **12**(2): 275-286.

The cheap manufacture of plastics compared with the relatively expensive labor-intensive cost of decontaminating medical equipment encourages the use of disposable single-use equipment. Although the manufacture and disposal of single-use equipment superficially would seem to have more environmental impact than reusable equipment, the processes of cleaning and decontaminating reusable items may impose an even greater cost on the environment. In a recent study at two United States hospitals, anesthetic tubing accounted for less than 10% of medical waste, about half the amount of the plastic waste generated by the cafeterias at the same two hospitals [34]. There may be a higher cost to the organization by using single-use breathing systems. One United States institution has estimated that changing from single-use to re-usable breathing systems, with a new filter for each patient, resulted in savings in initial cost and waste disposal of more than Dollars 100,000 per year [20]. In the light of current knowledge concerning infective agents, reusing breathing systems for up to 1 week with a new appropriate filter for each new patient seems to be safe practice, provided the manufacturer of the breathing system recommends such use, and the breathing system is carefully checked before each new patient. [References: 34]

Carter, J. M., et al. (2016). "Rapid, multiplexed characterization of Shiga toxin-producing Escherichia coli (STEC) isolates using suspension array technology." Frontiers in Microbiology **7**(May).

Molecular methods have emerged as the most reliable techniques to detect and characterize pathogenic Escherichia coli. These molecular techniques include conventional single analyte and multiplex PCR, PCR followed by microarray detection, pulsed-field gel electrophoresis (PFGE), and whole genome sequencing. The choice of methods used depends upon the specific needs of the particular study. One versatile method involves detecting serogroup-specific markers by hybridization or binding to encoded microbeads in a suspension array. This molecular serotyping method has been developed and adopted for investigating E. coli outbreaks. The major advantages of this technique are the ability to simultaneously serotype E. coli and detect the presence of virulence and pathogenicity markers. Here, we describe the development of a family of multiplex molecular serotyping methods for Shiga toxin-producing E. coli, compare their performance to traditional serotyping methods, and discuss the cost-benefit balance of these methods in the context of various food safety objectives.

Cartes, J. E., et al. (2016). "Contributions of allochthonous inputs of food to the diets of benthopelagic fish over the northwest Mediterranean slope (to 2300m)." Deep Sea Research (Part I, Oceanographic Research Papers) **109**: 123-136.

The contributions of allochthonous inputs of food (food falls, plastics and other anthropogenic remains) in the diets of large fish (6 teleosteans, 3 sharks) were analyzed for depths between 500 and 2300m in the deep Balearic basin (western Mediterranean). The analyses were based on gut contents. The identification was based on a multi-analytic approach, comprising morphological features (including morphometric analysis) and molecular genetics (DNA barcoding method). Remains of a number of anthropogenic, inorganic materials (microplastic fibres, plastic bags and cartons) appeared regularly in the guts of deep-sea fish (e.g., in Trachyrhynchus scabrus and Mora moro), though always at low occurrence (9.1% of fish at most) and negligible weights (< 2%W of diet). In our sampling, covering an area of ca. 12km2, large food falls contribute only a little to fish diets by weight, W, e.g., in shark diets they represented 4.5%W for Centroscymnus coelolepis and 11%W for Galeus melastomus. However, the importance of food falls (e.g., cetacean blubber and carcharhinid shark remains) was substantial locally (up to 70.8%W of C. coelolepis diet) particularly near canyons. The arrival of livestock remains (beef flesh, goat ribs and vertebrae) was shown by molecular analyses to contributed to deep-sea shark diets (ca. 5.5%W) comparably to natural food falls. These remains, which originate from human activity, may locally alter the food webs of oligotrophic environments like that of the deep Mediterranean. Food falls of both natural and anthropogenic origin were mainly found in fish collected close to canyon axes. The only cetacean fall documented in the deep Balearic Basin was also near a canyon, the carcass of a small (ca. 1.2m) striped dolphin, Stenella coeruleoalba, collected in a haul at 1750m off Barcelona.

Cartraud, A. E., et al. (2019). "Plastic ingestion in seabirds of the western Indian Ocean." Marine Pollution Bulletin **140**: 308-314.

We investigated seabird plastic ingestion in the western Indian Ocean by analyzing the stomach contents of 222 individuals belonging to nine seabird species (including two endangered species endemics to Reunion Island). The most affected species were tropical shearwaters (79%) and Barau's petrels (59%). The average number of plastic particles per contaminated bird was higher in Barau's petrels (6.10 +/- 1.29) than in tropical shearwaters (3.84 +/- 0.59). All other studied species also showed plastic presence in their stomach contents. The mass of plastic particles was significantly higher both in juvenile's Barau's petrels and tropical shearwaters than in adults. These results demonstrate the foraging areas of seabirds of the western Indian Ocean have a high level of plastic pollution. In Reunion Island, hundreds of tropical shearwaters and Barau's petrels are attracted by urban lights and die each year. We suggest taking advantage of this situation by using these species as long-term indicators of plastic marine pollution in the region. Copyright © 2019 Elsevier Ltd

Cartwright, M., et al. (2016). "A Broad-Spectrum Infection Diagnostic that Detects Pathogen-Associated Molecular Patterns (PAMPs) in Whole Blood." EBioMedicine **9**: 217-227.

BACKGROUND: Blood cultures, and molecular diagnostic tests that directly detect pathogen DNA in blood, fail to detect bloodstream infections in most infected patients. Thus, there is a need for a rapid test that can diagnose the presence of infection to triage patients, guide therapy, and decrease the incidence of sepsis.

METHODS: An Enzyme-Linked Lectin-Sorbent Assay (ELLecSA) that uses magnetic microbeads coated with an engineered version of the human opsonin, Mannose Binding Lectin, containing the Fc immunoglobulin domain linked to its carbohydrate recognition domain (FcMBL) was developed to quantify pathogen-associated molecular patterns (PAMPs) in whole blood. This assay was tested in rats and pigs to explore whether it can detect infections and monitor disease progression, and in prospectively enrolled, emergency room patients with suspected sepsis. These results were also compared with data obtained from non-infected patients with or without traumatic injuries.

RESULTS: The FcMBL ELLecSA was able to detect PAMPS present on, or released by, 85% of clinical isolates representing 47 of 55 different pathogen species, including the most common causes of sepsis. The PAMP assay rapidly (<1h) detected the presence of active infection in animals, even when blood cultures were negative and bacteriocidal antibiotics were administered. In patients with suspected sepsis, the FcMBL ELLecSA detected infection in 55 of 67 patients with high sensitivity (>81%), specificity (>89%), and diagnostic accuracy of 0.87. It also distinguished infection from trauma-related inflammation in the same patient cohorts with a higher specificity than the clinical sepsis biomarker, C-reactive Protein.

CONCLUSION: The FcMBL ELLecSA-based PAMP assay offers a rapid, simple, sensitive and specific method for diagnosing infections, even when blood cultures are negative and antibiotic therapy has been initiated. It may help to triage patients with suspected systemic infections, and serve as a companion diagnostic to guide administration of emerging dialysis-like sepsis therapies.

Caruso, G. (2019). "Microplastics as vectors of contaminants." Marine Pollution Bulletin **146**: 921-924.

Pollution by microplastics and antibiotics is an emerging environmental, human and animal health threat. In spite of several studies documenting the widespread occurrence of plastic debris in aquatic ecosystems, research focusing on occurrence and concentration of biological and chemical contaminants attached on microplastic surface as well as on possible interactions of these contaminants with microplastics is still at its beginning. The present note addresses the role of microplastics as vectors of contaminants in water bodies, stressing the need for future investigations on this hot topic.

Caruso, G., et al. (2018). "Effects of microplastics on trophic parameters, abundance and metabolic activities of seawater and fish gut bacteria in mesocosm conditions." Environmental Science and Pollution Research **25**(30): 30067-30083.

Plastic pollution is an emerging threat with severe implications on animals' and environmental health. Nevertheless, interactions of plastic particles with both microbial structure and metabolism are a new research challenge that needs to be elucidated yet. To improve knowledge on the effects played by microplastics on free-living and fish gut-associated microbial community in aquatic environments, a 90-day study was performed in three replicated mesocosms (control-CTRL, native polyvinyl chloride-MPV and weathered polyvinyl chloride-MPI), where sea bass specimens were hosted. In CTRL mesocosm, fish was fed with no-plastic-added food, whilst in MPV and MPI food was supplemented with native or exposed to polluted waters polyvinylchloride pellets, respectively. Particulate organic carbon (POC) and nitrogen, total and culturable bacteria, extracellular enzymatic activities, and microbial community substrate utilization profiles were analyzed. POC values were lower in MPI than MPV and CRTL mesocosms. Microplastics did not affect severely bacterial metabolism, although enzymatic activities decreased and microbes utilized a lower number of carbon substrates in MPI than MPV and CTRL. No shifts in the bacterial community composition of fish gut microflora were observed by denaturing gradient gel electrophoresis fingerprinting analysis.

Carvalheiro, V. (2009). "Particles and gel foam." CardioVascular and Interventional Radiology **2)**: 163.

Embolotherapy is an evolving field of interventional radiology in which occlusive agents play a major role. The choice of the optimal occlusive agent is of utmost importance for planning an embolization procedure. Particles are the most commons agents used for small vessel permanent distal occlusions. Traditional amorphous polyvinyl alcohol (PVA) is an inert injectable plastic particle of 45 to 1180 mum, which incites an inflammatory reaction, rendering it highly thrombogenic. Supplied as a dry coarse powder, PVA particles must be suspended in contrast medium or saline before injection through the delivery catheter. Clumping is a common problem when using the amorphous form of PVA. Particle size poorly matched to a chosen catheter can lead to catheter occlusion. PVA particles are difficult to calibrate and their behavior can be unpredictable during embolization, which leads to difficulties when performing targeted embolization^{1,2}. Calibrated microspheres have drastically changed the conditions of embolization since the radiologist may adapt the size of microspheres to the size of the vessels to be occluded, so that an accurate targeting can be obtained. Extruded PVA (Contour SE Microspheres, Boston Scientific) is regular in shape and it is slightly compressible when injected through a catheter³. Embosphere Microspheres are particles made of trisacryl gelatin, perfectly round and slightly compressible, delivered suspended in an aqueous solution. This product is colorless and radiolucent and must be mixed with a contrast medium before injection⁴. BeadBlock (Biocompatibles UK) microspheres are another small embolic particle made from PVA hydrogel. They are hydrophilic and compressible, decreasing the risk of clumping. Unlike amorphous PVA or spherical PVA, BeadBlock is suspended in sterile water in prepackaged syringes⁵. Gelatin sponge particles are agents used for small or large vessel temporary occlusions. Gelfoam is a water-insoluble hemostatic agent prepared from purified skin gelatin. The potential to induce the clotting cascade results from the close contact of the platelets when entrapped in the porous gelatin sponge. The overall use of gelfoam is related to its temporary effect and then attempted mainly either to stop a bleeding or to devascularize a lesion before surgical removal⁶. Gelfoam has been used in a variety of clinical indications, such as trauma, gastrointestinal bleeding, postpartum hemorrhage⁷, and also preoperative tumor embolization, including uterine artery embolization for fibroids⁸ and portal vein embolization to induce hepatic hypertrophy of one lobe before surgical resection of the other lobe⁹.

Casale, C., et al. (2014). "Realization a complex skin equivalent tissue." Journal of Investigative Dermatology **2)**: S50.

The aim of this work is the realization of a three-dimensional human skin equivalent tissue (3DHSE) completely made up by endogenous extra cellular matrix (ECM). The realization of 3D-HSE has been pursued by means of a bottom-up tissue engineering strategy that firstly comprises the fabrication of functional micro-metric tissue precursors (mTPs) through dynamic seeding of fibroblasts on biodegradable porous microbeads with a controlled and tunable degradation rate. Then mTPs have been assembled in a 3D dermis tissue and the epidermal cells are lastly seeded on the top of dermal equivalent. In the development of epithelial stratum is important to maintein the culture submerged to allow complete epidermal cells coverage, melanocytes organization along epidermal basal membrane and early keratinocytes

stratification, and later raising the developing culture to the air-liquid interface thus promoting epidermal differentiation. Epidermal differentiation markers have been investigated by means of the immunofluorescence analysis while collagen was assesses by multiphoton microscopy analysis. The functional endogenous dermis has a crucial role in the morphogenesis of a pluristratified epidermis. Transmission electron microscopy well show the fine structure of the dermal-epidermal junction confirming that epidermal layer is well anchored to the dermis. Moreover dermis-epidermis cross-talking is guaranteed as proved by the presence of basal membrane and this structure has a characteristic rete ridge morphology with typical epidermis appendages going deep through the underlying dermis resembling bulge-like structure. In view of its complexity, this skin model can be specifically used for tackling various problems in the chemical/ pharmaceutical and cosmetics industry. Since an endogenous ECM is present it is possible to study not only the cellular response but also the ECM response in terms of change in assembly as well as composition to a drug.

Cascone, S., et al. (2020). "Energy and environmental assessment of plastic granule production from recycled greenhouse covering films in a circular economy perspective." Journal of Environmental Management **254**: 109796.

Plastic films can be considered as a high-value auxiliary material in agriculture with multiple important uses to fulfil, including covering films in greenhouse cultivation system. Such an application enables several benefits and, therefore, it is going through an important upsurge, especially in regions where protected crop cultivation is highly widespread. However, the increased demand for these covering films arouses concerns for their post-use treatment with regard to both the consumption of Non-Renewable Primary Energy (NRPE) resources and the emission of Greenhouse Gases (GHGs). Therefore, environmental analysis is needed to find and follow cleaner paths for the management and treatment of this kind of Agricultural Plastic Waste (APW), especially in the light of the gap currently existing in the specialised literature. In this context, this paper reports upon findings from a combined Life Cycle Assessment (LCA) of single environmental issues (i.e., energy and water consumption, and GHG emissions) applied to a Sicilian firm, representative of APW collection and recycling to obtain Low-Density Polyethylene (LDPE) granules. The results showed that electricity consumption for the whole recycling process is the most NRPE resource demanding and the most GHG emitting input item. Moreover, the washing phase of disused covering films is the highest water demanding within the recycling process. Potential improvements could be achieved by shifting from fossil energy source to renewable one. The installation of a wind power plant would lead to around 56% and 85% reduction in NRPE resource exploitation and GHG emission, respectively. Finally, despite the huge consumption of water and NRPE resources and the resulting GHG emissions, the production of recycled-LDPE granules is far more sustainable than the virgin counterpart.

Caserta, S., et al. (2008). "Synthetic CD4⁺ T cell-targeted antigen-presenting cells elicit protective antitumor responses." Cancer Research **68**(8): 3010-3018.

CD4⁺ helper T cells are critical for protective immune responses and yet suboptimally primed in response to tumors. Cell-based vaccination strategies are under evaluation in clinical trials but limited by the need to derive antigenpresenting cells (APC) from patients or compatible healthy donors. To overcome these limitations, we developed CD4⁺ T cell-targeted synthetic microbead-based artificial APC (aAPC) and used them to activate CD4⁺ T lymphocytes specific for a tumor-associated model antigen (Ag) directly from the naive repertoire. In vitro, aAPC specifically primed Ag-specific CD4⁺ T cells that were activated to express high levels of CD44, produced mainly interleukin 2, and could differentiate into Th1-ike or Th2-like cells in combination with polarizing cytokines. I.v. administration of aAPC led to Ag-specific CD4⁺ T-cell activation and proliferation in secondary lymphoid organs, conferred partial protection against subcutaneous tumors, and prevented the establishment of lung metastasis. Taken together, our data support the use of cell-free, synthetic aAPC as a specific and versatile alternative to expand peptide-specific CD4⁺ T cells in adoptive and active immunotherapy. ©2008 American Association for Cancer Research.

Castaneda, R. A., et al. (2014). "Microplastic pollution in St. Lawrence river sediments." Canadian Journal of Fisheries and Aquatic Sciences **71**(12): 1767-1771.

Although widely detected in marine ecosystems, microplastic pollution has only recently been documented in freshwater environments, almost exclusively in surface waters. Here, we report microplastics (polyethylene microbeads, 0.40-2.16 mm diameter) in the sediments of the St. Lawrence River. We sampled 10 freshwater sites along a 320 km section from Lake St. Francis to Quebec City by passing sediment collected from a benthic grab through a 500 micro m sieve. Microbeads were discovered throughout this section, and their abundances varied by four orders of magnitude across sites. Median and mean (+or-1 SE) densities across sites were 52 microbeads.m⁻² and 13832 (+or-13677) microbeads.m⁻², respectively. The highest site density was 1.4x10⁵ microbeads.m⁻² (or 10³ microbeads.L⁻¹), which is similar in magnitude to microplastic concentrations found in the world's most contaminated marine sediments. Mean diameter of microbeads was smaller at sites receiving municipal or industrial effluent (0.70+or-0.01 mm) than at non-effluent sites (0.98+or-0.01 mm), perhaps suggesting differential origins. Given the prevalence and locally high densities of microplastics in St. Lawrence River sediments, their ingestion by benthivorous fishes and macroinvertebrates warrants investigation.

Castella, L. F., et al. (2010). "A new lock-step mechanism of matrix remodelling based on subcellular contractile events." Journal of Cell Science **123**(10): 1751-1760.

Myofibroblasts promote tissue contractures during fibrotic diseases. To understand how spontaneous changes in the intracellular calcium concentration, [Ca²⁺]<inf>i</inf>, contribute to myofibroblast contraction, we analysed both [Ca²⁺]<inf>i</inf> and subcellular contractions. Contractile events were assessed by tracking stress-fibre-linked microbeads and measured by atomic force microscopy. Myofibroblasts exhibit periodic (~100 seconds) [Ca²⁺]<inf>i</inf> oscillations that control small (~400 nm) and weak (~100 pN) contractions. Whereas depletion of [Ca²⁺] <inf>i</inf> reduces these microcontractions, cell isometric tension is unaffected, as shown by growing cells on deformable substrates. Inhibition of Rho- and ROCK-mediated Ca²⁺-independent contraction has no effect on microcontractions, but abolishes cell tension. On the basis of this two-level regulation of myofibroblast contraction, we propose a single-cell lock-step model. Rho- and ROCK-dependent isometric tension generates slack in extracellular matrix fibrils, which are then accessible for the low-amplitude and high-frequency contractions mediated by [Ca²⁺]<inf>i</inf>. The joint action of both contraction modes can result in macroscopic tissue contractures of ~1 cm per month.

Castelvetro, V., et al. (2020). "Quantification of poly(ethylene terephthalate) micro- and nanoparticle contaminants in marine sediments and other environmental matrices." Journal of Hazardous Materials **385**: 121517.

Microplastics are ubiquitous pollutants in marine and freshwater bodies. Poly(ethylene terephthalate) microfibers (PMFs) are among the main primary microplastics (as-produced polymer microparticles). Released in large amounts in laundry wastewaters, PMFs end up in freshwater and marine sediments due to their high density. PMFs are potentially hazardous pollutants for ecosystems and human health, being a deceiving food source for animal organisms at the base of the food chain (e.g. sediment and water filtrators, including edible shellfish and small crustaceans). This study describes a simple, sensitive and versatile procedure for quantifying the total mass of PET micro- and nano-particles in sediments. The procedure involves aqueous alkaline PET depolymerization with phase transfer catalysis, oxidation and fractionations to remove interfering species and pre-concentrate the terephthalic acid (TPA) monomer, and TPA quantification by reversed-phase HPLC. Recovery of TPA from a model sediment spiked with 800ppm PET micropowder was 98.2 %, with limits of detection/quantification LOD=17.2mug/kg and LOQ=57.0mug/kg. Analyses of sandy sediments from a marine beach in Tuscany, Italy, showed contamination in the 370-460mug/kg range, suggesting that a not negligible fraction of PET microfibers released in surface waters ends up in shore sediments.

Castillo, A. B., et al. (2016). "Prevalence of microplastics in the marine waters of Qatar." Marine Pollution Bulletin **111**(1-2): 260-267.

Microplastics are firmly recognized as a ubiquitous and growing threat to marine biota and their associated marine habitats worldwide. The evidence of the prevalence of microplastics was documented for the first time in the marine waters of Qatar's Exclusive Economic Zone (EEZ). An optimized and validated protocol was developed for the extraction of microplastics from plankton-rich seawater samples without loss of microplastic debris present and characterized using Attenuated Total Reflectance-Fourier Transform Infrared spectroscopy. In total 30 microplastic polymers have been identified with an average concentration of 0.71particlesm(-3) (range 0-3particlesm(-3)). Polypropylene, low density polyethylene, polyethylene, polystyrene, polyamide, polymethyl methacrylate, cellophane, and acrylonitrile butadiene styrene polymers were characterized with majority of the microplastics either granular shape, sizes ranging from 125mum to 1.82mm or fibrous with sizes from 150mum to 15.98mm. The microplastics are evident in areas where nearby anthropogenic activities, including oil-rig installations and shipping operations are present.

Castro, B., et al. (2018). "Portable and power-free serodiagnosis of Chagas disease using magnetic levitating microbeads." Analyst **143**(18): 4379-4386.

This work describes the detection of anti-T. cruzi antibodies in whole blood solutions using magnetic levitating microbeads (MLmuBs). This simple diagnostic method can be easily performed by minimally trained personnel using an inexpensive and portable magnetic stage that requires no electricity. A multiphase test tube containing the MLmuBs facilitates the sequential incubation, filtering, and reading of the immunoassays. The diagnostic method starts by adding a blood sample to the top phase of the test tube where the anti-T. cruzi antibodies present in the blood attach to the T. cruzi antigens on the surface of the MLmuBs. Shaking the test tube after incubation mixes the top layer with a paramagnetic medium loaded with SiO₂ microcrystals. The attachment of SiO₂ microcrystals to those MLmuBs bound to T. cruzi antibodies decreases their levitation height once the tube is placed between two antialigned permanent magnets. Measuring the levitation height of MLmuBs enables the accurate detection and quantification of anti-T. cruzi antibodies in the blood across the clinically relevant range, with a detection limit of 5 mug mL⁻¹. The small size of the test tubes facilitates the simultaneous analysis of over 50 different samples. MLmuBs act as

partial collimators for non-polarized light, facilitating their visual identification by the naked eye or by projecting incident light on a thin paper screen. A machine-vision algorithm was created to automatically interpret the results of the MLmuB tests from a digital image, resulting in a rapid, accurate, and user-friendly assay for Chagas disease that can be used in resource-limited settings.

Castro, C. M., et al. (2016). "Illuminating the shadows of cervical disease using a mobile digital diffraction platform." Molecular Imaging and Biology **1)**: S1184-S1185.

Background: The global burden of cervical cancer and the disproportionate access to prompt pathology services and emerging cell profiling technologies increase the need for low-cost, portable, and rapid pointof- care (POC) approaches. Emerging genomic data for cervical cancers support the need for personalized profiling strategies more accessible to clinical providers and investigators. While conventional microscopy (e.g. fluorescence, confocal) retains diagnostic importance, their costs and complexity challenge reliable and feasible implementation within resource-challenged areas. Method(s): We developed a digital diffraction diagnostic (D3) platform equipped with a portable smartphone module and: 1) optimized its protein and DNA readouts under preclinical conditions; and 2) conducted feasibility and pilot testing using human cervical biopsies from colposcopy. Result(s): Molecular analyses were achieved by labeling cells with polystyrene microbeads linked to antibodies targeting cervical cancer-related proteins. Diffraction patterns generated by the microbeads were detected with the smartphone camera using brightfield settings; digital processing reconstructed the images of bead-bound cells to retrieve molecular information (Fig. 1A). Optimizing the bead linking process and speeding up cell counting algorithms, led us to count thousands of beads and cells without washing steps (i.e. near real time). We enrolled 25 women with abnormal pap smears who were referred to the MGH Cancer Center for colposcopy and analyzed an extra biopsy specimen using our platform. Samples from higher risk patients showed increased numbers of microbeads per cell versus low risk and benign samples (Fig. 1B). The mean bead counts (nad) per targeted cell were significantly different among the clinical risk classifications ($p < 0.05$), indicating that nbead could serve as a single diagnostic measure (Fig. 1C). The D3 assay generated readouts within 45 min and showed excellent agreement with gold-standard pathology (96%). We enhanced our platform's capabilities to enable DNA detection by developing a bead-dimer assay (Fig. 1D). A pair of oligonucleotides, whose sequences were complementary to that of HPV target DNA, were conjugated to silica and polystyrene microbeads, respectively. The target DNA was captured on polystyrene (PS) beads and sequentially labeled with silica (SI) beads. The hybridization yielded PS-SI bead dimers with unique diffraction signatures. The number of PS-SI hybrids correlated with the amount of target DNA. The observed detection sensitivity was in the attomole range for HPV DNA 16 and 18 (Fig. 1D), which account for >70% of cervical cancers worldwide. Conclusion(s): Our approach could have favorable global health applications where medical access is limited or when pathology bottlenecks challenge prompt cancer diagnostic readouts. Once validated prospectively, we anticipate that the D3 platform should enhance the breadth and depth of cervical cancer testing in a manner that is both sustainable and feasible for resource-limited settings. (Figure Presented).

Castro, D., et al. (2018). "High-Throughput Incubation and Quantification of Agglutination Assays in a Microfluidic System." Genes **9**(6): 04.

In this paper, we present a two-phase microfluidic system capable of incubating and quantifying microbead-based agglutination assays. The microfluidic system is based on a simple fabrication solution, which requires only laboratory tubing filled with carrier oil, driven by negative pressure

using a syringe pump. We provide a user-friendly interface, in which a pipette is used to insert single droplets of a 1.25-micro L volume into a system that is continuously running and therefore works entirely on demand without the need for stopping, resetting or washing the system. These assays are incubated by highly efficient passive mixing with a sample-to-answer time of 2.5 min, a 5-10-fold improvement over traditional agglutination assays. We study system parameters such as channel length, incubation time and flow speed to select optimal assay conditions, using the streptavidin-biotin interaction as a model analyte quantified using optical image processing. We then investigate the effect of changing the concentration of both analyte and microbead concentrations, with a minimum detection limit of 100 ng/mL. The system can be both low- and high-throughput, depending on the rate at which assays are inserted. In our experiments, we were able to easily produce throughputs of 360 assays per hour by simple manual pipetting, which could be increased even further by automation and parallelization. Agglutination assays are a versatile tool, capable of detecting an ever-growing catalog of infectious diseases, proteins and metabolites. A system such as this one is a step towards being able to produce high-throughput microfluidic diagnostic solutions with widespread adoption. The development of analytical techniques in the microfluidic format, such as the one presented in this work, is an important step in being able to continuously monitor the performance and microfluidic outputs of organ-on-chip devices.

Castro, R. O., et al. (2016). "Evaluation of microplastics in Jurujuba Cove, Niteroi, RJ, Brazil, an area of mussels farming." Marine Pollution Bulletin. **22**.

Once non-biodegradable, microplastics remain on the environment absorbing toxic hydrophobic compounds making them a risk to biodiversity when ingested or filtered by organisms and entering in the food chain. To evaluate the potential of the contamination by microplastics in mussels cultivated in Jurujuba Cove, Niteroi, RJ, waters of three stations were collected during a rain and dry seasons using a plankton net and later filtered. Microplastics were quantified and characterized morphologically and chemically. The results showed a high concentration of microplastics in both seasons with diversity of colors, types and sizes. Synthetic polymers were present in all samples. The presence of microplastics was probably due to a high and constant load of effluent that this area receives and to the mussel farming activity that use many plastic materials. Areas with high concentrations of microplastics could not be used for mussel cultivation due to the risk of contamination to consumers. Copyright © 2016 Elsevier Ltd.

Castro, R. O., et al. (2016). "Evaluation of microplastics in Jurujuba Cove, Niterói, RJ, Brazil, an area of mussels farming." Marine Pollution Bulletin **110**(1): 555-558.

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Cataldi, P., et al. (2018). "Sustainable electronics based on crop plant extracts and graphene: a "bioadvantaged" approach." Advanced Sustainable Systems **2**(11): 1800069.

In today's fast-paced and well-connected world, consumer electronics are evolving rapidly. As a result, the amount of discarded electronic devices is becoming a major health and environmental concern. The rapid expansion of flexible electronics has the potential to transform consumer electronic devices from rigid phones and tablets to robust wearable devices. This means increased use of plastics in consumer electronics and the potential to generate more persistent plastic waste for the environment. Hence, today, the need for flexible biodegradable electronics is at the forefront of minimizing the mounting pile of global electronic waste. A "bioadvantaged" approach to develop a biodegradable, flexible, and application-adaptable electronic components based on crop components and graphene is reported. More specifically, by combining zein, a corn-derived protein, and aleuritic acid, a major monomer of tomato cuticles and sheellac, along with graphene, biocomposite conductors having low electrical resistance (~10 Omega sq⁻¹) with exceptional mechanical and fatigue resilience are fabricated. Further, a number of high-performance electronic applications, such as THz electromagnetic shielding, flexible GHz antenna construction, and flexible solar cell electrode, are demonstrated. Excellent performance results are measured from each application comparable to conventional nondegrading counterparts, thus paving the way for the concept of "plant-e-tronics" towards sustainability.

Catani, L., et al. (2010). "CD133⁺ pluripotent stem cells for the treatment of chronic liver failure." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

Background.: The potential role of bone marrow (BM)-derived stem cells (SCs) in patients with end-stage liver disease has been addressed by our group in four studies. Main objectives were: 1) to assess stem/progenitor cell mobilization in 24 patients receiving orthotopic liver transplantation (OLT); 2) to evaluate whether G-CSF can be safely administered to patients with liver cirrhosis in order to expand and mobilize BM-derived SCs; 3) to investigate the effects of transplantation of human G-CSF-mobilized CD34+ and CD133+ SCs in mice with chronic liver injury and fibrosis; 4) to evaluate the feasibility and the safety of the purification and intrahepatic reinfusion of increasing numbers of autologous BM-derived G-CSF-mobilized CD133+ SCs in patients with end-stage liver disease. Methods.: 1) Flow cytometry analysis, clonogenic assays and RT-PCR have been performed after OLT; 2) 18 patients with advanced liver disease were consecutively treated with increasing doses of G-CSF starting from 2 mug/kg/daily; 3) C57BL/6N mice received CCl4 by inhalation for thirteen weeks and were treated with Cyclosporin-A. Transplantation was performed by injection (tail vein) of 106 CD34+ or CD133+ SCs of three cirrhotic patients. After four weeks from transplantation all mice were sacrificed; 4) G-CSF at 7.5mug/Kg/b.i.d. is administered subcutaneosly (sc) from day 1 until the completion of peripheral blood stem cells (PBSC) collection. Collection of PBSC will begin on day + 4 only if the concentration of CD133+ cells is 38/mL. PB mononuclear cells obtained from mobilized standard-volume leukapheresis will be incubated with Macs colloidal superparamagnetic CD133 microbeads. CliniMacs device is used for the positive selection of CD133+ SCs under GMP conditions. At least 4 weeks after SC mobilization, collection and cryopreservation, highly purified autologous G-CSF-mobilized CD133+ cells are re-infused through the hepatic artery by transfemoral or transbranchial arteriography. CD133+ cells are administered to patients starting from 5x10⁴/Kg patient's body weight and increased every 3 patients. The maximum infused cell dose will be 1x10⁶/kg. G-CSF at 5mug/Kg/day is administered sc for 3 days after the reinfusion of SCs for their expansion and to induce a selective proliferative advantage of reinfused cells in vivo. Results and Discussion.: 1) We demonstrated that both early subsets of the hematopoietic SC compartment

(CD34⁺/CD90⁺ cells) and more mature committed progenitors (CFU-C) were mobilized into PB after OLT. We also demonstrated the release from the BM of liver-committed HSCs co-expressing epithelial markers after OLT; 2) We show that the administration of G-CSF to patients with liver cirrhosis is safe and feasible and allows the mobilization and collection of BM-derived SCs at the dose of 15 mg/kg/day. 3) We demonstrated that mice transplanted with either CD133+ or CD34+ human cells appear to have less fibrotic septa than mice without SC transplantation, suggesting the potential therapeutic role of human SCs on the recovery of liver fibrosis. 4) Up to date, three patients with end stage liver disease have been successfully mobilized with G-CSF and highly purified autologous CD133+ SCs have been re-infused. The number of collected CD133+ SCs is 0,7, 0,2 and 0.35x10⁶/Kg, respectively. The number of the re-infused highly purified CD133⁺ SCs is 4.7, 5.0 and 5.4x10⁴/Kg, respectively. No adverse events have been recorded during mobilization or intrahepatic SCs re-infusion. Updated results on current patients and future patients will be presented at the Meeting.

Catarino, A. I., et al. (2019). "Use of fluorescent-labelled nanoplastics (NPs) to demonstrate NP absorption is inconclusive without adequate controls." Science of the Total Environment **670**: 915-920.

Whether nanoplastics (NPs) are able to be absorbed across epithelial membranes and accumulate within internal tissues of organisms is an important determinant of their potential toxicity. Evidence of absorption and accumulation requires detection of NPs within internal tissues, and investigations with fluorescently labelled NPs have attempted to provide this information. We hypothesize that studies that do not control for the fluorescent dye leachate and/or cellular autofluorescence are inconclusive and can be misinterpreted. Our goal was to analyse previous investigations critically and conduct further research to determine if fluorescent-labelled polystyrene NPs (nanoPS) can provide conclusive evidence of absorption and internal accumulation of NPs. We exposed zebrafish embryos and larvae to NPs (500 and 1000nm) labelled with a green or an orange fluorescent dye, to solutions resulting from nanoPS dialysis, and to Nile-Red (a fluorescent dye used as a positive control). Previous studies have claimed that NPs cross epithelia without accounting for dye leachates and/or cellular autofluorescence. Our results demonstrate that commercial fluorescent-labelled nanoPS can leach their fluorophores, and the fluorophore alone can accumulate within internal tissues of zebrafish larvae. We further observed green autofluorescence in fish larvae not exposed to any particles. Previous claims of NP absorption based on observations of fluorescence in zebrafish tissues should thus be considered inconclusive. Although the addition of purification steps and inclusion of controls for leaching of dyes are methodological improvements, the use of fluorescent nanoPS should not be considered to provide absolute conclusive evidence of particle absorption.

Catarino, A. I., et al. (2018). "Low levels of microplastics (MP) in wild mussels indicate that MP ingestion by humans is minimal compared to exposure via household fibres fallout during a meal." Environmental Pollution **237**: 675-684.

Microplastics (MPs) are the most numerous debris reported in marine environments and assessment of the amounts of MPs that accumulate in wild organisms is necessary for risk assessment. Our objective was to assess MP contamination in mussels collected around the coast of Scotland (UK) to identify characteristics of MPs and to evaluate risk of human exposure to MPs via ingestion of mussels. We deployed caged mussels (Mytilus edulis) in an urbanised estuary (Edinburgh, UK) to assess seasonal changes in plastic pollution, and collected mussels (Mytilus spp and subtidal Modiolus modiolus) from eight sampling stations around Scotland to enumerate MP types at different locations. We determined the potential exposure of humans to household dust fibres during a meal to compare with amounts of MPs present in edible mussels. The mean number of MPs in M. modiolus was 0.086+/-0.031 (SE, n=6)/g ww (3.5+/-1.29 (SE) per mussel). In Mytilus spp, the mean number of MPs/g ww was 3.0+/-0.9 (SE, n=36) (3.2+/-0.52 (SE) per mussel), but weight dependent. The visual accuracy of plastic fibres identification was estimated to be between 48 and 50%, using Nile Red staining and FT-IR methodologies, respectively, halving the observed amounts of MPs in wild mussels. We observed an allometric relationship between the number of MPs and the mussels wet weight. Our predictions of MPs ingestion by humans via consumption of mussels is 123MP particles/y/capita in the UK and can go up to 4620 particles/y/capita in countries with a higher shellfish consumption. By comparison, the risk of plastic ingestion via mussel consumption is minimal when compared to fibre exposure during a meal via dust fallout in a household (13,731-68,415 particles/Y/capita).

Cattle, S. R., et al. (2020). "The character and distribution of physical contaminants found in soil previously treated with mixed waste organic outputs and garden waste compost." Waste Management **101**: 94-105.

The re-use of waste materials by application to land is an increasingly common practice around the world, but where municipal solid waste materials are applied, it is almost inevitable that physical contaminants such as glass and plastic will be added to the soil. In many jurisdictions, there are prescribed limits for the amounts of physical contaminants that may be present in these materials, but there is little information on whether these limits safeguard soil functional condition. Here, physical contamination of soil is described after varying rates of a mixed waste organic output (MWOO) and garden waste compost (GWC) were incorporated into field plots. At application rates of 100 and 200t/ha, both treatments resulted in a coarsening of the topsoil particle size distribution, but only in the MWOO-treated soils were physical contaminants largely responsible for this. The physical contaminant particles present were found only to the depth of cultivation, and included glass, rigid and film plastics, and synthetic fibres. These contaminants were most commonly observed in the gravel and coarse sand-sized fractions, and in those soils treated with the highest rates of MWOO application. Physical contaminant particles acted as both enveloping and nucleating agents for mineral grains and organic matter, and blocked some pores. Although soil physical condition is usually improved by the incorporation of organic matter, the extent of pore blockage evident here suggests that soil physical functions such as water percolation may be affected as the organic matter is broken down and the soil undergoes natural re-consolidation.

Cau, A., et al. (2019). "Microplastics in the crustaceans Nephrops norvegicus and Aristeus antennatus: Flagship species for deep-sea environments?" Environmental Pollution **255**(Pt 1): 113107.

Ingestion of microplastics (MPs) has been documented in several marine organisms, but their occurrence in deep-sea species remains almost unknown. In this study, MPs were investigated in two economically and ecologically key crustaceans of the Mediterranean Sea, the Norwegian lobster Nephrops norvegicus and the shrimp Aristeus antennatus. Both the species were collected from 14 sites around Sardinia Island, at depths comprised between 270 and 660m. A total of 89 and 63 stomachs were analysed for N. norvegicus and A. antennatus respectively, and more than 2000MPs-like particles were extracted and sorted for identification and characterization by muFT-IR. In N. norvegicus, 83% of the specimens contained MPs, with an average abundance of 5.5+/-0.8MPs individual⁻¹, while A. antennatus showed a lower frequency of ingestion (67%) and a lower mean number of MPs (1.66+/-0.1MPs individual⁻¹). Composition and size of particles differed significantly between the two species. The non-selective feeding strategy of N. norvegicus could explain the 3-5 folds higher numbers of MPs in its stomach, which were mostly composed of films and fragments derived by polyethylene and polypropylene single-use plastic items. Contrarily, most MPs in the stomachs of A. antennatus were polyester filaments. The MPs abundance observed in N. norvegicus is among the highest detected in Mediterranean species considering both fish and invertebrates species, and provides novel insights on MPs bioavailability in deep-sea habitats. The overall results suggest that both N. norvegicus and A. antennatus, easily available in common fishery markets, could be valuable bioindicators and flagship species for plastic contamination in the deep-sea.

Cauwenberghe, L. v., et al. (2015). "Microplastics are taken up by mussels (Mytilus edulis) and lugworms (Arenicola marina) living in natural habitats." Environmental Pollution **199**: 10-17.

We studied the uptake of microplastics under field conditions. At six locations along the French-Belgian-Dutch coastline we collected two species of marine invertebrates representing different feeding strategies: the blue mussel Mytilus edulis (filter feeder) and the lugworm Arenicola marina (deposit feeder). Additional laboratory experiments were performed to assess possible (adverse) effects of ingestion and translocation of microplastics on the energy metabolism (cellular energy allocation) of these species. Microplastics were present in all organisms collected in the field: on average 0.2+or-0.3 microplastics g⁻¹ (M. edulis) and 1.2+or-2.8 particles g⁻¹ (A. marina). In a proof of principle laboratory experiment, mussels and lugworms exposed to high concentrations of polystyrene microspheres (110 particles mL⁻¹ seawater and 110 particles g⁻¹ sediment, respectively) showed no significant adverse effect on the organisms' overall energy budget. The results are discussed in the context of possible risks as a result of the possible transfer of adsorbed contaminants.

Cauwenberghe, L. v. and C. R. Janssen (2014). "Microplastics in bivalves cultured for human consumption." Environmental Pollution **193**: 65-70.

Microplastics are present throughout the marine environment and ingestion of these plastic particles (<1 mm) has been demonstrated in a laboratory setting for a wide array of marine organisms. Here, we investigate the presence of microplastics in two species of commercially grown bivalves: Mytilus edulis and Crassostrea gigas. Microplastics were recovered from the soft tissues of both species. At time of human consumption, M. edulis contains on average 0.36+or-0.07 particles g⁻¹ (wet weight), while a plastic load of 0.47+or-0.16 particles g⁻¹ ww was detected in C. gigas. As a result, the annual dietary exposure for European shellfish consumers can amount to 11,000 microplastics per year. The presence of marine microplastics in seafood could pose a threat to food safety, however, due to the complexity of estimating microplastic toxicity, estimations of the potential risks for human health posed by microplastics in food stuffs is not (yet) possible.

Cavalieri, F. and F. Padella (2002). "Development of composite materials by mechanochemical treatment of post-consumer plastic waste." Waste Management **22**(8): 913-916.

Improvement of mechanical properties of recycled mixed plastic waste is one of the fundamental goals in any recycling process. However, polymer immiscibility makes the development of any effective reprocessing method difficult. In this work, a polymer milling process with liquid CO2 was applied to polymeric mixed waste, obtaining a powder material which was successfully utilized as a matrix for a new composite material. Developed materials have interesting mechanical properties and material performance can easily be improved.

Investigations on selected mixtures of PP and PE clearly showed evidence of chemical compatibilization.

Cavallari, C., et al. (2018). "MiR-296-5p and PDGF-BB in CD31EV cargo: Novel biomarkers of vascular smooth muscle cell dysfunction in diabetes." Journal of Extracellular Vesicles **7 (Supplement 1)**: 230.

Background: Endothelial cell-derived extracellular vesicles (CD31EVs) are a new entity for therapeutic/diagnostic purposes. The roles of CD31EVs as biomarkers and mediators of smooth muscle cell (VSMC) dysfunction in type 2 diabetes (T2D) are investigated herein. Method(s): Human atherosclerotic plaque specimens from 11 T2D and six non-diabetic individuals undergoing carotid endoarteriectomy surgery were analysed. siRNA technology was performed on vascular smooth muscle cells (VSMCs). The CD31 microbead kit was used to isolate CD31EVs from the sera of T2D (D-CD31EVs) and non-diabetic individuals (ND-CD31EVs). In selected experiments, VSMCs were cultured in HG and then treated with ND-CD31EVs, D-CD31EVs or stimulated with PDGF-BB. CD31EVs were processed for transmission electron microscopy (TEM), biological effects. miR analysis was also performed. PDGF-BB concentration in D-CD31EVs was measured using an ELISA kit. Result(s): We discovered that VSMCs, from human atherosclerotic arteries of T2D individuals, express low bak/bax and high bcl-2 levels. These effects were recapitulated in VSMCs subjected to HG and boosted by diabetic-sera-derived-EVs (D-CD31EVs). Moreover, unlike non-diabetic serum-derived EVs, D-CD31EVs increased HG-cultured VSMC resistance to apoptosis. We also found an increased expression of miR-296-5p in both T2D-derived atherosclerotic specimens and HG-cultured VSMCs treated with D-CD31EVs. D-CD31EVs were found almost depleted of miR-296-5p, while enriched in membrane-bound-plateletderived-growth-factor-BB (mbPDGF-BB). Thus, we postulated that mbPDGF-BB transfer by D-CD31EVs could account for VSMC-miR-296-5p content. By depleting CD31EVs of PDGF-BB or blocking the PDGF-BB receptor-beta, we demonstrated that PDGF-BB contributes to DCD31EV-mediated miR-296-5p expression and downstream events. In fact, while PDGF-BB-treatment recapitulated the D-CD31EV-mediated anti-apoptotic programme and VSMC resistance to apoptosis, PDGFBB-depleted CD31EVs failed. Finally, D-CD31EVs also increased VSMC migration and recruitment to neovessels, by means of mbPDGF-BB. Summary/Conclusion: This study identifies the mbPDGF-BB in DCD31EVs as a relevant mediator of diabetes-associated VSMC dysfunction, and recognizes CD31EV-miR-296-5p-mbPDGF-BB content as novel diabetes-associated biomarkers.

Cavers, C., et al. (2017). "Cotton buds—corporate change leads the way in the UK and Europe." Oryx **51**(4): 581-581.

The article offers conservation-related updates on the plastic pollution from cotton buds stems and ingested by marine animals.

Caykara, T., et al. (2007). "Competitive adsorption of uranyl ions in the presence of Pb(II) and Cd(II) ions by poly(glycidyl methacrylate) microbeads carrying amidoxime groups and polarographic determination." Journal of Applied Polymer Science **104**(6): 4168-4172.

The adsorption capacity of UO in the presence of Pb(II) and Cd(II) ions was investigated with amidoximated poly(glycidyl methacrylate) (PGMA) microbeads with an average size of 135 m packed in a glass column (0.5-cm i.d. and 20-cm length, flow rate = 3 mL/min) under competitive conditions. A differential pulse polarography technique was used for the determination of trace quantities of uptaken elements by the measurement of the reduction peak currents at -200/-950, -400, and -600 mV (vs a saturated calomel electrode) for UO, Pb(II), and Cd(II) ions, respectively. When only UO was found in the eluate, its adsorption was 85.3% from a 50 M initial solution. However, when there was UO with binary systems of Pb(II) or Cd(II), it was 78.2 and 76.3%, respectively. On the other hand, in a ternary mixture of UO with Pb(II) and Cd(II), the adsorption was found to be 75.2% with the same initial concentration. According to the results, the competitive adsorption studies showed that these amidoximated PGMA microbeads had good adsorption selectivity for UO with the coexistence of Pb(II) and Cd(II) ions. The ionic strength of the solution also influenced the UO adsorption capacity of the amidoximated PGMA microbeads.

Ceccarini, A., et al. (2018). "The Hidden Microplastics: New Insights and Figures from the Thorough Separation and Characterization of Microplastics and of Their Degradation Byproducts in Coastal Sediments." Environmental Science & Technology **52**(10): 5634-5643.

The environmental pollution by plastic debris directly dispersed in or eventually reaching marine habitats is raising increasing concern not only for the vulnerability of marine species to ingestion and entanglement by macroscopic debris, but also for the potential hazards from smaller fragments down to a few micrometer size, often referred to as "microplastics". A novel procedure for the selective quantitative and qualitative determination of organic solvent soluble microplastics and microplastics degradation products (<2 mm) in shoreline sediments was adopted to evaluate their concentration and distribution over the different sectors of a Tuscany (Italy) beach. Solvent extraction followed by gravimetric determination and chemical characterization by FT-IR, Pyrolysis-GC-MS, GPC and ¹H NMR analyses showed the presence of up to 30 mg microplastics in 1 kg sand, a figure corresponding to about 5.5 g of generally undetected and largely underestimated microplastics in the upper 10 cm layer of a square meter of sandy beach ! The extracted microplastic material was essentially polystyrene and polyolefin byproducts from oxidative degradation and erosion of larger fragments, with accumulation mainly above the storm berm. Chain scission and oxidation processes cause significant variations in the physical and chemical features of microplastics, promoting their adsorption onto sand particles and thus their persistence in the sediments.

Cedergren, J., et al. (2007). "Intracellular oxidative activation in synovial fluid neutrophils from patients with rheumatoid arthritis but not from other arthritis patients." Journal of Rheumatology **34**(11): 2162-2170.

Objective. To compare total and intracellular oxidative activation of blood and synovial fluid (SF) neutrophils from patients with rheumatoid arthritis (RA) and other arthritides with blood donor neutrophils. Methods. Peripheral blood and SF samples were obtained from 26 gonarthritis patients (13 RA, 13 non-RA) attending the rheumatology unit for therapeutic joint aspiration. Isolated neutrophils were stimulated by a formylated tripeptide (fMLF) or by microbeads coated with collagen-I. Formation of superoxide-anion-derived reactive oxygen species (ROS) was studied by luminol-enhanced chemiluminescence. Paired samples of blood and SF neutrophils from patients with active arthritis were compared with blood neutrophils from patients in remission and from 47 healthy blood donors. Results. SF neutrophils from patients with RA, but not from non-RA patients, showed high baseline intracellular ROS production. Blood neutrophils from arthritis patients in remission existed in a primed state as revealed by more rapid oxidative response after collagen-bead challenge and a more pronounced response after fMLF stimulation compared to healthy blood donors. Blood neutrophils from RA patients with ongoing gonarthritis, however, did not differ from healthy blood donors concerning oxidative activation, whereas blood neutrophils from non-RA patients with gonarthritis showed a significantly lower peak ROS production. Conclusion. A novel finding with pathogenetic implications in our study is that SF neutrophils from patients with RA, but not other arthritides, are activated and produce

ROS intracellularly. This implies that synovial neutrophils in RA are engaged in the processing of endocytosed material.

Cerna, K., et al. (2016). "Methods of sampling airborne fungi in working environments of waste treatment facilities." International Journal of Occupational Medicine & Environmental Health **29**(3): 493-502.

OBJECTIVES: The objective of the present study was to evaluate and compare the efficiency of a filter based sampling method and a high volume sampling method for sampling airborne culturable fungi present in waste sorting facilities.

MATERIAL AND METHODS: Membrane filters method was compared with surface air system method. The selected sampling methods were modified and tested in 2 plastic waste sorting facilities.

RESULTS: The total number of colony-forming units (CFU)/m3 of airborne fungi was dependent on the type of sampling device, on the time of sampling, which was carried out every hour from the beginning of the work shift, and on the type of cultivation medium ($p < 0.001$). Detected concentrations of airborne fungi ranged 2x102-1.7x106 CFU/m3 when using the membrane filters (MF) method, and 3x102-6.4x104 CFU/m3 when using the surface air system (SAS) method.

CONCLUSIONS: Both methods showed comparable sensitivity to the fluctuations of the concentrations of airborne fungi during the work shifts. The SAS method is adequate for a fast indicative determination of concentration of airborne fungi. The MF method is suitable for thorough assessment of working environment contamination by airborne fungi. Therefore we recommend the MF method for the implementation of a uniform standard methodology of airborne fungi sampling in working environments of waste treatment facilities.

Cerna, K., et al. (2017). "Exposure to airborne fungi during sorting of recyclable plastics in waste treatment facilities." Medycyna Pracy **68**(1): 1-9.

BACKGROUND: In working environment of waste treatment facilities, employees are exposed to high concentrations of airborne microorganisms. Fungi constitute an essential part of them. This study aims at evaluating the diurnal variation in concentrations and species composition of the fungal contamination in 2 plastic waste sorting facilities in different seasons.

MATERIAL AND METHODS: Air samples from the 2 sorting facilities were collected through the membrane filters method on 4 different types of cultivation media. Isolated fungi were classified to genera or species by using a light microscopy.

RESULTS: Overall, the highest concentrations of airborne fungi were recorded in summer (9.1x10³-9.0x10⁵ colony-forming units (CFU)/m₃), while the lowest ones in winter (2.7x10³-2.9x10⁵ CFU/m³). The concentration increased from the beginning of the work shift and reached a plateau after 6-7 h of the sorting. The most frequently isolated airborne fungi were those of the genera Penicillium and Aspergillus. The turnover of fungal species between seasons was relatively high as well as changes in the number of detected species, but potentially toxigenic and allergenic fungi were detected in both facilities during all seasons.

CONCLUSIONS: Generally, high concentrations of airborne fungi were detected in the working environment of plastic waste sorting facilities, which raises the question of health risk taken by the employees. Based on our results, the use of protective equipment by employees is recommended and preventive measures should be introduced into the working environment of waste sorting facilities to reduce health risk for employees. Med Pr 2017;68(1):1-9.

Cervero, J. M., et al. (2011). "Development of a technology to produce monodispersed microparticles

based on the formation of drops from viscous non-Newtonian liquids sprayed through a fan jet nozzle." Chemical Engineering Journal **174**(2-3): 699-708.

A new technique has been developed to produce microparticles as small as 30 mu m from a non-Newtonian viscous fluid such as sodium alginate. A fan jet nozzle was employed to produce a laminar jet, which was unstabilized by a rapid air gas stream co-axial to the flow. Behavior studies were conducted to show the performance of the system under the variation of parameters like air and liquid flow (imposed by pressure), and also viscosity, and their influence of the generated particles. Also, the downstream jet flow was parameterized as a function of controlled external variables: air and liquid pressure and viscosity. Agreement was found between the model and experimental data. Microbeads were obtained at different conditions to obtain a mathematical relationship between size parameters (Sauter Mean Diameter) and forces acting in the system, represented as dimensionless numbers: liquid/air mass ratio and Weber (We) and Ohneshorge (Oh) numbers. Based in wave propagation mechanisms, three semi-empirical models have been proposed based in these dimensionless numbers. Further experimental data agrees accurately with the models, and allow the prediction of the microbeads size obtained by this technique.

Cesur, S. (2018). "The Effects of Additives on the Biodegradation of Polycaprolactone Composites." Journal of Polymers & the Environment **26**(4): 1425-1444.

Because environmental pollution caused by plastic waste is a major problem investigations concerning biodegradable packaging are important and required. In this study, the biodegradation of PCL composite films with organic (glycerol monooleate and oleic acid) and inorganic additives (organo nano clay) was investigated to understand which additive and the amount of additive was more effective for biodegradation. The relationship between the degree of crystallinity and the effect of additives on the biodegradability of polycaprolactone (PCL) was examined. PCL composite films were prepared using organo nano clay (0.1-0.4-1-3 wt%) and oleic acid (1-3-5 wt%) or GMO (1-3-5 wt%). The 35 films prepared with PCL (P), clay (C), oleic acid (O), or glycerol monooleate (G) are coded as P_C#wt%_O (or G)#wt%. The composite films, P_C0.4_O5 contains 0.4 wt% clay and 5 wt% oleic acid and the P_C3_G1 contains 3 wt% clay and 1 wt% glycerol monooleate. The biodegradation of PCL films in simulated soil was studied for 36 months. The films were periodically removed from the simulated soil and film thicknesses, weight losses, visual changes, crystal structures, and a functional group analyses were performed. PCL composite films are separated into three groups, depending on degradation time, (1) films that degraded before 8 months (fast degradation), (2) films that degraded around 24 months (similar to neat PCL), and (3) films that take longer to degrade (slow degradation). The films in the first group are PCL films with 1 and 3 wt% clay additive and they begin to biodegrade at the 5th month. However, a composite film of PCL with only 0.4 wt% clay and 5 wt% GMO addition has the shortest degradation time and degraded in 5 months. The films in the last group are; P_G3, P_G5, P_C0.1, P_C0.1_O1, and P_C0.1_O5 and they took around 30 months for biodegradation. It was observed that increasing the organo nanoclay additive increases the biodegradability by disrupting the crystal structure and causing a defective crystal formation. The addition of GMO with organo nano clay also accelerates biodegradation. The addition of organo nano clay in an amount as small as 0.1 wt% acts as the nucleating agent, increases the degree of crystallinity of the PCL composites, and slows the biodegradation period by increasing the time. [ABSTRACT FROM AUTHOR]

Chae, D. H., et al. (2015). "Abundance and Distribution Characteristics of Microplastics in Surface Seawaters of the Incheon/Kyeonggi Coastal Region." Archives of Environmental Contamination & Toxicology **69**(3): 269-278.

Microplastics in marine environments are of emerging concern due to their widespread distribution, their ingestion by various marine organisms, and their roles as a source and transfer vector of toxic chemicals. However, our understanding of their abundance and distribution characteristics in surface seawater (SSW) remains limited. We investigated microplastics in the surface microlayer (SML) and the SSW at 12 stations near-shore and offshore of the Korean west coast, Incheon/Kyeonggi region. Variation between stations, sampling media, and sampling methods were compared based on abundances, size distribution, and composition profiles of microsized synthetic polymer particles. The abundance of microplastics was greater in the SML (152,688 +/- 92,384 particles/m(3)) than in SSW and showed a significant difference based on the sampling method for SSWs collected using a hand net (1602 +/- 1274 particles/m(3)) and a zooplankton trawl net (0.19 +/- 0.14 particles/m(3)). Ship paint particles (mostly alkyd resin polymer) accounted for the majority of microplastics detected in both SML and SSWs, and increased levels were observed around the voyage routes of large vessels. This indicates that polymers with marine-based origins become an important contributor to microplastics in coastal SSWs of this coastal region.

Chae, Y. and Y. J. An (2017). "Effects of micro- and nanoplastics on aquatic ecosystems: Current research trends and perspectives." Marine Pollution Bulletin **124**(2): 624-632.

Contamination by bulk plastics and plastic debris is currently the one of the most serious environmental problems in aquatic ecosystems. In particular, small-scale plastic debris such as microplastics and nanoplastics has become leading contributors to the pollution of marine and freshwater ecosystems. Studies are investigating the impacts of micro-and nanoplastics on aquatic organisms and ecosystems worldwide. This review covers 83 studies that investigated the distribution of microplastics and the ecotoxicity of micro- and nanoplastics in marine and freshwater ecosystems. The studies indicated that micro-sized plastics and plastic debris were distributed at various concentrations in aquatic ecosystems around the world. They had various effects on the growth, development, behavior, reproduction, and mortality of aquatic animals. We discuss these studies in detail and suggest directions for future research. Copyright © 2017 Elsevier Ltd

Chae, Y. and Y. J. An (2018). "Current research trends on plastic pollution and ecological impacts on the soil ecosystem: A review." Environmental Pollution **240**: 387-395.

Plastic pollution in the environment is currently receiving worldwide attention. Improper dumping of disused or abandoned plastic wastes leads to contamination of the environment. In particular, the disposal of municipal wastewater effluent, sewage sludge landfill, and plastic mulch from agricultural activities is a serious issue and of major concern regarding soil pollution. Compared to plastic pollution in the marine and freshwater ecosystems, that in the soil ecosystem has been relatively neglected. In this study, we discussed plastic pollution in the soil environment and investigated research on the effects of plastic wastes, especially microplastics, on the soil ecosystem. We found that earthworms have been predominantly used as the test species in investigating the effects of soil plastic pollution on organisms. Therefore, further research investigating the effects of plastic on other species models (invertebrates, plants, microorganisms, and insects) are required to understand the effects of plastic pollution on the overall soil ecosystem. In addition, we suggest other perspectives for future studies on plastic pollution and soil ecotoxicity of plastics wastes, providing a direction for such research.

Chae, Y. and Y. J. An (2020). "Effects of food presence on microplastic ingestion and egestion in Mytilus galloprovincialis." Chemosphere **240**: 124855.

Plastic wastes are widespread pollutants in marine environments and several studies have focused on their impacts on different ecosystems. Microplastics (MPs, < 5mm) have been the focus of a particularly extensive investigation because of their ubiquity, large surface area, interactions with organisms, and the challenges they present in terms of disposal and management. However, studies regarding their fates and life cycle in ecosystems are still limited. This study examined the effects of presence of food (the green microalga Dunaliella salina) on egestion rate of polyethylene MPs in the mussel Mytilus galloprovincialis. Ingestion and egestion rates were calculated after 6, 12, 18, and 24h of depuration. The results suggest that MPs exposed to algal food persisted in the mussels. A single exposure of MPs without food induced relatively rapid excretion by the mussels compared to MPs exposure with food. This could be attributed to the ability of mussels to distinguish between nutritive foods and unusable suspended particles. Thus, environmental factors, such as food abundance, can affect the cycle or fate of MPs in marine environments.

Chae, Y., et al. (2020). "Photosynthesis enhancement in four marine microalgal species exposed to expanded polystyrene leachate." Ecotoxicology & Environmental Safety **189**: N.PAG-N.PAG.

Due to its widespread use, large amounts of expanded polystyrene (EPS) have been released into the marine environment, where it is broken down into small pieces with large surface areas. As such, chemical additives may be released into the environment, which can affect marine organisms; however, studies of the effects of such additives are lacking. We assessed the effects of leachate from EPS on the photosynthetic activities of four microalgal species (Dunaliella salina , Scenedesmus rubescens , Chlorella saccharophila , and Stichococcus bacillaris). They were exposed to EPS leachate for seven days and their photosynthetic activities were analyzed based on seven parameters. Overall, leachate exposure increased photosynthetic activity in all four species, albeit to different degrees and showing slightly different trends among the seven parameters. Based on chemical analysis, hexabromocyclododecane concentrations were higher in small-fragment leachate, whereas UV326 concentrations were higher in low-concentration-large-sphere leachate; bisphenol-A and total organic carbon showed no major differences among leachates. Thus, we speculate that exposure to trace chemicals influenced microalgal photosynthesis and overall growth. These results support further investigation of the impacts of plastic debris and chemical additives on marine ecosystems and organisms. • Four microalgae species were exposed to leachate from EPS fragments/spheres. • The leachates contained varying concentrations of chemical additives. • Leachate exposure for 7 days enhanced photosynthetic activity in all species. • Exposure to chemical additives likely resulted in the changes to photosynthesis. [ABSTRACT FROM AUTHOR]

Chae, Y., et al. (2019). "Effects of micro-sized polyethylene spheres on the marine microalga Dunaliella salina: Focusing on the algal cell to plastic particle size ratio." Aquatic Toxicology **216**: 105296.

There is increasing concern about how microplastics (MPs) are impacting marine ecosystems. In particular, studies on how MPs impact microalgae are required because of the abundance of MPs and importance of green microalgae as primary producers. This study investigated how MPs that are larger (200 mum) than algal cells impact them, using the marine microalga Dunaliella salina as the test species. The microalga was exposed to polyethylene MPs for 6 days. Of interest, the growth and photosynthetic activity of D. salina was enhanced with exposure to MPs, while cell morphology (size and granularity) was not impacted. This phenomenon might be explained by trace concentrations of additive chemicals (endocrine disruptors, phthalates, stabilizers) that possibly leached from MPs promoting the growth and photosynthetic activity of D. salina. We also confirmed that MP size contributes towards determining how plastics affect microalgae. Specifically, as MP size shrinks compared to algal cell size, MPs have increasingly adverse effects. MPs of very small size (like nanoplastics) induce particularly adverse effects on algae. Further studies are required to establish the relationship between algal cell size and MP size.

Chae, Y., et al. (2019). "Impact of nano-sized plastic on the nutritional value and gut microbiota of whiteleg shrimp Litopenaeus vannamei via dietary exposure." Environment International **130**: 104848.

Contamination of the world's oceans with plastic waste has attracted increasing attention in recent years. Whereas the ecological consequences of plastic pollution have been the focus of increasing research, the health-related implications of plastic pollution have been somewhat overlooked. In this study, we exposed whiteleg shrimp (Litopenaeus vannamei), a widely consumed marine species, to nano-sized plastic (polystyrene) via a simulated marine food chain in which mussel (Mytilus edulis) was the food source, and evaluated the effects of plastic contamination on shrimp physical, biochemical, and nutritional characteristics over a 21-day exposure period. We identified the changes in certain important biochemical and nutritional indicators, including changes in the gut microbiota and contents of amino acids and fatty acids. The biochemical analysis revealed that microbial activities in the intestine and the glutathione S-transferase and superoxide dismutase activities changed in L. vannamei exposed to nano-sized plastic. In these individuals, the levels of some essential amino acids and fatty acids also decreased. Overall, our findings indicate that plastic pollution can directly interfere with nutritional changes in marine food resources, thereby indirectly causing potential health implications for human consumers.

Chae, Y., et al. (2018). "Trophic transfer and individual impact of nano-sized polystyrene in a four-species freshwater food chain." Scientific Reports **8**(1).

This study investigated the trophic transfer, individual impact, and embryonic uptake of fluorescent nano-sized polystyrene plastics (nanoplastics) through direct exposure in a freshwater ecosystem, with a food chain containing four species. The alga Chlamydomonas reinhardtii, water flea Daphnia magna, secondary-consumer fish Oryzias sinensis, and end-consumer fish Zacco temminckii were used as test species. In the trophic transfer test, algae were exposed to 50 mg/L nanoplastics, defined as plastic particles <100 nm in diameter; higher trophic level organisms were exposed through their diet. In the direct exposure test, each species was directly exposed to nanoplastics. Microscopic analysis confirmed that the nanoplastics adhered to the surface of the primary producer and were present in the digestive organs of the higher trophic level species. Nanoplastics also negatively affected fish activity, as measured by distance traveled and area covered, and induced histopathological changes in the livers of fish that were directly exposed. Additionally, nanoplastics penetrated the embryo walls and were present in the yolk sac of hatched juveniles. These observations clearly show that nanoplastics are easily transferred through food chain, albeit because of high experimental dosages. Nevertheless, the results strongly point to the potential health risks of nanoplastic exposure.

Chagnon, C., et al. (2018). "Plastic ingestion and trophic transfer between Easter Island flying fish (Cheilopogon rapanouiensis) and yellowfin tuna (Thunnus albacares) from Rapa Nui (Easter Island)." Environmental Pollution **Part A. 243**: 127-133.

Millimetre-sized fragments have been documented in many fish species, but their transfer through food webs is still poorly understood. Here we quantified and described plastic fragments in the digestive tracts of 43 Easter Island flying fish (Cheilopogon rapanouiensis) and 50 yellowfin tunas (Thunnus albacares) from coastal waters around Rapa Nui (Easter Island) in the South Pacific subtropical gyre, and of fish preyed upon by T. albacares. Overall, seven C. rapanouiensis (16%) individuals had ingested microplastics, most of which resembled the common planktonic prey of the fish. One microplastic was found in the gut of a fish ingested by a tuna, which indicates that trophic transfer may occur between tuna and prey. A single T. albacares (2%) had ingested five mesoplastics (15.2-26.3 mm) that were probably not mistaken for prey items, but rather accidentally ingested during foraging on fish prey. The absence of microplastics in T. albacares suggests that such small particles, if transferred from the prey, do not accumulate in the relatively large digestive tract of large predators. On the other hand, larger plastic items may accumulate in the gut of tunas, to which they may induce deleterious effects that still need to be examined. However, only a small portion of the fish had ingested mesoplastics. The results of this study suggest that microplastic contamination is not an immediate threat to large predatory fish, such as T. albacares, along the coast of Easter Island within the South Pacific subtropical gyre. Microplastics may be transferred from fish prey to their predators, but do not remain in the predators' guts. Mesoplastics may accumulate in the guts of large predators, but are only ingested by few fish. Copyright © 2018 Elsevier Ltd

Chaidaroglou, A., et al. (2012). "Donor specific anti-HLA antibody detection in heart transplantation: Comparison of a donor-specific bead-based crossmatch technique with flow-crossmatch and single-antigen bead methodology." Journal of Heart and Lung Transplantation **1)**: S168-S169.

Purpose: In the present study we analyzed the efficiency of three different laboratory methodologies for the detection of donor-specific anti-HLA antibodies (DSA), their degree of correlation and their clinical relevance. Methods and Materials: The results of a Luminex donor-specific crossmatch (DSA-LX), in which donor-isolated HLA antigens are coated onto capture microbeads (Gen-Probe, USA), were compared with the results of a flow-cytometric crossmatch (FCM-X) and the results of a Luminex single-antigen bead methodology (SA-LX) (One Lambda, USA). A total of 46 sera samples obtained pre- (27 samples) and post-transplant (19 samples) were included in the study. All samples were tested with the DSA-LX and SA-LX methodology, while the 27 pre-transplant samples were also analyzed by FCM-X. Result(s): For the pre- transplant sera, the results of the three methods were in agreement for class I DSA in 21/27 (77.8%) samples and for class II DSA in 17/27 (63.0%) samples. When the results of the two bead-based methodologies were compared to the results of the FCM-X methodology, the SA-LX results showed better correlation with the FCM-X results than the DSA-LX results both for class I and class II antibodies. The results of SA-LX and DSA-LX, coincided for 40/46 (87.0%) and for 33/46 (71.7%) of sera tested for class I and class II HLA-DSA respectively. Furthermore, in the

group of transplanted patients the SA-LX results had more clinical relevance than the DSA-LX results. The methodology reproducibility score for both the SA-LX and the FCM-X was 100% whereas for DSA-LX the score was 88.9%. Conclusion(s): The results of DSA-LX do not have a good correlation with the results of FCM-X and SA-LX techniques for the detection of DSA, particularly as far as class II antibodies. Furthermore, DSA-LX has a lower reproducibility performance and a lower clinical relevance which renders it unsuitable for reliable graft allocation and patient monitoring.

Chakraborty, P., et al. (2019). "Organic micropollutants in the surface riverine sediment along the lower stretch of the transboundary river Ganga: Occurrences, sources and ecological risk assessment." Environmental Pollution **249**: 1071-1080.

The Hooghly River (HR) estuary is the first deltaic off-shoot of the perennial and transboundary river, Ganga, India. HR receives industrial and domestic waste along with storm-water run-off from Kolkata city and the adjoining districts. Organic micropollutants (OMPs) have been collectively termed for plasticizers, pharmaceuticals and personal care products, which are extensively consumed and disposed in the waste streams. Hence emerging OMPs were investigated to obtain the first baseline data from the Hooghly riverine sediment (HRS) along urban and suburban transects using gas chromatography mass spectrometry (GC-MS). The concentration range of OMPs in the HRS varied between 3 and 519 ng/g for carbamazepine, 5–407 ng/g for non-steroidal anti-inflammatory drugs (NSAIDs), 2–26 ng/g for musk ketone, 2–84 ng/g for triclosan, 2–199 ng/g for bisphenol A (BPA), 2–422 ng/g for plasticizers (phthalic acid esters (PAEs) and bis (2-ethylhexyl) adipate (DEHA)) and 87–593 ng/g for parabens. Carbamazepine concentration in sediment was an useful marker for untreated wastewater in urban waterways. High concentrations of BPA and PAEs in the suburban industrial corridor together with significant correlation between these two type of OMPs ($r2 = 0.5$; $p < 0.01$) likely reflect a common source, possibly associated with the plastic and electronic scrap recycling industries. Among all the categories of OMPs, plasticizers seems to exhibit maximum screening level ecological risk through out the study area. Image 1 • Carbamazepine can act as a possible marker for untreated wastewater. • Industrial sludge and burning of dumped plastic waste are potential sources of plasticizers. • Direct domestic discharge outlets might be a possible source for preservatives. Surveillance of microorganic pollutants in the Hooghly riverine sediment. [ABSTRACT FROM AUTHOR]

Chakraborty, R., et al. (2018). "A comparative study on the effect of polyethylene plastic waste on sandy soils." International Journal of Environment & Sustainable Development **17**(1): 56-69.

Plastic pollution is one of the major global issues. Engineering measures are being undertaken to harness the non-biodegradability of plastic by converting it to a vital part of built environment. A comparative study is undertaken to evaluate the effects of the waste plastic (polyethylene) on the geotechnical properties of two locally available sands viz. Brahmaputra sand and Kulsi sand by conducting a series of direct shear tests on the two sand samples reinforced with polyethylene plastic strips. The effect of varying concentration of plastics (0.10%, 0.20%, 0.30%, 0.45%, 0.60%, 0.70% and 0.75% by weight of the sand) using different dimensions of the plastic strips is investigated. The polyethylene plastic strips' length varied from 15 mm to 45 mm and width varied from 5 mm to 15 mm. The shear strength parameters which are obtained ultimately for the composite specimens on which analysis have been done, positively reflect soil improvement due to the inclusion of polyethylene plastic waste. [ABSTRACT FROM AUTHOR]

Chan, H. S. H., et al. (2019). "Evidence for non-selective ingestion of microplastic in demersal fish." Marine Pollution Bulletin **149**: 110523.

Microplastics have been observed in >100 species of fish, with considerable variability in levels of contamination in different species and different geographic locations. Here, we investigated the incidence of microplastic in five species of demersal fish (four wild-caught species and one from a mariculture business) in Hong Kong. We observed that 54% of fish stomachs contained microplastic (hard fragments and fibres) with no significant difference in the abundance of microplastic ingested between the species, between wild and commercial fish farms, or between locations. In addition, we observed no difference between the type of microplastics (shape or composition) ingested by fish. However, we did observe spatial variation, with fish closest to the Pearl River having higher frequency of occurrence of microplastics which reinforce the evidence that fish collected close to urban area are more likely to ingest microplastics.

Chan, R. W. S., et al. (2012). "The effect of macrophages on putative stem/progenitor cells in endometriosis." Human Reproduction. Conference: 28th Annual Meeting of the European Society of Human Reproduction and Embryology, ESHRE **27**(SUPPL. 2).

Introduction: Women with endometriosis have altered immunologic responses and defective immunosurveillance can lead to persistence and growth of menstrual debris at ectopic sites. Macrophages are key players of the natural immunity and are more activated in patients with endometriosis1. Stem cells have been found in human endometrium2 and ovarian endometrioma3 and they exhibit clonogenic activity3, 4 (ability to form large colony forming units, CFUs). Since the pathogenesis of endometriosis remains uncertain, we hypothesis that women with endometriosis are more likely to shed endometrial stem/progenitor cells during menses and these cells can rapidly grow at ectopic tissue upon exposure to a conducive environment. In this study, we examined: 1) the cloning efficiency of endometriotic cells when co-cultured with macrophages, 2) the invasiveness of endometriotic progenies after macrophage exposure, and 3) the cytokine profile of macrophages from women with/without endometriosis. Method(s): Ovarian endometriotic cysts were obtained from women undergoing laparoscopic ovarian cystectomy. Lesions were dissociated to achieve single cell suspensions. Stromal and epithelial cells were separated using CD326 microbeads and cultured at low seeding density (500 cells/cm2). Monocytes were isolated from venous blood samples from the same patients and co-culture in inserts with endometriotic cells for 14 days. Phorbol 12-myristate 13 acetate was used to induce differentiation of monocytes into macrophages. Condition medium (CM) was also collected after 72 hours and diluted with fresh culture medium at a ratio of 3:7 (CM/fresh medium, v/v) for culturing of endometriotic cells. The number of large CFUs was calculated. Endometriotic cells were then re-seeded onto matrigel invasion inserts to assess its invasion ability after 48 hours. Human cytokine antibody arrays containing 43 antibodies were

used to examine the differences in cytokine expression between macrophage CM from women with/without endometriosis. Result(s): Co-culture of macrophage significantly increased the cloning efficiencies (CE) of endometriotic epithelial cells (0.162 +/- 0.040%, n = 11) when compared to control (0.008 +/- 0.005%, P < 0.001, n = 11). The invasiveness of endometriotic epithelial cells increased by 2-fold when co-cultured with macrophages and 1.5-fold when cultured in macrophage CM. For endometriotic stromal cells, co-culture with macrophages (0.173 +/- 0.040%, P < 0.001, n = 16) and in macrophage CM (0.053 +/- 0.027%, P < 0.05, n = 16) also significantly increased the CE when compared to the control (0.003 +/- 0.002%, n = 16). The invasion ability of endometriotic stromal cells after co-cultured with macrophage increased by 1.5-fold. Forty-three cytokines were identified in the macrophage CM from women with/without endometriosis (n = 6). Macrophage colony stimulating factor was found to be up-regulated in endometriotic macrophage CM when compared to macrophage CM without endometriosis (P < 0.01). The up-regulated cytokine was also confirmed by ELISA. Conclusion(s): Our findings demonstrate that macrophages can increase the proliferation and the invasiveness of endometriotic cells from ovarian endometrioma. It is possible that macrophages and its secreted cytokines could stimulate the proliferation of stem/progenitor cells and be responsible for the development this gynecologic disease.

Chand, R. and S. Neethirajan (2017). "Microfluidic platform integrated with graphene-gold nano-composite aptasensor for one-step detection of norovirus." Biosensors & Bioelectronics **98**: 47-53.

Noroviruses are a foremost cause of gastroenteritis outbreaks throughout the world. On-site sample processing and detection of the viral clinical samples has always been a problem. This study reports an all-polydimethylsiloxane microfluidic chip integrated with screen-printed carbon electrode for the electrochemical detection of norovirus. The microfluidic chip contained packed silica microbeads zones to filter and enrich the norovirus infected clinical sample. Selective detection of norovirus was accomplished by functionalizing the graphene-gold nanoparticles composite modified carbon electrode with the viral capsid-specific aptamer. Norovirus specific aptamer was tagged with a ferrocene molecule, which acts a redox probe. The interaction of aptamer and norovirus resulted in a decrease in the electrochemical signal from ferrocene. The microfluidic chip and functionalized electrodes were characterized using several microscopic and electrochemical techniques. The optimized microfluidic aptasensor was employed to detect a range of norovirus concentration. Using differential pulse voltammetric analysis, a detection limit of 100 pM with a detection range from 100 pM to 3.5nM for norovirus was obtained. The application of aptasensor was also assessed by detecting norovirus in spiked blood samples. The aptasensor could easily discriminate between the target norovirus and other interfering molecules. The developed microfluidic aptasensor has the potential to be used for point-of-care one-step detection of norovirus in clinical samples.

Chang, A. B. (2014). "Advances in diagnosing the aetiology of childhood pneumonia." Pediatric Pulmonology **37)**: S15-S16.

Current studies determining the aetiology of childhood pneumonia vary substantially with respect to factors that influence the diagnosis and ascribed microbial etiology. These factors include variations in case definitions, use and interpretation of chest x-rays (CXRs), peripheral blood white cell counts and inflammatory markers, depth of investigations, facility type, and patient characteristics.1 While procalcitonin is a promising biomarker in adults with pneumonia, its diagnostic thresholds in childhood pneumonia are less defined and its usefulness and safety in guiding management has not been established.2 Also, ascribing definitive etiology with confidence is exceeding difficult unless lower airway specimens can be obtained and/or

concurrent systemic infection is identified. Consequently, it is not surprising that studies describe different frequency and types of pathogens associated with pneumonia. The Pneumonia Etiology Research for Child Health (PERCH) project is the largest multisite study (6000 children, 7 African and Asian countries) of childhood pneumonia. It seeks to address the aforementioned limitations by using case-control methodologies and adopting a protocol that has standardized enrollment criteria, specimen collection, laboratory testing and molecular detection techniques.3 Further, despite advances in identifying microorganisms using highly sensitive molecular techniques, ascribing causation may be problematic. Nucleic acid amplification (NAA) techniques, such as polymerase chain reaction (PCR) assays, identify genetic material, but the implicated microbe may no longer be viable or infectious and their presence may be from a recent, but unrelated respiratory illness. For example, the prevalence of respiratory viruses detected by molecular techniques in asymptomatic children is as high as 42%4 and strains of adenovirus C may remain latent in mucosal lymphocytes and be shed for months or even years.5 Even when the same molecular detection techniques for viruses are used, the site of specimen collection influences results. In paired comparisons of concurrently obtained upper and lower airway specimens for respiratory viruses in 75 children, we found significant discordance between nasopharyngeal aspirate and bronchoalveolar lavage (BAL) specimens.6 The discordancewas dependent on the virus type andmost marked for human rhinovirus (hRV) and adenoviruses. Nasopharyngeal aspirate (NPA) had a high sensitivity (92%) and low specificity (57%) for detecting hRV in BAL with poor kappa agreement value of 0.398 (95% CI 0.218-0.578, P<0.001). NPA had a fair sensitivity (69%) and good specificity (90.3%) for detecting adenovirus on BAL, kappa agreement was 0.561 (95%CI 0.32-0.80). Additionally, even when investigating viral infections from a single specimen collection site, detection of multiple viral types is common. This observation compounds the difficulty in determining the primary causative agent and presents new questions about the roles of these viruses in the aetiology of the disease. The ideal samples for determining etiologic agents in bacterial pneumonia are lower airway specimens. It is usually neither necessary nor feasible to obtain either BAL or needle lung aspirate specimens in acute pneumonia. Induced sputum is an alternative only in older children, and as potential respiratory bacterial pathogens commonly colonize the upper airways of healthy children, oropharyngeal contamination can complicate interpretation of culture results. Blood cultures are also infrequently (<10%) positive in children with pneumonia and as pneumococcal conjugate vaccines become incorporated into national immunization schedules their sensitivity is likely to be further reduced.2 PCR techniques have only modestly increased the yield of pathogen detection in blood samples,7 while with the exception of M. pneumoniae, serology is impractical in most clinical situations. Thus, it remains a challenge to determine the ideal, yet feasible, specimen for identifying the aetiological agent(s) in children with pneumonia. Increas ngly, viral-viral, viral-bacterial and bacterial-bacterial interactions in the pathogenesis of respiratory infections are recognized with in-vitro and in-vivo animal and human studies.8 Thus, although viruses may initiate the respiratory infection, secondary bacterial infection may occur and simply identifying a virus at presentation (leading to antibiotics being with-held) may not indicate the sole etiology of the child's acute clinical presentation or determine its long term outcomes. The complexity of the microbial contribution is further increased by introducing the world of '-omics' (e.g. metagenomics). While interest in this field is exploding, its use will likely further complicate ascribing etiology to a single organism. Microarray-based gene expression profiling (DNA microarray) i.e. comparing gene expression in infected to that in uninfected cells or tissues shows considerable promise for identifying causative pathogens of pneumonia.9 However, these and other nucleic acid amplification platforms (e.g. microbead arrays) are unlikely to be made available in the near future to resource-poor countries where the burden of

childhood pneumonia is greatest. Nevertheless there are promising signs of improved diagnostic yields for pneumococcal pneumonia when using molecular techniques to detect pneumococcal gene sequences in blood7 or by combining elevated serum biomarker results (eg. C-reactive protein; CRP) with rapid pneumococcal urinary antigen testing.10.

Chang, J., et al. (2013). "Does growing vegetables in plastic greenhouses enhance regional ecosystem services beyond the food supply?" Frontiers in Ecology and the Environment **11**(1): 43-49.
In recent years, plastic greenhouse vegetable cultivation (PGVC) has expanded worldwide, particularly in China, where it accounts for more than 90% of all global PGVC operations. As compared with conventional agricultural methods, PGVC has doubled crop yields by extending growing seasons and intensifying agriculture. PGVC also offers more ecosystem services relative to conventional approaches, including greater soil carbon sequestration, lower water consumption, and improved soil protection at regional scales. The economic benefits of this easily implemented agricultural method are attractive to small-holder farmers. However, greater environmental impacts (eg greenhouse-gas emissions, generation of large amounts of plastic waste) are associated with PGVC than with conventional approaches. Here, we review what is currently known about PGVC and identify future research priorities that will comprehensively assess the ecosystem services offered by this method of cultivation, as well as its environmental impacts and socioeconomic benefits.

Chang, M. (2015). "Reducing microplastics from facial exfoliating cleansers in wastewater through treatment versus consumer product decisions." Marine Pollution Bulletin **101**(1): 330-333.
Microplastics (<5mm) have been discovered in fresh and saltwater ecosystems, sediments, and wastewater effluent around the world. Their ability to persist and accumulate up food chains should be a concern as research is still experimenting with techniques to assess their long-term effects on the environment. I sought to characterize the microbeads found in facial exfoliating cleansers so as to better understand how to reduce this source of pollution through consumer use and wastewater treatment solutions. By sampling products from national-grossing cosmetic personal care brands, I was able to gather information on the size, color, volume, mass, and concentration of polyethylene beads in the cleansers. From that data, I modeled onto a consumer survey the estimated volume of microplastics entering a wastewater stream. Through inquiry, I learned the practices of two local wastewater treatment facilities. My findings show that consumer decisions and treatment protocols both play crucial parts in minimizing microplastic pollution.

Chang, X., et al. (2020). "Potential health impact of environmental micro- and nanoplastics pollution." Journal of Applied Toxicology **40**(1): 4-15.
Micro- and nanoplastics are generated from plastics and have negative impacts on the environment due to their high level of fragmentation. They can originate from various sources such as fragments, fibers and foams. The large proportion of the waste and resistance to degradation means micro- and nanoplastics have become a serious global environmental problem, but there are few studies on their potential toxicity for human health. In this review, we discussed routes of exposure and the potential effects of micro- and nanoplastics to human health. Human beings could mainly be exposed to micro- and nanoplastics orally and by inhalation. The possible toxic effects of plastic particles are due to the potential toxicity of plastics themselves, and their combined toxicity with leachable additives and adsorbed contaminants. The potential risks for human health focused on their gastrointestinal toxicity and liver toxicity. The toxic mechanisms could involve oxidative stress, inflammatory reactions and

metabolism disorders. More studies are needed to carry out and explore the potential toxicological mechanisms of micro- and nanoplastics and evaluate the combined toxicity of their adsorbed contaminants.

Chang-Bum, J., et al. (2016). "Microplastic Size-Dependent Toxicity, Oxidative Stress Induction, and p-JNK and p-p38 Activation in the Monogonont Rotifer (Brachionus koreanus)." Environmental Science & Technology **50**(16): 8849-8857.

In this study, we evaluated accumulation and adverse effects of ingestion of microplastics in the monogonont rotifer (Brachionus koreanus). The dependence of microplastic toxicity on particle size was investigated by measuring several in vivo end points and studying the ingestion and egestion using 0.05-, 0.5-, and 6-μm nonfunctionalized polystyrene microbeads. To identify the defense mechanisms activated in response to microplastic exposure, the activities of several antioxidant-related enzymes and the phosphorylation status of mitogen-activated protein kinases (MAPKs) were determined. Exposure to polystyrene microbeads of all sizes led to significant size-dependent effects, including reduced growth rate, reduced fecundity, decreased lifespan and longer reproduction time. Rotifers exposed to 6-μm fluorescently labeled microbeads exhibited almost no fluorescence after 24 h, while rotifers exposed to 0.05- and 0.5-μm fluorescently labeled microbeads displayed fluorescence until 48 h, suggesting that 6-μm microbeads are more effectively egested from B. koreanus than 0.05- or 0.5-μm microbeads. This observation provides a potential explanation for our findings that microbead toxicity was size-dependent and smaller microbeads were more toxic. In vitro tests revealed that antioxidant-related enzymes and MAPK signaling pathways were significantly activated in response to microplastic exposure in a size-dependent manner. [ABSTRACT FROM AUTHOR]

Chanhoun, M., et al. (2018). "Study of the implementation of waste wood, plastics and polystyrenes for various applications in the building industry." Construction and Building Materials **167**: 936-941.

This work enrolls in the context of sustainable development and protection of the immediate environment. It concerns a recycling study of wood waste, polystyrene waste and plastic waste. The objective of this study is to upgrade wood waste and plastic wastes (low and high density polyethylene) and expanded polystyrene in waste disposal in the developing countries of Africa. Two types of wood particle composites based on plastic and polystyrene polymers have been developed. The physical properties (density, water absorption and volumetric swelling) and mechanical properties (modulus of elasticity and modulus of rupture) required for their implementation are determined. The quantities found show that these composites can be used to produce self-adhesive sandwich panels or boards which will serve as a door core, false ceilings, formwork sandwich boards, interior and exterior flooring and furnishing materials.

Chao, Y., et al. (2011). "Amplification of Human Epidermal Cells by a Rotary Bioreactor in Vitro." Progress In Modern Biomedicine **11**(13): 2409-2412.

Objective: We attempted to produce human epidermal cells (hECs) on a large scale by Rotary Cell Culture System (RCCS). In this cultural system we used Cytodex-3 microbeads as microcarriers and high aspect ratio vessel RCCS as cultural system. Methods: The hECs were

obtained from human skin by using the method of digesting human foreskin with Dispase II and Trypsin-EDT and cultured in vitro and labeled with DIL, then combined with Cytodex-3 in RCCS. The characteristics of hECs combined with microcarriers were observed with Inverted microscope, and scanning electronic microscope (SEM). The proliferative capacities of microgravity cultivation and routine cultivation were compared by group doubling time. Results: Our results showed that hECs rapidly attached to the microcarriers in the RCCS, achieving high cell densities. hECs cultured on the microbeads in the RCCS remained actively proliferating potentials. Conclusion: Using biological reactor and microcarriers culture human epidermal cells is a kind of effective method for preparation a large number of seed cells for tissue engineering.

Chattopadhyay, S., et al. (2016). "Functionalized polymeric magnetic nanoconstructs for selective capturing and sensitive detection of Salmonella typhimurium." Analytica Chimica Acta **937**: 127-135.

Rapid detection and enumeration of pathogens is essential for monitoring contamination and spoilage of food products to ensure improved quality control management. Functionalized polymeric magnetic nanoconstructs (FPMNCs) were developed as an effective immunomagnetic separator and sensing platform for the selective capturing of Salmonella typhimurium. Novel FPMNCs were prepared in three stages involving synthesis of iron oxide (IO) dispersion, capping with sodium oleate and encapsulation of preformed IO nanoparticles by in-situ free radical emulsion polymerization of styrene (St), methyl methacrylate (MMA) and acetoacetoxy ethylmethacrylate (AAEM). PMMA improves the stability of FPMNCs by bridging extremely hydrophobic PS and hydrophilic PAAEM. Core-shell morphology of hydrophobic core of IO, PS & PMMA and hydrophilic shell of PAAEM was demonstrated by SEM, TEM and FTIR studies. FPMNCs with surface functionalized acetoacetoxy groups were covalently attached with polyclonal antibodies against Salmonella common structural antigen (CSA-1-Ab) without using any linker and catalyst. Colorimetric readout signal was acquired using CSA-1-Ab-HRP as secondary antibody after formation of sandwich immunocomplex with bacteria where the optical density of the samples were recorded using ELISA plate reader at 450 nm. The developed immunoassay was specific and selective which captures only targeted S. typhimurium with a detection limit of 10 cells/mL lower than infectious dose of salmonellosis infection. Minimal interference of food matrix with high signal to noise ratio was shown by various food samples. In addition, the performance of developed FPMNC based immunoassay was superior to commercially available immunomagnetic microbeads demonstrating undisputed advantage for capturing and detecting specific bacteria without any pre-enrichment of sample.

Chattopadhyay, S., et al. (2013). "Sensitive detection of food-borne pathogen Salmonella by modified PAN fibers-immunoassay." Biosensors & Bioelectronics **45**: 274-280.

Sensitive and rapid detection of Salmonella is a key to the prevention and identification of problems associated with human health and safety. Enzyme Linked Immunosorbent Assays (ELISAs) are popular and widely implemented technique to detect pathogenic bacteria in routine analysis but a typical ELISA yields a sensitivity of 10(6)-10(7)cfu/mL. The present study consecrates on the applicability of surface modified polyacrylonitrile (PAN) fibers as a novel matrix of immunoassay for the detection of Salmonella typhimurium in a sandwich ELISA format. Affinity purified antibody against Salmonella common structural antigen (CSA-1-Ab) was immobilized on modified PAN (mPAN) fibers using covalent immobilization via amine-glutaraldehyde chemistry and inactivated S. typhimurium were captured from various samples and detected colorimetrically using peroxidase-labelled common structural antibody (CSA-1-Ab-HRP) against Salmonella. The performance of the developed immunoassay was compared with commercially available immunomagnetic microbeads (Dynabeads()

anti-Salmonella), polystyrene (PS) microtitre plate and glutaraldehyde activated PS plate. Limit of detection (LOD) was found to be 10, 10(5), 10(6) and 10(7)cells/mL of bacteria for mPAN, Dynabeads(), glu-plate and PS plate respectively without any pre-enrichment step. The assay was specific for the targeted bacteria when investigated with other cross-reactant food and water-borne pathogens. The developed immunoassay offered undisputed advantages of being simple, sensitive and specific for the detection of S. typhimurium.

Chaturvedi, P. K., et al. (2011). "HPV neutralizing antibody detection in serum using liquid bead array system." International Journal of Gynecological Cancer **2)**: 27.

Detection of HPV (Human papillomavirus) DNA by nucleic acid hybridization is the method of choice for the diagnosis of HPV infection. Though DNA detection assays used, are highly sensitive, the data define only current HPV status, and previous transient infection may be missed. Numerous serologic studies using mainly HPV VLPs (virus like particles) have demonstrated that infection with HPVs follows a serologic immune response to viral capsid proteins and that anti-VLP antibodies can be an indicator of life-time exposure to HPV infection. It has been suggested that HPV VLP serologic assays may be a potential tool to identify women at risk for high-grade cervical intraepithelial neoplasia.In this study, we introduce a convenient method for investigating the seroresponse to HPV. By using multiplex luminex microbeads covalently coupled with HPV antigen, we can evaluate neutralizing antibodies and measure the titers of antibodies specific to each subtype. HPV 6, 11, 16 and 18 L1 genes were amplified by PCR, cloned into pGEX vector with GST tag and expressed in E.coli. Purified GST fusion proteins were coupled to respective microbeads and luminex assay was performed with patients' serum, collected 3 months after the final dose of quadrivalent HPV vaccine. The assay described in this study proved to be a robust, sensitive and high throughput assay to simultaneously measure antibodies to HPV type-specific, neutralizing epitopes against multiple HPV genotypes.

Chaudhary, A., et al. (2016). "Lightweight and Easily Foldable MCMB-MWCNTs Composite Paper with Exceptional Electromagnetic Interference Shielding." Acs Applied Materials & Interfaces **8**(16): 10600-10608.

Lightweight and easily foldable with high conductivity, multiwalled carbon nanotube (MWCNT)-based mesocarbon microbead (MCMB) composite paper is prepared using a simple, efficient, and cost-effective strategy. The developed lightweight and conductive composite paper have been reported for the first time as an efficient electromagnetic interference (EMI) shielding material in X-band frequency region having a low density of 0.26 g/cm(3). The investigation revealed that composite paper shows an excellent absorption dominated EMI shielding effectiveness (SE) of -31 to -56 dB at 0.15-0.6 mm thickness, respectively. Specific EMI-SE of as high as -215 dB cm(3)/g exceeds the best values of metal and other low-density carbon-based composites. Additionally, lightweight and easily foldable ability of this composite paper will help in providing stable EMI shielding values even after constant bending. Such intriguing performances open the framework to designing a lightweight and easily foldable composite paper as promising EMI shielding material, especially in next-generation devices and for defense industries.

Chaure, S., et al. (2010). "Spectroscopic investigation of sulfonate phthalocyanine to probe enzyme reactions for heavy metals detection." Journal of Hazardous Materials **173**(1-3): 253-257.

Optical absorption and Raman spectra of the sulfonated copper phthalocyanine (CuTsPc) layer were exploited for detection of cadmium (Cd) contaminants in water. Acetylcholine esterase was immobilized by freely suspending them in calcium alginate microbeads and this gel was

then spincoated on the drop cast sulfonated copper phthalocyanine film on a glass substrate to form a bilayer. The inhibition of catalytic reaction between acetylcholine chloride and enzyme due to Cd contaminants was monitored by recording changes in spectra of drop cast CuTsPc as an indicator. The detection limit of cadmium content in water was found to be 1 ppm.

Chavez, K., et al. (2016). "Gender biased immune-biomarkers in active tuberculosis and correlation of their profiles to efficacy of therapy." Tuberculosis **99**: 17-24.

Active pulmonary TB is an inflammatory disease and is increasingly viewed as an imbalance of immune responses to Mycobacterium tuberculosis (M. tb.) infection. In addition, this immune imbalance may be gender biased (males have a higher prevalence of TB) but reasons for such bias are uncertain. We hypothesized that studies on profiles of immune-biomarkers will not only provide insight into molecular basis of gender bias but may also help identify biomarkers to monitor efficacy of TB therapy. We examined 10 plasma cytokine/chemokine/growth-factor and 8 antibody (against 8 M. tb. antigens) biomarkers (elevated in TB patients) by multiplex microbead immunoassays. In addition, we examined these biomarkers in patients under anti-tuberculosis therapy (ATT). The results showed that female patients contained significantly higher levels of CXCL9 (MIG) and CXCL10 (IP-10), while males contained higher levels of PDGF-BB. In contrast, more males than females contained antibodies against several antigens. Our results also show that there are progressive and substantial decreases in plasma levels of CXCL9, CXCL10, PDGF-BB, IFNgamma, and IL-18, correlating with treatment success. Our results suggest that studies on gender bias in immunebiomarkers will enhance understanding of host responses in TB and would be valuable as biomarkers for monitoring efficacy of ATT.

Chawla, N., et al. (1998). "Effect of SiC volume fraction and particle size on the fatigue resistance of a 2080 Al/SiC sub p composite." Metallurgical and Materials Transactions A (USA) **29A**(11): 2843-2854A.

The effect of SiC volume fraction and particle size on the fatigue behavior of 2080 Al was investigated. Matrix microstructure in the composite and the unreinforced alloy was held relatively constant by the introduction of a deformation stage prior to aging. It was found that increasing volume fraction and decreasing particle size resulted in an increase in fatigue resistance. Mechanisms responsible for this behavior are described in terms of load transfer from the matrix to the high stiffness reinforcement, increasing obstacles for dislocation motion in the form of S' precipitates, and the decrease in strain localization with decreasing reinforcement interparticle spacing as a result of reduced particle size. Microplasticity was also observed in the composite, in the form of stress-strain hysteresis loops, and is related to stress concentrations at the poles of the reinforcement. Finally, intermetallic inclusions in the matrix acted as fatigue crack initiation sites. The effect of inclusion size and location on fatigue life of the composites is discussed.

Che, X., et al. (2013). "Improve effectivity of microbead biofilter by media motion." Transactions of the Chinese Society of Agricultural Engineering **29**(5): 194-198.

Conventional microbead biofilters are simple and reliable in form, but they possess certain limitations due to the thickness of the filter. Excessive filter thickness can cause channeling along the wall and even moderate to severe blockage. Water channeling detrimentally decreases the residing time of the reactants, thus leading to decreased nitrification activity. Sequencing microbead biofilter, in which the media keeps continuous "up and down" movement, is developed on the basis of the traditional microbead filters. The breaker bars are positioned in the bead bed volume in order to generate a relative displacement between microbeads, which enable the biofilter obtain the effect of self-cleaning. The investigation of effect of media layer reciprocating motion on nitritification efficiency and kinetics of this type of filter as a purpose, a pilot scale experiment was carried out in a recirculating aquaculture system. The experimental biofilter was divided into two chambers, designated A-chamber and B-chamber. The water flow through the filtration system was proceed by the electric control valve and water level switch in an alternating fashion, regularly switching between the vessels to enter the A-chamber or B-chamber. Each chamber of the experimental filter was 30 cm in diameter and 50 cm height. The filter used expanded polystyrene beads (microbead) approximately 3.0 mm in diameter, with a density of 28 kg/m³ and a specific surface area of 1160 m²/m³. The microbead packing layer was highly filled at 0.26 m, exhibiting a microbead packing volume of 0.037 m³. The filter used a pump to carry water, while the water trickles down the microbead packing due to gravity. The RAS test system consisting of a 1.3 m³ culture tank, a particle trap, swirl separators, a pump sump, a reuse pump, a sequencing microbead biofilter, and an air diffuser. The bulk water was pumped from a sump to the tested filter after removing solid wastes by the swirl separator, and then returned to culture tank. The total water volume of the system was about 1.6 m³. The reciprocating motion was suspended for six days. Then resume movement of the media and compare the ammonia removal rate and nitritification kinetics in two operation conditions. The result revealed that the movement enhanced the treatment performance greatly. Six days later, when the reciprocating motion was suspended, the ammonia removal efficiency exhibited a gradual decline of 27.1%. Then, the movement of the media was resumed. As a result biological filter ammonia removal efficiency increased rapidly to the level before the motion stops after two days. The results of nitritification kinetics indicate that the media movement changed the kinetics characteristics of filter. Compared with that in stationary state, the threshold value from zero-order to half-order kinetics decreased significantly. The media reciprocating movement and the cutting of the flow greatly improved the hydraulics on the surface of media the mass transfer efficiency. Thereby, the biofilm activity and nitrification the efficiency increased correspondingly.

Cheema, S. (2011). Metagenomic approach to study the polyhydroxyalkanoate genes in hydrocarbon contaminated site.

Plastics being xenobiotic are recalcitrant to microbial degradation. Plastic production also involves a number of harmful chemicals which pose environmental as well as human health risks. There is an obvious need to minimize the generation of plastic waste and to search for newer technologies that can play a vital role in mitigating these problems. Research has been going on for quiet some time with the idea of developing an alternate environment friendly product. Many biodegradable plastic materials have been exploited such as: 1) PHAs (polyhydroxyalkanoates), 2) polylactides, 3) aliphatic polyesters, 4) polysaccharides, 5) co-polymers and /or blends of above. Of these, PHAs have gained more and more importance the world over due to their structural diversity and close analogy to plastics. The other advantage which PHAs have is that they are biodegradable and environmental friendly. Many microorganisms have the ability to degrade these macromolecules enzymatically. PHAs are polyesters of various hydroxyalkanoates that are synthesized by many grampositive and gram-negative bacteria. It was in the last century (1926) when Lemoigne reported the formation of poly(3-hydroxbutyrate) (PHB) inside bacteria for the first time. Since then research in this field has developed considerably with the discovery of many more different PHAs from at least 75 different genera. This polymer is accumulated intracellularly to levels as high as 90% of the cell dry weight under conditions of nutrient stress and acts as a carbon and energy reserve. Research over the years has focused on the use of alternative substrates, novel extraction methods, genetically enhanced species and mixed cultures with a view to make PHAs more commercially attractive. Enormous advances in molecular analysis of PHA biosynthesis genes and PHA production have been well documented. Many strategies such as homologous or heterologous gene probes, short consensus oligonucleotide hybridization or PCR techniques have been employed for identifying PHA synthase genes and other genes involved in PHA biosynthesis. In Escherichia coli, a previous non-PHA producer, many strategies such as pathway engineering has been developed to set up microbial production by recombinant DNA technology. The sequence analysis of 89 complete and 34 partially sequenced genomes was done in an attempt to identify domains of PHA genes using RPSBLAST. Computer simulations of PHA granule formation in vivo are being done to help design strategies to optimize the fermentation process and achieve higher yields of PHA. Although PHA have been commercially developed and marketed, there are several important factors influencing the large scale commercial production. Efforts are being devoted with a renewed interest to increase PHA yield and productivity. A search is on to identify organisms capable of PHA production at higher levels. Conventional methods for searching microbes employ ineffective laboratory method with the result that a major portion of the bacteria remain largely untapped, unknown, and uncharacterized due to lack of proper culture conditions. On the other hand, Metagenomics represents a powerful tool to access the abundant microbial diversity of native environmental samples. It helps to effectively characterize the genetic diversity present in any samples regardless of the availability of laboratory culturing techniques. The term "metagenome" was first coined by Handelsman, 1998, as: The genomes of the total microbiota found in nature. Metagenomics, instead of removing microbes from their environment to isolate them, just directly isolates genomic DNA. This DNA is then cloned and environmental genetic libraries are constructed. Relevant clones from the libraries are sequenced or screened for the expression of gene products. Nucleotide-sequence based screening is highly efficient in comparison to enzyme-activity based screening. The success of metagenomic approach has already been demonstrated in identifying novel products ranging from small-sized genes conferring enzymatic activities suc as lipases, amylases. Reassembly of multiple genomes has provided insight into energy and nutrient cycling within the community, genome structure, gene function, population genetics and microheterogeneity, and lateral gene transfer among members of an uncultured community. The application of metagenomics to PHA will facilitate the trapping of those microbes that might have a better potential to produce PHA but are being missed out due to lack of proper culture techniques. This study is aimed at using metagenomics approach for bioprospecting of the PHA synthase gene in the environmental sample. Hydrocarbon contaminated sites are rich in carbon and have nutrient imbalance, providing excellent conditions for microbes to accumulate large amounts of PHA. And therefore are appropriate sources of sampling for our study. (Abstract shortened by UMI.)

Chen, B., et al. (2012). "Responsive polymer welds via solution casting for stabilized self-assembly." Acs Applied Materials & Interfaces **4**(12): 6911-6916.

We present a simple solution casting technique to apply polymer welds to stabilize capillary-force directed self-assembled systems including arrays of pillars and microbeads. The strength of the polymer welds can be enhanced by increasing either the polymer concentration or molecular weight. The use of responsive polymers to form the welds allow for the fabrication of hierarchical structures that actuate in response to external stimuli. For example, temperature-responsive and pH-responsive microstructures can be formed by solution casting poly(vinyl methyl ether) and poly(methacrylic acid), respectively. We demonstrate that polymer welds formed using biocompatible alginate allows for controllable release of microbeads in microfluidic channels, which has potential applications in drug delivery.

Chen, C., et al. (2019). "Organotin Release from Polyvinyl Chloride Microplastics and Concurrent Photodegradation in Water: Impacts from Salinity, Dissolved Organic Matter, and Light Exposure." Environmental Science & Technology **53**(18): 10741-10752.

Photochemical weathering leads to degradation of microplastics and releases chemical additives, polymeric fragments, and/or byproducts. This study evaluated the release kinetics of organotin compounds (OTCs) from three different sized (10-300 mum) polyvinyl chloride (PVC) microplastics under UV- and visible light irradiation. Four OTCs, dimethyltin (DMT), monomethyltin (MMT), dibutyltin (DBT), and monobutyltin (MBT), were found to release from PVC particles after 24 h leaching in darkness ranging from 2 to 20 mug.g-PVC⁻¹. Under UV/visible light irradiation, only DMT and DBT were detectable, whereas MMT and MBT were not detected due to rapid photodegradation. The total tin concentrations (including organic and inorganic tins) in the aqueous phase monotonically increased under light exposure. By contrast, they reached plateaus after 24 h in darkness, confirming the photodegradation of OTCs. A release kinetics model was established and correctly interpreted the microplastics size effect on the OTC release process. Finally, the impacts of salinity and dissolved organic matter (DOM) were investigated. The release and photodegradation of OTCs were both inhibited at high salinity conditions, probably due to the enhanced readsorption of OTCs on PVC microplastics and the formation of halogen radicals that were less reactive toward neutral OTCs. The presence of DOM, however, increased OTCs release probably because the excited state triplet DOM (³DOM*) formed and reacted with OTCs from PVC microplastics.

Chen, C., et al. (2018). "Aberrant expression of the innate restriction factor bone marrow stromal antigen-2 in primary Sjogren's syndrome." Clinical and Experimental Rheumatology **36 (3 Supplement 112)**: S277.

Background. Bone marrow stromal antigen-2 (BST-2) is a transmembrane innate immune protein that was detected to play important role in some autoimmune diseases. The objective of this study was to analyze BST-2 levels in labial glands, total peripheral blood mononuclear cells (PBMCs) and PBMC subpopulations from primary Sjogren's syndrome (pSS) patients and determine the correlation between BST-2 expression and clinical characteristics. Methods. PBMC subsets were positively separated using magnetic microbeads. BST-2 mRNA levels in labial glands, total PBMCs and PBMC subsets of 30 pSS and 16 healthy control (HC) subjects were investigated using real-time polymerase chain reaction (RT-PCR). Distribution of BST-2-positive cells in the labial glands was assessed by immunohistochemistry. Results. BST-2 was significantly increased in pSS labial glands and was positively correlated with the VAS value for parotid gland swelling and rheumatoid factor and beta2-microglobulin serum levels. BST-2 levels were statistically different between pSS patients with positive and negative expression of anti-SSA antibody. Positive glandular epithelial cells, ductal epithelial cells and adjacent infiltrating lymphocytes were observed in labial glands from pSS patients, while there were a few scattered positive ductal epithelial cells in controls. BST-2 was also up-regulated in CD19+ B cells and the remaining CD4-CD8-CD19-PBMCs. Conclusion. BST-2 was aberrantly expressed in pSS patients, and expression in labial glands was positively correlated with important clinical characteristics; thus, it may be a potential biomarker of pSS activity.

Chen, F., et al. (2013). "Inkjet nanoinjection for high-thoughput chemiluminescence immunoassay on multicapillary glass plate." Analytical Chemistry **85**(15): 7413-7418.

We report a novel chemiluminescence diagnosis system for high-throughput human IgA

detection by inkjet nanoinjection on a multicapillary glass plate. As proof-of-concept, microhole-based polydimethylsiloxane (PDMS) sheets were aligned on a multicapillary glass plate to form a microwell array as microreactors for enzyme-linked immunosorbent assay (ELISA). The multicapillary glass plate was utilized as a switch that controlled the holding/passing of the solution. Further, anti-IgA-labeled polystyrene (PS) microbeads was assembled into the microwell array, and an inkjet nanoinjection was specially used to distribute the sample and reagent solution for chemiluminescence ELISA, enabling high-throughput detection of human IgA. As a result, the performance of human IgA tests revealed a wider range for the calibration curve and a lower limit of detection (LOD) of 0.1 ng mL(-1) than the ELISA by a standard 96-well plate. The analysis time and reagent consumption were significantly decreased. The IgA concentrations in saliva samples were determined after 10000-fold dilution by the developed ELISA system showing comparable results by conventional immune assay with 96-wells. Thus, we believe that the inkjet nanoinjection for high-throughput chemiluminescence immunoassay on a multicapillary glass plate will be promising in disease diagnosis.

Chen, G., et al. (2020). "Mini-review of microplastics in the atmosphere and their risks to humans." Science of the Total Environment **703**: 135504.

Studies of microplastics (MPs) have highlighted their ubiquity in various environments. Recently, microplastics have been observed in atmospheric fallout collected from some cities. Although the studies are limited, some researches have shown that synthetic textiles are main source of airborne microplastics, and fibers are the dominant shape of microplastics in the atmosphere. Due to their small size, airborne microplastics can be directly inhaled posing health risks to humans, particularly to industry workers. Meteorological conditions and human activities affect the distribution and deposition of airborne microplastics. Furthermore, airborne microplastics are contributors to microplastic pollution in aquatic environments. We summarized the current knowledge and provide insights into further research to better understand airborne microplastics and their risks to human.

Chen, H., et al. (2015). "Crosslinking of Fc gamma-RLLb and Fc epsilon-RI binding peptides inhibits osteoclast formation in multiple myeloma through inactivation of the ITAM signaling pathway." Blood **126 (23)**: 2995.

Introduction: Overactivity of osteoclasts resulting in bone destruction is a hallmark of multiple myeloma (MM). Receptor for activation of NF-kB ligand (RANKL) and monocyte colony stimulating factor (MCSF) signaling pathways both promote proliferation and survival of the precursors of the osteoclast lineage, and have been widely investigated in MM. The third pathway involved in osteoclast differentiation is the immunoreceptor tyrosine-based activation motif (ITAM) with c-Fms signaling. ITAM and its inhibitor ITIM provide the basis for two opposed signaling modules that duel for control of osteoclast formation. Human monocyte/macrophage expresses the low-affinity FcgammaRIIb and high-affinity Fc? receptor 1 (Fc?RI). Both receptors mediate Syk phosphorylation to activate or inactivate downstream ITAM or ITIM signaling molecules. In this study, we determined the effects of an IgG(CH2-CH3) and IgE(CH2-CH3-CH4) fusion protein that activates the ITIM inhibitory pathway on downstream signaling of Syk and osteoclast formation in monocytes from MM patients. Method(s): We constructed IgG(CH2-CH3) with an IgE(CH2-CH3-CH4) fusion protein using standard cloning techniques. We evaluated the fusion protein on osteoclast formation using cells from either human monocytes isolated from MM patients' peripheral blood mononuclear cells (PBMCs) or bone marrow (BM) MCs with an anti-CD14 micro-bead affinity column and magnetic bead selection (Miltenyi Biotec, Auburn, CA). The monocytes were cultured on slide-culture dishes (2 X 105 cells/well).

The cells were treated with the fusion protein or with IgE or IgG and subsequently treated with 50ng/ml RANKL (receptor for activation of nuclear factor kB and 10ng/ml MCSF (monocyte colony stimulating factor) in order to stimulate osteoclast formation at the beginning of the culture and during a medium change after 3 days with the same amount of growth factors added. The cells were fixed for tartrate resistant acid phosphatase (TRAP)-staining assay on day 21. To investigate ITIM signaling pathway we determined Syk phosphorylation of monocytes treated or without treated with fusion protein by Western blot analysis. Result(s): We found that in a concentration-dependent fashion, the fusion protein inhibited osteoclast cell formation from CD14+ MCs from PB or BM exposed to RANKL and MCSF. We further analyzed the effects on the FcgammaRIIb-SHIP signaling pathway in monocytes induced with 50ng/ml RANKL and 10ng/ml MCSF following exposure to fusion protein or control IgG or IgE. The results showed that the monocytes showed markedly lower Syk phosphorylation following exposure to the fusion protein (100-200ng/ml). There was no change of Syk phosphorylationl in monocytes treated with IgG or IgE or IgG with IgE. Conclusion(s): The results of our study show that intact human IgG or IgE does not affect the ITAM or ITIM signaling pathways. However, a fusion protein consisting of IgG(CH2-CH3) with IgE(CH2-CH3-CH4) showed the ability to activate the ITIM inhibition pathway through FcgammaRIIb to reduce osteoclast formation. Thus, blockage of ITAM may be treating novel treatment for preventing bone loss for MM patients.

Chen, H., et al. (2019). "A nationwide assessment of litter on China's beaches using citizen science data." Environmental Pollution **258**: 113756.

China is the largest plastic consumer in the world. Despite its plastic waste import ban in 2017, this populous economy inevitably generates a large amount of waste, including plastic waste, a considerable part of which has become marine litter. Data from the 2018 National Coastal Cleanup and Monitoring Project, the largest beach litter monitoring activities using the citizen science approach in China, have been retrieved and analyzed to understand spatial patterns, composition, and original usage of marine litter. Within this project, 24 beaches were surveyed every two months. As a result, the mean density was 3.85 +/- 5.39 items m⁻², much higher than that reported by previous studies in China. There were great differences in the spatial distribution of litter. The highest densities appeared in the runoff-affected area of the Yangtze River, which was another difference from previous studies. Low-density, easy-to-transport foamed plastics were the major contributor to marine litter in these areas. Along China's coast, approximately 90% of litter was from land-based sources, and over half of that originated from domestic sources. Including foamed plastic products, plastic litter with low recycling value dominated. Both natural and human factors influencing the spatiotemporal distribution and composition of litter are discussed. Socioeconomic factors, such as the lifestyle and consumption levels of citizens and local waste management systems, are possible explanations for the low-value characteristic of marine litter. The deviation between previous data and citizen science data in this study may be caused by many factors. Based on the discussion on these factors, some suggestions for citizen science research in China are also put forward.

Chen, H., et al. (2019). "Mixing effect of polylactic acid microplastic and straw residue on soil property and ecological function." Chemosphere **243**: 125271.

Microplastics have become a contaminant of increasing concern in soils. Although biodegradable plastics were considered as alternatives of traditional plastics, some evidence showed that biodegradable plastics might produce more microplastics. Until now, the effect of biodegradable microplastics on soil functions and processes, as well as microbial communities is

uncertain. Based on high throughput sequencing, enzymatic activity assay and dynamic analysis of soil carbon and nitrogen, we investigated the effects of biodegradable polylactic acid microplastics (PLA MPs) on soil microbiota and related ecological processes under conditions of high or low carbon content. The results showed that PLA MPs had no significant effect on the overall diversity and composition of bacterial communities or related ecosystem functions and processes. However, co-occurrence network analysis revealed that PLA MPs impacted the interactions between constituent species, which might have legacy effect on soil bacterial communities and functions. Our data also revealed that PLA MPs could trade off the priming effect of carbon source. Our results provided an integrated picture in understanding the effects of PLA MPs on soil microbes, properties and ecological functions, which will help to further understand the effects of MPs on terrestrial ecosystems.

Chen, H. J., et al. (2018). "Anomalous dispersion of magnetic spiky particles for enhanced oil emulsions/water separation." Nanoscale **10**(4): 1978-1986.

In situ effective separation of oil pollutants including oil spills and oil emulsions from water is an emerging technology yet remains challenging. Hydrophobic micro- or nano-materials with ferromagnetism have been explored for oil removal, yet the separation efficiency of an oil emulsion was compromised due to the limited dispersion of hydrophobic materials in water. A surfactant coating on microparticles prevented particle aggregation, but reduced oil absorption and emulsion cleaning ability. Recently, polystyrene microbeads covered with nanospikes have been reported to display anomalous dispersion in phobic media without surfactants. Inspired by this phenomenon, here magnetic microparticles attached with nanospikes were fabricated for enhanced separation of oil emulsions from water. In this design, the particle surfaces were functionalized to be superhydrophobic/superoleophilic for oil absorption, while the surface of the nanospikes prevented particle aggregation in water without compromising surface hydrophobicity. The magnetic spiky particles effectively absorbed oil spills on the water surface, and readily dispersed in water and offered facile cleaning of the oil emulsion. In contrast, hydrophobic microparticles without nanospikes aggregated in water limiting the particle-oil contact, while surfactant coating severely reduced particle hydrophobicity and oil absorption ability. Our work provides a unique application scope for the anomalous dispersity of microparticles and their potential opportunities in effective oil-water separation.

Chen, K. J., et al. (2019). "Biotechnology to sustainability: Consumer preferences for food products grown on biodegradable mulches." Food Research International **116**: 200-210.

This study evaluates consumer preferences for an agricultural product grown on biodegradable mulch film, which is an environmentally friendly soil cover that sustains plant growth, but that avoids the environmental harm of plastic pollution from non-biodegradable mulches in the field or upon disposal. Using a dichotomous-choice contingent valuation method, we assessed the willingness to pay for strawberries grown on biodegradable mulch with a randomized information treatment on 1510 consumers across different regions of the United States. On average, consumers are willing to pay 10.3% more for food -strawberries in our case- grown on biodegradable mulches. Consumers who are female, earn a higher income, have stronger environment-friendly attitudes, or received the information treatment on the benefits of biodegradable mulches, also expressed more willingness to pay a premium price for strawberries grown on biodegradable mulches. Our findings support that consumers are willing to internalize a price premium for food products on biodegradable mulches, suggesting that agricultural producers could realize private benefits from price premiums that could, in turn, generate social benefits by increasing biodegradable mulch use, leading to a reduction of plastic pollution. By providing empirical evidence on the potential adoption of biotechnology in the food production system, our results allow agricultural crop producers to make more informed decisions on growing and pricing strategies. Our research will also facilitate agricultural scientists and policymakers to articulate industry-supporting policies for sustainable development.

Chen, K. S. and R. Z. Yeh (1996). "Pyrolysis kinetics of epoxy resin in a nitrogen atmosphere." Journal of Hazardous Materials **49**(2-3): 105-113.

Pyrolysis kinetics of epoxy resins are investigated under various heating conditions (2, 5, 10, and 20 K min⁻¹) in nitrogen by means of thermogravimetric measurements. Experimental initial reaction temperatures are within 531-552 K for each heating rate and the averaged apparent activation energy is 41.26 kcal mol⁻¹. The initial and final reaction temperatures, and thus the reaction range, all increase when the heating rate is increased. The overall rate equation can be modelled by an Arrhenius-type equation from which the kinetic parameters such as the activation energy, the pre-exponential factor, and the reaction order are determined by using the Friedman method. The results will be useful in developing pyrolysis or starved-air incineration systems for thermosetting plastic waste.

Chen, L., et al. (2018). "Curcumin attenuates sepsis-induced acute organ dysfunction by preventing inflammation and enhancing the suppressive function of Tregs." International Immunopharmacology **61**: 1-7.

Sepsis is characterized by the extensive release of cytokines and other mediators. It results in a dysregulated immune response and can lead to organ damage and death. Curcumin has anti-inflammatory properties and immunoregulation functions in various disorders such as sepsis, cancer, rheumatoid arthritis, cardiovascular diseases, lung fibrosis, gallstone formation, and diabetes. This paper investigates the effects of curcumin on immune status and inflammatory response in mice subjected to cecal ligation and puncture (CLP). Inflammatory tissue injury was evaluated by histological observation. Magnetic microbeads were used to isolate splenic CD4⁺CD25⁺regulatory T cells (Tregs), and phenotypes were then analyzed by flow cytometry. The levels of Foxp3 were detected by Western blot and real-time PCR and cytokine levels were determined by enzyme-linked immunosorbent assay. We found that the administration of curcumin significantly alleviated inflammatory injury of the lung and kidney in septic mice. The suppressive function of Treg cells was enhanced and the plasma levels of IL-10 increased after treatment with curcumin. Furthermore, the secretion of plasma TNF-alpha and IL-6 was notably inhibited in septic mice treated with curcumin and administration with curcumin could improve survival after CLP. These data suggest that curcumin could be used as a potential therapeutic agent for sepsis.

Chen, Q., et al. (2019). "Leaching of endocrine disrupting chemicals from marine microplastics and mesoplastics under common life stress conditions." Environment International **130**: 104938.

Microplastics (MPs) and mesoplastics are able to sorb harmful substances and often contain additives, e.g., endocrine disrupting chemicals (EDCs), that can cause adverse effects to organisms. The present study aims to determine EDC concentrations and their endocrine activities in leachates of field-collected marine MPs and mesoplastics under stress conditions that are known to occur during the plastic life cycle. Estrogens were the dominant EDCs on plastic particles and were either concentrated from the surrounding water or originated from plastic manufacturing. Bisphenol A had the highest detection frequency (75%) with an average concentration of 475+/-882mug/kg, followed by bisphenol S, octylphenol and nonylphenol.

Moreover, smaller marine MPs leached greater quantities of EDCs because the sorption from surrounding seawater is more efficient for smaller particles. It was found that normal life stresses such as microwaving (MW) and autoclaving (AC) can decrease EDC concentrations, but solar irradiation (solar) can increase EDC concentrations in leachates. Even though organisms with higher metabolic ability exhibited greater estrogenic effects, the comprehensive toxicity of plastic leachates after common life treatments was still limited (below the EC₁₀ value) if 0.1% is taken as the EDC uptake from plastic. In future studies, the accurate contribution of plastic bound EDCs needs to be further explored, and the monitoring of MPs and mesoplastics in the human diet remains important because the concentrations of these plastics may change in the future.

Chen, Q., et al. (2017). "Quantitative investigation of the mechanisms of microplastics and nanoplastics toward zebrafish larvae locomotor activity." Science of the Total Environment **584**(585): 1022-1031.

This study investigated the direct and indirect toxic effects of microplastics and nanoplastics toward zebrafish (Danio rerio) larvae locomotor activity. Results showed that microplastics alone exhibited no significant effects except for the upregulated zfrho visual gene expression; whereas nanoplastics inhibited the larval locomotion by 22% during the last darkness period, and significantly reduced larvae body length by 6%, inhibited the acetylcholinesterase activity by 40%, and upregulated gfap, alpha 1-tubulin, zfrho and zfblue gene expression significantly. When co-exposed with 2 micro g/L 17 alpha -ethynylestradiol (EE2), microplastics led to alleviation on EE2's inhibition effect on locomotion, which was probably due to the decreased freely dissolved EE2 concentration. However, though nanoplastics showed stronger adsorption ability for EE2, the hypoactivity phenomenon still existed in the nanoplastics co-exposure group. Moreover, when co-exposed with a higher concentration of EE2 (20 micro g/L), both plastics showed an enhanced effect on the hypoactivity. Principal component analysis was performed to reduce data dimensions and four principal components were reconstituted in terms of oxidative stress, body length, nervous and visual system related genes explaining 84% of total variance. Furthermore, oxidative damage and body length reduction were evaluated to be main reasons for the hypoactivity. Therefore, nanoplastics alone suppressed zebrafish larvae locomotor activity and both plastic particles can change the larvae swimming behavior when co-exposed with EE2. This study provides new insights into plastic particles' effects on zebrafish larvae, improving the understanding of their environmental risks to the aquatic environment.

Chen, Q., et al. (2012). "Haemodynamics-Driven Developmental Pruning of Brain Vasculature in Zebrafish." PLoS Biology **10**(8): e1001374.

Author Summary Although the brain comprises only 2% of body weight, it receives 15% of cardiac output and consumes 20% of total body oxygen delivered through its blood vasculature. The brain blood vasculature consists of a highly branched vessel network that is tailored to efficiently deliver oxygen and nutrients to each brain region. However, little is known about how the brain vasculature develops. Using in vivo long-term serial confocal imaging of zebrafish larvae, we analyze this process and find that the developing midbrain vasculature undergoes not only vessel growth but also blood flow-driven vessel pruning. We show that vessel pruning occurs preferentially at loop-shaped vessel segments via the migration of endothelial cells to adjacent unpruned segments; over time, such vessel pruning reduces the complexity of the early primitive midbrain vasculature. We also observe that pruned vessel segments exhibit a lower and more variable blood flow than do unpruned segments and that the local blocking of blood flow triggers vessel pruning. By contrast, increases in blood flow impair vessel pruning. Finally, we show that pruning events can be predicted using a haemodynamics based mathematical

model of the midbrain vasculature. These findings demonstrate the existence of brain vessel pruning during development and provide novel insights into the role of haemodynamics in brain vascular refinement.

Chen, Q., et al. (2020). "Is color a matter of concern during microplastic exposure to Scenedesmus obliquus and Daphnia magna?" Journal of Hazardous Materials **383**: 121224.

Toxicities of microplastics (MPs) on aquatic organisms have been widely investigated often by using white or transparent MPs. However, various colored MPs scatter in the real aquatic environment. Here we investigated four colored MPs' effects on Scenedesmus obliquus algal growth first. Under the light condition, algal growth increased initially due to hormesis stimulation and then decreased gradually at higher MP concentrations. Green colored MPs exhibited the lowest inhibition effect, probably due to their resemblance to algae; white MPs inhibited the algal growth significantly, which was attributed to the presence of ethanol. Turbulence condition seemed to diminish algal growth differences among groups, but it led to slight oxidative stress. Furthermore, we also tested MP effects on Daphnia magna feeding ability.

Chen, Q., et al. (2017). "Enhanced uptake of BPA in the presence of nanoplastics can lead to neurotoxic effects in adult zebrafish." Science of the Total Environment **609**: 1312-1321.

Plastic particles have been proven to be abundant in the aquatic environment, raising concerns about their potential toxic effects. In the present study, we determined the bioaccumulation potential of bisphenol A (BPA) in adult zebrafish (Danio rerio) in the absence and presence of nano-sized plastic particles (nanoplastics, NPPs). Results show that BPA can accumulate in the viscera, gill, head and muscle of zebrafish with 85, 43, 20, and 3 micro g/g ww after 1 d exposure. NPPs were also found to accumulate in different tissues of the fish. Relative equilibrium was reached after 1 d exposure in different tissues with 39 to 636 mg/kg ww. Co-exposure of NPPs and BPA led to a 2.2 and 2.6-fold significant increment of BPA uptake in the head and viscera, if compared with BPA alone treatment after 3 d exposure. As such, we further investigated several neurotoxic biomarker alterations in the fish head. It was found that either BPA or NPPs can cause myelin basic protein (MBP)/gene up-regulation in the central nervous system (CNS); meanwhile, both contaminants exhibited significant inhibition of acetylcholinesterase (AChE) activity, which is a well-known representative biomarker for neurotoxicity. Moreover, for the co-exposure treatment, biomarkers of myeline and tubulin protein/gene expressions, dopamine content, and the mRNA expression of mesencephalic astrocyte derived neurotrophic factor (MANF) were all significantly up-regulated, suggesting that an enhanced neurotoxic effects in both CNS and dopaminergic system occurred. However, AChE activity was no more inhibited in the co-exposure treatment, which implies that solely AChE measurement may not be sufficient to identify neurotoxic effects in the cholinergic system. Overall, the present study demonstrates that the presence of NPPs can increase BPA bioavailability and cause neurotoxicity in adult zebrafish.

Chen, Q., et al. (2019). "Marine microplastics bound dioxin-like chemicals: Model explanation and risk assessment." Journal of Hazardous Materials **364**: 82-90.

Microplastics have become one of the most pervasive emerging pollutants in the marine environment because of their wide occurrence and high sorption ability for hydrophobic organic contaminants (HOCs). Among the associated HOCs, dioxin-like chemicals (DLCs) can pose severe health risks; however, information on effects of microplastics bound DLCs is lacking. To fill this knowledge gap, this study integrated chemical analysis and in vitro bioassays to elucidate the

potential dioxin-like effects of microplastics bound DLCs. Chemical analysis results demonstrated that styrofoams possessed significantly greater DLCs than other coastal or open ocean plastic particles. This was probably due to the presence of additives and greater sorption ability of expanded polystyrene. However, styrofoams did not show as strong dioxin-like effects as predicted by the bioanalysis equivalent model in bioassays. This could be attributed to the decreased DLC bioavailability and increased competition with the presence of styrene oligomers. Besides, bioassay results also demonstrated that aging increased the associated DLC concentrations, since extra sorption from surrounding environment occurred during prolonged retention periods. Finally, it was estimated that the leaching of DLCs could induce dioxin-like effects in marine organisms under 100% (11/11) and 18% (2/11) scenarios for aged pellets and styrofoams through aqueous or dietary exposures.

Chen, S. and G. Cao (2002). "Photocatalytic oxidation of nitrite by sunlight using TiO_2 supported on hollow glass microbeads." Solar Energy **73**(1): 15-21.

The feasibility of photocatalytic oxidation of nitrite using TiO_2 supported on hollow glass microbeads as a photocatalyst by sunlight was studied. The results showed that $1.1x10^{-4}$mol/dm^3 of nitrite can be completely photocatalytically oxidized after 120-min illumination by sunlight. The conversion of nitrite was increased rapidly by adding a small amount of H_2O_2, Fe^{3+} and Pd^{2+}. The effects of parameters such as the amount of TiO_2/beads, air flow, initial pH, dichromate, SO_4^{2-}, NO_3^-, Cl^- and organic compounds on the photocatalytic oxidation of nitrite were also studied. The possible mechanisms of photocatalytic oxidation of nitrite were investigated. After 150-h illumination by sunlight, there was no significant loss of the photocatalytic activity of TiO_2/beads.

Chen, S., et al. (1997). "Photocatalytic degradation of dichlorvos using TiO sub(2) supported on hollow glass microbeads." Journal of Environmental Sciences (China) **9**(3): 278-282.

In this paper, a method for TiO sub(2) supported on hollow glass microbeads was described and the feasibility of photocatalytic degradation of dichlorvos using supported TiO sub(2)(TiO sub(2)/beads) was studied. The results showed that 1.0 x 10 super(-4) mol.dm super(-3) of dichlorvos could be completely photocatalytically degraded into PO sub(4) super(3-) after 120 min illumination with a 375 W medium pressure mercury lamp. The effects of the amount of TiO sub(2)/beads and concentration of Cu super(2+) on the photocatalytic degradation were also investigated. Some intermediate products of photocatalytic degradation of dichlorvos were detected.

Chen, S., et al. (2020). "Carbonization: A feasible route for reutilization of plastic wastes." Science of the Total Environment **710 (no pagination)**(136250).

Plastics not only bring convenience and color to human life, but also bring endless troubles and disaster to our environment. Reutilization of plastic wastes is in favor of energy conservation and emission reduction, thereby is a significant pathway of plastic wastes disposal. Carbonization is an effective way of converting polymer precursors to valuable carbon materials for use in fields of energy conversion and storage, environmental protection and restoration. Here, we present a systematic multi-perspective overview of carbonization as a feasible route of reutilization of plastic wastes. A brief summary of conventional routes for plastic wastes is followed by a brief introduction of carbonization for converting plastics to carbon materials. Special emphasis is paid on the carbonization pathways and mechanisms of common plastics. Finally, the feasibility, application prospect and challenge of carbonization as one method of reutilization of plastic wastes are proposed. By presenting a consolidated information source on

different carbonization mechanisms, this review provides a valuable guideline for reutilization of plastic wastes by carbonization. Copyright © 2018 Elsevier B.V.

Chen, S., et al. (1997). "Photocatalytic degradation of dichlorvos using TiO₂ supported on hollow glass microbeads." Journal of Environmental Sciences **9**(3): 278-282.

A method for TiO₂ supported on hollow glass microbeads was described and the feasibility of photocatalytic degradation of dichlorvos using supported TiO₂ (TiO₂/beads) was studied. The results showed that 1.0 x 10⁻⁴ mol/dmsuperscript 3 of dichlorvos could be completely photocatalytically degraded into PO³⁻₄ after 120 min illumination with a 375 W medium pressure mercury lamp. The effects of the amount of TiO₂/beads and concentration of Cu²⁺ on the photocatalytic degradation were also investigated. Some intermediate products of photocatalytic degradation of dichlorvos were detected.

Chen, S.-F. and X.-L. Cheng (1999). "Photocatalytic degradation of oil films floating on water by TiO sub(2) supported hollow glass microbeads." China Environmental Science **19**(1): 47-50.

The TiO sub(2)/beads photocatalyst was prepared by dip-coating technique using the hollow glass microbeads as a supporter. The feasibility of photocatalytic degradation of dodecane and toluene floating on water using TiO sub(2)/beads was studied. The results showed that 100% of toluene was photocatalytically degraded after 80 min illumination and 93.5% of dodecane degraded after 120 min illumination with a 375W medium pressure mercury lamp. Bubbling air was favourable for the photocatalytic removal of dodecane and toluene. The photocatalytic removal efficiency was increased rapidly by adding a trace amount of H sub(2)O sub(2) (5.0 mmol/L). Adding a small amount of Na super(+), no obviously effect for the photocatalytic removal of dodecane and toluene was observed.

Chen, T., et al. (1999). "Charged microbeads are not transported across the human stratum corneum in vitro by short high-voltage pulses." Bioelectrochemistry & Bioenergetics **48**(1): 181-192.

There have been several reports of particle transport due to high-voltage pulsing of human skin. Here, several different short, high-voltage pulsing protocols were used in vitro to study the possible transport of highly charged, fluorescent polystyrene particles (14 nm to 2.1 microns in diameter; surface charges of -4.05 x 10(3) e to -2.77 x 10(7) e) across the skin. Two different methods were used to trap and measure particles on the other side of the skin. The first used a polycarbonate membrane to trap the particles, determining the amount of transport by enumeration under a fluorescence microscope. The second used spectrofluorimetry to measure the amount of particles transported. After pulsing, particles were found in randomly distributed clusters on the surface of the skin. No detectable transport across the stratum corneum for any size particle was observed.

Chen, W., et al. (2013). "Surface-micromachined microfiltration membranes for efficient isolation and functional immunophenotyping of subpopulations of immune cells." Advanced Healthcare Materials **2**(7): 965-975.

An accurate measurement of the immune status in patients with immune system disorders is critical in evaluating the stage of diseases and tailoring drug treatments. The functional cellular immunity test is a promising method to establish the diagnosis of immune dysfunctions. The conventional functional cellular immunity test involves measurements of the capacity of peripheral blood mononuclear cells to produce pro-inflammatory cytokines when stimulated ex vivo. However, this "bulk" assay measures the overall reactivity of a population of lymphocytes and monocytes, making it difficult to pinpoint the phenotype or real identity of the reactive immune cells involved. In this research, we develop a large surface micromachined poly-dimethylsiloxane (PDMS) microfiltration membrane (PMM) with high porosity, which is integrated in a microfluidic microfiltration platform. Using the PMM with functionalized microbeads conjugated with antibodies against specific cell surface proteins, we demonstrated rapid, efficient and high-throughput on-chip isolation, enrichment, and stimulation of subpopulations of immune cells from blood specimens. Furthermore, the PMM-integrated microfiltration platform, coupled with a no-wash homogeneous chemiluminescence assay ("AlphaLISA"), enables us to demonstrate rapid and sensitive on-chip immunophenotyping assays for subpopulations of immune cells isolated directly from minute quantities of blood samples.

Chen, W., et al. (2013). "Microfluidic one-step synthesis of alginate microspheres immobilized with antibodies." Journal of the Royal Society Interface **10**(88): 20130566.

Micrometre- and submicrometre-size functionalized beads are frequently used to capture targets of interest from a biological sample for biological characterizations and disease diagnosis. The main challenge of the microbead-based assay is in the immobilization of probe molecules onto the microbead surfaces. In this paper, we report a versatile droplet microfluidics method to fabricate alginate microspheres while simultaneously immobilizing anti-Mycobacterium tuberculosis complex IgY and anti-Escherichia coli IgG antibodies primarily on the porous alginate carriers for specific binding and binding affinity tests. The binding affinity of antibodies is directly measured by fluorescence intensity of stained target bacteria on the microspheres. We demonstrate that the functionalized alginate microspheres yield specificity comparable with an enzyme-linked immunosorbent assay. The high surface area-to-volume ratio of the functionalized porous alginate microspheres improves the detection limit. By using the droplet microfluidics, we can easily modify the size and shape of alginate microspheres, and increase the concentration of functionalized alginate microspheres to further enhance binding kinetics and enable multiplexing.

Chen, W., et al. (2018). "Induced structural changes of humic acid by exposure of polystyrene microplastics: A spectroscopic insight." Environmental Pollution **233**: 1-7.

The occurrence of microplastics (MPs) as emerging contaminants in the environment may cause changes in water or sediment characteristics, and further affect their biogeochemical cycles. Thus, insights into the interactions between dissolved organic matter (DOM) and MPs are essential for the assessment of environmental impacts of MPs in ecosystems. Integrating spectroscopic methods with chemometric analyses, this work explored the chemical and microstructural changes of DOM-MP complex to reveal the mechanism of DOM-MP interaction at a molecular level. MPs were found to interact with the aromatic structure of DOM via pi-pi conjugation, then be entrapped in the DOM polymers by the carboxyl groups and C=O bonds, constituting a highly conjugated co-polymer with increased electron density. This induced the fluorescence intensity increase in DOM. The interaction affinity of DOM-MP was highly dependent on the MP size and solution pH. This work offers a new insight into the impact of MP discharge on environment and may provide an analytical framework for evaluating MP hetero-aggregation and the roles of MPs in the transportation of other contaminants. Furthermore, the integrated methods used in this work exhibit potential applications in exploring the fragmentation processes of MPs and formation of secondary MPs under natural conditions.

Chen, W., et al. (2020). "Single and combined effects of amino polystyrene and perfluorooctane sulfonate on hydrogen-producing thermophilic bacteria and the interaction mechanisms." Science of the Total Environment **703**: 135015.

As a carrier of perfluorooctane sulfonate, nano-plastics are ubiquitous and finally enriched in the sludge, which is widely used as a raw material for the production of bioenergy (hydrogen or methane) by anaerobic digestion. However, there are still many unknowns about their metabolic toxicity to functional microbes (e.g. hydrogen-producing thermophilic bacteria). Therefore, single and combined effects of amino polystyrene (NPS: 70nm; 0.2mg/L) and perfluorooctane sulfonate (PFOS: 0.1, 1 and 5mg/L) on hydrogen-producing thermophilic bacteria were investigated after exposure for 7days at 55degreeC and pH=5.7. Single NPS exhibited obvious interference to the metabolism of thermophilic bacteria, resulting in a 53.9% reduction in hydrogen production. However, the combined NPS+PFOS produced an antagonistic effect, leading to a 31.6% reduction in hydrogen production. Nonetheless, the single and combined exposure did not alter the type of hydrogen production (acetic acid-type hydrogen fermentation). Moreover, single NPS and combined NPS+PFOS not only induced the changes of the composition of extracellular polymers (EPSs) and pi bond structure of the protein in EPSs, but also decreased the activity of hydrolase in EPSs and surface charge of EPSs. Compared to single NPS exposure, NPS+PFOS-exposed thermophilic bacteria was less permeable to a semi-membrane permeable dye and produced less reactive oxygen species, but were still significantly higher than control group. In short, the main mechanisms of single NPS and combined NPS+PFOS were both to increase cell permeability and to induce oxidative stress. The addition of PFOS alleviated the toxic effect of NPS, but did not change its mechanism of toxicity.

Chen, X., et al. (2017). "Transport of biomolecules to binding partners displayed on the surface of microbeads arrayed in traps in a microfluidic cell." Biomicrofluidics **11**(1): 014101.

Arrays of probe molecules integrated into a microfluidic cell are utilized as analytical tools to screen the binding interactions of the displayed probes against a target molecule. These assay platforms are useful in enzyme or antibody discovery, clinical diagnostics, and biosensing, as their ultraminiaturized design allows for high sensitivity and reduced consumption of reagents and target. We study here a platform in which the probes are first grafted to microbeads which are then arrayed in the microfluidic cell by capture in a trapping course. We examine a course which consists of V-shaped, half-open enclosures, and study theoretically and experimentally target mass transfer to the surface probes. Target binding is a two step process of diffusion across streamlines which convect the target over the microbead surface, and kinetic conjugation to the surface probes. Finite element simulations are obtained to calculate the target surface concentration as a function of time. For slow convection, large diffusive gradients build around the microbead and the trap, decreasing the overall binding rate. For rapid convection, thin diffusion boundary layers develop along the microbead surface and within the trap, increasing the binding rate to the idealized limit of untrapped microbeads in a channel. Experiments are undertaken using the binding of a target, fluorescently labeled NeutrAvidin, to its binding partner biotin, on the microbead surface. With the simulations as a guide, we identify convective flow rates which minimize diffusion barriers so that the transport rate is only kinetically determined and measure the rate constant.

Chen, Y., et al. (2019). "Life cycle assessment of end-of-life treatments of waste plastics in China." Resources, Conservation and Recycling **146**: 348-357.

As the world's largest producer and consumer of plastics, China is also the largest producer and recycler of waste plastics. It is necessary to explore the environmental impacts of actual

end-of-life (EOL) treatments of waste plastics in China. In this study, a life cycle assessment (LCA) was conducted to evaluate the environmental impacts of mechanical recycling of waste plastics as well as incineration and landfilling with municipal solid waste in China. The results indicate the environmental benefits of current EOL treatments of waste plastics in China. Mechanical recycling was a negative and decisive contributor, with a minimum impact on terrestrial acidification potential (-83.4%) and a maximum impact on global warming potential (-165.8%). Incineration had negative contributions to 8 of the 12 environmental indicators, and landfilling was a positive contributor to all environmental impacts. Scenarios of treatment pattern, recycling technologies and import policy were set to analyze the potential reduction in environmental impacts of future EOL treatments of waste plastics. Increasing the proportion of mechanical recycling would reduce all environmental impacts, including up to 51.8% on particulate matter formation potential. Energy conservation and emission reduction in atmospheric pollutants would effectively reduce the environmental impacts of mechanical recycling. Banning waste plastics imports would decrease the transportation distances of waste plastics, thereby reducing the related environmental impacts, most notably a reduction of 84.8% for marine ecotoxicity potential. This study provides robust references for waste plastics management in China. Copyright © 2019 Elsevier B.V.

Chen, Y., et al. (2017). "Low cost smart phone diagnostics for food using paper-based colorimetric sensor arrays." Food Control **82**: 227-232.

There is a need for an accurate end-of-life indicator for packaged food (meat, seafood, dairy food etc.) beyond a simple "best use by" date on the food package. In this work, we propose a low cost solution by repurposing the food's barcode as a colorimetric sensor array to monitor food condition. A smart phone camera is used to read color information from the sensor barcode for quantitative estimate of the food aging and quality. The sensor is based on cross-reactive vapor sensitive dyes encapsulated in resin microbeads, which are impregnated onto a low cost paper substrate in a barcode pattern. The entire sensor platform is validated by accurately monitoring chicken aging and eventual spoilage under different temperature conditions. The proposed food diagnostics platform has the potential to reduce food waste and eliminate food-borne illness.

Chen, Y., et al. (2020). "Microplastic pollution in vegetable farmlands of suburb Wuhan, central China." Environmental Pollution **257 (no pagination)**(113449).

Microplastic pollution has become an emergency issue in the global environment. However, little is known about the occurrence and distribution of microplastics in agroecological system. In this study, we investigated the pollution of microplastics in vegetable farmlands in suburb of Wuhan, central China. Results showed that the abundance of microplastics ranged from 320 to 12,560 items/kg<inf>dw.</inf> Microplastic pollution adjacent to the suburban roads was about 1.8 times as serious as that in the residential areas. Microplastics with size less than 0.2 mm were dominated, reaching 70% in total. The main types of microplastics were fibers and microbeads. Moreover, polyamide (32.5%) and polypropylene (28.8%) were the main types of polymer. This study proclaims the occurrence and characteristics of microplastic pollution in typical farmland soils of suburb land. It may provide significant basis for subsequent research about microplastics contaminant in the terrestrial ecosystem. Microplastic pollution in agricultural soils from central China. Copyright © 2019 Elsevier Ltd

Chen, Y., et al. (2016). "Establishment and clinical application of a liquid chip technology for high throughput screening pathogens of acute contagious respiratory disease." Chest **1)**: A94.

PURPOSE: To establish a liquid microarrays technology for the simultaneous, rapid, high throughput screening of 20 acute contagious respiratory disease pathogens. This technology can detect virus, atypical pathogens and bacteria simultaneously and rapidly. What more, This research was also designed investigate the clinical application value of this technology. METHOD(S): 1:Establishment of the liquid chip technology: First, we obtain pathogens gene sequence of bacteria and atypical pathogens. The primers and the probes were designed on conserved sequence. Then, Pathogens' gene was amplified. Amino-modified probes were spotted on encoding microbeads hybridized with the PCR amplicon. Finally, Liquid chip equipment get mean fluorescent intensity. As a result, The liquid chip technology can detecte the corresponding pathogens with these specific primers and the probes repeatedly and sensitivitily. 2: we used the liquid chip technology to screen 20 pathgens from 333 chinical speum samples, comparing with bacteria culture for bacteria and Real-time PCR assay for virus and atypical pathogens, so as to obtian the sensitivity and specificity of this method. RESULT(S): A liquid microarrays technology for high throughput screening of 20 contagious respiratory disease pathogens was establish sucessfully. Of 333 specimens, the positive rates of bacteria detection by liquid chip technology was significantly higherly than traditional bacteria culture (37.8%vs 10.8%) ($P<0.05$); The positive rates of atypical pathogens and viral detection by liquid chip technology and real-time PCR showed no significant differences (2.7%vs 3.0%) and (34.5% vs 31.2%) ($P>0.05$). comparing with standard methods, the sensitivity and specificity of liquid chip technology was 74.4% and 93.0% in bacteria detection, 50.0% and 99.4% in atypical pathogens detection, and 63.0% and 98.3% in viral detection. CONCLUSION(S): A liquid chip technology for high throughput screening of pathogens of acute contagious respiratory disease including bacteria, virus and atypical pathogens was established. This technology has a potential clinical application in high throughput screening multiple species of repiratory pathgens of the unexplained acute pneumonia comparing with other methods before which can only screen Single species. CLINICAL IMPLICATIONS: The liquid chip technology has a potential clinical application in high throughput screening multiple species of repiratory pathgens of the unexplained acute pneumonia comparing with other methods before which can only screen Single species.

Chen, Y., et al. (2020). "Defense responses in earthworms (Eisenia fetida) exposed to low-density polyethylene microplastics in soils." Ecotoxicology & Environmental Safety **187**: 109788.

The potential threats of microplastics to global health are a new problem. However, little is known about the influence of microplastics on soil organisms. Here, we investigated the effects of low-density polyethylene (LDPE, < 400mum) on earthworms (Eisenia fetida) under different concentrations (0.1, 0.25, 0.5, 1.0, 1.5g/kg dry) with three replicates in artificial soil.

Chen, Y., et al. (2013). "Multicompartmental Janus microbeads from branched polymers by single-emulsion droplet microfluidics." Langmuir **29**(41): 12657-12662.

We describe a versatile and facile route for the preparation of Janus microbeads using single emulsion droplet-based microfluidics, in which water droplets that contain a mixture of branched poly(N-isopropylacrylamide)-co-(poly(ethylene glycol)diacrylate)-co-(methacrylic acid) and colloidal particles form the basis of our approach. The colloidal particles, poly(methyl methacrylate) microspheres or titanium dioxide particles, and iron oxide nanoparticles are spatially positioned within the water droplets through gravity and an externally applied magnetic force, respectively. Evaporation of water leads to gel formation of the branched copolymer matrix as a result of physical cross-linking through hydrogen bond interactions, fixing the spatial position of the colloidal particles. The thermo- and pH-responsive nature of the branched poly(N-isopropylacrylamide) (PNIPAm)-based copolymer allows for the disintegration of the polymer network of the Janus microbeads and a triggered release of the colloidal content at temperatures below the lower critical solution temperature (LCST) and at increased pH values.

Chen, Y. C. (2018). "Effects of urbanization on municipal solid waste composition." Waste Management **79**: 828-836.

The generation of municipal solid waste (MSW) is related to various features of urbanization. In this study, a linear regression model was used to evaluate the effects of several urbanization indicators on the composition of MSW. Household population (P), area of urban planning (L), tap water penetration (W), electricity sold (El), number of operating factories (I), car density (T), education level (Ed), and annual revenue (R) were chosen as important indicators of urbanization. The five major categories of MSW-paper, food waste, plastic, metal, and glass-were also chosen for specific analysis, and MSW composition was found to be closely related to household population (P) (r²>0.8). The volume of one category of waste, food waste, was related to the industrialization indicator (r²>0.9). The total volume of MSW and the total volume of metal waste were linked with household population divided by tap water penetration (P/W) (r²=0.9903), and with annual revenue divided by tap water penetration (R/W) (r²=0.9364). The volume of plastic waste and glass waste generated, respectively, was related to annual revenue divided by education level (R/Ed) (r²=0.9814 vs. r²=0.9371). In addition, a case study of Taipei City indicated that MSW disposal fees should reflect not only household population (P) but also tap water penetration (W). This study provides valuable findings quantifying the effects of urbanization on MSW composition. The results will help governments and enterprises to efficiently evaluate and predict variation in MSW composition with reference to indicators of urbanization, thereby improving the management of waste.

Chen, Z., et al. (2005). "A practical approach to the detection of prognostically significant genomic aberrations in multiple myeloma." Journal of Molecular Diagnostics **7**(5): 560-565.

Multiple myeloma (MM) is a malignancy of differentiated B lymphocytes and has remained an incurable disease. Chromosomal abnormalities are among the most important prognostic parameters for MM. Cytoplasm immunoglobulin-enhanced interphase fluorescent in situ hybridization (FISH) has been a standard cell-targeting method for identifying genomic aberrations in MM. We have developed another cell-targeting approach by using CD138 magnetic microbeads to sort plasma cells for FISH analysis. The FISH panel consisted of four probes targeting RB-1, D13S319, immunoglobulin H, and p53 loci. We reviewed the FISH and conventional cytogenetic results of 60 patients with MM. The present cell-targeting approach in conjunction with the FISH probe panel was more sensitive than FISH performed on untargeted cells in detecting prognostically significant genomic aberrations (72 versus 24%, P = 0.0016). The frequencies of genomic abnormalities identified were similar to previously reported data obtained with the standard cell-targeting method. Therefore, our cell-targeting approach and FISH panel reliably detect prognostically important genomic abnormalities in MM and are potentially suitable for widespread use.

Chen, Z., et al. (2011). "Phase-separated chitosan-fibrin microbeads for cell delivery." Journal of Microencapsulation **28**(5): 344-352.

Matrix-enhanced delivery of cells is a promising approach to improving current cell therapies. Our objective was to create cell-laden composite microbeads that combine the attractive features of the natural polymers chitosan and fibrin. Liquid polydimethylsiloxane was used to emulsify a chitosanfibrinogen solution containing suspended human fibroblast cells, followed by initiation of thrombin-mediated polymerization of fibrin and thermal/pH-mediated gelation of chitosan. Chitosan/fibrin weight percent (wt%) ratios of 100/0, 75/25, 50/50 and 25/75 were investigated. Microbead diameters ranged from 275?+/- ?99?mum to 38?+/- ?10?mum using impeller speeds from 600 to 1400?rpm. Fibroblasts remained viable on day 1 post-fabrication in all matrices, but cell viability was markedly higher in high-fibrin microbeads by day 8 post-fabrication. Cell spreading and interaction with the extracellular matrix was also markedly increased in high-fibrin matrices. Such composite microbeads containing viable entrapped cells have potential for minimally invasive delivery of cells for a variety of tissue repair applications. © 2011 Informa UK Ltd All rights reserved.

Chen, Z., et al. (2020). "Enhanced in situ biodegradation of microplastics in sewage sludge using hyperthermophilic composting technology." Journal of Hazardous Materials **384**: 121271.

Land spreading of sewage sludge is a major source of environmental microplastics (MPs) contamination. However, conventional sludge treatments are inefficient at removing sludge-based MPs. Herein, hyperthermophilic composting (hTC) technology is proposed and demonstrated in full-scale (200t) for in situ biodegradation of sludge-based MPs. After 45 days of hTC treatment, 43.7% of the MPs was removed from the sewage sludge, which is the highest value ever reported for MPs biodegradation. The underlying mechanisms of MPs removal were investigated in lab-scale polystyrene-microplastics (PS-MPs) biodegradation experiments. The hTC inoculum degraded 7.3% of the PS-MPs at 70degreeC in 56 days, which was about 6.6 times higher than that of the conventional thermophilic composting (cTC) inoculum at 40degreeC. Analyses of the molecular weight and physicochemical properties of the PS-MPs residuals indicated that hyperthermophilic bacteria in hTC accelerated PS-MPs biodegradation through excellent bio-oxidation performance. High-throughput sequencing suggested that Thermus, Bacillus, and Geobacillus were the dominant bacteria responsible for the highly efficient biodegradation during hTC. These results reveal the critical role of hyperthermophilic bacteria in MPs biodegradation during hTC, highlighting a promising strategy for sludge-based MPs removal from the real environment.

Cheng, D., et al. (2018). "A simple microdevice for single cell capture, array, release, and fast staining using oscillatory method." Biomicrofluidics **12**(3): 034105.

Microchips that perform single cell capture, array, and identification have become powerful tools for single cell studies, which can reveal precise underlying mechanisms among bulk cell populations. However, current single cell capture and on-chip immunostaining methods consume more time and reagent than desired. To optimize this technology, we designed a novel trap structure for single cell capture, array, and release, and meanwhile an oscillatory method was used to perform rapid on-chip cell immunostaining. The trap structure array used equal distribution of lateral flow to achieve single cell array in high velocity flows and decrease the risk of clogging. A length of glass capillary with a sealed bubble was inserted into the outlet so that it could act in a manner analogous to that of a capacitor in an RC circuit. By applying one periodic air pressure to the inlet, oscillation motion was generated, which significantly enhanced the on-chip reaction efficiency. In addition, the oscillation performance could be easily regulated by changing the length of the capillary. The trapped cells could maintain their positions during oscillation; hence, they were able to be tracked in real time. Through our trap microchip, 12 mum microbeads were successfully trapped to form a microarray with a capture efficiency of ~92.7% and 2 mum microbeads were filtered. With an optimized oscillation condition

(P_{push} = 0.03 MPa, f = 1 Hz, L = 3 cm), fast on-chip immunostaining was achieved with the advantages of less time (5 min) and reagent (2 mul) consumption. The effectiveness of this method was demonstrated through quantitative microbead and qualitative Caco-2 cell experiments. The device is simple, flexible, and efficient, which we believe provides a promising approach to single cell heterogeneity studies, drug screening, and clinical diagnosis.

Cheng, L., et al. (2019). "Silica microbeads capture fetal nucleated red blood cells for noninvasive prenatal testing of fetal ABO genotype." Electrophoresis **04**: 04.

ABO hemolytic disease of the newborn (ABO-HDN), which may cause neonatal jaundice and polycythemia, or even stillbirth or neonatal death, is widespread in China. Prenatal testing for the fetal ABO blood group can reduce unnecessary concerns or ensure prompt treatment. Herein, we presented a method to employ high-density silica microbeads (SiO₂ MBs) for capturing fetal nucleated red blood cells (fnRBCs) in maternal peripheral blood, and we detected the ABO genotype of the fetus using these captured cells. We evaluated 52 patients using the SiO₂ MBs. Among 26 pregnant women with type O blood, 8 (30.8%) of the fetuses had type A blood, 5 (19.2%) had type B blood, and 13 (50%) had type O blood. SRY genes were detected in all 27 male fetuses. This study represents a simple and effective method for noninvasive prenatal detection of the fetal ABO genotype. We believe that this method has great potential for noninvasive prenatal testing of the fetal Rh blood group and other fetal diseases as well.

Cheng, S. H., et al. (2001). "The use of microangiography in detecting aberrant vasculature in zebrafish embryos exposed to cadmium." Aquatic toxicology (Amsterdam, Netherlands) **52**(1): 61-71.

Embryonic vascular patterns in zebrafish (Danio rerio) could be visualised by confocal microscopy coupled with microinjected fluorescent microbeads. This microangiographic technique was adopted here, for the first time, to study the effects of cadmium on cardiovascular development in zebrafish embryos. Zebrafish embryos were incubated in culture medium containing 100 microM cadmium from 5 h post fertilisation (hpf) to 48 hpf. At 48 hpf, embryos were examined for viability and occurrence of malformations. The 100 microM cadmium caused 32.21 +/- 3.65% mortality and 20.33 +/- 4.04% visible malformations in surviving embryos. In the remaining embryos with no visible signs of malformations, further assessments for less obvious abnormalities were performed. Assessments on craniofacial development were made by digital measurements on areas of brains and eyes. Cardiac development was assessed by immunostaining the heart with the antibody MF20 specific for myosin heavy chain. Body lengths of the embryos were also measured. Embryonic development of brains, eyes, hearts and body lengths of visibly healthy embryos in the cadmium treatment group showed no significant difference from the controls. Embryonic vasculature of these visibly healthy embryos was then studied by microinjecting fluorescent microbeads of diameter 0.02 microm into the circulation. All the cadmium treated embryos showed localised vascular defects in the dorsal aortae, segmental and cranial vessels while none of the control embryos showed any aberrant patterns in the networking of the vasculature. Improved image analyses on the anterior regions revealed that cadmium treated embryos had markedly less complex networks of cranial vessels with fewer vessels perfusing the craniofacial regions. The number of branch points in the vascular network was counted. In untreated embryos, there were 135.6 +/- 51 branches in the vasculature in entire body. In the cadmium treated embryos, there were 64.5+/-31 branches. The difference was significant when assessed with Student's t-test. It appeared that although cadmium did not cause any signs of external malformations in these visibly healthy embryos, nonetheless induced impaired branching and anastomsis of the cranial

vessels. This study revealed, for the first time, that vital vascular structures in fish embryos could be affected by exposure to cadmium. This technique allowed visualisation of vascular anomalies in embryos showing no external signs of malformations. The impairment of anatomical features during embryonic development might serve as meaningful health endpoints in ecotoxicological studies and in risk assessment.

Cheng, W., et al. (2013). "Organophosphorus esters in the oceans and possible relation with ocean gyres." Environmental Pollution **180**: 159-164.

Abstract: Four organophosphorus esters (OPEs) were detected in aerosol samples collected in the West Pacific, the Indian Ocean and the Southern Ocean from 2009 to 2010, suggesting their circumpolar and global distribution. In general, the highest concentrations were detected near populated regions in China, Australia and New Zealand. OPE concentrations in the Southern Ocean were about two orders of magnitude lower than those near major continents. Additionally, relatively high OPE concentrations were detected at the Antarctic Peninsula, where several scientific survey stations are located. The four OPEs investigated here are significantly correlated with each other, suggesting they may derive from the same source. In the circumpolar transect, OPE concentrations were associated with ocean gyres in the open ocean. Their concentrations were positively related with average vorticity in the sampling area suggesting that a major source of OPEs may be found in ocean gyres where plastic debris is known to accumulate. [Copyright &y& Elsevier]

Cheng, Y., et al. (2016). "A bubble- and clogging-free microfluidic particle separation platform with multi-filtration." Lab on a Chip **16**(23): 4517-4526.

Microfiltration is a compelling method to separate particles based on their distinct size and deformability. However, this approach is prone to clogging after processing a certain number of particles and forming bubbles in the separation procedure, which often leads to malfunctioning of devices. In this work, we report a bubble-free and clogging-free microfluidic particle separation platform with high throughput. The platform features an integrated bidirectional micropump, a hydrophilic microporous filtration membrane and a hydrophobic porous degassing membrane. The bidirectional micropump enables the fluid to flow back and forth repeatedly, which flushes the filtration membrane and clears the filtration micropores for further filtration, and to flow forward to implement multi-filtration. The hydrophobic porous membrane on top of the separation channel removes air bubbles forming in the separation channel, improving the separation efficiency and operational reliability. The microbead mixture and undiluted whole blood were separated using the microfluidic chip. After 5 cycles of reverse flushing and forward re-filtration, a 2857-fold enrichment ratio and an 89.8% recovery rate of 10 mum microbeads were achieved for microbead separation with 99.9% removal efficiency of 2 mum microbeads. After 8 cycles, white blood cells were effectively separated from whole blood with a 396-fold enrichment ratio and a 70.6% recovery rate at a throughput of 39.1 mul min⁻¹, demonstrating that the platform can potentially be used in biomedical applications.

Chengaiah, B., et al. (2011). "Self emulsifying drug delivery system: A novel approach for drug delivery." Research Journal of Pharmacy and Technology **4**(2): 175-181.

The oral delivery of hydrophobic drugs presents a major challenge because of the low aqueous solubility of such compounds. Self-emulsifying drug delivery systems (SEDDS) are mixtures of oils and surfactants, ideally isotropic, sometimes including co-solvents, which emulsify under conditions of gentle agitation, similar to those which would be encountered in the gastrointestinal tract. Recently, much attention has been focused on SEDDS to improve the oral bioavailability of poorly aqueous soluble drugs. The sole objective of pharmaceutical science is to design successful dosage forms which fulfill the therapeutic needs of the patients effectively. SEDDS are liquid to semisolid in nature, but it has drawbacks as formulation development, quality control, stability etc. These liquid SEDDS can be converted into solid dosage forms such as pellets, tablets, capsules, microspheres, micro-beads, nanoparticles etc without affecting drug release property. After administering the drug gets released and self emulsify in the GI tract. This article gives an overview of the new excipients used in SEDDS, types of formulations and SE dosage forms with characterization methods and pharmaceutical applications of SEDDS. © RJPT All right reserved.

Cheremisinoff, N. P. and P. N. Cheremisinoff (1989). "The Plastics Waste Problem." Pollution Engineering **21**(8): 58.

Plastics disposal has reached crisis proportions and resolution of the disposal problem is necessary. This crisis is expected to impact on industry in three ways: increased direct costs, reduced price competitiveness, and reduced plastic uses. Sources of plastic waste are identified. In 1980 plastics constituted only 2-3% of municipal waste. This amount has increased steadily and will reach 10-15% by the year 2000. Separation methods for municipal refuse applicable to plastics, such as air classification, shredders, and hammermills, are discussed, as are primary recycling and disposal options.

Chersi, A., et al. (2004). "Responses of peptide-specific T cells to stimulation with polystyrene beads carrying HLA class I molecules loaded with single peptides." Journal of Immunological Methods **291**(1-2): 79-91.

Cell-sized microbeads carrying single peptide-loaded HLA class I molecules were prepared for HLA-A2 and HLA-B7 by a simple procedure which transfers single peptide-loaded HLA class I molecules from cultured cells to polystyrene beads using anti-peptide antibodies directed to an intracellular segment of HLA-A alpha chains. The surface density of peptide-loaded HLA class I molecules on beads was comparable to that on the peptide-loaded cells. HLA-A2 beads loaded with an HCV peptide HCV1073 were tested for stimulation activity on an HCV1073-specific CD8+ T cell clone NS3-1. A substantial level of gamma-IFN production was induced. The stimulation was peptide-specific. The efficiency was dependent on the bead concentration and the surface HLA class I density on beads and enhanced significantly by co-coupling of anti-CD28 to peptide-loaded beads. The peptide-loading efficiency on HLA class I molecules and the transfer efficiency of HLA class I molecules to polystyrene beads were reasonably high for HLA-A2 and HLA-B7. Thus, polystyrene beads carrying these single peptide-loaded HLA class I molecules are potentially useful in further analysis of the co-stimulatory or inhibitory factors involved in CD8+ T cell responses and eventually in detection of cytotoxic T cells in PBLs.

Chesler, N. C., et al. (2011). "Acute thromboembolic pulmonary hypertension in a dog model - Correlation of right ventricular ejection fraction and pulmonary arterial distensibility measured by MRI." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society

International Conference, ATS **183**(1 MeetingAbstracts).

Introduction: The hemodynamic mechanisms of heart failure in pulmonary arterial hypertension (PAH) are not well understood. Non-invasive imaging techniques offer many advantages for diagnosis and prognosis of PAH as well as quantification of cardiopulmonary status changes during disease progression. We hypothesized that large pulmonary artery (PA) stiffening impairs right ventricular (RV) function in PAH, and that magnetic resonance imaging (MRI) could be effectively used to demonstrate this relationship in a dog model of disease. To provide an initial test of our hypothesis, we created an acute model of PAH by embolizing dog lungs with micro-beads. Success was confirmed by high-resolution digital subtraction angiography (DSA). Method(s): Four adult female beagles were induced with propofol and maintained under anesthesia with isoflurane. Baseline pulmonary arterial pressures (PAP) were measured by right heart catheterization (RHC). Baseline DSA and MRI were performed to assess a) the pulmonary vasculature, b) RV function, and c) PA distensibility via the relative area change (RAC) between systole and diastole. PAH was induced by injecting micro-beads (150-500mm) into the right atrium and ventricle. Post-embolization, MRI, DSA and RHC were repeated. RV ejection fraction (RVEF) was quantified from CINE MR images per clinical standard. PA RAC was determined from phase contrast MR images of the PA cross-sectional area at peak systole and end-diastole. Three dogs were humanely euthanized with pentobarbital intravenously after the procedures; one dog died of presumed worsening PH before post-embolization tests could be performed. High quality MR images could not be obtained in one dog at baseline. Result(s): DSA revealed multiple wedge-shaped areas indicative of acute embolism. Mean PAP was higher in the embolized dogs (38.6 +/- 2.5 mmHg vs. 21 +/- 6.5 mmHg, p = 0.01) (Fig. 1); PA RAC and RVEF tended to decrease. A good correlation (R2 = 0.64) was found between RVEF and PA RAC, which supports our hypothesis. (Figure presented) Conclusion(s): and RVEF were not Acute PAH was successfully induced in dogs by micro-bead embolization. While the decreases in RAC Conclusion(s): and RVEF were not significant, both decreased and a positive correlation was found between RVEF and PA RAC, which is in agreement with our previously reported human data. Future work will focus on larger number of animals and expanding this initial work to a chronic model. This approach may provide valuable insights into the mechanisms of RV failure in acute and chronic PAH in patients.

Cheung, A. K., et al. (2015). "Quantitative detection of eryptosis in human erythrocytes using tunable resistive pulse sensing and annexin-V-beads." Analyst **140**(4): 1337-1348.

Toxicological assessments of human red blood cells (RBCs) are important in human health because RBCs are the most abundant cell type in our body. Erythrotoxicology testing guidelines using hemolysis have been established as a standard (e.g. by the ASTM International). However, many xenobiotics promote eryptosis (apoptosis in human RBCs) without causing hemolysis. Based on the major features of eryptosis, i.e. cell shrinkage and translocation of phosphatidylserine (PS) to the outer lipid bilayer of the plasma membrane, we report here a novel approach utilizing the quantitative tunable resistive pulse sensing (TRPS) technology, a widely adopted technique for characterizing nanoparticles in the field of nanotechnology, to measure the degree of eryptosis in a non-optical manner. With the TRPS system, we were able to determine PS externalization with microbeads functionalized with annexin-V for PS binding, cell swelling and shrinkage in physiological buffers (cell volume: 86 +/- 12 fL) and solutions of different osmolarities with or without apoptotic trigger. After setting these standards, we then evaluated the toxicity of Polyphyllin D (PD), a potential anti-cancer drug that kills more liver cancer cells with multi-drug resistance, in erythrocytes to prove our concept. Data revealed that PD induced PS externalization and shrinkage in RBCs in a dose-dependent manner. Moreover, another feature of eryptosis, as small as 5 fL, was detected thus showing the PD-induced erythrotoxicity in human cells. Taken together, our results indicate that our approach using annexin-V-beads and TRPS is simple, safe and convenient, using only a small volume (35 muL) to evaluate the erythrotoxicity of xenobiotics.

Cheung, L. T. O., et al. (2018). "Microplastic Contamination of Wild and Captive Flathead Grey Mullet (Mugil cephalus)." International Journal of Environmental Research and Public Health **15**(4): 597.

A total of 60 flathead grey mullets were examined for microplastic ingestion. Thirty wild mullets were captured from the eastern coast of Hong Kong and 30 captive mullets were obtained from fish farms. Microplastic ingestion was detected in 60% of the wild mullets, with an average of 4.3 plastic items per mullet, while only 16.7% of captive mullets were found to have ingested microplastics, with an average of 0.2 items per mullet. The results suggested that wild mullets have a higher risk of microplastic ingestion than their captive counterparts. The most common plastic items were fibres that were green in colour and small in size (<2 mm). Polypropylene was the most common polymer (42%), followed by polyethylene (25%). In addition, the abundance of microplastics was positively correlated with larger body size among the mullets.

Cheung, P. K. and L. Fok (2016). "Evidence of microbeads from personal care product contaminating the sea." Marine Pollution Bulletin **109**(1): 582-585.

Plastic microbeads in personal care products have been identified as a source of marine pollution. Yet, their existence in the environment is rarely reported. During two surface manta trawls in the coastal waters of Hong Kong, eleven blue, spherical microbeads were captured. Their sizes (in diameters) ranged from 0.332 to 1.015mm. These microbeads possessed similar characteristics in terms of colour, shape and size with those identified and extracted from a facial scrub available in the local market. The FT-IR spectrum of the captured microbeads also matched those from the facial scrub. It was likely that the floating microbeads at the sea surface originated from a facial scrub and they have bypassed or escaped the sewage treatment system in Hong Kong. Timely voluntary or legislative actions are required to prevent more microbeads from entering the aquatic environment.

Cheung, P. K. and L. Fok (2017). "Characterisation of plastic microbeads in facial scrubs and their estimated emissions in Mainland China." Water Research **122**: 53-61.

Plastic microbeads are often added to personal care and cosmetic products (PCCPs) as an abrasive agent in exfoliants. These beads have been reported to contaminate the aquatic environment and are sufficiently small to be readily ingested by aquatic organisms. Plastic microbeads can be directly released into the aquatic environment with domestic sewage if no sewage treatment is provided, and they can also escape from wastewater treatment plants (WWTPs) because of incomplete removal. However, the emissions of microbeads from these two sources have never been estimated for China, and no regulation has been imposed on the use of plastic microbeads in PCCPs. Therefore, in this study, we aimed to estimate the annual microbead emissions in Mainland China from both direct emissions and WWTP emissions. Nine facial scrubs were purchased, and the microbeads in the scrubs were extracted and enumerated. The microbead density in those products ranged from 5219 to 50,391 particles/g, with an average of 20,860 particles/g. Direct emissions arising from the use of facial scrubs were estimated using this average density number, population data, facial scrub usage rate, sewage treatment rate, and a few conservative assumptions. WWTP emissions were calculated by multiplying the annual treated sewage volume and estimated microbead density in treated sewage. We estimated that, on average, 209.7 trillion microbeads (306.9 tonnes) are emitted

into the aquatic environment in Mainland China every year. More than 80% of the emissions originate from incomplete removal in WWTPs, and the remaining 20% are derived from direct emissions. Although the weight of the emitted microbeads only accounts for approximately 0.03% of the plastic waste input into the ocean from China, the number of microbeads emitted far exceeds the previous estimate of plastic debris (>330 mum) on the world's sea surface. Immediate actions are required to prevent plastic microbeads from entering the aquatic environment.

Cheung, P. K., et al. (2018). "Spatio-temporal comparison of neustonic microplastic density in Hong Kong waters under the influence of the Pearl River Estuary." Science of the Total Environment **628-629**: 731-739.

Rivers are recognised as an important source of plastic debris in the open sea. The Pearl River in China is estimated to transport 0.1milliontonnes of plastic waste to the open sea annually. However, no empirical study has been conducted to assess the plastic contamination levels in the Pearl River Estuary. Hong Kong is situated in the east of the Pearl River Estuary; its western waters are strongly influenced by river discharge, whereas the eastern waters are unaffected by the freshwater plume. In this study, we quantified the neustonic plastic debris density in the western and eastern waters of Hong Kong. The mean microplastic (0.355-4.749mm) and large plastic debris (>=4.75mm) densities in the western side were 3.627 and 0.758n/m³, respectively. Seasonal comparisons indicated that both size classes of plastic debris were significantly more abundant by number in the rainy season than the dry season (p<0.001). However, the influence of rivers on plastic density at the sea surface may be highly restricted to the estuarine delta, as no significant spatial difference was found between the western and eastern waters.

Chi, W., et al. (2011). "CD4+ T cells from behcet patients produce high levels of IL-17." Eye Science **26**(2): 65-69.

PURPOSE: To investigate the role of interleukin (IL)-17-producing CD4+ T cells in Behcet disease (BD).

METHODS: Blood samples were drawn from eight BD patients with active uveitis, eight BD patients with inactive uveitis and eight normal controls, respectively. PBMCs were prepared from heparinized blood by Ficoll-Hypaque density-gradient centrifugation. Peripheral CD4+ T cells were purified by Human CD4 Microbeads (MACS). The purity rate of CD4+ T cells was detected using flow cytometry. Purified CD4+ T cells were stimulated with or without anti-CD3 and anti-CD28 antibodies in the presence or absence of recombinant-IL-23 (rIL-23) or recombinant-IL-12 (rIL-12) for 72 hours. The concentrations of IL-17, IFN-gamma and IL-4 in the collected supernatants from CD4+ T cells were measured using a Duoset ELISA Development kit.

RESULTS: The results showed that the levels of IL-17 and IFN-gamma observed in active BD patients were significantly higher as compared with those in inactive patients and normal controls. There was no significant difference concerning IL-4 production between BD patients and normal controls. rIL-23 significantly augmented the production of IL-17 by CD4+ T cells from both BD patients and normal controls. Both rIL-23 and rIL-12 could increase IFN-gamma production by CD4+ T cells from BD patients and normal controls. Moreover, the effect of rIL-12 was more robust compared with that of rIL-23. Neither rIL-23 nor rIL-12 exerted any effect on IL-4 production.

CONCLUSION: rIL-23 can promote the production of IL-17 by CD4+ T cells in BD patients. The upregulated IL-17 levels may be related with the intraocular inflammation of Behcet patients.

Chi, W., et al. (2019). "Research of Cu-Doped Hydroxyapatite Microbeads Fabricated by Pneumatic Extrusion Printing." Materials **12**(11): 31.

Copper is an indispensable micronutrient in human health, which has important effects on the promotion of angiogenesis and thus contributes to bone formation and antimicrobial activity. We used ion exchange and pneumatic printing methods to prepare hydroxyapatite (HA) microspheres with different copper content. The microspheres were characterized by scanning electron microscope (SEM), X-ray diffractometry (XRD) and X-Ray photoelectron spectroscopy (XPS). Considering the resistance of hydroxyapatite to biodegradation in vivo, the degradation rate of microspheres in modified simulated body fluids was studied. In addition, cell proliferation and antibacterial experiments were carried out to study the biological properties of microspheres. HA-1.5MCu microbeads treated by 1.5 mol/L CuSO₄ curing solution have good performance on degradation, antibacterial properties and cell survival rate on day 7. The results showed that HA-1.5MCu microbeads may be used as a good repair material for bone defects.

Chi, Y., et al. (2013). "Cytokine and chemokine levels in patients infected with the novel avian influenza A (H7N9) virus in China." Journal of Infectious Diseases **208**(12): 1962-1967.

H7N9 avian influenza is an emerging viral disease in China caused by avian influenza A (H7N9) virus. We investigated host cytokine and chemokine profiles in serum samples of H7N9 patients by multiplex-microbead immunoassays. Statistical analysis showed that IP-10, IL-6, IL-17, and IL-2 were increased in H7N9 infected patients. Furthermore, IL-6 and the chemokine IP-10 were significantly higher in severe H7N9 patients compared to nonsevere H7N9 cases. We suggest that proinflammatory cytokine responses, characterized by a combined Th1/Th17 cytokine induction, are partially responsible for the disease progression of patients with H7N9 infection.

Chiang, C. T. and L. J. Huang The utilization and preparation of soil conditioner from plastic waste materials. Technical Bulletin, Taiwan Fertilizer Company; 1977. (54):23 pp.

In pot experiments with wheat, an application of PVC charcoal (a soil conditioner obtained by heating PVC at 350 deg C) increased grain yields by 30%. This conditioner (which contains humic substances) was more effective under upland conditions than under lowland (paddy) conditions. An improvement in soil properties was apparent at an application rate as low as 0.05%. Nitrification treatment of the conditioner did not significantly change its effects on the contents of exchangeable nitrogen, available phosphorus, exchangeable potassium in the soil or on the percentage of water stable aggregates.

Chiang, W. L., et al. (2014). "Injectable microbeads with a thermo-responsive shell and a pH-responsive core as a dual-switch-controlled release system." SMALL **10**(20): 4100-4105.

Treating inflammation with a dual-switch-controlled release system: The release of a drug from the developed microbead system occurs only in response to both an increase in local temperature and an acidic environmental pH. This dual-switch-controlled release system has the advantages of distinguishing between inflamed and healthy tissues to improve treatment efficacy.

Chib, A., et al. (2009). "[minus]plastic: influencing pro-environmental attitudes among Singaporean youth." Environmental Education Research **15**(6): 679-696.

Plastics have much to offer as a modern convenience, but lack of responsible plastic waste management habits can lead to potentially harmful environmental effects. Past environmental initiatives revealed a lack of understanding about youth attitudes towards pro-environmental

issues. [minus]plastic, an online public environmental promotional campaign, encouraged Singaporean youth to recognize the importance of, adopt positive attitudes towards and subsequently adopt the practice of responsible plastic management. We propose the Temporal Incentives Model of Social Influence, based on Prochaska and DiClemente's stages of change model, to guide social campaign design. A pre-post quantitative research design showed that the pre-contemplation, contemplation and preparation stages progressed significantly after the campaign. The findings suggest that stimuli incorporating specialized information and small action steps allow migration to successive stages. With the strong presence of internet culture among Singaporean youth, the online medium was found effective in altering the attitudes of the campaign target audience, while exposure to the campaign messages proved useful in encouraging environmental learning among youth. [ABSTRACT FROM AUTHOR]
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Chidi Onyema, E., et al. (2018). "Feasting on microplastics: ingestion by and effects on marine organisms." Aquatic Biology **27**: 93-106.
Ingestion of microplastics by marine organisms is a common occurrence in marine ecosystems, but the experimental demonstration of the effects of ingested microplastics on marine organisms has only recently become an important subject of research. In this review, the ingestion of microplastics by marine organisms, its attendant potential consequences and specific hypothetical questions for further studies are discussed. The formation of heteroaggregates in the gut of prey organisms may delay microplastic clearance, potentially increasing the chances of microplastic trophic transfer to predators. Also, the survival and energetics of keystone species at lower trophic levels are negatively affected by ingestion of microplastics, thereby raising questions about the transfer of energy and nutrients to organisms at higher trophic levels. Further, since microplastics are able to adsorb and concentrate organic pollutants up to 1 million times more than the pollutant concentration in ambient waters, the ingestion of such small plastic fragments is, a probable route for the entrance and biomagnification of toxic chemicals in the marine food web. However, the equilibrium state between pollutant concentration in marine organisms and that of surrounding waters makes it unclear whether the ingestion of microplastics actually increases the pollutant load of organisms. Finally, microplastic ingestion can cause endocrine disorders in adult fish, which could result in neoplasia via epigenetic programming. Therefore, microplastic pollution may be a contributory cause of increased incidents of neoplasia in marine animals. The amount of microplastics in marine waters will steadily rise, and questions about their impact on marine ecosystems will linger.

Chilvers, R. A., et al. (2010). "Development of a novel protocol for isolation and purification of human granulosa cells." Fertility and Sterility **1)**: S185.
OBJECTIVE: To develop an optimal method to purify human granulosa cells and a method to account for red blood cell (RBC) contamination in samples. DESIGN: Prospective experimental study. MATERIALS AND METHODS: Follicular fluid was collected from 25 patients after oocyte retrieval. A series of experimental granulosa isolation and purifying techniques was performed with adjustments after determination of results from former sample collections. The techniques

include: 1) density gradient (DG) centrifugation with colloidal silica, 2) DG centrifugation with a polymer of sucrose, 3) negative selection of RBCs using primary antibody (Ab) to glycophorin A and secondary Ab connected to spherical, paramagnetic, epoxy beads, 4) positive selection of granulosa cells using primary Ab to mullerian inhibiting substance receptor II (MISRII) and secondary Ab coupled to irregular, superparamagnetic (SPM) beads, 5) positive selection of granulosa cells using primary Ab to MISRII and secondary Ab coupled to biodegradable, SPM microbeads, 6) dilution of follicular fluid samples with buffer before DG centrifugation. In addition, Western blotting was used to analyze samples for relative amounts of hemoglobin A (HgbA) as compared to a standard curve of blood samples. RESULT(S): The procedure that resulted in the largest increase in purity of usable granulosa cells is dilution of the follicular fluid with buffer, then use of DG centrifugation using colloidal silica, then positive selection of granulosa cells using MISRII and secondary Ab coupled to biodegradable, SPM microbeads. Western blotting with staining of samples for HgbA provided visible quantification of RBCs. CONCLUSION(S): A novel protocol has been developed yielding granulosa cell samples that are largely free of nondesirable cells. This technique provides a solution for patient samples that have heavy RBC contamination and uniquely involves a primary Ab against the MISRII. Western blotting with HbgA antibody is an effective means of comparing patient sample purity.

Chimenti, M. S., et al. (2013). "Multiplatform metabolomic study of CD4+ cells after methotrexate and infliximab treatment: Focus on safety and tolerability profiles." Annals of the Rheumatic Diseases. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **72**(SUPPL. 3).

Background Activated CD4+ cells comprise a large proportion of inflammatory cells involved in the development of rheumatoid arthritis (RA). Inflammatory cytokines, as tumor necrosis factor-a (TNFa), have also been implicated in the establishment and progression of joint destruction. Treatments for RA include synthetical and biological disease modifying anti-rheumatic drugs (DMARDs), as methotrexate (MTX) and TNFa-inhibitors, as infliximab. Cellular effects can be evaluated by metabolomics with measurement of ideally all endogenous metabolites. Objectives Evaluation in CD4+ cells, from a multiplatform metabolomic study, of MTX and infliximab treatment in order to investigate the metabolomic features. Methods Blood samples from 5 healthy controls were collected for metabolomic study. CD4+ cells were isolated by magnetic separation using CD4 MicroBeads from peripheral blood mononuclear cells, divided in 5 different groups and cultured for 24 hours: 1. CD4+ T cells as control, 2. CD4+ T cells treated with MTX at the dosage of 0.01 mM, 3. CD4+ T cells treated with MTX at the dosage of 0.1mM, 4. CD4+ T cells treated with infliximab at the dosage of 1 mug/ml, 5. CD4+ T cells treated with IgG1k at the dosage of 1mug/ml as control of Infliximab. A total of 25 cell samples were analysed using Metabolon's standard extraction method. Results Ribulose was reduced with decrease in glycolysis and inhibition of phosphofructose kinase 1 (PFK1) by MTX ($p<0.05$). This reflects CD4+ cells effort to increase the production of cellular reducing power (NADPH) to offset stress exerted by MTX. Isovalerylcarnitine, linked to proteolytic enzymes and calpain system, was increased by MTX ($p<0.05$). Both calpain and caspase systems lead to cytochrome activation and promote early apoptosis. Hypotaurine, an antioxidants in vivo, was increased by both MTX and Infliximab ($p<0.05$). Glutarate (pentanedioate) was reduced by infliximab($p<0.05$). This agent is linked to oxidized phospholipids and proteins; measurement of protein-bound phosphate and long-chain fatty acids may be useful for assessing long-term lipid peroxidative damage to proteins in vivo. Methylphosphate was increased by MTX and infliximab ($p<0.05$): It reduce transcription of inflammatory genes and decrease RNAs affinity to nuclear phosphoprotein. 7 beta-hydroxycholesterol was reduced by infliximab ($p<0.05$). It is present at

elevated concentrations in inflammatory lesions, strongly cytotoxic and pro-oxidative. Its effect is relevant on cell death and oxidative DNA damage. Conclusions Biochemicals involved in a number of pathways showed some promising and subtle trends and better elucidate the pathogenetic mechanisms of the disease and response to treatments. MTX and Infliximab treatment of CD4+ cells had an impact on inflammation and cellular defence. This is the first demonstration of metabolites that can be monitored for treatment efficacy and tolerability. These observations provide some insights into the potential mechanisms involved in mediating the anti-inflammatory and the immunomodulation effects of MTX and infliximab.

Chindavijak, S., et al. (2018). "Effect of therapeutic vaccine on CTLA4 and tumor debulking response in recurrent and metastatic HNSCC." Journal of Clinical Oncology. Conference **36**(5 Supplement 1).

Background: Head and Neck Squamous Cell Carcinoma (HNSCC) is associated with multiple immune suppression and avoidance mechanisms . Blocking the PD-1 signal axis in second line provides a significant survival advantage compared to chemotherapy. However, checkpoint blockade efficacy is limited to the subset of patients that present with tumors highly infiltrated with effector immune cells. We investigated a novel vaccine designed to increase the infiltration of tumor-specific effector cells and counter-regulate the suppressive tumor microenvironment. Method(s): Pre-treated r/m HNSCC patients with externally visible tumors were accrued. Tumor biopsy samples were processed at baseline to purify endogenous chaperones with calreticulin, hsp70, hsp90 and gr94/gp96 (CRCL) as a source of tumor neoantigen. Exvivo differentiated, allogeneic Th1 memory cells with CD3/CD28-coated microbeads attached (aTh1) expressing CD40L and IFNgamma served as adjuvant. Subjects were primed with 4 weekly aTh1 ID injections to increase allo-specific Th1 memory titer. Primed subjects were provided 3 weekly ID injections of CRCL + aTh1 to increase tumor-specific Th1 memory titer followed by intravenous aTh1 in the 4th week to activate circulating memory cells through CD40-CD40L, causing their extravasation and trafficking to tumor lesions. Allo-rejection response produces a sustained Type 1 cytokine release which dys-regulates suppressor circuits. The ID/IV cycle was then repeated. Result(s): 10 subjects with recurrent or metastatic disease were accrued. All with prior radiochemotherapy. 50% (5/10) had clinical response with visible reduction in tumor burden. Vaccine was well tolerated. Debulking response correlated with increased CD3+ immune cell infiltration and decreased CTLA-4 expression. Conclusion(s): This individualized vaccine caused increased immune cell infiltration in tumors, downregulation of CTLA4 and visible tumor debulking in a heavily pretreated, chemotherapy-refractory population. These results provide rationale for further evaluation of this vaccine in a first-line setting with and without PD1/L1 blockade.

Chisada, S., et al. (2019). "Ingestion of polyethylene microbeads affects the growth and reproduction of medaka, Oryzias latipes." Environmental Pollution **254**(Part B).

Research using various species of wild and cultured fish has identified negative effects of short-term exposure to microbeads. Although wild animals might be contaminated with microbeads and/or other pharmaceuticals, data regarding the long-term effects remain limited. To clearly elucidate the effects of microbeads, studies of long-term exposure using animal models are necessary. Our aim was to elucidate the effects of microbeads alone on the growth and fecundity of medaka following long-term exposure (12 weeks). In experiment 1, fish groups (except controls) were temporarily exposed to polyethylene microbeads (10-63 micro m diameter) a low dose of 0.065 microbeads-mg/L and high dose of 0.65 microbeads-mg/L. In experiment 2, see-through medaka and fluorescent polyethylene microbeads (10-45 micro m diameter) were used to estimate the retention time of ingested microbeads in the digestive

tract, which was 4-9 days. The low dose of microbeads did not affect growth but did decrease the number of eggs and the hatching rate. The high dose decreased growth, the number of eggs, and hatching rate. Growth differences were recognized for the first time at 7 weeks, and differences in the number of eggs at 12 weeks. Thus, long-term tests using medaka indicated that microbeads per se exhibit growth inhibition and reproductive toxicity. These effects could be associated with nutritional factors resulting from the long retention time of microbeads in the digestive tract. We also determined the dose that affects only fecundity. This suggests that normal growth of medaka in the wild does not mean the environment is free from microbead contamination. We are thus attempting to identify new biological indexes for monitoring the status of microbead contamination using our system.

Chitaka, T. Y. and H. von Blottnitz (2019). "Accumulation and characteristics of plastic debris along five beaches in Cape Town." Marine Pollution Bulletin **138**: 451-457.

Beach accumulation surveys can be used as a proxy to estimate litter flows into the marine environment. However, litter loads can be influenced by various factors including catchment area characteristics, weather conditions and ocean water movements. This complexity is evidenced by the results of five beach surveys conducted in Cape Town in 2017. Observed average litter accumulation rates across the beaches ranged from 36 to 2961items.day⁻¹.100m⁻¹. Item mass ranged from 0.01-367g, with items weighing <1g contributing 61-85% of count. Plastic items accounted for 94.5-98.9% of total count and this prevalence appears to have increased relative to older data (1989-1994). The top ten identifiable items accounted for 40-57% of plastic debris. Nine of these were associated with foods commonly consumed on-the-go, including polystyrene packaging, snack packets and straws. A mitigation approach focused on these items may address one third to one half of marine litter sources in Cape Town.

Cho, H. M., et al. (2015). "Microcalcification detectability using a bench-top prototype photon-counting breast CT based on a Si strip detector." Medical Physics **42**(7): 4401-4410.

PURPOSE: To investigate the feasibility of detecting breast microcalcification (muCa) with a dedicated breast computed tomography (CT) system based on energy-resolved photon-counting silicon (Si) strip detectors.

METHODS: The proposed photon-counting breast CT system and a bench-top prototype photon-counting breast CT system were simulated using a simulation package written in matlab to determine the smallest detectable muCa. A 14 cm diameter cylindrical phantom made of breast tissue with 20% glandularity was used to simulate an average-sized breast. Five different size groups of calcium carbonate grains, from 100 to 180 mum in diameter, were simulated inside of the cylindrical phantom. The images were acquired with a mean glandular dose (MGD) in the range of 0.7-8 mGy. A total of 400 images was used to perform a reader study. Another simulation study was performed using a 1.6 cm diameter cylindrical phantom to validate the experimental results from a bench-top prototype breast CT system. In the experimental study, a bench-top prototype CT system was constructed using a tungsten anode x-ray source and a single line 256-pixels Si strip photon-counting detector with a pixel pitch of 100 mum. Calcium carbonate grains, with diameter in the range of 105-215 mum, were embedded in a cylindrical plastic resin phantom to simulate muCas. The physical phantoms were imaged at 65 kVp with an entrance exposure in the range of 0.6-8 mGy. A total of 500 images was used to perform another reader study. The images were displayed in random order to three blinded observers, who were asked to give a 4-point confidence rating on each image regarding the presence of muCa. The muCa detectability for each image was evaluated by using the average area under the receiver operating characteristic curve (AUC) across the readers.

RESULTS: The simulation results using a 14 cm diameter breast phantom showed that the proposed photon-counting breast CT system can achieve high detection accuracy with an average AUC greater than 0.89 +/- 0.07 for muCas larger than 120 mum in diameter at a MGD of 3 mGy. The experimental results using a 1.6 cm diameter breast phantom showed that the prototype system can achieve an average AUC greater than 0.98 +/- 0.01 for muCas larger than 140 mum in diameter using an entrance exposure of 1.2 mGy.

CONCLUSIONS: The proposed photon-counting breast CT system based on a Si strip detector can potentially offer superior image quality to detect muCa with a lower dose level than a standard two-view mammography.

Cho, M., et al. (2014). "Combination of biobarcode assay with on-chip capillary electrophoresis for ultrasensitive and multiplex biological agent detection." Biosensors & Bioelectronics **61**: 172-176.

Early diagnosis of biological agents is of paramount importance to prevent the casualties and fatal disease in human during bioterrorism or biological warfare. In this study, we reported an efficient and sensitive multiplex biological agent detection method based on the DNA biobarcode assay and the micro-capillary electrophoresis (muCE) technology. Monoplex as well as multiplex pathogen identification was performed using five targets including Bacillus anthracis, Francisella tularensis, Yersinia pestis, Vaccinia virus and Botulinum toxin A. Through the DNA biobarcode assay process, the magnetic microparticle-pathogen-polystyrene microbead complexes were formed, and the FAM labeled single stranded barcode DNA could be released from the complexes upon denaturation. Different lengths of a barcode DNA were designed to designate each pathogen, so that the specific peak elution time in the capillary electrophoresis on a chip allows us to distinguish the target with high accuracy within 3 min. We improved the assignment accuracy of the peak in the electropherogram by adding two bracket ladders. Owing to the abundant amount of barcode DNAs, the presence of B. anthracis, F. tularensis, Y. pestis, Vaccinia virus was confirmed with a limit of detection of 50CFU/mL, while Botulinum toxin A was analyzed even at a concentration of 12.5 ag/mL. Multiple pathogen detection was also successfully conducted in a phosphate buffered saline (PBS) as well as a serum medium with background of other pathogens. Thus, our analytical platform based on the biobarcode assay and on-chip CE analysis provides rapid, sensitive, multiplex, and accurate biological agent identification.

Cho, M.-H., et al. (2015). "Air gasification of PVC (polyvinyl chloride)-containing plastic waste in a two-stage gasifier using Ca-based additives and Ni-loaded activated carbon for the production of clean and hydrogen-rich producer gas." Energy **87**: 586-593.

A plastic waste containing polyvinyl chloride was gasified in a two-stage gasifier consisting of a fluidized bed reactor and tar-cracking zone to produce a hydrogen-rich producer gas with low tar and HCl contents. In particular, this study investigated the effects of calcined Ca-based additives, especially oyster shells, and a Ni-loaded activated carbon on the chlorine and tar removal. Additionally, a ~3 h gasification of the plastic waste was performed using a distributor with a large hole size to confirm the gasification stability. In the experiments, where 900 g activated carbon was applied, all the producer gases were free of tar. The maximum H sub(2) content (30 vol.%) in the producer gas was obtained with 900 g of Ni-loaded activated carbon. Chlorine in the feed material was mainly distributed in char and condensate liquid. The HCl contents in the producer gases obtained with the calcined Ca-based additives including oyster shells were under 1 ppm. The ~3 h gasification revealed that the gasification was stable in terms of tar content in producer gas and producer gas composition.

Cho, M.-H., et al. (2014). "Two-stage air gasification of mixed plastic waste: Olivine as the bed material and effects of various additives and a nickel-plated distributor on the tar removal." Energy **70**: 128-134.

Air gasification of mixed plastic waste was conducted in a two-stage gasifier. The effects of the combination of olivine as the fluidized bed material and activated carbon with or without other additives for tar cracking, as well as a Ni-plated distributor, the use of steam as a gasifying agent, and the calcination of olivine on the producer gas compositions and tar production, were also investigated. The maximum Hz concentration (27.3 vol%) was obtained with 900 g of activated carbon in the tar-cracking zone, and through the use of calcined olivine as the bed material. In the experiments, the maximum tar removal efficiency calculated using a base case reached 98.2%. The LHVs of the producer gases were in the range of 6.1-9.0 MJ/Nm super(3). The increase in the activated carbon amount led to an enhanced H sub(2) production, as well as a decrease in tar production. The Ni-plated distributor was found to be effective for tar removal. In the application of dolomite in the tar-cracking zone and the use of steam as a fluidizing medium resulted in a high rate of HCl removal. The minimum HCl concentration in the producer gases was under 1 ppm.

Cho, M.-H., et al. (2013). "Production of low-tar producer gas from air gasification of mixed plastic waste in a two-stage gasifier using olivine combined with activated carbon." Energy **58**: 688-694.

A fraction of mixed plastic waste was gasified using olivine as a bed material and activated carbon as a tar-cracking additive in a two-stage gasifier. The effects of the amount of activated carbon, the use of an activated carbon filter, and the removal of an EP (electrostatic precipitator) from the process on the gas composition and tar amount generated were investigated. The effects of the ER (equivalence ratio), the type of distributor, the use of steam and the use of a wire mesh basket for activated carbon on the coke removal were also examined. As a result, H2 concentrations of around 30 vol% were obtained with 1500 g of activated carbon. The tar removal efficiency was maximized at about 98% with the application of 1500 g of activated carbon and steam. The LHVs (lower heating values) of the producer gases obtained with the two additives at ERs of about 0.31 were in the range of 5.3a6.2 MJ/Nm3.

Cho, M. K. and H. S. Shin (2016). "Mechanotransduction-Induced Lipid Production System with High Robustness and Controllability for Microalgae." Scientific Reports **6**: 32860.

Microalgae lipids are a promising energy source, but current biochemical methods of lipid-inductions such as nitrogen deprivation have low process robustness and controllability. Recently, use of mechanotransduction based membrane distortion by applying compression stress in a 2D-microsystem was suggested as a way to overcome these limitations of biochemical induction. However, reproduction in large numbers of cells without cell death has been difficult to overcome because compression for direct membrane distortion reduces culture volume and leads to cell death due to nutrient deprivation. In this study, a mechanotransduction-induced lipid production (MDLP) system that redirects elastic microbeads to induce membrane distortion of microalgae with alleviating cell death was developed. This system resulted in accumulation of lipid in as little as 4 hr. Once compressed, porous microbeads absorb media and swell simultaneously while homogeneously inducing compression stress of microalgae. The absorbed media within beads could be supplied to adjacent cells and could minimize cell death from nutrient deficiency. All mechanotransduction was confirmed by measuring upregulation of calcium influx and Mat3 genes. The microbeads ensured robustness and controllability in repeated compression/de-compression processes. Overall, the MDLP system has potential for use as a fundamental biodiesel process that requires robustness and controllability.

Cho, S., et al. (2004). "Microbead-based affinity chromatography chip using RNA aptamer modified with photocleavable linker." Electrophoresis **25**(21-22): 3730-3739.

A microbead-based affinity chromatography chip (micro-BACC) controlling hundreds of nanoliters of reaction volume was developed to separate and analyze hepatitis C virus (HCV) RNA polymerase protein by immobilization of an RNA aptamer on beads. A photocleavable linker was conjugated in between the beads and the aptamer to elute the bound RNA polymerase from the RNA aptamer in one step by UV irradiation, resulting in an efficient method to elute and identify the target molecule bound on RNA using a mass spectrometer. This linker showed a cleavage activity over 70% upon UV irradiation at 1050 mW/cm2 for more than 5 min. The photoelution method could prevent the target molecule from contaminations in affinity chromatography caused by elution solutions of high salt concentration, extreme pH and detergent, respectively. In this chip, sample reagents up to 800 nL could be metered quantitatively into the bead chamber using a nanoliter dispenser working, based on surface-guided flow control and pneumatic control by external air pressure on the chip. RNA polymerase eluted after UV irradiation was successfully analyzed by trypsin treatment without additional purification. As a result, using the aptamer, we could detect RNA polymerase from 800 nL hepatitis C patient serum containing 96 fmol HCV RNA polymerase. The detection limit of this system was estimated to be 9.6 fmol HCV RNA polymerase.

Cho, Y., et al. (2019). "Abundance and characteristics of microplastics in market bivalves from South Korea." Environmental Pollution **245**: 1107-1116.

Microplastic contamination in marine organisms is a growing environmental issue with implications for seafood safety. Among marine organisms, shellfish are considered to be an important route of human exposure to microplastics because they filter a large volume of seawater while feeding and, thus, accumulate microplastics from seawater; furthermore, they are consumed whole, without gut removal. In this study, a market survey was carried out to understand microplastic contamination in domestic bivalves sold in fishery markets in three major cities of South Korea. Four popular bivalve species, oyster (Crassostrea gigas), mussel (Mytilus edulis), Manila clam (Tapes philippinarum) and scallop (Patinopecten yessoensis), were selected as monitoring species, which together account for 79-84% of total shellfish consumption in Korea. The mean concentration of microplastics in these four species was 0.15+/-0.20 n/g and 0.97+/-0.74 n/individual. Fragments and particles smaller than 300mum were dominant shape and size, accounting for 76% and 65% of total microplastics, respectively. Polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyester were the major polymer types. Interestingly, differing polymer compositions were observed according to the culture methods and habitat characteristics of each species. PS was found in high proportions in oysters and mussels cultured in the upper layer of the water column, while the proportions decreased and those of polyester increased in Manila clams and scallops that were cultured in intertidal sediments or the middle and bottom layers of the water column. The annual dietary intake of microplastics by the Korean population via shellfish consumption was estimated as 212 n/person.year. Our results suggested that microplastic pollution is widespread in commercial bivalves and we recommend a systematic and integrative market-basket survey to clarify the current status of human exposure to microplastics.

Choi, D., et al. (2014). "A prototype of time temperature integrator (TTI) with microbeads-entrapped microorganisms maintained at a constant concentration." Journal of Food Engineering **120**: 118-123.

The existing microbial TTIs based on lactic acid production have some weakness that their

kinetics includes both the microbial growth and the lactic acid production. Such weakness was improved by applying SPG (Shirasu porous glass) membrane emulsification to produce microbeads entrapping microorganisms, resulting in maintaining constant microbial levels throughout the use periods and considering only lactic acid production in kinetics. The TTIs containing the microbeads with the initial concentration of 10.7 log CFU/g of Weissella cibaria CIFP 009 maintained the microbial level constant during the use, while the TTIs with less initial levels (6.2 and 9.3 log CFU/g) showed a slight increase. A wide range of TTI response (pH) rates in zero-order reaction were obtained by varying the amounts of the microbeads in TTI formulations. In addition, the lag phase common to microbial growth was not manifested in the pH change, which facilitates an immediate TTI response after activation. In conclusion, the application of the microbeads to microbial TTI could provide the wide response rates in zero-order and the absence of lag phase favorable to an ideal microbial TTI.

Choi, E. S., et al. (2015). "Haploidentical hematopoietic stem cell transplantation in pediatric patients: Comparison of depletion efficacy and engraftment according to in vitro T cell depletion method." Bone Marrow Transplantation **1)**: S327.

Introduction: We compared the efficacy of CD3 depletion with TCRalphabeta depletion in haploidentical stem cell transplantation (HHCT) for children and adolescents with malignant or non-malignant diseases. Materials (or patients) and methods: Sixty-seven HHCTs were performed in 57 patients (SAA 19, MDS 7, AML 17, ALL 7, NBL 1, NHL 2, CDA 1, Rhabdomyosarcoma 1, Ewing's sarcoma 1, WAS 1) using CD3-depleted (HHCT-CD3, n=38) or TCRalphabeta-depleted (HHCT-TCRalphabeta, n=29) grafts from haploidentical family donors between 2008 and 2014 at AMCCH. A total of 67 graft manipulations were done with anti-CD3 (n=38) or anti-TCRalphabeta (n=29) microbeads (CliniMACS, MiltenyiBiotec). Donors included mother (n=36), sibling (n=18) and father (n=13). We sought toobtain at least 4x10⁶ CD34⁺ cells/kg of recipient. MMF and cyclosporine or FK506 were used for GVHD prophylaxis. Result(s): As for 67 graft manipulations, mean recovery of CD34⁺ stem cells after CD3 depletion and TCRalphabeta depletion were 82.4% and 89.8% (P=0.04), respectively. Mean depletion efficacy of CD3⁺ Tcells after CD3 depletion was 3.1 log and that of alphabeta⁺ Tcells after TCRalphabeta depletion was 3.6 log (P=0.01). Of a total of 67 HHCTs, 3 (4.5%) experienced primary graft failure(GF) and additional 6 (8.9%) experienced graft rejection(GR) after HHCT-CD3. All 9 GF/GR were rescued with a second HHCT. There were neither GF nor GR in HHCT-TCRalphabeta. The median day of neutrophil engraftment was 10 days (range, 9-15) post-transplant which was not different according to depletion methods (P>0.05). However, platelet engraftment was faster in HHCT-TCRalphabeta compared to HHCTCD3 (median 16 days; 17 days for HHCT-TCRalphabeta vs 31 days for HHCT-CD3, P=0.03). Conclusion(s): TCRalphabeta depletion is a highly effective method to deplete T cells along with enrichment of CD34⁺ stem cells. Given the high engraftment rate, HHCT using TCRalphabeta depletion is a promising approach in children and adolescents who lack a suitable donor.

Choi, J. S., et al. (2019). "Evaluation of microplastic toxicity in accordance with different sizes and exposure times in the marine copepod Tigriopus japonicus." Marine Environmental Research: 104838.

The indiscriminate use of plastic has greatly increased microplastic contamination risk in the marine environment. Microplastics can affect all marine life via the food web, from primary producers (e.g., microalgae) to final consumers (e.g., carnivorous fish). Thus, several studies have attempted to evaluate microplastic toxicity, but information about the underlying mechanisms of their effect is limited. Therefore, in this study, we examined multiple factors that

could contribute to microplastic-induced toxicity. We investigated the potential molecular effects of microplastic size and exposure time. We exposed the marine copepod Tigriopus japonicus to 50nm and 10mum polystyrene microbeads. We found that both size and exposure time increased intracellular levels of reactive oxygen species. In addition, antioxidant-related gene expression was modulated and antioxidant enzyme activities were changed significantly. The results of this study provide important insights into the molecular mechanisms of microplastic-induced toxicity in a marine organism.

Choi, J. S., et al. (2018). "Toxicological effects of irregularly shaped and spherical microplastics in a marine teleost, the sheepshead minnow (Cyprinodon variegatus)." Marine Pollution Bulletin **129**: 231.
The increasing global contamination of plastics in marine environments is raising public concerns about the potential hazards of microplastics to environmental and human health. Microplastics formed by the breakdown of larger plastics are typically irregular in shape. The objective of this study was to compare the effects of spherical or irregular shapes of microplastics on changes in organ distribution, swimming behaviors, gene expression, and enzyme activities in sheepshead minnow (Cyprinodon variegatus). Both types of microplastics accumulated in the digestive system, causing intestinal distention. However, when compared to spherical microplastics, irregular microplastics decreased swimming behavior (i.e., total distance travelled and maximum velocity) of sheepshead minnow. Both microplastics generated cellular reactive oxygen species (ROS), while ROS-related molecular changes (i.e., transcriptional and enzymatic characteristics) differed. This study provides toxicological insights into the impacts of environmentally relevant (fragmented) microplastics on fish and improves our understanding of the environmental effects of microplastics in the ecosystem.

Choi, S., et al. (2017). "Inhibition by miR-410 facilitates direct retinal pigment epithelium differentiation of umbilical cord blood-derived mesenchymal stem cells." Journal of Veterinary Science **18**(1): 59-65.
Retinal pigment epithelium (RPE) is a major component of the eye. This highly specialized cell type facilitates maintenance of the visual system. Because RPE loss induces an irreversible visual impairment, RPE generation techniques have recently been investigated as a potential therapeutic approach to RPE degeneration. A microRNA-based technique is a new strategy for producing RPE cells from adult stem cell sources. Previously, we identified that antisense microRNA-410 (anti-miR-410) induces RPE differentiation from amniotic epithelial stem cells. In this study, we investigated RPE differentiation from umbilical cord blood-derived mesenchymal stem cells (UCB-MSCs) via anti-miR-410 treatment. We identified miR-410 as a RPE-relevant microRNA in UCB-MSCs from among 21 putative human RPE-depleted microRNAs. Inhibition of miR-410 induces overexpression of immature and mature RPE-specific factors, including MITF, LRAT, RPE65, Bestrophin, and EMMPRIN. The RPE-induced cells were able to phagocytize microbeads. Results of our microRNA-based strategy demonstrated proof-of-principle for RPE differentiation in UCB-MSCs by using anti-miR-410 treatment without the use of additional factors or exogenous transduction.

Choi, S. W., et al. (2015). "miR-410 Inhibition Induces RPE Differentiation of Amniotic Epithelial Stem Cells via Overexpression of OTX2 and RPE65." Stem Cell Reviews & Reports **11**(3): 376-386.
The retinal pigment epithelium (RPE) is a highly specialized cell type located between the choroid and neural retina of the eye. RPE degeneration causes irreversible visual impairment, extending to blindness. Cell therapy has recently emerged as a potential therapeutic approach for retinal degeneration. MicroRNA-based differentiation of stem cells is a new strategy for producing tissue-specific cell types. In this study, we developed a novel microRNA-based

strategy for RPE induction from human amniotic epithelial stem cells (AESCs). We identified microRNAs involved in RPE development in AESCs. Of 29 putative human RPE-relevant microRNAs, microRNA-410 (miR-410) was predicted to target multiple RPE development-relevant genes. Inhibition of miR-410 induces overexpression of immature and mature RPE-specific factors, including OTX2, RPE65, Bestrophin and EMMPRIN. These RPE-like cells were morphologically altered toward a cobblestone-like shape and were able to phagocytize microbeads. We showed that miR-410 directly regulates predicted target genes OTX2 and RPE65. Our microRNA-based strategy demonstrated RPE differentiation in AESCs by treatment of an antisense microRNA-410 (anti-miR-410), without the use of additional factors or exogenous transduction. These findings suggest that miR-410 inhibition can be a useful tool for directed cell differentiation and an attractive method for cell therapy in human retinal degenerative diseases.

Chon, J. W. and M. Gu (2004). "Scanning total internal reflection fluorescence microscopy under one-photon and two-photon excitation: image formation." Applied Optics **43**(5): 1063-1071.

We propose a new type of total internal reflection fluorescence microscopy (TIRFM) called scanning TIRFM (STIRFM) that uses a focused ring-beam illumination and a high-numerical-aperture objective (NA = 1.65). The evanescent field produced by the STIRFM is focused laterally, producing a small excitation volume that can induce a nonlinear effect such as two-photon absorption. Experimental images of CdSe quantum dot nanocrystals and Rhodamine 6G-doped microbeads show that good lateral and axial resolutions are achieved with the current setup. The theoretical simulation of the focal spot produced in STIRFM geometry shows that the focused evanescent field is split into two peaks because of the depolarization effect of a high numerical-aperture objective lens. However, the point-spread function analysis of both one-photon and two-photon excitation cases shows that the detection of the focus-splitting effect is dependent on the detection pinhole size. The effect of pinhole size on image formation is theoretically investigated and confirmed experimentally with the nanocrystal images.

Chong, J., et al. (2019). "Two-stage cultivation of the marine microalga Chlorella salina for starch and carbohydrate production." Aquaculture International **27**(5): 1269-1288.

Growing concern and awareness towards environmental issues, such as plastic pollution, have encouraged scientific focus on microalgae as a potential feedstock for thermoplastic starch production. Given their unique ability to utilize wastewater nutrients, microalgae are suitable to be used in wastewater treatment. In first-stage cultivation, Chlorella salina was grown in a Conway medium at 30 degrees C and exposed to red light under a photoperiod of 24:0 h light-dark cycle to maximize biomass production. The microalgal biomass harvested from the first stage was used as the inoculum for second-stage cultivation. The effects of photoperiod, CO₂ concentration, and nutrient limitation were investigated. Cultivation using wastewater was compared with the synthetic medium for starch and carbohydrate accumulation. C. salina cultivated under 12:12 h light-dark cycle significantly accumulated the highest starch and carbohydrate with respective concentrations of 16.769 and 70.850 mg L⁻¹. Under 5% (v/v) CO₂, C. salina significantly accumulated starch and carbohydrate with respective concentrations of 13.699 and 58.910 mg L⁻¹. The combination of nitrogen and sulfur limitation significantly triggered the highest starch (30.505 mg L⁻¹) and carbohydrate (145.994 mg L⁻¹) accumulation. Under optimized 5% v/v CO₂ supply, the concentrations of starch and carbohydrate accumulated by C. salina using wastewater were 24.971 and 110.756 mg L⁻¹, respectively, which were approximately twice higher compared with the synthetic medium. The

usage of wastewater aerated with 5% v/v CO₂ would be a more sustainable and economical strategy for high starch and carbohydrate accumulation in C. salina compared with the combination of nitrogen with sulfur limitation.

Chong, S., et al. (2017). "Physical Characterization and Pre-assessment of Recycled High-Density Polyethylene as 3D Printing Material." Journal of Polymers & the Environment **25**(2): 136-145.

3D printing has received lots of attention due to its limitless potential and advantages in comparison to traditional manufacturing processes. This study focuses on the most popular type of home 3D printers, namely fused filament fabrication (FFF) printers, which use plastic filaments as the feedstock. The rather high material cost and large amount of plastic waste generated by FFF 3D printers have driven the need for plastic filaments produced from recycled plastic waste. This study evaluates, in terms of physical characterization, the feasibility of using recycled high-density polyethylene (HDPE), one of the most commonly used plastics, as the feedstock for 3D printers, in comparison with the common acrylonitrile butadiene styrene plastic pellets. In-house extrusion using recycled HDPE pellets and flakes is possible. The diameter consistency and extrusion rate results, along with other physical characterization results, including differential scanning calorimetry, thermogravimetric analysis, Fourier transform infrared spectroscopy, Raman spectroscopy, and water absorption, suggest that making filaments from recycled HDPE pellets is a viable option, as the obtained filament has favorable water rejection and comparable extrusion rate and thermal stability. Existing methods for overcoming the warping and adhesion problems in 3D printing with HDPE were also reviewed. In order to increase the market competitiveness of waste-derived filaments, optimization of the extrusion process, studies on the mechanical and aging properties, and development of a standard characterization methodology and database are crucial. [ABSTRACT FROM AUTHOR]

Chou, J., et al. (2012). "Modeling Analyte Transport and Capture in Porous Bead Sensors." Analytical Chemistry **84**(5): 2569.

Porous agarose microbeads, with high surface to volume ratios and high binding densities, are attracting attention as highly sensitive, affordable sensor elements for a variety of high performance bioassays. While such polymer microspheres have been extensively studied and reported on previously and are now moving into real-world clinical practice, very little work has been completed to date to model the convection, diffusion, and binding kinetics of soluble reagents captured within such fibrous networks. Here, we report the development of a three-dimensional computational model and provide the initial evidence for its agreement with experimental outcomes derived from the capture and detection of representative protein and genetic biomolecules in 290 µm porous beads. We compare this model to antibody-mediated capture of C-reactive protein and bovine serum albumin, along with hybridization of oligonucleotide sequences to DNA probes. These results suggest that, due to the porous interior of the agarose bead, internal analyte transport is both diffusion and convection based, and regardless of the nature of analyte, the bead interiors reveal an interesting trickle of convection-driven internal flow. On the basis of this model, the internal to external flow rate

ratio is found to be in the range of 1:170 to 1:3100 for beads with agarose concentration ranging from 0.5% to 8% for the sensor ensembles here studied. Further, both model and experimental evidence suggest that binding kinetics strongly affect analyte distribution of captured reagents within the beads. These findings reveal that high association constants create a steep moving boundary in which unbound analytes are held back at the periphery of the bead sensor. Low association constants create a more shallow moving boundary in which unbound analytes diffuse further into the bead before binding. These models agree with experimental evidence and thus serve as a new tool set for the study of bioagent transport processes within a new class of medical microdevices. [PUBLICATION ABSTRACT]

Choudhary, S., et al. (2018). "Hypoxic Three-Dimensional Cellular Network Construction Replicates Ex Vivo the Phenotype of Primary Human Osteocytes." Tissue engineering. Part A. **24**(5-6): 458-468.

Osteocytes are deeply embedded in the mineralized matrix of bone and are nonproliferative, making them a challenge to isolate and maintain using traditional in vitro culture methods without sacrificing their inimitable phenotype. We studied the synergistic effects of two microenvironmental factors that are vital in retaining, ex vivo, the phenotype of primary human osteocytes: hypoxia and three-dimensional (3D) cellular network. To recapitulate the lacunocanalicular structure of bone tissue, we assembled and cultured primary human osteocytic cells with biphasic calcium phosphate microbeads in a microfluidic perfusion culture device. The 3D cellular network was constructed by the following: (1) the inhibited proliferation of cells entrapped by microbeads, biomimetically resembling lacunae, and (2) the connection of neighboring cells by dendrites through the mineralized, canaliculi-like interstitial spaces between the microbeads. We found that hypoxia synergistically and remarkably upregulated the mature osteocytic gene expressions of the 3D-networked cells, SOST (encoding sclerostin) and FGF23 (encoding fibroblast growth factor 23), by several orders of magnitude in comparison to those observed from two-dimensional and normoxic culture controls. Intriguingly, hypoxia facilitated the self-assembly of a nonproliferating, osteoblastic monolayer on the surface of the 3D-networked cells, replicating the osteoblastic endosteal cell layer found at the interface between native bone and bone marrow tissues. Our ability to replicate, with hypoxia, the strong expressions of these mature osteocytic markers, SOST and FGF23, is important since these (1) could not be significantly produced in vitro and (2) are new important targets for treating bone diseases. Our findings are therefore expected to facilitate ex vivo studies of human bone diseases using primary human bone cells and enable high-throughput evaluation of potential bone-targeting therapies with clinical relevance.

Choudhury, P. K., et al. (2010). "Design, development and evaluation of frusemide loaded micropellets prepared by ionotropic gelation method." International Journal of PharmTech Research **2**(1): 420-426.

Frusemide is a representative of loop diuretics, which is commonly indicated for acute or chronic renal failure. In low dose it is also used for the treatment of chronic hypertension. It has got pH independent solubility behavior. The half life of Frusemide is 1.5 hr and it is predominantly metabolized in kidney. The micro beads were prepared by the ionotropic gelation of sodium alginate in calcium chloride solution, which were further made sustained by using different acrylic polymers namely Eudragit NE30D, Eudragit S100. The prepared micro beads were evaluated mainly for the sustain release of the drug and the effect of these polymers on the release profile of the drug has been reported in this study. Different formulations were prepared using Eudragit NE30D (F1, F2); and Eudragit S100 (F3, F4) at concentration 2%, 4%w/w. The final formulations were subjected to several characterization studies like, general appearance, particle size determination, rheological studies, Scanning

Electron Microscopy, moisture content, loose surface crystals study, drug content and % drug encapsulation efficiency and in vitro drug release study. The method had resulted in good encapsulation efficiency and micron sized alginate spheres. The drug release was found to be sustained as only 72 % to 90 % of the cumulative drug release were observed in all formulations after 9 hours, which found to follow the Higuchi's diffusion model. Among all formulations, the formulation F2 with Eudragit NE30D 4%w/w showed high encapsulation efficiencies and maximum prolongation of drug release.

Chow, C.-f., et al. (2016). "Research and development of a new waste collection bin to facilitate education in plastic recycling." Applied Environmental Education and Communication **15**(1): 45-57.

Plastic recycling has been an alternative method for solid waste management apart from landfill and incineration. However, recycling quality is affected when all plastics are discarded into a single recycling bin that increases cross contaminations and operation cost to the recycling industry. Following the engineering design process, a new eight-compartment plastic waste collection bin is designed to facilitate plastic recycling and sorting at source, which also provides insight to educators about problem solving on environmental issues. The volumes of plastic wastes collected match the design dimensions well. Further education about plastic recycling is required to improve the recycling quality.

Christiansen, K. (2014). Mind the gap: lost opportunities. **203:** 16-18.

An interview with Kim Christiansen, the northern region director of the trade association PlasticsEurope is presented, in which he discusses the findings of a study of post-consumption plastic waste management across the continent. Christiansen reveals that the rates of plastic recycling and energy recovery have grown considerably from 2006 to 2012, yet the European plastics industry must do more to achieve its goal of reducing the amount of plastic waste going into landfill to zero by 2020.

Chu, J. H., et al. (2012). "Dynamic network connectivity mapping of T-cell activation in Caucasians and African Americans identifies a common set of asthma-associated hub genes." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **185**(MeetingAbstracts).

Background: CD4+ T-cell activation represents a sentinel event in the expression of allergic and asthmatic responses. Though individual molecular components of this process have been characterized, more holistic, system-wide descriptions using transcriptome network mapping in large populations has not been performed. Objective(s): We set out to characterize and compare the gene networks in resting and stimulated human CD4+ peripheral blood lymphocytes, and define those focal modules most radically altered upon activation. Method(s): A subset of subjects participating in the Asthma BRIDGE initiative from six clinical centers provided whole blood samples, from which PBMCs were isolated and plated in split samples. 25ul of PHA (@5ug/ml) was added to 50% of wells (stimulated samples). At 24 hours, cells were harvested and CD4+ cells were isolated using CD4 Microbeads (Miltenyi); RNA was isolated using the QIAGEN AllPrep DNA/RNA extraction protocol. Expression profiling was performed using the Illumina Human HT12 array. Following data QC and preprocessing procedures, we used differential connectivity mapping procedures (Chu et al. BMC Systems Biology 2011) and compared the transcriptome networks of the stimulated and unstimulated samples to define regulatory modules that undergo restructuring during T-cell activation. Result(s): Expression data from 98 non-Hispanic whites and 157 African Americans were available for analysis. We noted widespread differences in the topographical landscape of the CD4+ lymphocyte

transcriptome following stimulation, identifying 216 gene hubs that each demonstrated differential connectivity to no fewer than 50 genes. In comparisons across ethnic groups, the correlation of observed differential connectivity was high (0.68). 86 genes were identified in both the white and African American samples, representing a reproducible set of regulatory modules with altered topography (i.e. altered gene-gene co-expression patterns) upon T-cell activation. These 86 genes are enriched for genes involved in antigen processing and presentation (p=3.0E-04) and those with genetic variants associated with immune-related diseases. As proof of concept that detection of these hubs can define potential disease-susceptibility targets, we found that among the most differentially connected genes were UTS2, GSTM1, HLA-C, ARG1 and HLA-DRB1, all of which have been implicated in the genetics of asthma. Conclusion(s): We have described the network topography underlying T-cell activation, and have identified a reproducible set of 86 gene hubs with substantially altered connectivity upon stimulation. As many of the genes on this list are known asthma genes, the remainder should be prioritized for further evaluation as therapeutic targets in the treatment of allergic and autoimmune disease.

Chu, S., et al. (2015). "Perfluoroalkyl sulfonates and carboxylic acids in liver, muscle and adipose tissues of black-footed albatross (Phoebastria nigripes) from Midway Island, North Pacific Ocean." Chemosphere **138**: 60-66.

The Great Pacific Garbage Patch (GPGP) is a gyre of marine plastic debris in the North Pacific Ocean, and nearby is Midway Atoll which is a focal point for ecological damage. This study investigated 13 C 4 –C 16 perfluorinated carboxylic acids (PFCAs), four (C 4 , C 6 , C 8 and C 10) perfluorinated sulfonates and perfluoro-4-ethylcyclohexane sulfonate [collectively perfluoroalkyl acids (PFAAs)] in black-footed albatross tissues (collected in 2011) from Midway Atoll. Of the 18 PFCAs and PFSAs monitored, most were detectable in the liver, muscle and adipose tissues. The concentrations of PFCAs and PFSAs were higher than those in most seabirds from the arctic environment, but lower than those in most of fish-eating water birds collected in the U.S. mainland. The concentrations of the PFAAs in the albatross livers were 7-fold higher than those in Laysan albatross liver samples from the same location reported in 1994. The concentration ranges of PFOS were 22.91–70.48, 3.01–6.59 and 0.53–8.35 ng g −1 wet weight (ww), respectively, in the liver, muscle and adipose. In the liver samples PFOS was dominant, followed by longer chain PFUdA (8.04–18.70 ng g −1 ww), PFTrDA, and then PFNA, PFDA and PFDoA. Short chain PFBA, PFPeA, PFBS and PFODA were below limit of quantification. C 8 –C 13 PFCAs showed much higher composition compared to those found in other wildlife where PFOS typically predominated. The concentrations of PFUdA in all 8 individual albatross muscle samples were even higher than those of PFOS. This phenomenon may be attributable to GPGP as a pollution source as well as PFAA physicochemical properties. [ABSTRACT FROM AUTHOR]

Chua, E. M., et al. (2014). "Assimilation of Polybrominated Diphenyl Ethers from Microplastics by the Marine Amphipod, Allorchestes Compressa." Environmental Science & Technology **48**(14): 8127-8134.

Microplastic particles (MPPs; <5 mm) are found in skin cleansing soaps and are released into the environment via the sewage system. MPPs in the environment can sorb persistent organic

pollutants (POPs) that can potentially be assimilated by organisms mistaking MPPs for food. Amphipods (Allorchestes compressa) exposed to MPPs isolated from a commercial facial cleansing soap ingested ⩽45 particles per animal and evacuated them within 36 h. Amphipods were exposed to polybrominated diphenyl ether (PBDEs) congeners (BDE-28, -47, -99, -100, -153, -154, and -183) in the presence or absence of MPPs. This study has demonstrated that PBDEs derived from MPPs can be assimilated into the tissue of a marine amphipod. MPPs reduced PBDE uptake compared to controls, but they caused greater proportional uptake of higher-brominated congeners such as BDE-154 and -153 compared to BDE-28 and -47. While MPPs in the environment may lower PBDE uptake compared to unabsorbed free chemicals, our study has demonstrated they can transfer PBDEs into a marine organism. Therefore, MPPs pose a risk of contaminating aquatic food chains with the potential for increasing public exposure through dietary sources. This study has demonstrated that MPPs can act as a vector for the assimilation of POPs into marine organisms. [ABSTRACT FROM AUTHOR]

Chui, C. Y., et al. (2019). "Atomic force microscopy-indentation demonstrates that alginate beads are mechanically stable under cell culture conditions." Journal of the Mechanical Behavior of Biomedical Materials **93**: 61-69.

Alginate microbeads are extensively used in tissue engineering as microcarriers and cell encapsulation vessels. In this study, we used atomic force microscopy (AFM) based indentation using 20micro m colloidal probes to assess the local reduced elastic modulus (E*) using a novel method to detect the contact point based on the principle of virtual work, to measure microbead mechanical stability under cell culture conditions for 2 weeks. The bead diameter and swelling were assessed in parallel. Alginate beads swelled up to 150% of their original diameter following addition of cell culture media. The diameter eventually stabilized from day 2 onwards. This behaviour was mirrored in E*where a significant decrease was observed at the start of the culture period before stabilization was observed at ~ 2.1kPa. Furthermore, the mechanical properties of freeze dried alginate beads after re-swelling them in culture media were measured. These beads displayed vastly different structural and mechanical properties compared those that did not go through the freeze drying process, with around 125% swelling and a significantly higher E*at values over 3kPa.

Chui, C. Y., et al. (2018). "Direct electrospinning of poly(vinyl butyral) onto human dermal fibroblasts using a portable device." Biotechnology Letters **40**(4): 737-744.

OBJECTIVE: To demonstrate that uniform poly(vinyl butyral) (PVB) fibres can be safely electrospun onto a monolayer of human dermal fibroblasts using a portable device.

RESULTS: PVB in solvent mixtures containing various amounts of ethanol and water was electrospun. Six percent (weight-to-volume ratio) PVB in a 9:1 ethanol:water ratio was the solution with the highest content in water that could be electrospun into consistent fibres with an average diameter of 0.9 mum (+/- 0.1 mum). Four and five percent PVB solutions created beaded fibres. A 8:2 ethanol:water solution lead to microbead formation while a 7:3 ethanol:water mix failed to fully dissolve. The selected solution was successfully electrospun onto a monolayer of human dermal fibroblasts and the process had no significant effect ($p < 0.05$) on cell viability compared

to the control without fibres.
CONCLUSIONS: PVB-ethanol-water solutions could be electrospun without damaging the exposed cell layer. However, further work is required to demonstrate the long-term effect of PVB as a wound healing material.

Chung, S., et al. (2015). "The microfluidic chip module for the detection of murine norovirus in oysters using charge switchable micro-bead beating." Biosensors & Bioelectronics **67**: 625-633.

Sample preparation has recently been an issue in the detection of food poisoning pathogens, particularly viruses such as norovirus (NoV), in food because of the complexity of foods and raw fresh materials. Here, we demonstrate a total analytical microfluidic chip module to automatically perform a series of essential processes (cell concentration, lysis (RNA extraction), nucleic acid amplification, and detection) for the fast but sensitive detection of norovirus in oysters. The murine NoV spiked oyster was stomached using a standard method. The supernatant was first loaded into a shape switchable sample preparation chamber consisting of charge switchable micro-beads. Murine NoV, which was adsorbed on microbeads by electrostatic physisorption, was lysed using bead beating. The extracted RNA was transferred to the detection chamber to be amplified using Nucleic Acid Sequence Based Amplification (NASBA). The optimal surface functionality, size, and number of microbeads were achieved for the virus concentration and the stable RNA extraction in the shape-switchable micro-channel. As a result, murine NoV in a single oyster was successfully detected within 4 h by the microfluidic chip developed here, and could be directly applied to the large volume environmental sample as well as the food sample.

Chung, S., et al. (2018). "Nicotine activates epithelial trpa1 receptors to cause mucociliary dysfunction." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **197**(MeetingAbstracts).

RATIONALE: Widespread e-cigarette use, touted as a 'safer' form of nicotine delivery, is confounded by high-dose nicotine deposition onto the airway epithelium. Historically, nicotine was studied for its properties on excitable systems (e.g., central nervous system), where nicotineinduced calcium (Ca2+) signaling is highly variable due to differential expression of nicotinic receptors. TRPA1, a Ca2+-selective ionophore receptor, was also reported to be nicotinesensitive in chemosensory neurons. Here, we investigated whether TRPA1 is expressed and functional in the less excitable ciliated airway epithelia and whether TRPA1 contributes to effects of nicotine on mucociliary function. METHOD(S): Primary normal human bronchial epithelial (NHBE) cells, isolated from appropriately consented donors whose lungs were found unsuitable for transplantation, were expanded and then re-differentiated at the air-liquid interface (ALI) on collagen-coated Transwell inserts. For Ca2+ measurements, GCaMP6s was transduced into NHBE cells. GCaMP6s emissions (Ex 495 nm) were recorded using MetaFluor software. Aerosolized treatments for assessing mucociliary parameters were deposited via a mesh nebulizer. Airway surface liquid (ASL) volume was measured by meniscus scanning. Ciliary beat frequency (CBF) was recorded and analyzed by SAVA software. Mucociliary transport (MCT) was assessed by recording movement of fluorescent micro-beads. RESULT(S): TRPA1 mRNA and protein were consistently expressed in low but detectable quantities in ALI-differentiated NHBE cells isolated from lungs of young non-smokers. A plasmid encoding a characterized human TRPA1 orthologue was used as a positive control for primer and antibody validation. TRPA1 function was probed by perfusing cultures with the TRPA1 agonist cinnamaldehyde, which caused robust Ca2+ influx in NHBE cells that was significantly reduced by the TRPA1 antagonist A967079. Nicotine induced a similar Ca2+ response that was also reduced by A967079 and

HC030031, both TRPA1 antagonists. To assess Ca2+ signaling contributions from ER stores, experiments were repeated in the presence of thapsigargin: similar but smaller Ca2+ responses were again observed with nicotine but reduced with TRPA1 antagonists. Lastly, nicotine exposure via nebulization caused ASL volume loss, reduced CBF, and impaired MCT as early as 1 hr and up to 24 hrs post-exposure. Again, these parameters of mucociliary function were partially protected by pre-treatment with A967079. CONCLUSION(S): Low but functional TRPA1 expression occurs in NHBE cells of non-smokers. Its expression is relevant since it contributes to nicotine signaling, which triggers a series of events that causes mucociliary dysfunction. Future studies will investigate how Ca2+ influx through TRPA1 impairs various molecular mechanisms related to airway hydration.

Chung, S. S. and C. S. Poon (2001). "Characterisation of municipal solid waste and its recyclable contents of Guangzhou." Waste Management and Research **19**(6): 473-485.

Waste characteristics are essential data for waste disposal facilities planning and waste management policy formulation. However, waste composition studies are rarely carried out in mainland Chinese cities and even when it does, the methodologies used are not stringent. A year-long field survey on the physical components of waste and the recyclable in the waste stream has been conducted in Guangzhou to fill the information gap and to provide further experience for waste characterization study in mainland China. It was found that the ash content in the waste stream has decreased considerably. But the proportion of plastic materials in the waste stream has increased and is now comparable to its more urbanized cities. Although this lends support to the recent controls on expanded polystyrene food containers implemented by the Guangzhou environmental protection bureau, more detailed analysis shows that the focus should not only be on disposable food containers, but also on film plastic waste. Furthermore, the abundance of composite materials in the waste stream solicits attention from the waste management authority to step up the monitoring of their generation pattern and to consider imposing control measures.

Ciechomska, M., et al. (2012). "Toll-like receptor-mediated expression of profibrotic tissue-inhibitor of metalloproteinase-1 by circulating monocytes in Systemic sclerosis." European Journal of Clinical Investigation **1)**: 57.

Background: Systemic sclerosis (SSc) is an autoimmune disease characterised by fibrosis, vascular dysfunction and abnormal activation of immune cells including monocytes. Substantial evidence indicates that SSc monocytes overexpress interferon-regulated genes in response to certain toll-like receptor (TLR) stimulation. Therefore, we aim to test weather circulating monocytes from SSc patients produce tissue-inhibitor of metalloproteinase-1 (TIMP-1) following TLR activation, which contributes to excessive matrix deposition and consequently disease progression. Material(s) and Method(s): 23 patients with SSc and 16 HC were included in this study. Peripheral blood monocytes were further separated by CD14+ microbeads. Production of TIMP-1 by monocytes was determined by ELISA, qRT-PCR or functional assay in response to either panel of TLR agonists or patient's sera. Result(s): TIMP-1 produced by monocytes was elevated in SSc patients compared to HC as measured by qRT-PCR (fold increase 3.1, P = 0.03) and ELISA (fold increase 3.2, P = 0.02). Also, TIMP-1 expression was significantly stronger when SSc and HC monocytes were stimulated with TLR4 (LPS) or TLR8 (ss-RNA) agonists, but the response was more pronounced in SSc monocytes (Fig. 1). Agonists against other TLRs were less effective in the induction of TIMP-1. Matrix assay of TLR8 stimulated monocytes also confirmed functional TIMP-1 secretion, as matrix metalloproteinase-1 activity was significantly inhibited. Furthermore, HC monocytes co-cultured with sera from (Figure Presented) SSc patients induce elevated level of TIMP-1 compare to HC sera (Fig. 2). However, pre-treatment with Myd88 inhibitors attenuated TIMP-1 production, but not when incubated with control peptides, confirming the specificity of the agonists. Conclusion(s): This study indicates a potential link between TLR signaling and excessive TIMP-1 secretion in circulating monocytes from SSc patients, supporting an important role of monocytes in production of pro-fibrotic factors.

Ciechomska, M., et al. (2013). "The role of serum factors and toll-like receptor signaling in the induction of profibrotic TIMP-1 by monocytes in systemic sclerosis." Annals of the Rheumatic Diseases **1)**: A11-A12.

Background and Objectives Systemic sclerosis (SSc) is an autoimmune disease characterised by fibrosis, vascular dysfunction and abnormal activation of immune cells including monocytes. Monocytes along with fibroblasts play an important role in the production of profibrotic factors such as IL-6 and TIMP-1 (tissue-inhibitor of metalloproteinase-1). TIMPs are specific inhibitors of matrix metalloproteinases (MMPs) regulating extracellular matrix (ECM) turnover. Importantly, the balance between TIMPs and MMPs is altered in most pathological stages including SSc and is associated with abnormal ECM formation. However, the exact factors which drive both profibrotic TIMP-1 secretion are not fully defined. We aim to test whether circulating monocytes from SSc patients produce TIMP-1 in response to TLR activation and serum factors, which contributes to excessive matrix deposition and consequently disease progression. Materials and Methods 25 patients with SSc, one IRAK4 deficient patient and 20 HC (healthy control) were included in this study. Peripheral blood monocytes were further separated by CD14+ microbeads. Production of TIMP-1, IL-6 by monocytes was determined by ELISA, qRT-PCR or functional assay in response to either panel of conventional TLR agonists or HC and SSc sera. Skin section from SSc patient was stained with CD14+ and TIMP-1 antibodies and further analysed by confocal microscopy. Results TIMP-1 production by monocytes was observed in the SSc skin section and was upregulated in SSc patients compared to HC. Incubation of HC monocytes with SSc sera resulted in functionally active TIMP-1 production. However, pre-treatment with MyD88 inhibitor, but not control peptide, decreased TIMP-1 secretion. Furthermore, SSc-mediated TIMP-1 induction by monocytes was attenuated when FcgammaR was blocked and also when SSc sera were treated with DNA/RNA endonuclease prior to stimulation. This indicates that SSc sera contain RNA/DNA agonists inducing TIMP-1 production. Indeed, direct treatment of HC and SSc monocytes with a panel of TLR ligands demonstrated strong TIMP-1 and IL-6 production following triggering with TLR8 agonists (ssRNA). TLR8-mediated TIMP-1 production was reduced in monocytes from a patient with a genetic TLR signalling defect or HC monocytes cultured with MyD88 inhibitory peptide. Furthermore, matrix assay of TLR8 stimulated monocytes also confirmed functional TIMP-1 secretion, as matrix metalloproteinase-1 activity was significantly inhibited. Conclusions This study indicates a potential link between SSc serum factors and TLR signalling resulting in excessive TIMP-1 secretion by circulating monocytes from SSc patients.

Ciechomska, M., et al. (2012). "Toll-like receptor-mediated expression of profibrotic mediators by circulating monocytes in systemic sclerosis." Annals of the Rheumatic Disease. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **71**(SUPPL. 3).

Background Systemic sclerosis (SSc) is an autoimmune disease characterised by fibrosis, vascular dysfunction and abnormal activation of immune cells including monocytes. It was suggested that monocytes along with fibroblasts play an important role in the production of profibrotic factors such as IL-6 and TIMP-1 (tissue-inhibitor of metalloproteinase-1). TIMPs are specific inhibitors of matrix metalloproteinases (MMPs) regulating extracellular matrix (ECM) turnover.

Importantly, the balance between TIMPs and MMPs is altered in most pathological stages including SSc and is associated with abnormal ECM formation. However, the exact factors which drive both profibrotic TIMP-1 and IL-6 secretion have not been fully established. Objectives We aim to test whether circulating monocytes from SSc patients and dermal fibroblasts produce TIMP-1 and IL-6 in response to TLR activation, which contributes to excessive matrix deposition and consequently disease progression. Methods 23 patients with SSc and 19 HC (healthy control) were included in this study. Peripheral blood monocytes were further separated by CD14+ microbeads. Production of TIMP-1, IL-6 by monocytes and dermal fibroblasts was determined by ELISA, qRT-PCR or functional assay in response to either panel of conventional TLR agonists or Danger Associated Molecular Patterns (DAMPs) such as High-Mobility Group Box-1 protein (HMGB-1) and hyaluronic acid (HA). Results TIMP-1 produced by monocytes was elevated in SSc patients compared to HC as measured by qRT-PCR (fold increase 3.1, p=0.03) and ELISA (fold increase 3.2, p=0.02). The level of TIMP-1 present in SSc sera patients was also higher than in the HC (fold increase 1.8, p<0.001). In addition, IL-6 and TIMP-1 expression was significantly stronger when SSc and HC monocytes were stimulated with TLR4 (LPS) or TLR8 (ss-RNA) agonists, but the response was more pronounced in SSc monocytes. Agonists against other TLRs were less effective in the induction of TIMP-1 and IL-6. Furthermore, SSc and HC monocytes stimulated with HMGB-1 alone did not induce the secretion of profibrotic factors. However, combination of HMGB-1 and LPS upregulated the expression of both IL-6 and TIMP-1. These results suggest that there is the synergic effect between LPS and HMGB-1 on monocytes and fibroblasts activation. Interestingly, HC and SSc monocytes stimulated with HA alone or in the combination with LPS upregulated TIMP-1 and IL-6 at the same level as HA stimulation only. Furthermore, matrix assay of TLR8 stimulated monocytes also confirmed functional TIMP-1 secretion, as matrix metalloproteinase-1 activity was significantly inhibited. Conclusions This study indicates a potential link between TLR signaling and excessive TIMP-1 and IL-6 secretion in circulating monocytes from SSc patients and activated dermal fibroblasts, supporting an important role of these cells in production of pro-fibrotic factors.

Ciechomska, M. and J. Van Laar (2013). "Role of FRA-2 in TLR8-mediated TIMP-1 production in systemic sclerosis." Annals of the Rheumatic Diseases. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **72**(SUPPL. 3).

Background Systemic sclerosis (SSc) is an autoimmune connective tissue disease characterised by fibrosis, vascular dysfunction and abnormal activation of immune cells. We and others have shown that monocytes along with fibroblasts play an important role in the production of pro-fibrotic factors such as IL-6 and TIMP-1 (tissue-inhibitor of metalloproteinase-1). Importantly, the balance between TIMP-1 and MMPs is altered in SSc leading to abnormal ECM formation. However, the exact factors which drive pro-fibrotic TIMP-1 in monocytes have not been fully established. Previous studies showed that AP-1 transcription factors including Fra-2 and JunD are involved in TIMP-1 gene expression in hepatic stellate cells contributing to liver fibrosis. Also Fra-2 transgenic mice develop a proliferative vasculopathy of the lung and skin fibrosis resembling similar disease manifestations seen in SSc patients. Objectives The aim of this study is to determine the role of Fra-2 in TIMP-1 production. We also plan to determine if TIMP-1 is a direct target gene of Fra-2 upon TLR8 stimulation in SSc monocytes. Additionally, we want to investigate if altered Fra-2 signalling results in enhanced TIMP-1 production thus contributing to ECM deposition and fibrosis development observed in systemic sclerosis. Methods 20 patients with SSc, one IRAK4 deficient patient and 20 HC (healthy control) were included in this study. Peripheral blood monocytes were further separated by CD14+ microbeads. Expression of TIMP-1 and Fra-2 by monocytes was determined by ELISA, qRT-PCR in

response toTLR8 agonists (ssRNA). Results The results from our group demonstrated that circulating monocytes from SSc patients contribute to the imbalance between TIMP-1 and MMPs and to an increased pro-fibrotic IL-6 production upon TLR8 agonist stimulation (ssRNA). Interestingly, monocytes from an IRAK-4 (a key kinase in TLR-signalling) deficient patient did not produce IL-6 and TIMP-1. In addition, the results showed that the basal gene expression level of Fra-2 in SSc monocytes is higher than in healthy or IRAK-4 deficient monocytes. Interestingly, TLR8 activation induced even stronger Fra-2 gene expression and correlated with increased expression of TIMP-1 in SSc monocytes, suggesting that the TLR signalling pathway may be involved in Fra-2 mediated TIMP-1 induction and therefore promotes fibrosis. Also, we plan to pre-treat monocytes with the chemical AP-1 inhibitor (T-5224) and assess both gene and protein level of TIMP-1 upon TLR8 activation. Conclusions This study helps to understand the molecular mechanisms of Fra-2 mediated fibrogenesis in SSc.

Cinar, U., et al. (2019). "INVESTIGATION OF USABILITY OF RECYCLED MATERIALS IN PROTECTIVE EARMUFFS." Fresenius Environmental Bulletin **28**(10): 7282-7286.

Exposure to high volume for long periods of time can cause hearing loss for workers. Furthermore, in the case of intermittent exposure to loudly noise may lead to hearing damage, irritability, decreased concentration and even occupational accidents. Passive protective earmuffs are highly preferred because of its cost and durability. It is generally mandatory to use earmuffs, which must be renewed at certain times, during the heavy industrial works. A new earmuff model that complies the principles of EN 352-1 standard is proposed. It is made of materials which can be recycled from paper, glass and plastic waste. This fact will also be beneficial in terms of environmental and economic aspects. The outer part of the earmuff consists of recycled polymers and inner part consists of materials which are combined differently with egg tray, recycled fibers, bondex foam, melamine foam, glass wool and corkboard. Depending on the results of the studies performed, it was determined that all passive noise cancelling earmuffs containing recyclable materials in certain layers were usable and all combinations other than the combination consisting of egg tray and recycled fibers were detected to have a better noise damping property compared to conventional earmuffs. [ABSTRACT FROM AUTHOR]

Cincinelli, A., et al. (2019). "A potpourri of microplastics in the sea surface and water column of the Mediterranean Sea." TrAC - Trends in Analytical Chemistry **110**: 321-326.

This review provides insight into the abundance, origin, distribution and composition of MPs in the sea surface and water column of the Mediterranean Sea. Literature data on MP particles on the sea surface showed an evident heterogeneous distribution and composition, with marked geographical differences between Mediterranean sub-basins. A standardized protocol for water sampling, extraction and detection of plastic debris is strongly recommended. The heterogenicity of MPs distribution and its concentration levels could be related to several factors, such as the different methodological approaches. In addition, the influence of hydrodynamic features such as currents, up and down-welling, gyres and fronts could also be responsible for this heterogeneity in concentrations. Marine litter modelling studies have been applied to understand litter sources, fate, transport and accumulation in oceans. Recent studies focused on the "plastisphere" in order to better understand the potential risk of pathogen dispersion with plastic transport in the Mediterranean Sea. Copyright © 2018 Elsevier B.V.

Cincinelli, A., et al. (2017). "Microplastic in the surface waters of the Ross Sea (Antarctica): Occurrence, distribution and characterization by FTIR." Chemosphere **175**: 391-400.

This is the first survey to investigate the occurrence and extent of microplastic (MPs) contamination in sub surface waters collected near-shore and off-shore the coastal area of the Ross Sea (Antarctica). Moreover, a non-invasive method to analyze MPs, consisting in filtration after water sampling and analysis of the dried filter through Fourier Transform Infrared Spectroscopy (FTIR) 2D Imaging, using an FPA detector, was proposed. The non-invasiveness of analytical set-up reduces potential bias and allows subsequent analysis of the filter sample for determination of other classes of contaminants. MPs ranged from 0.0032 to 1.18 particle per m³ of seawater, with a mean value of 0.17 +/- 0.34 particle m⁻³, showing concentrations lower than those found in the oceans worldwide. MPs included fragments (mean 71.9 +/- 21.6%), fibers (mean 12.7 +/- 14.3%), and others (mean 15.4 +/- 12.8%). The presence of different types of MPs was confirmed by FTIR spectroscopy, with predominant abundance of polyethylene and polypropylene. The potential environmental impact arising from scientific activities, such as marine activities for scientific purposes, and from the sewage treatment plant, was also evidenced.

Civancik-Uslu, D., et al. (2019). "Life cycle assessment of carrier bags and development of a littering indicator." Science of the Total Environment **685**: 621-630.

Increased plastic consumption has resulted in high amounts of plastic waste ending up in the environment. Recently, the European Commission (EC) has identified a list of single-use plastics, including plastic bags, most commonly found in the European beaches. As a response, alternatives for plastic carrier bags have been more of a concern. Many life cycle assessment (LCA) studies have been performed to evaluate the environmental profile of different carrier bags; however, without considering the possibility of contribution to the littering problem. Therefore, in this study, an indicator has been introduced, based on an LCA study of carrier bags which was performed in Spain. The indicator is influenced by parameters such as: number of bags to fulfill the functional unit, weight, surface, fee, and biodegradability. In this paper, a comparative LCA of HDPE, LDPE, PP, paper and biodegradable plastic bags is presented. Following that, a littering indicator is introduced to allow a comparison of the risk of littering of the different carrier bags in marine environment. The results given by the Littering Potential indicator rank the bags oppositely to the results given by the LCA as usual. Further research is needed to refine the model and include additional contributing variables.

Civancik-Uslu, D., et al. (2019). "Improving the production chain with LCA and eco-design: application to cosmetic packaging." Resources, Conservation & Recycling **151**: N.PAG-N.PAG.

One of the main drivers for companies to perform environmental improvements is economic benefit, either by obtaining a more valuable product or gaining new customers. Circular economy combines environmental improvements with these drivers to achieve higher and quicker benefits. This paper is a case study on packaging eco-design aligned with circular economy strategy along the production chain. Life cycle assessment (LCA) was used to identify the product life cycle stages where the application of eco-design strategies would be more efficient (in this case, raw materials production from virgin petrochemicals). To improve the environmental profile of this packaging, virgin petrochemicals were partially replaced by mineral

fillers (calcium carbonate based) or/and post-consumer recycled plastics. Different technically compliant cosmetic tubes were produced by collaboration between a company producing the plastic granulates with mineral fillers and a company producing the cosmetic tubes and cradle-to-gate LCA were performed. The replacement of virgin petrochemicals by mineral fillers helped to reduce the environmental impacts by an average of 12% and the use of post-consumer recycled plastic further decreased emissions up to 29% for 6 out of the 9 evaluated impact categories. The option with better environmental performance was also the one with lower economic costs. According to the involved companies, LCA combined with ecodesign helped to achieve efficient environmental and economic savings. The findings are important for the plastic packaging sector because they tackle with prime concerns, like plastic debris, climate change and resource depletion. They are of main interest for industrial activities where brand positioning is a priority (i.e. cosmetics). [ABSTRACT FROM AUTHOR]

Claessens, M., et al. (2011). "Occurrence and distribution of microplastics in marine sediments along the Belgian coast." Marine Pollution Bulletin **62**(10): 2199-2204.

Plastic debris is known to undergo fragmentation at sea, which leads to the formation of microscopic particles of plastic; the so called 'microplastics'. Due to their buoyant and persistent properties, these microplastics have the potential to become widely dispersed in the marine environment through hydrodynamic processes and ocean currents. In this study, the occurrence and distribution of microplastics was investigated in Belgian marine sediments from different locations (coastal harbours, beaches and sublittoral areas).Particles were found in large numbers in all samples, showing the wide distribution of microplastics in Belgian coastal waters. The highest concentrations were found in the harbours where total microplastic concentrations of up to 390particleskg⁻¹ dry sediment were observed, which is 15-50 times higher than reported maximum concentrations of other, similar study areas.The depth profile of sediment cores suggested that microplastic concentrations on the beaches reflect the global plastic production increase. © 2011 Elsevier Ltd.

Claessens, M., et al. (2013). "New techniques for the detection of microplastics in sediments and field collected organisms." Marine Pollution Bulletin **70**(1-2): 227-233.

Microplastics have been reported in marine environments worldwide. Accurate assessment of quantity and type is therefore needed. Here, we propose new techniques for extracting microplastics from sediment and invertebrate tissue. The method developed for sediments involves a volume reduction of the sample by elutriation, followed by density separation using a high density NaI solution. Comparison of this methods' efficiency to that of a widely used technique indicated that the new method has a considerably higher extraction efficiency. For fibres and granules an increase of 23% and 39% was noted, extraction efficiency of PVC increased by 100%. The second method aimed at extracting microplastics from animal tissues based on chemical digestion. Extraction of microspheres yielded high efficiencies (94-98%). For fibres, efficiencies were highly variable (0-98%), depending on polymer type. The use of these two techniques will result in a more complete assessment of marine microplastic concentrations.

Clauss, M., et al. (2011). "The effect of size and density on the mean retention time of particles in the reticulorumen of cattle (Bos primigenius f. taurus), muskoxen (Ovibos moschatus) and moose (Alces alces)." British Journal of Nutrition **105**(4): 634-644.

Particle passage from the reticulorumen (RR) depends on particle density and size. Forage particle density and size are related and change over time in the RR. Particle density mainly influences sorting in the reticulum, whereas particle size influences particle retention in the fibre mat of stratified rumen contents ('filter-bed' effect). We investigated these effects independently, by inserting plastic particles of different sizes (1, 10 and 20 mm) and densities (1.03, 1.20 and 1.44 mg/ml) in the RR of cattle (Bos primigenius f. taurus) as a pilot study, and of muskoxen (Ovibos moschatus; n 4) and moose (Alces alces; n 2) both fed two diets (browse and grass). Faeces were analysed for plastic residues for 13 d after dosing to calculate mean retention times (MRT). The results confirmed previous findings of differences in absolute MRT between species. Comparing muskoxen with moose, there was no difference in the effect of particle density on the MRT between species but particle size had a more pronounced effect on the MRT in muskoxen than in moose. This indicated a stronger 'filter-bed effect' in muskoxen, in accord with the reports of stratified RR contents in this species v. the absence of RR content stratification in moose. Low-density particles were retained longer in both species fed on grass diets, indicating a contribution of forage type to the 'filter-bed effect'. The results indicate that retention based on particle size may differ between ruminant species, depending on the presence of a fibre mat in the RR, whereas the density-dependent mechanism of sedimentation in the RR is rather constant across species.

Clegg, C. D., et al. (1996). "Biophysical processes affecting the transit of a genetically-modified Pseudomonas fluorescens through the gut of the woodlouse Porcellio scaber." Soil Biology & Biochemistry **28**(8): 997-1004.

The effect was determined of gut transit retention time of genetically-modified bacteria ingested by Porcellio scaber. The experimental animals were supplied ash leaf litter inoculated with the genetically-modified bacterium Pseudomonas fluorescens KTG and bacteria in food and faeces were counted using selective plating and immunofluorescent techniques. The bacteria were also detected using the polymerase chain reaction (PCR). Plate counts of P. fluorescens KTG in fresh faeces were lower than those in the litter when the genetically modified microorganism (GEMMO) was supplied to animals at five different population densities, suggesting that a proportion of the GEMMO population was lost during gut transit. There was no significant difference in the survival of freshly cultured and starved cultures of P. fluorescens KTG on gut transit through Porcellio scaber as determined by plate counts in fresh faeces. Retention time of Pseudomonas fluorescens KTG in the wood louse gut was longer than that of the food bolus. The passage of bacteria through the gut was modelled and tracked using microbeads of a size similar to bacteria. Fluorescent microbeads added to food litter were detected within the anterior chamber, papillate region and rectum of the wood louse for at least 17 days after ingestion. Beads were retained within the cuticular structure of the digestive tract and also within mucopolysaccharide produced within the gut. Immunofluorescent observations of washed hindgut samples provided little evidence to suggest P. fluorescens KTG had become attached to the hindgut wall during transit. Very few colonies of the GEMMO and indigenous bacteria were detected from homogenised hepatopancreas samples. P. fluorescens KTG was however detected in the hepatopancreas of Porcellio scaber using PCR. It is suggested that the retention of bacteria within the guts of woodlice is by physical rather than biological mechanisms such as growth or attachment.

Clemente, T. M., et al. (2010). SUPER HI-CAT: Survey of Underwater Plastic and Ecosystem Response between Hawaii and California, American Geophysical Union, 2000 Florida Ave., N.W. Washington DC 20009 USA, [URL:http://www.agu.org].

Microbes are the most abundant organisms in the oceans and are vital to the Earths habitability. Marine microbes produce the oxygen we breathe, form the base of the marine food web and help regulate the Earths climate. Marine debris has become a serious issue concerning the health of todays oceans. Plastic debris in particular is known to have negative impacts on marine organisms through ingestion and entanglement by seabirds and large marine fauna; however, little is known about its influence on microbial communities. The objective of the SUPER HI-CAT cruise was to locate and sample microbial communities and biogeochemical properties associated with the so-called Pacific plastic patch between Honolulu, HI and Port Hueneme, CA. Sampling was conducted from the R/V Kilo Moana between 25 August - 5 September 2008. During the transit a total of 15 CTD/Trawl/Optics stations and 15 underway stations were occupied. Hydrographic and biogeochemical data were collected to characterize the upper 150m water column and a Manta Trawl was used to map the surface distribution of plastic. Plastic samples were size fractioned into the following size classes; 5mm and larger, 2- 5mm size classes ranged from 0.35-3.71 pieces m-3 across all sampling stations. Integrated over the top 0.5m of the ocean, the particle concentrations along the transect ranged from 0.17-1.85 x 106 plastic fragments km-2. Total microbial biomass, as measured by ATP content and Chlorophyll were measured for a range of plastic types and size categories. ATP and Chlorophyll concentrations were highly variable across the transect (100 to 1000 fold range, respectively), but provided proof that microorganisms colonized the plastic particles and occasionally achieved significant enrichments relative to their distributions in seawater. Total particle abundance and particle size distributions, as determined by a forward scattering measurement, were not correlated with measured abundance of size-fractionated plastic in the surface waters along our transect. Rather total particle distributions tracked phytoplankton biomass, as chlorophyll or particulate carbon. Measurements of Gross Primary Production (GPP), Net Community Production (NCP) and Respiration (R) revealed high community metabolic rates on plastic particles in the two larger size classes. More importantly, whereas rates of NCP in the seawater were close to zero (GPP=R), microbial assemblages associated with the plastic debris were demonstrably net auto-trophic suggesting the presence of phytoplankton enriched biofilms.

Clotilde, L. M., et al. (2011). "Microbead-based immunoassay for simultaneous detection of Shiga toxins and isolation of Escherichia coli O157 in foods." Journal of Food Protection **74**(3): 373-379.

Shiga toxin-producing Escherichia coli (STEC) is a significant foodborne pathogen with great economic consequences. There has been an increased food safety concern with this organism since outbreaks of human illnesses caused by this pathogen were first reported in 1982. Therefore, developing a reliable, sensitive, and rapid assay capable of detecting E. coli O157 and the main toxins produced by STEC (i.e., Shiga toxins 1 [Stx(1)] and 2 [Stx(2)]) will directly benefit regulatory agencies by minimizing analysis time. Here, we use Luminex technology to detect multiple analytes in a single 50-ml sample. Using commercially available monoclonal antibodies coupled to carboxylated magnetic microbeads, we developed an immunoassay capable of simultaneously serotyping E. coli O157 and detecting Stx(1) and/or Stx(2). The specificity and sensitivity of this immunoassay was tested against a collection of 34 E. coli isolates belonging to various O serogroups phenotypically different for Stx. The results were compared with microplate sandwich enzyme-linked immunosorbent assay (ELISA), and no cross-reactivity was

observed for any of the monoclonal antibodies used. An increased sensitivity up to 1,000 times was observed in the microbead-based immunoassay when compared with the microplate sandwich ELISA. The results indicate that Luminex technology has the potential to simultaneously detect multiple targets without loss of specificity and/or sensitivity. A blind experiment was conducted with 48 samples of ground beef, lettuce, and milk spiked with <=2 CFU/g E. coli. All the samples were correctly identified, with no false positives or false negatives. This microbead-based immunoassay could be extended to simultaneously detect additional foodborne pathogens and their toxic markers.

Clotilde, L. M., et al. (2015). "Comparison of multiplex immunochemical and molecular serotyping methods for Shiga toxin-producing Escherichia coli." Foodborne Pathogens and Disease **12**(2): 118-121.

Traditionally, serotyping of Escherichia coli has been performed via slide agglutination methods using antisera. More recently, multiplex immunoassays and "molecular serotyping" via polymerase chain reaction (PCR) have been validated for this purpose. In this study, the serogroups of 161 Shiga toxin-producing Escherichia coli (STEC) strains isolated from fecal samples of California cattle were typed by conventional methods using antisera as well as two newly developed multiplex PCR- and antibody-based microbead assays using the Luminex technology. Using the Luminex assays, we were capable of serotyping 11 STEC isolates that were previously determined untypeable for the O antigen by conventional methods using antisera. Except for 14 isolates, results from the 2 Luminex assays agreed.

Clukey, K. E., et al. (2018). "Persistent organic pollutants in fat of three species of Pacific pelagic longline caught sea turtles: Accumulation in relation to ingested plastic marine debris." Science of the Total Environment **610/611**: 402-411.

In addition to eating contaminated prey, sea turtles may be exposed to persistent organic pollutants (POPs) from ingesting plastic debris that has absorbed these chemicals. Given the limited knowledge about POPs in pelagic sea turtles and how plastic ingestion influences POP exposure, our objectives were to: 1) provide baseline contaminant levels of three species of pelagic Pacific sea turtles; and 2) assess trends of contaminant levels in relation to species, sex, length, body condition and capture location. In addition, we hypothesized that if ingesting plastic is a significant source of POP exposure, then the amount of ingested plastic may be correlated to POP concentrations accumulated in fat. To address our objectives we compared POP concentrations in fat samples to previously described amounts of ingested plastic from the same turtles. Fat samples from 25 Pacific pelagic sea turtles [2 loggerhead (Caretta caretta), 6 green (Chelonia mydas) and 17 olive ridley (Lepidochelys olivacea) turtles] were analyzed for 81 polychlorinated biphenyls (PCBs), 20 organochlorine pesticides, and 35 brominated flame-retardants. The olive ridley and loggerhead turtles had higher ΣDDTs (dichlorodiphenyltrichloroethane and metabolites) than ΣPCBs, at a ratio similar to biota measured in the South China Sea and southern California. Green turtles had a ratio close to 1:1. These pelagic turtles had lower POP levels than previously reported in nearshore turtles. POP concentrations were unrelated to the amounts of ingested plastic in olive ridleys, suggesting that their exposure to POPs is mainly through prey. In green turtles, concentrations of ΣPCBs were positively correlated with the number of plastic pieces ingested, but these findings were confounded by covariance with body condition index (BCI). Green turtles with a higher BCI had eaten more plastic and also had higher POPs. Taken together, our findings suggest that sea turtles accumulate most POPs through their prey rather than marine debris. [ABSTRACT FROM AUTHOR] copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use. This abstract may be abridged. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material for the full abstract. (Copyright applies to all Abstracts.)

Clunies-Ross, P. J., et al. (2016). "Synthetic shorelines in New Zealand? Quantification and characterisation of microplastic pollution on Canterbury's coastlines." New Zealand Journal of Marine and Freshwater Research **50**(2): 317-325.

Microplastics are persistent environmental contaminants found in marine environments worldwide. Microplastic particles isolated from coastlines in the Canterbury region of New Zealand were quantified and characterised. Sediment samples were collected from 10 locations representing exposed-beach, estuarine and harbour environments in both urban and non-urban settings. Particles were isolated from sediments using an NaCl density-separation procedure and quantified and characterised with a combination of optical/fluorescence imaging and micro-Raman spectroscopy. Microplastics were detected at eight out of 10 locations, at concentrations ranging from 0-45.4 particles kg-1 of dry sediment. The majority of microplastics were identified as polystyrene (55%), polyethylene (21%) and polypropylene (11%). Microplastic concentrations in exposed-beach environments were significantly greater than in harbour and estuarine environments.

Cluzard, M., et al. (2015). "Intertidal Concentrations of Microplastics and Their Influence on Ammonium Cycling as Related to the Shellfish Industry." Archives of Environmental Contamination & Toxicology **69**(3): 310-319.

Microplastics are ubiquitous within the marine environment. The last 10 years have seen research directed at understanding the fate and effect of microplastics within the marine environment; however, no studies have yet addressed how concentrations of these particles could affect sedimentary processes such as nutrient cycling. Herein we first determine the concentration and spatial distribution of microplastics within Baynes Sound, a key shellfish-growing area within coastal British Columbia (BC). We also determined sediment grain size and % organic matter (OM) such that we could relate spatial patterns in sediment microplastic concentrations to sedimentary processes that determine zones of accretion and erosion. Using field-determined concentrations of microplastics, we applied laboratory microcosms studies, which manipulated sediment concentrations of microplastics, OM, and bivalves to determine the influence of sediment microplastics on ammonium cycling within intertidal sediments. Concentrations of microplastics determined within the intertidal sediment varied spatially and were similar to those found in other coastal regions of high urban use. Concentrations were independent of grain size and OM suggesting that physical processes other than those that govern natural sediment components determine the fate of microplastics within sediments. Under laboratory conditions, concentrations of ammonium were significantly greater in the overlying water of treatments with microplastics, clams, and OM compared with treatments without microplastics. These preliminary studies suggest that high concentrations of microplastics have the potential to alter key sedimentary processes such as ammonium flux. This could have serious implications, for example, contributing to eutrophication events in regions of the coast that are highly urbanized.

Coburn, C. (2019). "Microplastics and gastrointestinal health: how big is the problem?" The Lancet. Gastroenterology & Hepatology **4**(12): 907-908.

Coburn, R. (2010). "Crafting for a Greener World." Natural Life(136): 12-15.

The article offers the author's insights regarding the growing concern on plastics and industrial wastes that are accumulated in oceans and the use of recycled plastics as a craft material. It mentions the Plastiki, a sailing boat made from gas filled polyethylene terephthalate (PET) soda bottles, which sails from San Francisco, California to Australia to address the problem of plastic waste. Furthermore, it explores the potential impact of plastic materials on ocean organisms at various levels.

Coda, B., et al. (2001). "Behavior of Chlorine and Enrichment of Risky Elements in Bubbling Fluidized Bed Combustion of Biomass and Waste Assisted by Additives." Energy & Fuels **15**(3): 680-690.

High contents of chlorine and alkalies restrict the use of biomass in energy production. Alkali chlorides vaporize during combustion. Chlorine tends to produce corrosive deposits and unacceptably high emissions of HCl and dioxins. Chlorine recovery and enrichment of Cl, Na, K, Ca, Al, and Si in coarse and fine fly ash were studied experimentally with two electrically stabilized bubbling fluidized bed (BFB) reactors capable of reproducing the particle residence times existing in full-scale BFB plants. Feedstocks were fir (mixture of heartwood and bark), paper sludge, and blends of fir with agricultural waste or plastic waste. Sulfur concentrations of feed components were low (<0.5 wt %), while chlorine and potassium concentrations ranged widely (0.02-3.2 wt % for Cl and 0.07-3.1 wt % for K). Aluminum-containing additives (kaolin, bauxite and fly ash from a pulverized coal plant) and limestone were added to the feedstocks at various dosages to evaluate their influence on Cl behavior and enrichment of the elements of interest. HCl was measured by FTIR and wet-absorption methods. Different ash samples (bed, cyclone and filter ash) were characterized for their Cl content and the major ash-forming constituents. Cl was completely volatilized from bed ash and recovered only in coarse (cyclone) and fine (filter) fly ash fractions. Al-containing additives increased HCl formation and decreased Cl concentration in the fly ash. In the case of Al-Si based additives, evidence was found of the formation of alkali aluminum silicates from alkali chlorides. The aluminum silicates were transferred mainly to the coarse fly ash fraction. Al-based additives also seemed to liberate Cl from alkali chlorides with reactions forming water-soluble alkali compounds. Limestone had the opposite effect to the Al-containing additives by binding Cl from gas phase to fly ash, but mainly to the coarse fly ash fraction. The results will be useful in optimizing the behavior of chlorine in bubbling bed combustion of Cl- and alkali-containing biomass.

Codina-Garcia, M., et al. (2013). "Plastic debris in Mediterranean seabirds." Marine Pollution Bulletin **77**(1/2): 220-226.

Plastic debris is often ingested by marine predators and can cause health disorders and even death. We present the first assessment of plastic ingestion in Mediterranean seabirds. We quantified and measured plastics accumulated in the stomach of 171 birds from 9 species accidentally caught by longliners in the western Mediterranean from 2003 to 2010. Cory's shearwaters (Calonectris diomedea) showed the highest occurrence (94%) and large numbers of small plastic particles per affected bird (on average N=15.3+or-24.4 plastics and mass=23.4+or-49.6 mg), followed by Yelkouan shearwaters (Puffinus yelkouan, 70%, N=7.0+or-7.9, 42.1+or-100.0 mg), Balearic shearwaters (Puffinus mauretanicus, 70%, N=3.6+or-2.9, 5.5+or-9.7 mg) and the rest of species (below 33%, N=2.7, 113.6+or-128.4 mg). Plastic characteristics did not differ between sexes and were not related to the physical condition of the birds. Our results point out the three endemic and threatened shearwater species as being particularly exposed to plastic accumulation.

Coffin, S., et al. (2018). "Comparisons of analytical chemistry and biological activities of extracts from North Pacific gyre plastics with UV-treated and untreated plastics using in vitro and in vivo models." Environment International **121**: 942-954.

Plastic debris is an emerging worldwide threat to marine biota. Marine species may face unique challenges in low-flow estuarine systems with a high abundance of "macro-sized" (>4.75 mm) plastic due to the leaching of constituents and adsorbed contaminants. To simulate this leaching process, plastic samples recovered from the North Pacific Gyre along with corresponding UV-irradiated virgin plastic and non-irradiated virgin plastic counterparts were incubated in saltwater for 30 days at ambient temperatures ranging from 17 to 25 °C. Following solid-phase extraction, water samples were fractionated with sequential methanol elution from 10 to 100% and evaluated using in vitro assays assessing estrogen receptor (ER) and aryl hydrocarbon receptor (AhR) activities. In vivo responses (vitellogenin [vtg] and cytochrome p 450 1A [cyp1a] mRNA) were measured following 5-day exposures in Japanese medaka (Oryzias latipes) larvae (3 days post hatch). Estrogenic plasticizers, co-planar PCBs and PAHs were quantified in the extracts using targeted GC–MS/MS and UPLC-MS/MS. In vitro estrogenicity showed highest activity in the 70% methanol fraction for all plastic leachate exposures. Whole extract in vitro estradiol equivalent (EEQ) values were 4.34 ± 2.65, 8.79 ± 2.09 and 13.78 ± 3.64 ng/L, for virgin plastic, UV-irradiated virgin plastic and North Pacific Gyre-recovered plastic, respectively (mean ± SD). Significant vtg induction was observed in medaka larvae exposed to leachate extracts from North Pacific Gyre-recovered plastic and UV-irradiated virgin plastic (9.9-fold, $p = 0.039$ and 10.1-fold, $p = 0.042$, respectively). Chemically-determined EEQ values were also localized in the 70% methanol fraction. Whole leachate extract chemical EEQ values were 0.33 ± 0.07, 1.64 ± 0.62 and 11.4 ± 2.13 ng/L, for virgin plastic, UV-irradiated virgin plastic and North Pacific Gyre-recovered plastic, respectively. In-vitro AhR activity was highest in the 70% methanol elution with greater activity in North Pacific Gyre-recovered plastic than in virgin plastic and UV-irradiated virgin plastic (toxic equivalency [TEQ] = 1.06 ± 0.54, 0.38 ± 0.07 and 0.71 ± 0.47 ng/L, respectively). CYP1A mRNA was significantly induced in larval medaka exposed to North Pacific Gyre-recovered plastic leachates (17.8-fold, $p = 0.02$) while exposure to virgin plastic and UV-irradiated virgin plastic leachates caused no significant change. Chemically-determined TEQ analysis for AhR indicated highest activity in the 90% methanol fraction for all leachates, with whole extract in vitro TEQs being 1.47 ± 0.87, 0.03 ± 0.05 and 0.42 ± 0.38 ng/L for North Pacific Gyre-recovered plastic, virgin plastic and UV-irradiated virgin plastic, respectively. These results indicate that weathering and UV radiation release estrogenic plasticizers and demonstrate the ability for plastics to transport adsorbed persistent organic pollutants at eco-toxicologically relevant concentrations. Graphical abstract Unlabelled Image Highlights • North Pacific Gyre plastic leached higher in vitro and chemical EEQ and TEQ than "virgin" and irradiated "virgin" plastic. • North Pacific Gyre plastic leachates significantly induced cyp1a and VTG mRNA in Oryzias latipes. • UV radiation enhanced desorption of BPA, OP and PCBs from virgin plastic and induced VTG mRNA in Oryzias latipes. [ABSTRACT FROM AUTHOR]

Coffin, S., et al. (2019). "Simulated digestion of polystyrene foam enhances desorption of diethylhexyl

phthalate (DEHP) and In vitro estrogenic activity in a size-dependent manner." Environmental Pollution **246**: 452-462.

Marine polychaetes and fish are known to ingest polystyrene microparticles in the environment. Laboratory microplastic feeding experiments have demonstrated that plastic may release endocrine-disrupting compounds such as diethylhexyl phthalate (DEHP), which can cause adverse effects in both vertebrates and invertebrates. In order to determine the influence of size and digestive conditions on the desorption of DEHP and other plasticizers to polychaetes and fish, we exposed polystyrene particles of various sizes under invertebrate and vertebrate digestive conditions (vertebrate mimic; pepsin, pH = 2.0, 24 degreeC, invertebrate mimic; Na taurocholate pH = 7, 18 degreeC). Estrogen receptor activation and concentrations of 12 plasticizers were measured in the extracts. DEHP, bisphenol S and 4-tert-octylphenol were the only compounds detected. Simulated vertebrate gut digestion did not significantly enhance the release of chemicals nor estrogenic activity. However, a 6.3 +/- 2.0-fold increase in the concentration of DEHP was observed in extracts from invertebrate gut conditions (Mean +/- SD; N = 24, p < 0.0001). Additionally, estimated particle surface area was positively correlated with estrogenic activity across all treatment types (r = 0.85, p < 0.0001). Overall, these data indicate an elevated bioaccessibility of DEHP may occur in invertebrates, and size-dependent desorption of uncharacterized estrogenic compounds from plastic suggest additional complexity when considering the risks of MP to aquatic organisms. This study concludes that polystyrene particles release more biologically-active estrogenic chemicals with decreasing size, and releases DEHP at higher quantities under invertebrate gut conditions. Copyright © 2018 Elsevier Ltd

Coghlan, A. (2018). "Plastic in bottled water shouldn't be a worry." New Scientist(3170): 25-25.

The article discusses microplastic contamination in bottled water, which the author maintains is not a health risk, referencing a study by the global consortium Orb Media.

Cohen, D. (2019). "Towards a Plastic-Free Future." Earth Island Journal **34**(1): 56-56.

The article offers information on the views of author towards several initiatives such as Plastic Pollution Coalition which provides tools and share best practices to empower people to reduce their own plastic footprint, and to help their families, friends, towns, states, and countries do the same. Topics include details on toxic chemicals such as phthalates and bisphenols that leach into the food and beverages and impacts the bodies and the environment.

Cohen, J. H., et al. (2019). "Observations and Simulations of Microplastic Debris in a Tide, Wind, and Freshwater-Driven Estuarine Environment: the Delaware Bay." Environmental Science & Technology **53**(24): 14204-14211.

Microplastic (MP) in estuarine and coastal environments remains poorly characterized, despite the importance of these physically dynamic regions as a buffer between land, freshwater environments, and the open ocean where plastic debris accumulates. We sampled MP particles to determine concentration, size, and type in Delaware Bay and numerically simulated transport and distribution at a high spatiotemporal resolution of positively buoyant particles, representing common MP types. Baywide MP concentrations averaged between 0.19 and 1.24 pieces m⁻³ depending on size fraction (300-1000 and 1000-5000 mum) and sampling month (April and June 2017). Upper bay stations, which are located in or near the estuarine turbidity maximum, had higher MP concentrations than lower bay and New Jersey shore stations. Fragments were predominately polyethylene, and filaments predominately polypropylene. Model results suggest that buoyant particles quickly (i.e., within hours) organize in patchy, highly inhomogeneous distributions, creating "hot spots" of MP. In the presence of variable currents driven by buoyancy, wind, and tides, we predict high spatial and temporal variability of MP distributions in Delaware Bay; MP concentrations could vary by a factor of 1000 within a tidal cycle at our sample locations. Collectively, these observations and simulations provide a baseline of MP concentrations in Delaware Bay along with broader, contextual understanding for how measurements reflect MP concentrations in a dynamic estuarine system.

Colabuono, F. I., et al. (2009). "Plastic ingestion by Procellariiformes in Southern Brazil." Marine Pollution Bulletin **58**(1): 93-96.

The Procellariiformes are the birds most affected by plastic pollution. Plastic fragments and pellets were the most frequent items found in the digestive tract of eight species of Procellariiformes incidentally caught by longline fisheries as well as beached birds in Southern Brazil. Plastic objects were found in 62% of the petrels and 12% of the albatrosses. The Great shearwater, Manx shearwater, Cory's shearwater and Antarctic fulmar were found to have greater quantities and frequencies of occurrence of plastic. There was no significant difference in the number of plastics between the birds from longline fisheries and beached birds. No correlation was found between the number of prey and number of plastics in the digestive tract of the birds analyzed, but this does not discard the hypothesis that, in some cases, the presence of plastic in the digestive tract has a negative effect on the feeding efficiency of these birds.

Colabuono, F. I., et al. (2010). "Polychlorinated biphenyls and organochlorine pesticides in plastics ingested by seabirds." Marine Pollution Bulletin **60**(4): 630-634.

The occurrence of plastic objects in the digestive tract was assessed in eight species of Procellariiformes collected in southern Brazil and the occurrence of polychlorinated biphenyls (PCBs) and organochlorine pesticides (OCPs) in the ingested plastics pellets and plastic fragments was evaluated. PCBs were detected in plastic pellets (491 ng g⁻¹) and plastic fragments (243-418 ng g⁻¹). Among the OCPs, p,p'-DDE had the highest concentrations, ranging from 68.0 to 99.0 ng g⁻¹. The occurrence of organic pollutants in post-consumer plastics supports the fact that plastics are an important source carrying persistent organic pollutants in the marine environment. Although transfer through the food chain may be the main source of exposure to POPs to seabirds, plastics could be an additional source for the organisms which ingest them, like Procellariiformes which are the seabirds most affected by plastic pollution.

Colangelo, F., et al. (2013). "Experimental and Numerical Analysis of Thermal and Hygrometric Characteristics of Building Structures Employing Recycled Plastic Aggregates and Geopolymer Concrete." Energies **6**(11): 6077-6101.

The correct estimation of building energy consumptions is assuming an always increasing importance, and a detailed reproduction of building structures, with all the single components involved, is necessary to achieve this aim. In addition, the current ecological development tries to limit the use of natural raw materials as building components, in favor of alternative (waste) materials, which ensure significant advantages from the economic, energetic and environmental point of views. In this work, dynamic heat and vapor transport in a typical three-dimensional (3D) building structure, involving different types of environmental-friendly concrete mixtures, have been simulated by using finite elements. In particular, the authors propose to substitute part of the aggregates with plastic waste and to use a fly ash based geopolymeric binder for the production of low conductivity concrete, to be employed in eco-efficient buildings. Concrete produced with natural limestone aggregates has been considered as the reference benchmark. The whole characterization of the different types of concrete tested in the present work has

been obtained through laboratory experiments. The structure taken into account in the simulations is a 3D thermal bridge, typical of building envelopes. The thermal and hygrometric transient behavior of this structure, employing plastic waste in different percentages and geopolymer concrete, has been analyzed by the authors.

Cole, M., et al. (2019). "Effects of Nylon Microplastic on Feeding, Lipid Accumulation, and Moulting in a Coldwater Copepod." Environmental Science & Technology **53**(12): 7075.

Microplastic debris is a pervasive environmental contaminant that has the potential to impact the health of biota, although its modes of action remain somewhat unclear. The current study tested the hypothesis that exposure to fibrous and particulate microplastics would alter feeding, impacting on lipid accumulation, and normal development (e.g., growth, moulting) in an ecologically important coldwater copepod Calanus finmarchicus. Preadult copepods were incubated in seawater containing a mixed assemblage of cultured microalgae (control), with the addition of ~50 microplastics mL–1 of nylon microplastic granules (10–30 μm) or fibers (10 × 30 μm), which are similar in shape and size to the microalgal prey. The additive chemical profiles showed the presence of stabilizers, lubricants, monomer residues, and byproducts. Prey selectivity was significantly altered in copepods exposed to nylon fibers (ANOVA, $P < 0.01$) resulting in a nonsignificant 40% decrease in algal ingestion rates (ANOVA, $P = 0.07$), and copepods exposed to nylon granules showed nonsignificant lipid accumulation (ANOVA, $P = 0.62$). Both microplastics triggered premature moulting in juvenile copepods (Bernoulli GLM, $P < 0.01$). Our results emphasize that the shape and chemical profile of a microplastic can influence its bioavailability and toxicity, drawing attention to the importance of using environmentally relevant microplastics and chemically profiling plastics used in toxicity testing.

Cole, M. and T. S. Galloway (2015). "Ingestion of Nanoplastics and Microplastics by Pacific Oyster Larvae." Environmental Science & Technology **49**(24): 14625-14632.

Plastic debris is a prolific contaminant effecting freshwater and marine ecosystems across the globe. Of growing environmental concern are "microplastics"and "nanoplastics" encompassing tiny particles of plastic derived from manufacturing and macroplastic fragmentation. Pelagic zooplankton are susceptible to consuming microplastics, however the threat posed to larvae of commercially important bivalves is currently unknown. We exposed Pacific oyster (Crassostrea gigas) larvae (3-24 d.p.f.) to polystyrene particles spanning 70 nm-20 μm in size, including plastics with differing surface properties, and tested the impact of microplastics on larval feeding and growth. The frequency and magnitude of plastic ingestion over 24 h varied by larval age and size of polystyrene particle (ANOVA, $P < 0.01$), and surface properties of the plastic, with aminated particles ingested and retained more frequently (ANOVA, $P < 0.01$). A strong, significant correlation between propensity for plastic consumption and plastic load per organism was identified (Spearmans, $r = 0.95$, $P < 0.01$). Exposure to 1 and 10 μm PS for up to 8 days had no significant effect on C. gigas feeding or growth at <100 microplastics mL1. In conclusion, whil micro- and nanoplastics were readily ingested by oyster larvae, exposure to plastic concentrations exceeding those observed in the marine environment resulted in no measurable effects on the development or feeding capacity of the larvae over the duration of the study. [ABSTRACT FROM AUTHOR]

Cole, M., et al. (2015). "The Impact of Polystyrene Microplastics on Feeding, Function and Fecundity in the Marine Copepod Calanus helgolandicus." Environmental Science & Technology **49**(2): 1130-1137.

Microscopic plastic debris, termed "microplastics", are of increasing environmental concern. Recent studies have demonstrated that a range of zooplankton, including copepods, can ingest microplastics. Copepods are a globally abundant class of zooplankton that form a key trophic link between primary producers and higher trophic marine organisms. Here we demonstrate that ingestion of microplastics can significantly alter the feeding capacity of the pelagic copepod Calanus helgolandicus. Exposed to 20 μm polystyrene beads (75 microplastics mL-1) and cultured algae ([250 μg C L-1) for 24 h, C. helgolandicus ingested 11% fewer algal cells (P = 0.33) and 40% less carbon biomass (P < 0.01). There was a net downward shift in the mean size of algal prey consumed (P < 0.001), with a 3.6 fold increase in ingestion rate for the smallest size class of algal prey (11.6-12.6 μm), suggestive of postcapture or postingestion rejection. Prolonged exposure to polystyrene microplastics significantly decreased reproductive output, but there were no significant differences in egg production rates, respiration or survival. We constructed a conceptual energetic (carbon) budget showing that microplastic-exposed copepods suffer energetic depletion over time. We conclude that microplastics impede feeding in copepods, which over time could lead to sustained reductions in ingested carbon biomass. [ABSTRACT FROM AUTHOR]

Cole, M., et al. (2013). "Microplastic Ingestion by Zooplankton." Environmental Science & Technology **47**(12): 6646-6655.

Small plastic detritus, termed "microplastics", are a widespread and ubiquitous contaminant of marine ecosystems across the globe. Ingestion of microplastics by marine biota, including mussels, worms, fish, and seabirds, has been widely reported, but despite their vital ecological role in marine food-webs, the impact of microplastics on zooplankton remains under-researched. Here, we show that microplastics are ingested by, and may impact upon, zooplankton. We used bioimaging techniques to document ingestion, egestion, and adherence of microplastics in a range of zooplankton common to the northeast Atlantic, and employed feeding rate studies to determine the impact of plastic detritus on algal ingestion rates in copepods. Using fluorescence and coherent anti-Stokes Raman scattering (CARS) microscopy we identified that thirteen zooplankton taxa had the capacity to ingest 1.7-30.6 μm polystyrene beads, with uptake varying by taxa, life-stage and bead-size. Post-ingestion, copepods egested faecal pellets laden with microplastics. We further observed microplastics adhered to the external carapace and appendages of exposed zooplankton. Exposure of the copepod Centropages typicus to natural assemblages of algae with and without microplastics showed that 7.3 μm microplastics (>4000 mL-1) significantly decreased algal feeding. Our findings imply that marine microplastic debris can negatively impact upon zooplankton function and health. [ABSTRACT FROM AUTHOR]

Cole, M., et al. (2011). "Microplastics as contaminants in the marine environment: A review." Marine Pollution Bulletin **62**(12): 2588-2597.

Since the mass production of plastics began in the 1940s, microplastic contamination of the marine environment has been a growing problem. Here, a review of the literature has been conducted with the following objectives: (1) to summarise the properties, nomenclature and sources of microplastics; (2) to discuss the routes by which microplastics enter the marine environment; (3) to evaluate the methods by which microplastics are detected in the marine environment; (4) to assess spatial and temporal trends of microplastic abundance; and (5) to discuss the environmental impact of microplastics. Microplastics are both abundant and widespread within the marine environment, found in their highest concentrations along coastlines and within mid-ocean gyres. Ingestion of microplastics has been demonstrated in a range of marine organisms, a process which may facilitate the transfer of chemical additives or hydrophobic waterborne pollutants to biota. We conclude by highlighting key future research areas for scientists and policymakers. © 2011 Elsevier Ltd.

Cole, M., et al. (2016). "Microplastics Alter the Properties and Sinking Rates of Zooplankton Faecal Pellets." Environmental Science & Technology **50**(6): 3239-3246.

Plastic debris is a widespread contaminant, prevalent in aquatic ecosystems across the globe. Zooplankton readily ingest microscopic plastic (microplastic, < 1 mm), which are later egested within their faecal pellets. These pellets are a source of food for marine organisms, and contribute to the oceanic vertical flux of particulate organic matter as part of the biological pump. The effects of microplastics on faecal pellet properties are currendy unknown. Here we test the hypotheses that (l) faecal pellets are a vector for transport of microplastics, (2) polystyrene microplastics can alter the properties and sinking rates of zooplankton egests and, (3) faecal pellets can facilitate the transfer of plastics to coprophagous biota. Following exposure to 20.6 µm polystyrene microplastics (1000 microplastics mL-1) and natural prey (~1650 algae mL-1) the copepod Calanus helgolandkxis egested faecal pellets with significantly (P < 0.001) reduced densities, a 2.25-fold reduction in sinking rates, and a higher propensity for fragmentation. We further show that microplastics, encapsulated within egests of the copepod Centropages typicas, could be transferred to C. helgolandicus via coprophagy. Our results support the proposal that sinking faecal matter represents a mechanism by which floating plastics can be vertically transported away from surface waters. [ABSTRACT FROM AUTHOR]

Cole, M., et al. (2014). "Isolation of microplastics in biota-rich seawater samples and marine organisms." Scientific Reports **4**(1).

Microplastic litter is a pervasive pollutant present in aquatic systems across the globe. A range of marine organisms have the capacity to ingest microplastics, resulting in adverse health effects. Developing methods to accurately quantify microplastics in productive marine waters, and those internalized by marine organisms, is of growing importance. Here we investigate the efficacy of using acid, alkaline and enzymatic digestion techniques in mineralizing biological material from marine surface trawls to reveal any microplastics present. Our optimized enzymatic protocol can digest >97% (by weight) of the material present in plankton-rich seawater samples without destroying any microplastic debris present. In applying the method to replicate marine samples from the western English Channel, we identified 0.27 microplastics m⁻³. The protocol was further used to extract microplastics ingested by marine zooplankton under laboratory conditions. Our findings illustrate that enzymatic digestion can aid the detection of microplastic debris within seawater samples and marine biota.

Colic, M., et al. (2010). "Production of IL-10 and IL-12 by antigen-presenting cells in periapical lesions." Journal of Oral Pathology and Medicine **39**(9): 690-696.

Background: Interferon-gamma (IFN-gamma) plays an important role in the pathogenesis of periapical lesions. Its expression is up-regulated by interleukin (IL)-12) and down-regulated by IL-10. The aim of this work was to study the cellular source of these cytokines and their mutual interactions in human periapical lesions. Method(s): Mononuclear cells, macrophages and dendritic cells were isolated from periapical lesions using plastic adherence and osmotic gradients. Cytokines were measured in culture supernatants by a microbeads fluorescence assay. Phenotypic characteristics of cells were studied by immunocytochemistry, whereas allostimulatory activity of antigen-presenting cells was tested using a mixed leukocyte reaction. Result(s): We observed the positive correlations between the levels of IL-12 and IFN-gamma as well as IL-12 and IL-10 in cultures of mononuclear cells. As IL-10 and IL-12 are produced by dendritic cells and activated macrophages, we examined their contribution to the production of these cytokines. Macrophages, CD14⁺ adherent cells, produced high levels of IL-10 and very low levels of IL-12. In contrast, non-adherent, strongly HLA-DR⁺ dendritic cells, potent stimulators of the alloreactive T-cell response, produced low levels of IL-10 and moderate levels of IL-12. Dendritic cells stimulated the production of IFN-gamma by allogeneic CD4⁺ T cells. In contrast, the level of IFN-gamma was significantly decreased and the production of IL-10 was enhanced by addition of macrophages to the culture system. Conclusion(s): Our results suggest that a fine balance between the production of IL-10 and IL-12 by different antigen-presenting cells, through IFN-gamma, may control the course of chronic inflammation in periapical lesions. © 2010 The Authors. Journal compilation © 2010 John Wiley & Sons A/S.

Collard, F., et al. (2019). "Plastic Particle Ingestion by Wild Freshwater Fish: A Critical Review." Environmental Science & Technology **53**(22): 12974.

Plastic pollution, especially microplastics (MP) pollution, is a hot topic in both mainstream media and scientific literature. Although rivers are potentially the major transport pathway of this pollution to the sea, plastic contamination in freshwater bodies is comparatively understudied. Microplastic pollution in freshwater fish is of growing interest, and while few studies exist, discrepancies do occur in the sampling, extraction, and identification of MP and in the expression of the results. Even though those differences hamper comparisons between some studies, a comparative work has been performed to identify the factors influencing MP ingestion by fish and consequently to target potential ecological traits that can be used to monitor species. Monitoring plastic ingested by fish will give relevant ecological information on MP pollution. This review focuses on MP ingestion by wild freshwater and estuarine fish. In addition to providing an overview of the existing data concerning contamination levels in wild freshwater

fish, we aimed to (1) propose several overall recommendations on the methodologies applicable to all biota, (2) compare MP contamination levels in fish and in their environment, and (3) determine which parameters could help to define fish species for monitoring.

Collard, F., et al. (2018). "Anthropogenic particles in the stomach contents and liver of the freshwater fish Squalius cephalus." Science of the Total Environment **643**: 1257-1264.

Anthropogenic particles (APs) are a very broad category of particles produced directly or indirectly by human activities. Their ingestion by biota is well studied in the marine environment. In contrast, studies on AP ingestion in wild freshwater organisms are scarce despite high contamination levels in some rivers and lakes. In this study, we aimed to evaluate the ingestion of APs and the possible occurrence of APs in the liver and muscle of a freshwater fish, Squalius cephalus, from the Parisian conurbation. After isolation, the particles were analyzed using Raman spectroscopy. In sixty stomachs, eighteen APs were found, half of which were plastics and the other half were dyed particles. Twenty-five percent of sampled individuals had ingested at least one AP. The mean length of the APs was 2.41 mm. No significant difference was found between the sites upstream and downstream of Paris. Additionally, 5% of sampled livers contained one or more APs, which were characterized as microplastics (MPs). No APs were found in the muscle tissue. The majority of APs isolated from stomach contents were fibers, which is similar to the findings of a previous river contamination study. This highlights that fish could be more exposed to fibers than previously thought and that more studies on the impacts of fiber ingestion are required. Despite their low occurrence, MPs are reported, for the first time, in the liver of a wild freshwater fish species. While the pathways and impacts are still unknown, MPs also occur in liver of marine mollusks and fish. Physiological in vitro studies are needed to better evaluate the impacts of such phenomena.

Collard, F., et al. (2017). "Microplastics in livers of European anchovies (Engraulis encrasicolus, L.)." Environmental Pollution **229**: 1000-1005.

Microplastics (MPs) are thought to be ingested by a wide range of marine organisms before being excreted. However, several studies in marine organisms from different taxa have shown that MPs and nanoplastics could be translocated in other organs. In this study, we investigated the presence of MPs in the livers of commercial zooplanktivorous fishes collected in the field. The study focuses mainly on the European anchovy Engraulis encrasicolus but concerns also the European pilchard Sardina pilchardus and the Atlantic herring Clupea harengus. Two complementary methodologies were used to attest the occurrence of MPs in the hepatic tissue and to exclude contamination. (1) MPs were isolated by degradation of the hepatic tissue. (2) Cryosections were made on the livers and observed in polarized light microscopy. Both methods separately revealed that MPs, mainly polyethylene (PE), were translocated into the livers of the three clupeid species. In anchovy, 80 per cent of livers contained relatively large MPs that ranged from 124 micro m to 438 micro m, showing a high level of contamination. Two translocation pathways are hypothesized: (i) large particles found in the liver resulted from the agglomeration of smaller pieces, and/or (ii) they simply pass through the intestinal barrier. Further studies are however required to understand the exact process.

Collard, F., et al. (2015). "Detection of Anthropogenic Particles in Fish Stomachs: An Isolation Method Adapted to Identification by Raman Spectroscopy." Archives of Environmental Contamination & Toxicology **69**(3): 331-339.

Microplastic particles (MP) contaminate oceans and affect marine organisms in several ways. Ingestion combined with food intake is generally reported. However, data interpretation often is

circumvented by the difficulty to separate MP from bulk samples. Visual examination often is used as one or the only step to sort these particles. However, color, size, and shape are insufficient and often unreliable criteria. We present an extraction method based on hypochlorite digestion and isolation of MP from the membrane by sonication. The protocol is especially well adapted to a subsequent analysis by Raman spectroscopy. The method avoids fluorescence problems, allowing better identification of anthropogenic particles (AP) from stomach contents of fish by Raman spectroscopy. It was developed with commercial samples of microplastics and cotton along with stomach contents from three different Clupeiformes fishes: Clupea harengus, Sardina pilchardus, and Engraulis encrasicolus. The optimized digestion and isolation protocol showed no visible impact on microplastics and cotton particles while the Raman spectroscopic spectrum allowed the precise identification of microplastics and textile fibers. Thirty-five particles were isolated from nine fish stomach contents. Raman analysis has confirmed 11 microplastics and 13 fibers mainly made of cellulose or lignin. Some particles were not completely identified but contained artificial dyes. The novel approach developed in this manuscript should help to assess the presence, quantity, and composition of AP in planktivorous fish stomachs. [ABSTRACT FROM AUTHOR]

Collard, F., et al. (2017). "Morphology of the filtration apparatus of three planktivorous fishes and relation with ingested anthropogenic particles." Marine Pollution Bulletin **116**(1/2): 182-191.

Anthropogenic particles (APs), including microplastics, are ingested by a wide variety of marine organisms. Exposure of Clupeiformes (e.g. herrings, anchovies, sardines) is poorly studied despite their economic and ecological importance. This study aims to describe the morphology of the filtration apparatus of three wild-caught Clupeiformes (Sardina pilchardus, Clupea harengus and Engraulis encrasicolus) and to relate the results to ingested APs. Consequently, the species with the more efficient filtration apparatus will be more likely to ingest APs. We hypothesized that sardines were the most exposed species. The filtration area and particle retention threshold were determined in the three species, with sardines displaying the highest filtration area and the closest gill rakers. Sardines ingested more fibers and smaller fragments, confirming that it is the most efficient filtering species. These two results lead to the conclusion that, among the three studied, the sardine is the species most exposed to APs.

Collicutt, B., et al. (2019). "Microplastics in juvenile Chinook salmon and their nearshore environments on the east coast of Vancouver Island." Environmental Pollution **244**: 135-142.

Microplastics are a significant issue in the world's oceans. These small plastic particles (<5 mm in size) are becoming globally ubiquitous in the marine environment and are ingested by various fish species. Here we investigate the incidence of microplastics in juvenile Chinook salmon and their nearshore marine environments on the east coast of Vancouver Island, British Columbia. We completed a series of beach seines, plankton tows and sediment cores in nearshore areas of importance to juvenile salmon. Microplastics were extracted from fish, water and sediment samples and concentrations were quantified. Microplastics analysis, consisting predominantly of fibrous plastics, showed juvenile Chinook salmon contained 1.2+or-1.4 (SD) microplastics per individual while water and sediment samples had 659.9+or-520.9 microplastics m⁻³

and 60.2+or-63.4 microplastics kg⁻¹ dry weight, respectively. We found no differences in microplastic concentrations in juvenile Chinook and water samples among sites but observed significantly higher concentrations in sediment at the Deep Bay site compared to Nanaimo and Cowichan Bay sites. Chinook microplastic concentrations were relatively low compared to literature values and, given the size and type of microplastics we observed, are unlikely to represent an immediate threat to fish in this area. However, microplastics less than 100 micro m in size were not included in the study and may represent a greater threat due to their ability to translocate through tissues.

Collignon, A., et al. (2014). "Annual variation in neustonic micro- and meso-plastic particles and zooplankton in the Bay of Calvi (Mediterranean-Corsica)." Marine Pollution Bulletin **79**(1-2): 293-298.

The annual variation in neustonic plastic particles and zooplankton was studied in the Bay of Calvi (Corsica) between 30 August 2011 and 7 August 2012. Plastic particles were classified into three size classes, small microplastics (0.2-2. mm), large microplastics (2-5. mm) and mesoplastics (5-10. mm).74% of the 38 samples contained plastic particles of varying composition: e.g. filaments, polystyrene, thin plastic films. An average concentration of 6.2particles/100m² was observed. The highest abundance values (69 particles/100m²) observed occurred during periods of low offshore wind conditions. These values rose in the same order of magnitude as in previous studies in the North Western Mediterranean.The relationships between the abundance values of the size classes between zooplankton and plastic particles were then examined. The ratio for the intermediate size class (2-5. mm) reached 2.73. This would suggest a potential confusion for predators regarding planktonic prey of this size class. © 2013 Elsevier Ltd.

Collignon, A., et al. "Neustonic microplastic and zooplankton in the North Western Mediterranean Sea." Marine Pollution Bulletin.

Neustonic microplastic and zooplankton abundance was determined in the North Western Mediterranean Sea during a summer cruise between July 9th and August 6th 2010, with a break between July 22th and 25th due to a strong wind event. Ninety percent of the 40 stations contained microplastic particles (size 0.3-5 mm) of various compositions: e.g., filaments, polystyrene, thin plastic films. An average concentration of 0.116 particles/m² was observed. The highest abundances (>0.36 particles/m²) were observed in shelf stations. The neustonic plastic particles concentrations were 5 times higher before than after the strong wind event which increased the mixing and the vertical repartition of plastic particles in the upper layers of the water column. The values rise in the same order of magnitude than in the North Pacific Gyre. The average ratio between microplastics and mesozooplankton weights was 0.5 for the whole survey and might induce a potential confusion for zooplankton feeders. © 2012 Elsevier Ltd. All rights reserved.

Collins, E., et al. (2014). "Effects of mesenchymal stem cells on human B cell proliferation." Arthritis and Rheumatology **10)**: S854.

Background/Purpose: Human mesenchymal stem cells (MSC) are progenitor cells that have immunomodulatory properties. MSCs have been used to treat a variety of autoimmune diseases, including lupus. However, literatures have reported conflicting results of MSC function in regards to B cell biological behaviors. We tested the ability of MSCs from umbilical cords, and MSCs from healthy and lupus bone marrow in modulating the B cell functions of healthy and lupus patients. Method(s): Human MSCs were isolated from umbilical cords (UC), healthy bone marrow (HBM), and lupus patient bone marrow (LBM). Passages between 4 and 7 were used for these assays. B cells were isolated from peripheral blood of healthy and lupus donors using CD19 micro-beads, then labeled with CFSE for detection of proliferation. B cells were plated at 5x10⁴ per well in 96-well plates, with or without pre-plated MSCs, at the same number, within 24 hours. The cells were incubated at 37degreeC and 5% CO<inf>2</inf> for 96 hours +/- stimulation (CpG, CD40L, IL2, and anti-human IgG/IgA/ IgG). B cells were then collected and analyzed for proliferation by flow cytometry. Supernatants were collected for detection of antibodies and cytokines via ELISA. Result(s): When co-cultured, UC-MSC and HBM-MSC inhibited healthy B cell proliferation better than LBM-MSC. However, only UC-MSC appeared to reduce the proliferation of lupus patient B cells. Regardless of proliferation, healthy B cells cultured in the presences of MSCs experienced increased IgM and IgG production. Supernatants of healthy B cells cocultured with MSCs also presented increased the levels of IL-6 while having decreased amounts TNF-alpha when compared to the supernatants of wells with B cells alone. Conclusion(s): In our experiments, MSCs obtained from umbilical cords exhibited strong activity in suppressing both healthy and lupus B cell proliferation while MSCs from healthy bone marrow suppressed healthy, but not lupus B cell proliferation. Lupus patient derived MSCs were unable to significantly suppress B cell proliferation from healthy or lupus patients. Furthermore, MSCs from all sources did not inhibit healthy B cell IgG or IgM secretion. These studies aim to improve our understanding of the in vitro effects of MSCs on B cell function in order to predict in vivo efficacy of MSCs to be used in the treatment of SLE.

Colomer, J., et al. (2019). "Mediated food and hydrodynamics on the ingestion of microplastics by Daphnia magna." Environmental Pollution **251**: 434-441.

There is consensus on the need to study the potential impact microplastics (MP) have on freshwater planktonic organisms. It is not yet fully understood how MP enter the aquatic food web or the effect they have on all the trophic levels. As a result of the potential for MP to accumulate throughout food webs, there is increasing interest in evaluating their fate in a variety of environmental conditions. This study investigated the variability in the ingestion of MP to food ratios and the exposed time of MP to Daphnia magna in non-sheared and sheared conditions. The sheared environment provided Daphnia magna with the conditions for optimal filtering capacity. Regardless of the ratios of MP concentration to food concentration (MP:Food), the filtration capacity of the Daphnia magna was enhanced in the sheared experiments. In both the sheared and non-sheared experiments, filtration capacity decreased when the ratios of MP to food concentration and the exposure times to MP were increased. Mortality was mainly enhanced in the non-sheared conditions at higher MP concentrations and exposure times to MP. No mortality was found in the sheared conditions for the exposure times studied. Therefore, in aquatic systems that undergo constant low sheared conditions, Daphnia magna can survive longer when exposed to MP than in calm conditions, provided food concentrations do not limit their capacity to filter.

Colton Jr, J. B., et al. (1974). "Plastic particles in surface waters of the Northwestern Atlantic." Science **185**(4150): 491-497.

The occurrence of plastic particles has recently been reported in the Sargasso Sea and in coastal waters of southern New England. These reports were based on a small number of samples within limited geographic areas, but the observers suggested that plastics might be more widely distributed. In this study the authors confirm, after examination of neuston (surface) net samples taken in July and August 1972, that plastic particles do occur over a wide area of the North Atlantic. These samples were collected on the first multiship MARMAP ichthyo plankton survey of coastal and oceanic waters from Cape Cod to the North Caribbean. Three National

Oceanic and Atmospheric Administration vessels participated in the survey. The type and characteristics of the plastic particles were as follows: white opaque polystyrene spherules; translucent to clear polystyrene spherules containing gaseous voids; opaque to translucent polyethylene cylinders or disks; pieces of Styrofoam; sheets of thin, flexible wrapping material; and pieces of hard and soft, clear and opaque plastics of various thicknesses which appear to be parts of plastic containers, toys, and so forth. It is concluded that the widespread distribution of polystyrene spherules and polyethylene disks in rivers, estuaries, and the open ocean suggests that improper waste water disposal is common practice in the plastics industry. Strong federal, state, and municipal pollution control and monitory programs are necessary to prevent the emission of plastic beads into the waste water systems of plastic producing and plastic processing plants.

Comăniță, E.-D., et al. (2016). "OCCURRENCE OF PLASTIC WASTE IN THE ENVIRONMENT: ECOLOGICAL AND HEALTH RISKS." Environmental Engineering & Management Journal (EEMJ) **15**(3): 675-685.

Environmental threats posed in the environment by plastic production and plastic wastes continue to be a major problem today, closely connected with the increase of plastics consumption by the population. Moreover, little efforts are involved in some parts of the world associated to plastic waste collection, recycling and reuse. Considering all these prerequisites, the identification and discussion of risks generated by plastic production and waste in the environment are performed in this paper and some measures for plastic waste reduction were proposed. Although plastic polymers are not considered toxic, some residual monomers contained in the materials can be hazardous. Also, many chemical compounds used in the plastics manufacturing as additives, in particular plasticizers are dangerous to human health and the environment, along with some degradation products that may be released during the plastic life cycle. Bearing in mind the potential impacts and risks generated by these products in the environment and for humans, the paper highlights that the current requirements and tendencies are to reduce the need for plastic, the enhancement of recycling and recovering the waste, simultaneously with the replacement of plastic from fossil fuel with a continuous widening spectrum of biodegradable polymers. Bioplastics began to be recognized as a positive and important invention of chemical and plastics industry, providing many and varied opportunities for environmental impacts and risks abatement. [ABSTRACT FROM AUTHOR]

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Comella, K., et al. (2001). "Effects of antibody concentration on the separation of human natural killer cells in a commercial immunomagnetic separation system." Cytometry **45**(4): 285-293.

BACKGROUND: The magnetic separation of a cell population based on cell surface markers is a critical step in many biological and clinical laboratories. In this study, the effect of antibody concentration on the separation of human natural killer cells in a commercial, immunomagnetic cell separation system was investigated.

METHODS: Specifically, the degree of saturation of antibody binding sites using a two-step antibody sandwich was quantified. The quantification of the first step, a primary anti-CD56-PE antibody, was achieved through fluorescence intensity measurements using a flow cytometer. The quantification of the second step, an anti-PE-microbeads antibody reagent, was achieved

through magnetophoretic mobility measurements using cell tracking velocimetry.

RESULTS: From the results of these studies, two different labeling protocols were used to separate CD56+ cells from human, peripheral blood by a Miltenyi Biotech MiniMACS cell separation system. The first of these two labeling protocols was based on company recommendations, whereas the second was based on the results of the saturation studies. The results from these studies demonstrate that the magnetophoretic mobility is a function of both primary and secondary antibody concentrations and that mobility does have an effect on the performance of the separation system.

CONCLUSIONS: As the mobility increased due to an increase in bound antibodies, the positive cells were almost completely eliminated from the negative eluent. However, with an increase in bound antibodies, and thus mobility, the total amount of positive cells recovered decreases. It is speculated that these cells are irreversibly retained in the column. These results demonstrate the complexity of immunomagnetic cell separation and the need to further optimize the cell separation process.

Comini, M., et al. (2016). "Evaluation of chimerism in the CD34+ sorted cells with the STR-PCR method." Bone Marrow Transplantation **1)**: S445.

Introduction: Analysis of donor chimerism is an important diagnostic tool to assess the risk of relapse after Hematopoietic Stem Cell Transplantation (HSCT), especially in patients lacking a specific marker suitable for monitoring of minimal residual disease. We investigated the predictive role of donor chimerism analysis in sorted CD34+ bone marrow (BM) cells patients (pts) with hematological disease. Material (or patients) and methods: We analyzed 25 pts affected by ALL (n = 8), CML (n = 1), AML (n = 14), MDS (n=1) and Myelofibrosis (n = 1). Fresh mononuclear cells (MNC) were isolated from anticoagulated BM using Ficoll-Paque density gradient centrifugation. CD34+ cells were selected using a CD34 MicroBeads Kit and the AutoMACS automated selection device (MiltenyiBiotec, Bergisch Galdbach, Germany) according to the manufacturer's instructions. STR amplifcation: PCR was performed using the AmpFlSTR Profiler Plus Kit Amplification as recommended by the manufacture. Result(s): We sorted CD34+ cells from BM and we performed STR-PCR in order to detect host cells in all fractions. Sorted CD34+ cells STR analysis showed a complete donor chimerism (CC) in 17 pts: 7 ALL, 7 AML, 1 CML, 1 MDS and 1 Myelofibrosis, while the CD34+ fraction from 1 ALL and 7 AML showed a mixed donor chimerism (MC). In samples with MC <90% of donor there is correlation with molecular MRD (Table 1). In pt 4 the analysis of CD34+ sorted cells showed MC (98,49% of donor) corresponding with the presence of a complex karyotype clone, with no molecular evidences and after chemotherapy treatment we observed a conversion from MC to CC. Instead pt 5 showed a spontaneous conversion from MC to CC. Conclusion(s): The STR-PCR based on CD34+ cells sorted could be used as an useful diagnostic tool, providing to clinicians additional informations, specially when MRD is not available in patients who lack specific molecular markers. This method could be an accurate alternative approach in the evaluation of chimerism, suggesting the possible persistence of disease: in fact our preliminary data indicate that decrease of CD34+ chimerism of less than 90% is a strong evidence of relapse. (Table presented).

Commendatore, C. ISRI Focuses on Safety, Design for Recycling at 2019 Convention.

The article focuses on the Institute of Scrap Recycling Industries' (ISRI) 2019 Convention & Exposition held in Los Angeles, California on April 11, 2019. It refers to a presentation by by ISRI Chairman Brian Shineon ISRI's Design for Recycling Award to Nestle Waters North America and Circle of Safety Excellence (COSE) initiative.

Commendatore, C. (2019). "Study Links Consumer Choice Modification to Plastic Straw Reduction." Waste360: N.PAG-N.PAG.

The article discusses the study "Assessing the Use of Default Choice Modification to Reduce Consumption of Plastic Straws" in San Luis Obispo, California by co-author Travis Wagner of University of Southern Maine to address plastic marine debris. Topics mentioned include the focus of the study on the city's ordinance plastic straw upon request only, survey of restaurants covered by the ordinance, and the reduction in straw consumption following the ordinance.

Comnea-Stancu, I. R., et al. (2017). "On the Identification of Rayon/Viscose as a Major Fraction of Microplastics in the Marine Environment: Discrimination between Natural and Manmade Cellulosic Fibers Using Fourier Transform Infrared Spectroscopy." Applied Spectroscopy **71**(5): 939-950.

This work was sparked by the reported identification of man-made cellulosic fibers (rayon/viscose) in the marine environment as a major fraction of plastic litter by Fourier transform infrared (FT-IR) transmission spectroscopy and library search. To assess the plausibility of such findings, both natural and man-made fibers were examined using FT-IR spectroscopy. Spectra acquired by transmission microscopy, attenuated total reflection (ATR) microscopy, and ATR spectroscopy were compared. Library search was employed and results show significant differences in the identification rate depending on the acquisition method of the spectra. Careful selection of search parameters and the choice of spectra acquisition method were found to be essential for optimization of the library search results. When using transmission spectra of fibers and ATR libraries it was not possible to differentiate between man-made and natural fibers. Successful differentiation of natural and man-made cellulosic fibers has been achieved for FT-IR spectra acquired by ATR microscopy and ATR spectroscopy, and application of ATR libraries. As an alternative, chemometric methods such as unsupervised hierarchical cluster analysis, principal component analysis, and partial least squares-discriminant analysis were employed to facilitate identification based on intrinsic relationships of sample spectra and successful discrimination of the fiber type could be achieved. Differences in the ATR spectra depending on the internal reflection element (Ge versus diamond) were observed as expected; however, these did not impair correct classification by chemometric analysis. Moreover, the effects of different levels of humidity on the IR spectra of natural and man-made fibers were investigated, too. It has been found that drying and re-humidification leads to intensity changes of absorption bands of the carbohydrate backbone, but does not impair the identification of the fiber type by library search or cluster analysis.

Compa, M., et al. (2019). "Risk assessment of plastic pollution on marine diversity in the Mediterranean Sea." Science of the Total Environment **678**: 188-196.

Plastic marine pollution is an increasing threat to global marine diversity. Quantifying this threat is particularly difficult and complex, especially when evaluating multiple species with different ecological requirements. Here, we examine the semi-enclosed basin of the Mediterranean Sea where the inputs of plastic pollution and its impact on marine diversity are still widely unknown. Eighty-four species from six taxonomic classes were evaluated to assess the risk of ingesting plastic marine debris, integrating inter-specific factors such as plastic exposure rates and life history traits (e.g., motility, habitat, and body size). Species were modelled within a spatial context to identify and estimate their exposure to plastic ingestion across the Mediterranean Sea using literature data, species distribution maps and plastic dispersion models. Our approach identified hotspots for the risk of plastic ingestion across multiple taxa in the Mediterranean Sea, highlighting that coastal species are at higher risk of ingesting plastic in the marine environment than open-sea species. The plastic exposure analysis indicated that species with larger home ranges were more at risk of exposure with increased distances while local species were more likely to be exposed to plastic closer to the centre of their home range location. The approach used in this study can be applied to support management and mitigation efforts throughout the Mediterranean Sea and in other geographic regions to minimize the impact of plastic pollution on marine diversity. Copyright © 2019 Elsevier B.V.

Compa, M., et al. (2018). "Ingestion of microplastics and natural fibres in Sardina pilchardus (Walbaum, 1792) and Engraulis encrasicolus (Linnaeus, 1758) along the Spanish Mediterranean coast." Marine Pollution Bulletin **128**: 89-96.

The ingestion of microplastics and natural fibres (<5 mm) was assessed for two commercial fish species in the western Mediterranean Sea: Sardina pilchardus and Engraulis encrasicolus. Gastrointestinal tracts from 210 individuals from 14 stations were examined with 14.28-15.24% of the small pelagic fish S. pilchardus and E. encrasicolus having ingested microplastics and natural fibres. A latitudinal increase in condition index (Fulton's K) of S. pilchardus gave an indication that larger individuals with better physical condition are less likely to ingest microplastics and natural fibres. Fibres were the most frequent particle type (83%) and Fourier Transform Infrared spectroscopy (FT-IR) analysis indicated polyethylene terephthalate was the most common microplastics material (30%). Results from this study show that both microplastics and natural fibres of anthropogenic origin are common throughout the pelagic environment along the Spanish Mediterranean coast.

Comte, J., et al. (2006). "Microbial Community Structure and Dynamics in the Largest Natural French Lake (Lake Bourget)." Microbial Ecology **52**(1): 72-89.

We investigated the dynamics and diversity of heterotrophic bacteria, autotrophic and heterotrophic flagellates, and ciliates from March to July 2002 in the surface waters (0-50 m) of Lake Bourget. The heterotrophic bacteria consisted mainly of "small" cocci, but filaments (>2 µm), commonly considered to be grazing-resistant forms under increased nanoflagellate grazing, were also detected. These elongated cells mainly belonged to the Cytophaga-Flavobacterium (CF) cluster, and were most abundant during spring and early summer, when mixotrophic or heterotrophic flagellates were the main bacterial predators. The CF group strongly dominated fluorescent in situ hybridization-detected cells from March to June, whereas clear changes were observed in early summer when Beta-proteobacteria and Alpha-proteobacteria increased concomitantly with maximal protist grazing pressures. The analysis of protist community structure revealed that the flagellates consisted mainly of cryptomonad forms. The dynamics of Cryptomonas sp. and Dinobryon sp. suggested the potential importance of mixotrophs as consumers of bacteria. This point was verified by an experimental approach based on fluorescent microbeads to assess the potential grazing impact of all protist taxa in the epilimnion. From the results, three distinct periods in the functioning of the epilimnetic microbial loop were identified. In early spring, mixotrophic and heterotrophic flagellates constituted the main bacterivores, and were regulated by the availability of their resources mainly during April (phase 1). Once the "clear water phase" was established, the predation pressure of metazooplankton represented a strong top-down force on all microbial compartments. During this period only mixotrophic flagellates occasionally exerted a significant bacterivory pressure (phase 2). Finally, the early summer was characterized by the highest protozoan grazing impact and by a rapid shift in the carbon pathway transfer, with a fast change-over of the main predators contribution, i.e., mixotrophic, heterotrophic flagellates and ciliates in bacterial mortality. The high abundance of ciliates during this period was consistent with the high densities of resources (heterotrophic nanoflagellates, algae, bacteria) in deep layers containing the most chlorophyll. Bacteria, as ciliates, responded clearly to increasing phytoplankton abundance, and although bacterial grazing impact could vary largely, bacterial abundance seemed to be primarily bottom-up regulated (phase 3).[PUBLICATION ABSTRACT]

Cong, Y., et al. (2019). "Ingestion, egestion and post-exposure effects of polystyrene microspheres on marine medaka (Oryzias melastigma)." Chemosphere **228**: 93-100.

Microplastics (MPs) are of environmental concern due to their bioavailability and potential impacts on a wide range of marine biota. In this study, we investigated the ingestion, bioaccumulation and egestion of fluorescent polystyrene (PS) micospheres (10 micro m) in both larvae and adults of marine medaka (Oryzias melastigma), with or without food supply. The post-exposure effects of non-fluorescent PS (10 micro m) on the survival, growth and reproduction of medaka larvae were also explored. Results showed that the PS microspheres could be ingested by both larvae and adults during the 48 h-exposure. Notably, feeding status was found to significantly affect the ingestion in medaka adults, which was not observed in the larvae. The egestion process of PS was rapid during the first recovery day but there was still certain percent of particles retained in digestive tracts at the end of 7 d recovery for either larvae or adults. After a 14 d pre-exposure with the non-fluorescent PS microspheres, the subsequent survival, growth and reproduction of medaka larvae were all significantly affected at the end of 120 d of experiment without PS. Overall, these results indicate that fishes might ingest or retain more MPs if the environmental abundance of MPs continues to increase while the available food decreases. Medaka fishes in larval stage have no capacity to select natural food sources like the adults. The chronic and "legacy effect" of MPs might also be a problem worthy paid more attention in future research instead of acute and immediate effect studies.

Cong, Y., et al. (2019). "Ingestion, egestion and toxic effects of fluorescent polystyrene microspheres on the Polychaete, Perinereis aibuhitensis." Haiyang Huanjing Kexue = Marine Environmental Science(2): 161.

Marine microplastic(MP) pollution has become a global concern. It was reported that the content of MPs in intertidal zone was relatively high. However,relatively few studies have been conducted on the effects of MPs on organisms inhabiting intertidal zones. In this study,we investigated the ingestion,bioaccumulation and egestion processes of fluorescent polystyrene microspheres(PS,10 μm) in sediment-dwelling organism,Perinereis aibuhitensis,through seawater exposure pathway. The impacts of PS on the burrowing behavior and subcellular structure alteration of worms were also explored after a 14 d of sediment exposure. Results showed that the ingested PS microspheres in worms increased with time within 48 h,and the retained PS percentage decreased after transferring to clean seawater,which reached to only 2. 2 % after depuration of 96 h. However,the burrowing time of worms in clean sediment was significantly prolonged after 14 d of sediment exposure,and epithelia apoptosis of worm body wall and mitochondria edema of worm myocytes were observed. The impairment of worm burrowing behavior was possibly related to the dysfunction of mitochondria. This study emphasized the sensitivity of behavior indicator when assessing the toxicity of MPs on sediment-dwelling organisms. Findings are expected to provide a basis for exploration of mechanisms of MPs and their ecological risk assessment.

Conkle, J. L., et al. (2018). "Are We Underestimating Microplastic Contamination in Aquatic Environments?" Environmental Management **61**(1): 1-8.

Plastic debris, specifically microplastic in the aquatic environment, is an escalating environmental crisis. Efforts at national scales to reduce or ban microplastics in personal care products are starting to pay off, but this will not affect those materials already in the environment or those that result from unregulated products and materials. To better inform future microplastic research and mitigation efforts this study (1) evaluates methods currently used to quantify microplastics in the environment and (2) characterizes the concentration and size distribution of microplastics in a variety of products. In this study, 50 published aquatic surveys were reviewed and they demonstrated that most (~80%) only account for plastics >= 300 mum in diameter. In addition, we surveyed 770 personal care products to determine the occurrence, concentration and size distribution of polyethylene microbeads. Particle concentrations ranged from 1.9 to 71.9 mg g⁻¹ of product or 1649 to 31,266 particles g⁻¹ of product. The large majority (> 95%) of particles in products surveyed were less than the 300 mum minimum diameter, indicating that previous environmental surveys could be underestimating microplastic contamination. To account for smaller particles as well as microfibers from synthetic textiles, we strongly recommend that future surveys consider methods that materials < 300 mum in diameter.

Conley, K. R. and K. R. Sutherland (2017). "Particle shape impacts export and fate in the ocean through interactions with the globally abundant appendicularian Oikopleura dioica." PLoS ONE **12**(8).

Marine microbes exhibit highly varied, often non-spherical shapes that have functional significance for essential processes, including nutrient acquisition and sinking rates. There is a surprising absence of data, however, on how cell shape affects grazing, which is crucial for predicting the fate of oceanic carbon. We used synthetic spherical and prolate spheroid microbeads to isolate the effect of particle length-to-width ratios on grazing and fate in the ocean. Here we show that the shape of microbe-sized particles affects predation by the appendicularian Oikopleura dioica, a globally abundant marine grazer. Using incubation experiments, we demonstrate that shape affects how particles are retained in the house and that the minimum particle diameter is the key variable determining how particles are ingested. High-speed videography revealed the mechanism behind these results: microbe-sized spheroids oriented with the long axis parallel to fluid streamlines, matching the speed and tortuosity of spheres of equivalent width. Our results suggest that the minimum particle diameter determines how elongated prey interact with the feeding-filters of appendicularians, which may help to explain the prevalence of ellipsoidal cells in the ocean, since a cell’s increased surface-to-volume ratio does not always increase predation. We provide the first evidence that grazing by appendicularians can cause non-uniform export of different shaped particles, thereby influencing particle fate.

Conlon, K. (2020). "Adaptive injustice: Responsibility to act in the plastics economy." Resources, Conservation & Recycling **153**: N.PAG-N.PAG.

Connor, T. H. and J. P. Smith (2016). "New approaches to wipe sampling methods for antineoplastic and other hazardous drugs in healthcare settings." Pharmaceutical Technology in Hospital Pharmacy **1**(3): 107-114.

PURPOSE: At the present time, the method of choice to determine surface contamination of the workplace with antineoplastic and other hazardous drugs is surface wipe sampling and subsequent sample analysis with a variety of analytical techniques. The purpose of this article is to review current methodology for determining the level of surface contamination with hazardous drugs in healthcare settings and to discuss recent advances in this area. In addition it will provide some guidance for conducting surface wipe sampling and sample analysis for these

drugs in healthcare settings.

METHODS: Published studies on the use of wipe sampling to measure hazardous drugs on surfaces in healthcare settings drugs were reviewed. These studies include the use of well-documented chromatographic techniques for sample analysis in addition to newly evolving technology that provides rapid analysis of specific antineoplastic.

RESULTS: Methodology for the analysis of surface wipe samples for hazardous drugs are reviewed, including the purposes, technical factors, sampling strategy, materials required, and limitations. The use of lateral flow immunoassay (LFIA) and fluorescence covalent microbead immunosorbent assay (FCMIA) for surface wipe sample evaluation is also discussed.

CONCLUSIONS: Current recommendations are that all healthcare settings where antineoplastic and other hazardous drugs are handled include surface wipe sampling as part of a comprehensive hazardous drug-safe handling program. Surface wipe sampling may be used as a method to characterize potential occupational dermal exposure risk and to evaluate the effectiveness of implemented controls and the overall safety program. New technology, although currently limited in scope, may make wipe sampling for hazardous drugs more routine, less costly, and provide a shorter response time than classical analytical techniques now in use.

Connors, E. J. (2017). "Distribution and biological implications of plastic pollution on the fringing reef of Mo'orea, French Polynesia." PeerJ **5**: e3733.

Coral reef ecosystems of the South Pacific are extremely vulnerable to plastic pollution from oceanic gyres and land-based sources. To describe the extent and impact of plastic pollution, the distribution of both macro- (>5 mm) and microplastic (plastic < 5 mm) of the fringing reef of an isolated South Pacific island, Mo'orea, French Polynesia was quantified. Macroplastic was found on every beach on the island that was surveyed. The distribution of this plastic was categorized by site type and by the presence of Turbinaria ornata, a common macroalgae on Mo'orea. Microplastics were discovered in the water column of the fringing reef of the island, at a concentration of 0.74 pieces m⁻². Additionally, this study reports for the first time the ingestion of microplastic by the corallimorpha Discosoma nummiforme. Microplastics were made available to corallimorph polyps in a laboratory setting over the course of 108 h. Positively and negatively buoyant microplastics were ingested, and a microplastic particle that was not experimentally introduced was also discovered in the stomach cavity of one organism. This study indicates that plastic pollution has the potential to negatively impact coral reef ecosystems of the South Pacific, and warrants further study to explore the broader potential impacts of plastic pollution on coral reef ecosystems.

Connors, K. A., et al. (2017). "Advancing the quality of environmental microplastic research." Environmental Toxicology and Chemistry **36**(7): 1697-1703.

Investigations into the environmental fate and effects of microplastics have been gaining momentum. Small, insoluble polymeric particles are implicated by scientists in a wide variety of studies that are used to suggest a potential for widespread impacts in freshwater and marine pelagic and sediment environments. An exponential growth in scientific publications and an increase in regulatory attention have occurred. However, despite these efforts, the environmental hazard of these particles is still unknown. To evaluate the hazard of microplastics within a risk assessment context, we need a way to evaluate the quality of experimental studies. We performed a thorough review of the quality and focus of environmental microplastic research, to understand the methodologies employed and how this may assist or distract from the ability of environmental risk assessors to evaluate microplastics. We provide guidance to improve the reliability and relevance of ecotoxicological studies for regulatory and broader

environmental assessments. Nine areas of needed improvement are identified and discussed. Important data gaps and experimental limitations are highlighted. Environ Toxicol Chem 2017;36:1697-1703. © 2017 SETAC.

Constant, M., et al. (2019). "Beached microplastics in the Northwestern Mediterranean Sea." Marine Pollution Bulletin **142**: 263.

Microplastics are small (<5 mm) fragments of plastic debris that are ubiquitous in coastal areas and in open ocean. We have investigated the occurrence and composition of microplastics in beach sediments from the micro-tidal Northwestern Mediterranean Sea. Samples were collected on two beaches (northern and southern site) of the western Gulf of Lion showing markedly different characteristics. Sampling was performed along depositional lower, mid and upper beaches and repeated after 1 month. Concentrations of microplastics in the northern and southern site were highly variable, ranging from 33 to 798 and from 12 to 187 microplastics per kg of dry sediment, respectively. Highest concentrations were found at three specific locations: nearby a local river mouth, within an accretionary area and in a depositional upper beach. The spatial and temporal distribution of beached microplastics seems to be directly dependent on external forcing such as wind, swell, precipitation, outflow and river mouth proximity.

Constantino, P. J., et al. (2016). "Simulation of enamel wear for reconstruction of diet and feeding behavior in fossil animals: A micromechanics approach." BioEssays **38**(1): 89-99.

The deformation and wear events that underlie microwear and macrowear signals commonly used for dietary reconstruction in fossil animals can be replicated and quantified by controlled laboratory tests on extracted tooth specimens in conjunction with fundamental micromechanics analysis. Key variables governing wear relations include angularity, stiffness (modulus), and size of the contacting particle, along with material properties of enamel. Both axial and sliding contacts can result in the removal of tooth enamel. The degree of removal, characterized by a "wear coefficient," varies strongly with particle content at the occlusal interface. Conditions leading to a transition from mild to severe wear are discussed. Measurements of wear traces can provide information about contact force and particle shape. The potential utility of the micromechanics methodology as an adjunct for investigating tooth durability and reconstructing diet is explored. Microindentation and wear tests on human enamel are used to simulate microwear and macrowear patterns in fossil teeth. Characteristic "pit" and "scratch" traces associated with axial and sliding loading are quantified using micromechanics analysis. Mild and severe wear states identify with microplastic and microfracture modes, respectively. Copyright © 2015 WILEY Periodicals, Inc.

Contado, C., et al. (2007). "Sedimentation field flow fractionation of immunoglobulin A coated polystyrene beads. Influence of carrier composition on complex characterization." Journal of Chromatography. A **1169**(1-2): 158-174.

The amount of immunoglobulin A (IgA) adsorbed on the surface of two different samples of polystyrene (PS) microbeads was evaluated using differential sedimentation field flow fractionation (SdFFF) analyses. For the first time, the SdFFF separations obtained by using, as mobile phase, solutions common to many biochemical procedures and applications have been compared and discussed. Good separation results were achieved in the different carriers, and the SdFFF gave equivalent mass per particle values in all carriers provided that the pH and ionic strength conditions of the eluents were well controlled. The IgA adsorption process onto PS occurred by maintaining unaltered the capacity of the PS-IgA substrate to selectively recognize anti-IgA (aIgA), as proven by elution of the ternary complex PS-IgA-aIgA and from the monitored

lack of reaction when the PS-IgA was placed in contact with aIgE.

Contessi Negrini, N., et al. (2019). "Tissue-mimicking gelatin scaffolds by alginate sacrificial templates for adipose tissue engineering." Acta Biomaterialia **87**: 61-75.

When adipose tissue (AT) is impaired by trauma or disease, AT engineering could provide a shelf-ready structural and functional restoration as alternative to current clinical treatments, which mainly aim at aesthetic replacement. Yet, the lack of an efficient vascular network within the scaffolds represents a major limitation to their translation application in patients. Here, we propose the use of microstructured crosslinked gelatin hydrogels with an embedded prevascular channel as scaffolding materials for AT engineering. The scaffolds are fabricated using - simultaneously - alginate-based microbeads and 3D printed filaments as sacrificial material encapsulated in gelatin at the point of material fabrication and removed post-crosslinking. This method yields the formation of microstructures that resemble the micro-architecture of physiological human fat tissue and of microvessels that can facilitate vascularization through anastomosis with patients' own blood vessels. The cytocompatible method used to prepare the gelatin scaffolds showed structural stability over time while allowing for cell infiltration and protease-based remodeling/degradation. Scaffolds' mechanical properties were also designed to mimic the one of natural breast adipose tissue, a key parameter for AT regeneration. Scaffold's embedded channel (=300-400micro m) allowed for cell infiltration and enabled blood flow in vitro when an anastomosis with a rat blood artery was performed using surgical glue. In vitro tests with human mesenchymal stem cells (hMSC) showed colonization of the porous structure of the gelatin hydrogels, differentiation into adipocytes and accumulation of lipid droplets, as shown by Oil Red O staining. STATEMENT OF SIGNIFICANCE: The potential clinical use of scaffolds for adipose tissue (AT) regeneration is currently limited by an unmet simultaneous achievement of adequate structural/morphological properties together with a promoted scaffold vascularization. Sacrificial materials, currently used either to obtain a tissue-mimicking structure or hollow channels to promote scaffold' vascularization, are powerful versatile tools for the fabrication of scaffolds with desired features. However, an integrated approach by means of sacrificial templates aiming at simultaneously achieving an adequate AT-mimicking structure and hollow channels for vascularization is missing. Here, we prove the suitability of crosslinked gelatin scaffolds obtained by using sacrificial alginate microbeads and 3D printed strands to achieve proper features and hollow channels useful for scaffolds vascularization.

Conti, B., et al. (2013). "Adhesive microbeads for the targeting delivery of anticaries agents of vegetable origin." Food Chemistry **138**(2-3): 898-904.

The formulation of quinic acid, a food constituent demonstrating potential anticaries and antigingivitis properties, was investigated in an adhesive microparticulate delivery system with the goal of improving its effect by prolonging its residence time at the site of action. Alginate and chitosan were selected as mucoadhesive polymers. The microspheres were prepared by coacervation. Different types of alginates, polymers blends and crosslinking agent concentrations were considered and evaluated. The best results in terms of encapsulation efficiency, in vitro active agent release profile and in vitro adhesive properties, both to oral mucosa and to teeth surface, were obtained with a blend of Alginate Protanal LF200S: Alginate Protanal LF120LS 1:1.5 w/w, 0.1 M CaCl<inf>2</inf>, and chitosan coating, prepared by a one-step complex coacervation method. This microparticulate delivery system showed prolonged release of quinic acid, and could be used as an active component in chewing gums or mouthwashes for both caries and gingivitis prevention. © 2012 Elsevier Ltd. All rights reserved.

Cooper, J. (2019). "Tackling Packaging Waste Through Public/Private Partnerships." Food Technology **73**(9): 71.

Institute of Food Technologists (IFT) and author Dale Buss (July) are to be commended for prominently bringing the plastic waste "tsunami" issue to the attention of IFT members. A PPP board would be able to secure research funding and establish research priorities and application procedures. Engagement with a spectrum of industry, academic, consumer, regulatory, and public stakeholders could best address and balance inherent food safety, integrity, and quality requirements as well as the environmental, infrastructure, and financial considerations involved in what should be a united priority effort to discover new food packaging materials.

Coppock, R. L., et al. (2017). "A small-scale, portable method for extracting microplastics from marine sediments." Environmental Pollution **230**: 829-837.

Microplastics (plastic particles, 0.1 mum-5 mm in size) are widespread marine pollutants, accumulating in benthic sediments and shorelines the world over. To gain a clearer understanding of microplastic availability to marine life, and the risks they pose to the health of benthic communities, ecological processes and food security, it is important to obtain accurate measures of microplastic abundance in marine sediments. To date, methods for extracting microplastics from marine sediments have been disadvantaged by complexity, expense, low extraction efficiencies and incompatibility with very fine sediments. Here we present a new, portable method to separate microplastics from sediments of differing types, using the principle of density floatation. The Sediment-Microplastic Isolation (SMI) unit is a custom-built apparatus which consistently extracted microplastics from sediments in a single step, with a mean efficiency of 95.8% (+/-SE 1.6%; min 70%, max 100%). Zinc chloride, at a density of 1.5 g cm⁻³, was deemed an effective and relatively inexpensive floatation media, allowing fine sediment to settle whilst simultaneously enabling floatation of dense polymers. The method was validated by artificially spiking sediment with low and high density microplastics, and its environmental relevance was further tested by extracting plastics present in natural sediment samples from sites ranging in sediment type; fine silt/clay (mean size 10.25 +/- SD 3.02 mum) to coarse sand (mean size 149.3 +/- SD 49.9 mum). The method presented here is cheap, reproducible and is easily portable, lending itself for use in the laboratory and in the field, eg. on board research vessels. By employing this method, accurate estimates of microplastic type, distribution and abundance in natural sediments can be achieved, with the potential to further our understanding of the availability of microplastics to benthic organisms.

Coppock, R. L., et al. (2019). "Microplastics alter feeding selectivity and faecal density in the copepod, Calanus helgolandicus." Science of the Total Environment **687**: 780-789.

Microplastics (1 micro m-5 mm) are a ubiquitous marine contaminant of global concern, ingested by a wide range of marine taxa. Copepods are a key component of marine food webs, providing a source of food for higher trophic levels, and playing an important role in marine nutrient cycling. Microplastic ingestion has been documented in copepods, but knowledge gaps remain over how this affects feeding preference and faecal density. Here, we use exposure studies incorporating algal prey and microplastics of varying sizes and shapes at a concentration of 100 microplastics mL⁻¹ to show: (1) prey selection by the copepod Calanus helgolandicus was affected by the size and shape of microplastics and algae they were exposed to; Exposure to nylon fibres resulted in a 6% decrease in ingestion of similar shaped chain-forming algae, whilst exposure to nylon fragments led to an 8% decrease in ingestion of a unicellular algae that were similar in shape and size. (2) Ingestion of microplastics with different densities altered the sinking rates of faecal pellets. Faeces containing low-density polyethylene sank significantly more slowly than controls, whilst sinking rates increased when faeces contained high-density polyethylene terephthalate. These results suggest that C. helgolandicus avoid ingesting algae that are similar in size and/or shape to the microplastic particles they are exposed to, potentially in a bid to avoid consuming the plastic.

Corbi, F., et al. (2011). "Point mutations in kinase and pseudokinase domains of JAK1 gene do not seem to be responsible for activation of JAK/STAT pathway in multiple myeloma." Haematologica **2)**: 528.

Background: JAK/STAT pathway, which can be persistently activated in multiple myeloma (MM) patients due to constant stimulation by IL- 6, was recently explored by Burger et al (2009) as potential therapeutic target in this still incurable disease: Janus Kinase (JAK) inhibitor INCB20 presented antiproliferative and apoptotic effects on human myeloma cells in vitro and in vivo. Aims. To search for point mutations in JAK1 gene kinase and pseudokinase domains in an attempt to define any critical and recurrent alteration that could be used as therapeutic target for MM. Patients and Methods. We obtained RNA from purified CD138-positive cells from MM bone marrow samples using microbeads conjugated to monoclonal anti-human CD138 (sydecan-1) by the MACS methodology - Magnetic Cell Sorting of Human Cells (Miltenyi Biotec, Bergisch Gladbach, Germany) from 21 newly diagnosed patients MM, four healthy controls (one peripheral blood and three reactive tonsils) and four MM cell lines (U266, Sko-007, SKMM-2, RPMI). After amplification of of JAK1 pseudokinase (exons 12-18) and kinase (exons 19-24) domains in cDNA samples, we performed automatic sequencing of fragments using forward and reverse primers. Result(s): 15 of the 21 (71%) MM cases showed at least one polymorphism, all synonymous SNPs, being: 12/15 in codon 733 (CCA>CCG), 6/15 in codon 683 (AGC>AGT), 4/15 in codons 1032 (AAG>AAA) and 659 (CGC>CGT), and 3/15 in codon 699 (GCC>GCG). All the four cell lines also presented only synonymous SNP: 4/4 in codon 683 (AGC>AGT) and 1/4 in codon 733 (CCA>CCG). Among the four controls, one showed synonymous SNP in codon 733 (CCA>CCG), one in codon 683 (AGC>AGT) and one in codon 1032 (AAG>AAA). Conclusions. Mutations in kinase and pseudokinase domains of JAK1 gene do not seem to be important for activation of JAK/STAT pathway in multiple myeloma and other underlying mechanisms, besides IL-6 stimulation, must be investigated.

Corcoran, P. L., et al. (2009). "Plastics and beaches: a degrading relationship." Marine Pollution Bulletin **58**(1): 80-84.

Plastic debris in Earth's oceans presents a serious environmental issue because breakdown by chemical weathering and mechanical erosion is minimal at sea. Following deposition on beaches, plastic materials are exposed to UV radiation and physical processes controlled by wind, current, wave and tide action. Plastic particles from Kauai's beaches were sampled to determine relationships between composition, surface textures, and plastics degradation. SEM images indicated that beach plastics feature both mechanically eroded and chemically weathered surface textures. Granular oxidation textures were concentrated along mechanically weakened fractures and along the margins of the more rounded plastic particles. Particles with oxidation textures also produced the most intense peaks in the lower wavenumber region of FTIR spectra. The textural results suggest that plastic debris is particularly conducive to both chemical and mechanical breakdown in beach environments, which cannot be said for plastics in other natural settings on Earth.

Corcoran, P. L., et al. (2015). "Hidden plastics of Lake Ontario, Canada and their potential preservation in the sediment record." Environmental Pollution **204**: 17-25.

Microplastics are a source of environmental pollution resulting from degradation of plastic products and spillage of resin pellets. We report the amounts of microplastics from various sites of Lake Ontario and evaluate their potential for preservation in the sediment record. A total of 4635 pellets were sampled from the Humber Bay shoreline on three sampling dates. Pellet colours were similar to those from the Humber River bank, suggesting that the river is a pathway for plastics transport into Lake Ontario. Once in the lake, high density microplastics, including mineral-polyethylene and mineral-polypropylene mixtures, sink to the bottom. The minerals may be fillers that were combined with plastics during production, or may have adsorbed to the surfaces of the polymers in the water column or on the lake bottom. Based on sediment depths and accumulation rates, microplastics have accumulated in the offshore region for less than 38 years. Their burial increases the chance of microplastics preservation. Shoreline pellets may not be preserved because they are mingled with organic debris that is reworked during storm events. [ABSTRACT FROM AUTHOR]
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Cordier, M. and T. Uehara (2019). "How much innovation is needed to protect the ocean from plastic contamination?" Science of the Total Environment **670**: 789-799.
Plastics are non-biodegradable, and increasing accumulation of plastic debris in the ocean is a major cause for concern. The World Economic Forum, Ellen MacArthur Foundation, and McKinsey & Company claimed in 2016 that technological innovations can solve the plastic problem. Such a claim raises an as yet unanswered question: how much technological innovation is needed and is it economically feasible? We offer answers to this question via a system dynamics model that we developed to simulate different scenarios aimed at controlling plastic debris entering the global ocean. Our results show that ocean cleanup technologies could achieve a 25% reduction in the level of plastic debris in the ocean below 2010 levels in 2030. However, this would require removing 15% of the stock of plastic debris from the ocean every year over the period 2020-2030, which equates to 135 million tons of plastic in total (metric tons). The implementation cost of such an ocean cleanup effort would amount to 492 billion-708 billion, which represents 0.7%-1.0% of the world GDP in 2017 - this calculation is based on unit costs in /kg estimated in The Ocean Cleanup project feasibility study. The Ocean Cleanup project alone is designed to collect 70,320 tons of plastic debris over a 10year period. Removing 135 million tons of plastic debris would require investing in 1924 similar cleanup projects. These results help to assess the economic feasibility of removing such large volume of plastics. Moreover, our results provide quantitative confirmation that technological solutions alone are not sufficient to solve plastic pollution issues. A portfolio of diverse solutions - not only technological ones - is likely to have greater technical, political and economic feasibility. Our model shows that such a combined portfolio implemented over the period 2020-2030 could reduce the ocean plastic stock to 2013 levels (94 million tons) by 2030.

Cordova, M. R., et al. (2018). "Occurrence and abundance of microplastics in coral reef sediment: a case study in Sekotong, Lombok-Indonesia." AES Bioflux **10**(1): 23-29.
Microplastics are categorized as less than 5 mm in length - sized plastics. Lombok is located in Indonesia, part of the coral triangle region, and one of the out flow locations of the Indonesian

Through Flow (ITF). There is likelihood that microplastics would flow across the ITF and would be accumulated in the coral reef ecosystem, especially in biota and sediment. To improve the knowledge of microplastics pollution in Indonesia, we analyzed sediment samples from 10 stations at coral reef habitats in Sekotong, Lombok - Indonesia. The microplastics concentration in Sekotong varied from 35 to 77 particles per-kg, with average 48.3+or-13.98 (SD) particles per-kg, found in all ten sampling location. The highest concentration was found in the south-west of Gili Gede Island (77 particles per-kg). All of the microplastics collected were foam (41.20%), fragment (32.51%), granule (22.77%) and fiber (3.52%). Microplastic with size more than 1000 micro m found at most, followed by size range of 500-1000 micro m, 200-500 micro m and particle size less than 200 micro m in length. Polystyrene was the most abundant type of plastic polymer identified, followed by polyethylene and polypropylene. This type of polymers indicates that the primary source of microplastics in the Sekotong's coral reef sediment was from the usage of styrofoam, food and beverage packages, also fishing devices. It is strongly suggested that the management of plastic waste to be improved and it is essential to develop an environmentally friendly substance to replace plastics in near future.

Cormier, B., et al. (2019). "Multi-Laboratory Hazard Assessment of Contaminated Microplastic Particles by Means of Enhanced Fish Embryo Test With the Zebrafish (Danio rerio)." Frontiers in Environmental Science.

As wide-spread pollutants in the marine environment, microplastics (MPs) have raised public concern about potential toxic effects in aquatic organisms, and, among others, MPs were suspected to act as a vector for organic pollutants to biota. The purpose of the present study was to investigate effects by three model pollutants, oxybenzone (BP3), benzo[a]pyrene (BaP) and perfluorooctane sulfonate (PFOS) adsorbed to polyethylene MPs on the basis of a standard assay, the acute fish embryo toxicity test (FET; OECD TG 236) with zebrafish (Danio rerio) supplemented by additional endpoints such as induction of ethoxyresorufin-O-deethylase (EROD) activity, modification of cyp1a gene transcription and changes in larval swimming behavior. FET assays were performed in three laboratories using slightly different husbandry and exposure conditions, which, however, were all fully compatible with the limits defined by OECD TG 236. This allowed for testing of potential changes in the FET assay due to protocol variations. The standard endpoints of the FET (acute embryotoxicity) did not reveal any acute toxicity for both virgin MPs and MPs spiked with BP3, BaP and PFOS. With respect to sublethal endpoints, EROD activity was increased after exposure to MPs spiked with BP3 (3 h pulse) and MPs spiked with BaP (96 h continuous exposure). Cyp1a transcription was increased upon exposure to MPs spiked with BP3 or BaP. For the selected combination of MPs particles and contaminants, the basic FET proved not sensitive enough to reveal effects of (virgin and spiked) MPs. However, given that the FET can easily be supplemented by a broad variety of more subtle and sensitive endpoints, an enhanced FET protocol may provide a relevant approach with developmental stages of a vertebrate animal model, which is not protected by current EU animal welfare legislation (Directive EU 2010/63).

Cornejo-D'Ottone, M., et al. (2019). "Greenhouse gas cycling by the plastisphere: The sleeper issue of plastic pollution." Chemosphere **246**: 125709.

Plastic is an allochthonous material to marine ecosystems but is rapidly colonized by marine microbial communities, with an as yet unclear contribution to biogeochemical cycles. In this study, we investigated the influence of an active microbial community grown on microplastic particles (the plastisphere) on CO₂ and N₂O recycling and its potential role in greenhouse gas inventories and air-sea exchange. Microplastics were collected during two cruises (Cimar 21 and FIP Montes Submarinos) from the surface layer (5 m depth) from several contrasting trophic regions of the South Pacific Ocean, i.e., from a transition zone off the eutrophic coastal upwelling of Chile, to a mesotrophic transition area of oceanic seamounts and, finally, to an oligotrophic zone in the South Pacific Subtropical Gyre. . Experiments were carried out onboard to evaluate CO₂ and N₂O production/consumption by the plastisphere. The active microbial community and its specific quantification were determined for Cimar 21 using iTag 16 S rRNA. The experiments showed that the plastisphere generally contributed to CO₂ and N₂O production/consumption, with rates ranging from -20.5 (consumption) to +4.5 (production) mumol/m²/d. The seamounts and the transition zone presented the highest production/consumption rates. The experiments performed in the two seamount stations showed that production and consumption of CO₂ were related to the environmental nutrient concentration. Both stations presented N₂O consumption that was associated with the high nitrogen deficit of the subantarctic water mass. The transition zone presented CO₂ and N₂O production in a plastisphere dominated by heterotrophic communities. The plastisphere in oligotrophic waters was diverse and active. The experiments, however, presented low or no production of greenhouse gases. Our results show a contribution of CO₂ and N₂O to the global gas surface inventories and air-sea exchange is lower than 1% of the global sources. These results highlight different critical impacts of plastic pollution on the environment that have, until now, not been considered.

Corradini, F., et al. (2019). "Predicting soil microplastic concentration using vis-NIR spectroscopy." Science of the Total Environment **650**(Pt 1): 922-932.

Microplastic accumulation in soil may have a detrimental impact on soil biota. The lack of standardized methods to identify and quantify microplastics in soils is an obstacle to research. Existing techniques are time-consuming and field data are seldom collected. To tackle the problem, we explored the possibilities of using a portable spectroradiometer working in the near infrared range (350-2500nm) to rapidly assess microplastic concentrations in soils without extraction. Four sets of artificially polluted soil samples were prepared. Three sets had only one polymer polluting the soil (low-density polyethylene (LDPE), polyethylene terephthalate (PET), or polyvinyl chloride (PVC)). The fourth set contained random amounts of the three polymers (Mix). The concentrations of microplastics were regressed on the reflectance observed for each of the 2150 wavelengths registered by the instrument, using a Bayesian approach. For a measurement range between 1 and 100gkg⁻¹, results showed a root-mean-squared-deviation (RMSD) of 8, 18, and 10gkg⁻¹ for LDPE, PET, and PVC. The Mix treatment presented an RMSD of 8, 10, and 5gkg⁻¹ for LDPE, PET, and PVC. The repeatability of the proposed method was 0.2-8.4, 0.1-5.1, and 0.1-9.0gkg⁻¹ for LDPE, PET, and PVC, respectively. Overall, our results suggest that vis-NIR techniques are suitable to identify and quantify LDPE, PET, and PVC microplastics in soil samples, with a 10gkg⁻¹ accuracy and a detection limit=15gkg⁻¹. The method proposed is different than other approaches since it is faster because it avoids extraction steps and can directly quantify the amount of plastic in a sample. Nevertheless, it seems to be useful only for pollution hotspots.

Corradini, F., et al. (2019). "Evidence of microplastic accumulation in agricultural soils from sewage sludge disposal." Science of the Total Environment **671**: 411-420.

Microplastics are emerging as a steadily increasing environmental threat. Wastewater treatment plants efficiently remove microplastics from sewage, trapping the particles in the sludge and preventing their entrance into aquatic environments. Treatment plants are essentially taking the microplastics out of the waste water and concentrating them in the sludge, however. It has become common practice to use this sludge on agricultural soils as a fertilizer. The aim of the current research was to evaluate the microplastic contamination of soils by this practice, assessing the implications of successive sludge applications by looking at the total count of microplastic particles in soil samples. Thirty-one agricultural fields with different sludge application records and similar edaphoclimatic conditions were evaluated. Field records of sludge application covered a ten year period. For all fields, historical disposal events used the same amount of sludge (40tonha⁻¹ dry weight). Extraction of microplastics was done by flotation and particles were then counted and classified with the help of a microscope. Seven sludge samples were collected in the fields that underwent sludge applications during the study period. Soils where 1, 2, 3, 4, and 5 applications of sludge had been performed had a median of 1.1, 1.6, 1.7, 2.3, and 3.5 particles g⁻¹ dry soil, respectively. There were statistical differences in the microplastic contents related to the number of applications that a field had undergone (1, 2, 3<4, 5). Microplastic content in sludge ranged from 18 to 41 particles g⁻¹, with a median of 34 particles g⁻¹. The majority of the observed microplastics were fibers (90% in sludge, and 97% in soil). Our results indicate that microplastic counts increase over time where successive sludge applications are performed. Microplastics observed in soil samples stress the relevance of sludge as a driver of soil microplastic contamination.

Corrales Escobosa, A. R., et al. (2015). "Effect of different glycation agents on Cu(II) binding to human serum albumin, studied by liquid chromatography, nitrogen microwave-plasma atomic-emission spectrometry, inductively-coupled-plasma mass spectrometry, and high-resolution molecular-mass spectrometry." Analytical and bioanalytical chemistry **407**(4): 1149-1157.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis The ability of human serum albumin to capture unbound copper under different clinical conditions is an important variable potentially affecting homeostasis of this element. Here, we propose a simple procedure based on size-exclusion chromatography with on-line UV and nitrogen microwave-plasma atomic-emission spectrometry (MP-AES) for quantitative evaluation of Cu(II) binding to HSA upon its glycation in vitro. The Cu-to-protein molar ratio for non-glycated albumin was 0.98±0.09; for HSA modified with glyoxal (GO), methylglyoxal (MGO), oxoacetic acid (GA), and glucose (Glc), the ratios were 1.30±0.22, 0.72±0.14, 0.50±0.06, and 0.95±0.12, respectively. The results were confirmed by using ICP-MS as an alternative detection system. A reduced ability of glycated protein to coordinate Cu(II) was associated with alteration of the N-terminal metal-binding site during incubation with MGO and GA. In contrast, glycation with GO seemed to generate new binding sites as a result of tertiary structural changes in HSA. Capillary reversed-phase liquid chromatography with electrospray-ionization quadrupole-time-of-flight tandem mass spectrometry enabled detection and identification of Cu(II) coordinated to the N-terminal metal-binding site (Cu(II)-DAHK) in all tryptic digests analyzed. This is the first report confirming Cu(II)-DAHK species in HSA by means of high-resolution tandem mass spectrometry, and the first report on the use of MP-AES in combination with chromatographic separation. [Figure not available: see fulltext.]

Correa, C. A., et al. (2019). "Green-PVC with full recycled industrial waste and renewably sourced content." Journal of Cleaner Production **229**: 1397-1411.

Polyvinyl Chloride (PVC) resins and their compounds are very versatile materials with applications ranging from flexible packaging to rigid building products, such as extruded pipes, profiles and injection moulded electrical/plumbing fittings. Nowadays, large amounts of industrial waste resulting from PVC processing must be handled in order to comply with enacted environmental and health hazards legislations concerning plastic waste disposal. Nonetheless, provided the waste contamination is controlled at its source, PVC waste is potentially recyclable and can be compounded with thermoplastic starches leading to reprocessed formulations with renewable content. These formulations can be reengineered onto injection moulded appliances within a closed-loop manufacturing framework. Starches can be gelatinized by heat, pressure and shearing with glycerol, and in the present work, a by-product of the biodiesel manufacturing was used for this purpose. The main aspects related to cascaded recycling of PVC waste from pipe processors are discussed, in regard to challenges for developing alternative green markets for plastic products in terms of recycling technology and properties compliance for using reprocessed plastic plumbing waste on electrical fittings. Coping with hygroscopic nature of glycerol plasticized starch was the main challenge and many bioderived plasticizers have been tested to overcome this drawback. The research on Green PVC implied that eco-innovation in the conventional plastic industry requires "drop-in" solution regardless of their renewably or fossil sourced feedstock. Furthermore, the green value is not clearly perceived as marketing advantage by plastic processors and consumers and a green-premium associated with production costs tend to hinder a pervading market. 2019 Elsevier Ltd

Correia, M. and K. Loeschner (2018). "Detection of nanoplastics in food by asymmetric flow field-flow fractionation coupled to multi-angle light scattering: possibilities, challenges and analytical limitations. (Special Issue: Food safety analysis.)." Analytical and bioanalytical chemistry **410**(22): 5603-5615.

We tested the suitability of asymmetric flow field-flow fractionation (AF4) coupled to multi-angle light scattering (MALS) for detection of nanoplastics in fish. A homogenized fish sample was spiked with 100 nm polystyrene nanoparticles (PSNPs) (1.3 mg/g fish). Two sample preparation strategies were tested: acid digestion and enzymatic digestion with proteinase K. Both procedures were found suitable for degradation of the organic matrix. However, acid digestion resulted in large PSNPs aggregates/agglomerates (>1 micro m). The presence of large particulates was not observed after enzymatic digestion, and consequently it was chosen as a sample preparation method. The results demonstrated that it was possible to use AF4 for separating the PSNPs from the digested fish and to determine their size by MALS. The PSNPs could be easily detected by following their light scattering (LS) signal with a limit of detection of 52 micro g/g fish. The AF4-MALS method could also be exploited for another type of nanoplastics in solution, namely polyethylene (PE). However, it was not possible to detect the PE particles in fish, due to the presence of an elevated LS background. Our results demonstrate that an analytical method developed for a certain type of nanoplastics may not be directly applicable to other types of nanoplastics and may require further adjustment. This work describes for the first time the detection of nanoplastics in a food matrix by AF4-MALS. Despite the current limitations, this is a promising methodology for detecting nanoplastics in food and in experimental studies (e.g., toxicity tests, uptake studies).

Corrigan, O. I., et al. (2003). "Influence of dissolution medium buffer composition on ketoprofen release from ER products and in vitro-in vivo correlation." International Journal of Pharmaceutics **254**(2): 147-154.

The purpose of this work was to investigate the influence of dissolution medium composition on the in vitro release of ketoprofen from a series of ER products and the impact of the different

buffer media on the in vivo-in vitro (IVIV) relationship. The products investigated were coated micro bead preparations having increasing levels of coating to retard drug release. Four common dissolution media; USP phosphate buffers of pH 7.2 and 6.8, phosphate (modified isotonic) buffer pH 6.8 and a fasted state simulated intestinal fluid without lipid components (FaSSIFLF) of pH 6.5, were employed in the USP 2 apparatus. Release profiles were compared to the corresponding in vivo release profiles, obtained following deconvolution of the plasma level versus time profiles obtained from a 10-subject five-period cross-over study. Despite the relative similarity in composition of the media employed, significant differences in release profiles were observed reflecting media differences in buffer capacity, ionic strength and pH. As a consequence, the quality and shape of the IVIV relationship changed significantly, the only apparent IVIVC incorporating all four ER products, which was non-linear, was obtained using the phosphate (modified isotonic) buffer of pH 6.8. This data was fitted, using a non-linear least squares method, by the equation of Polli et al. [J. Pharm. Sci. 85 (1996) 753] and gave an alpha parameter estimate of 2, consistent with initial dissolution being more rapid in vitro than in vivo. The systematic shift in profiles, particularly with buffer capacity, underlines the sensitivity of IVIV relationship to medium composition and hence the current difficulties in making a rational choice of an appropriate single dissolution medium.

Cortina, M. E., et al. (2016). "Electrochemical magnetic microbeads-based biosensor for point-of-care serodiagnosis of infectious diseases." Biosensors & Bioelectronics **80**: 24-33.

Access to appropriate diagnostic tools is an essential component in the evaluation and improvement of global health. Additionally, timely detection of infectious agents is critical in early diagnosis and treatment of infectious diseases. Conventional pathogen detection methods such as culturing, enzyme linked immunosorbent assay (ELISA) or polymerase chain reaction (PCR) require long assay times, and complex and expensive instruments making them not adaptable to point-of-care (PoC) needs at resource-constrained places and primary care settings. Therefore, there is an unmet need to develop portable, simple, rapid, and accurate methods for PoC detection of infections. Here, we present the development and validation of a portable, robust and inexpensive electrochemical magnetic microbeads-based biosensor (EMBIA) platform for PoC serodiagnosis of infectious diseases caused by different types of microorganisms (parasitic protozoa, bacteria and viruses). We demonstrate the potential use of the EMBIA platform for in situ diagnosis of human (Chagas disease and human brucellosis) and animal (bovine brucellosis and foot-and-mouth disease) infections clearly differentiating infected from non-infected individuals or animals. For Chagas disease, a more extensive validation of the test was performed showing that the EMBIA platform displayed an excellent diagnostic performance almost indistinguishable, in terms of specificity and sensitivity, from a fluorescent immunomagnetic assay and the conventional ELISA using the same combination of antigens. This platform technology could potentially be applicable to diagnose other infectious and non-infectious diseases as well as detection and/or quantification of biomarkers at the POC and primary care settings.

Costa, E., et al. (2020). "Microplastics ingestion in the ephyra stage of Aurelia sp. triggers acute and behavioral responses." Ecotoxicology & Environmental Safety **189**: 109983.

For the first time, we report a correspondence between microplastics (MP) ingestion and ecotoxicological effects in gelatinous zooplankton (Cnidarian jellyfish). The ephyra stage of the jellyfish Aurelia sp. was exposed to both environmental and high concentrations of fluorescent 1-4 mum polyethylene MP (0.01-10 mg/L). After 24 and 48 h, MP accumulation, acute (Immobility) and behavioral (Frequency pulsation) endpoints were investigated. MP were detected by confocal and tomographic investigations on gelatinous body and mouth, either attached on the surface or ingested. This interaction was responsible for impairing ephyrae survival and behavior at all tested concentrations after 24 h. Acute and behavioral effects were also related to mechanical disturbance, caused by MP, triggering a loss of radial symmetry. Contaminated ephyrae exposed to clean seawater showed full recovery after 72 h highlighting the organisms without the microspheres, attached on body jellyfish surface around the mouth and lappets. In conclusion, short-term exposure to MP affects ephyrae jellyfish health, impairing both their survival and behavior. Polyethylene MP temporarily affect both Immobility and Frequency of pulsation of Aurelia sp. jellyfish. This study provides a first step towards understanding and clarifying the potential impacts of MP contamination in gelatinous zooplankton.

Costa, E., et al. (2012). "Tuning smart microgel swelling and responsive behavior through strong and weak polyelectrolyte pair assembly." Langmuir **28**(26): 10082-10090.

The layer-by-layer (LbL) assembly of polyelectrolyte pairs on temperature and pH-sensitive cross-linked poly(N-isopropylacrylamide)-co-(methacrylic acid), poly(NIPAAm-co-MAA), microgels enabled a fine-tuning of the gel swelling and responsive behavior according to the mobility of the assembled polyelectrolyte (PE) pair and the composition of the outermost layer. Microbeads with well-defined morphology were initially prepared by synthesis in supercritical carbon dioxide. Upon LbL assembly of polyelectrolytes, interactions between the multilayers and the soft porous microgel led to differences in swelling and thermoresponsive behavior. For the weak PE pairs, namely poly(L-lysine)/poly(L-glutamic acid) and poly(allylamine hydrochloride)/poly(acrylic acid), polycation-terminated microgels were less swollen and more thermoresponsive than native microgel, whereas polyanion-terminated microgels were more swollen and not significantly responsive to temperature, in a quasi-reversible process with consecutive PE assembly. For the strong PE pair, poly(diallyldimethylammonium chloride)/poly(sodium styrene sulfonate), the differences among polycation and polyanion-terminated microgels are not sustained after the first PE bilayer due to extensive ionic cross-linking between the polyelectrolytes. The tendencies across the explored systems became less noteworthy in solutions with larger ionic strength due to overall charge shielding of the polyelectrolytes and microgel. ATR FT-IR studies correlated the swelling and responsive behavior after LbL assembly on the microgels with the extent of H-bonding and alternating charge distribution within the gel. Thus, the proposed LbL strategy may be a simple and flexible way to engineer smart microgels in terms of size, surface chemistry, overall charge and permeability.

Costa, E., et al. (2018). "Development of an artifact to attenuate whole-body vibration in agricultural tractors." Energia na Agricultura **33**(1): 22-26.

The use of tractors in agriculture is a key element in increasing productivity and quality of agricultural production, as it is able to perform operations in less time, more efficiently and decrease production costs. Although tractors provide increased productivity, their use can damage the machine operator health, that is exposed to problems such as vibration when using the tractor. Over the years, the weight of agricultural tractors without ballast has decreased due to the development of lighter materials and increase in displacement speeds, what can cause vibration and increase operator health problems. The objective of the work was to develop an artifact to attenuate the whole body vibrations (VCI) to which the agricultural tractor operator is exposed. The experimental design was completely randomized, in which three treatments were evaluated, using two attenuating materials on the seat (viscoelastic foam and polystyrene microbeads) and one without attenuation (control treatment). Readings were taken with 3 min of duration, and every 10 s a sample was collected totaling 18 samples collected for each repetition, with 5 replicates for each treatment. Statistical analysis of the data was performed using ASSISTAT statistical software. To verify the normality of the data, the Anderson-Darling test was performed. After the normality of the data was confirmed, they were submitted to analysis of variance by the F test, and when significant, the means were compared by the Tukey test, at 5% significance. According to the results obtained, the viscoelastic foam and the polystyrene micro-beads presented VDVR and lower area values, within the acceptable level established by the NR-15, which characterizes the materials used as good alternative attenuation. Both materials used showed similar attenuation.

Costa, L. L., et al. (2019). "Can the Atlantic ghost crab be a potential biomonitor of microplastic pollution of sandy beaches sediment?" Marine Pollution Bulletin **145**: 5-13.

The objective of the present study was to test whether the Atlantic ghost crab Ocypode quadrata is a reliable biomonitor of microplastic (MP) pollution of beach sediments. To test the hypothesis (H1) that the sediment is the main source of MP ingestion, the proportion of MP types (hard plastic, microfibers, pellet, soft plastic, and extruded polystyrene foam) in the gut content was compared with that on the strandline. The types of MPs in the gut content and sediment had similar proportions; black (~49%) and blue (~45%) microfibers were responsible for this similarity (55%), hence confirming H1. However, the second hypothesis (H2) that prevalence of MP in the gut content is related to its density on beach with distinct urbanization degree was not accepted. These results indicate that high trophic plasticity of the ghost crab and, consequently, multiple-sources of contamination may interfere with its use as a biomonitor of MP pollution. Copyright © 2019

Costa, M. F. and M. Barletta (2015). "Microplastics in coastal and marine environments of the western tropical and sub-tropical Atlantic Ocean." Environmental Science. Processes & Impacts **17**(11): 1868-1879.

Microplastic pollution is a global issue. It is present even in remote and pristine coastal and marine environments, likely causing impacts of unknown scale. Microplastics are primary- and secondary-sourced plastics with diameters of 5 mm or less that are either free in the water column or mixed in sandy and muddy sediments. Since the early 1970s, they have been reported to pollute marine environments; recently, concern has increased as soaring amounts of microplastics in the oceans were detected and because the development of unprecedented processes involving this pollutant at sea is being unveiled. Coastal and marine environments of the western tropical and sub-tropical Atlantic Ocean (WTAO) are contaminated with microplastics at different quantities and from a variety of types. The main environmental compartments (water, sediments and biota) are contaminated, but the consequences are still poorly understood. Rivers and all scales of fishery activities are identified as the most likely sources of this pollutant to coastal waters; however, based on the types of microplastics observed, other maritime operations are also possible sources. Ingestion by marine biota occurs in the vertebrate groups (fish, birds, and turtles) in these environments. In addition, the presence of microplastics in plankton samples from different habitats of estuaries and oceanic islands is confirmed. The connectivity among environmental compartments regarding microplastic pollution is a new research frontier in the region.

Costa, M. F., et al. (2010). "On the importance of size of plastic fragments and pellets on the strandline: A snapshot of a Brazilian beach." Environmental Monitoring and Assessment **168**(1-4): 299-304.

Virgin plastic pellets and plastic fragments are reported as ubiquitous beach contaminants in the peer-reviewed literature. A surface density of 0.3 virgin plastic pellets and plastic fragments per square centimeter of the strandline area was registered on an urban beach of the northeast of Brazil. This beach is presently not affected by petrochemical facilities or pellet processing plants. The main source of fragments (96.7%) was attributed to the breaking down of larger plastic items deposited on the beach. In the case of virgin plastic pellets (3.3%), the main sources were the marine environment and possibly nearby port facilities. This category of plastic pollutant offers particular threats to the marine environment and to beach users. © 2009 Springer Science+Business Media B.V.

Costiuc, L., et al. (2015). "EXPERIMENTAL INVESTIGATION ON THE HEAT OF COMBUSTION FOR SOLID PLASTIC WASTE MIXTURES." Environmental Engineering & Management Journal (EEMJ) **14**(6): 1295-1302.

The aim of this paper is to determine the heat of combustion of plastic wastes resulted from municipal solid waste, automotive shredder facility waste and building and construction waste. The plastic wastes have been separated by flotation technique using as flotation media: water, ethanol, their mixtures and magnetic fluid. Resulted fractions have been analyzed aiming to determine the most effective fraction from the heat of combustion point of view. The obtained results have been compared to those reported in the literature, with those calculated by oxygen consumption method and those proposed in this paper and calculated by weighted sum of combustion heat of components, aiming to allow its approximation for different fractions of polymeric wastes with known composition, avoiding the experimental measurements. Deviations of measured values of the heat of combustion from those obtained by theoretical calculation have been explained by the polymer degradation during their life cycle. The most effective fraction from calorific point of view is that containing polyolefins, but this fraction could be mechanically recycled. The present study evidenced that the heat of combustion of the plastic waste decreases after polyolefin extraction and the remaining density fractions can be effectively used for energy recovery of the plastic waste by incineration. [ABSTRACT FROM AUTHOR]

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Cotruvo, J. P. B. (2019). Managing plastic microparticles in water. Water Technology. Latham, National Trade Publications Incorporated. **42:** 8.

Cotruvo focuses on the management of plastic microparticles in water. More recently, microplastic particles have been detected in seawater, freshwaters and drinking waters, including bottled waters and foods. Environmental plastics are a risk to aquatic organisms from ingestion; they are unsightly and indicative of gross mismanagement of disposal of plastic wastes. For perspective, the maximum contaminant level (MCL) for asbestos microparticles in drinking water is 7,000,000 fibers per liter longer than 10 µm. Ingested plastic microparticles have not yet been shown to produce adverse human health effects.

Coudron, L., et al. (2019). "Fully integrated digital microfluidics platform for automated immunoassay; A versatile tool for rapid, specific detection of a wide range of pathogens." Biosensors & Bioelectronics **128**: 52-60.

With the tangible threat posed by the release of chemical and biological warfare (CBW) agents, detection of airborne pathogens is a critical military and security concern. Recent air sampling techniques developed for biocollection take advantage of Electrowetting on Dielectric (EWOD) to recover material, producing highly concentrated droplet samples. Bespoke EWOD-based digital microfluidics platforms are very well suited to take full advantage of the microlitre concentrated droplet resulting from this recovery process. In this paper we present a free-standing, fully automated DMF platform for immunoassay. Using this system, we demonstrate the automated detection of four classes of CBW agent simulant biomolecules and organisms each representing credible threat agents. Taking advantage of the full magnetic separation process with antibody-bound microbeads, rapid and complete separation of specific target antigen can be achieved with minimal washing steps allowing for very rapid detection. Here, we report clear detection of four categories of antigens achieved with assay completion times of between six and ten minutes. Detection of HSA, Bacillus atrophaeus (BG spores), MS2 bacteriophage and Escherichia coli are demonstrated with estimated limit of detection of respectively 30ngml⁻¹, 4x10⁴ cfuml⁻¹, 10⁶ pfuml⁻¹ and 2x10⁷ cfuml⁻¹. The fully-integrated portable platform described in this paper is highly compatible with the next generation of electrowetting-coupled air samplers and thus shows strong potential toward future in-field deployable biodetection systems and could have key implication in life-changing sectors such as healthcare, environment or food security.

Courtene-Jones, W., et al. (2019). "Consistent microplastic ingestion by deep-sea invertebrates over the last four decades (1976–2015), a study from the North East Atlantic." Environmental Pollution **244**: 503-512.

Although evidence suggests the ubiquity of microplastics in the marine environment, our knowledge of its occurrence within remote habitats, such as the deep sea, is scarce. Furthermore, long term investigations of microplastic abundances are even more limited. Here we present a long-term study of the ingestion of microplastics by two deep-sea benthic invertebrates (Ophiomusium lymani and Hymenaster pellucidus) sampled over four decades. Specimens were collected between the years 1976–2015 from a repeat monitoring site >2000 m deep in the Rockall Trough, North East Atlantic. Microplastics were identified at a relatively consistent level throughout and therefore may have been present at this locality prior to 1976. Considering the mass production of plastics began in the 1940s - 50s our data suggest the relatively rapid occurrence of microplastics within the deep sea. Of the individuals examined (n = 153), 45% had ingested microplastics, of which fibres were most prevalent (95%). A total of eight different polymer types were isolated; polyamide and polyester were found in the highest concentrations and in the majority of years, while low-density polystyrene was only identified in 2015. This study provides an assessment of the historic occurrence of microplastics on the deep seafloor and presents a detailed quantification and characterisation of microplastics ingested by benthic species. Furthermore these data advance our knowledge on the long-term fate of microplastic in marine systems. Graphical abstract Image 1 Highlights • First long-term study of microplastic pollution in the deep sea. • Ingested microplastic abundance remained relatively consistent 1976–2015. • Data indicate microplastics may have been present at this location prior to 1976. • No trends were observed in polymer type or overall abundance across years. • Eight polymers were identified of which polyamide and polyester dominated. This unique dataset reveals consistent levels of microplastics were ingested by deep-sea invertebrates since 1976, indicating the long-term occurrence of microplastic pollution in this region. [ABSTRACT FROM AUTHOR]

Courtene-Jones, W., et al. (2017). "Microplastic pollution identified in deep-sea water and ingested by benthic invertebrates in the Rockall Trough, North Atlantic Ocean." Environmental Pollution **Part 1. 231**: 271-280.

Microplastics are widespread in the natural environment and present numerous ecological threats. While the ultimate fate of marine microplastics are not well known, it is hypothesized that the deep sea is the final sink for this anthropogenic contaminant. This study provides a quantification and characterisation of microplastic pollution ingested by benthic macroinvertebrates with different feeding modes (Ophiomusium lymani, Hymenaster pellucidus and Colus jeffreysianus) and in adjacent deep water > 2200 m, in the Rockall Trough, Northeast Atlantic Ocean. Despite the remote location, microplastic fibres were identified in deep-sea water at a concentration of 70.8 particles m⁻³, comparable to that in surface waters. Of the invertebrates examined (n = 66), 48% ingested microplastics with quantities enumerated comparable to coastal species. The number of ingested microplastics differed significantly between species and generalized linear modelling identified that the number of microplastics ingested for a given tissue mass was related to species and not organism feeding mode or the length or overall weight of the individual. Deep-sea microplastics were visually highly degraded with surface areas more than double that of pristine particles. The identification of synthetic polymers with densities greater and less than seawater along with comparable quantities to the upper ocean indicates processes of vertical re-distribution. This study presents the first snapshot of deep ocean microplastics and the quantification of microplastic pollution in the Rockall Trough. Additional sampling throughout the deep-sea is required to assess levels of microplastic pollution, vertical transportation and sequestration, which have the potential to impact the largest global ecosystem. Microplastics were identified in deep-sea benthic invertebrates and adjacent water >2200 m deep in the Rockall Trough with quantities comparable to surface concentrations. Copyright © 2017 Elsevier Ltd

Cousin, H. R., et al. (2015). "The frequency of ingested plastic debris and its effects on body condition of Short-tailed Shearwater (Puffinus tenuirostris) pre-fledging chicks in Tasmania, Australia." Emu - Austral Ornithology **115**(1): 6-11.

In recent years, there have been increasing reports of ingestion of marine plastic debris in seabirds. Our aim was to assess the frequency and effects of ingested plastic debris in pre-fledging Short-tailed Shearwaters (Puffinus tenuirostris) in Tasmania. We conducted necropsies of 171 Shearwater chicks, confiscated after illegal poaching, to determine the presence of plastic debris in the proventriculus and ventriculus. We also examined whether there was a correlation between body condition (based on body mass and fat-scores) and quantity of plastic ingested (by count and weight). We recorded 1032 ingested plastic particles, consisting of industrial plastic (31%) and user plastic (69%). Most of the Shearwater chicks (96%) contained plastic debris with a mean of 148.1 mg per bird (s.e. 8.1). Most plastic was found in the ventriculus. Light-coloured plastic dominated (63.8%), with the rest medium (22.1%) and dark (14.1%) plastics. We found that total mass of ingested plastic was not significantly related to body condition, or fat-scores or mass individually. Our study highlights the prevalence of

plastic pollution in apparently healthy Shearwater chicks and underscores concern regarding the effects of increasing marine pollution on a global scale. Additional keywords: industrial plastic, marine debris, nurdles, plastic colour, plastic pollution, user plastic.

Cousins, D. (2009). "Untitled." Farmers Weekly: 98-98.
The article features a dog-kennel, which is one of the latest additions to products to be created using recycled farm plastic waste collected from farms by the National Farmers Recycling Service in Dumfries, Scotland in 2009. Other products to be made using such materials are cited, including chicken cages.

Couto, J. A., et al. (2017). "Somatic PIK3CA mutations are present in multiple tissues of facial infiltrating lipomatosis." Pediatric Research **82**(5): 850-854.
BackgroundFacial infiltrating lipomatosis (FIL) is a congenital disorder that causes overgrowth of one side of the face. The purpose of this study was to determine whether PIK3CA mutations are present in tissues outside of the subcutaneous adipose.

Couture, O., et al. (2006). "A model for reflectivity enhancement due to surface bound submicrometer particles." Ultrasound in Medicine & Biology **32**(8): 1247-1255.
Submicrometer particles filled with liquid perfluorocarbon have been shown to increase the ultrasound reflectivity of surfaces onto which they bind and, consequently, are seen as potential targeted contrast agents. The objective of this study is to explain the reflectivity enhancement as a result of the presence of randomly distributed particles on a surface. A model is presented where the diffraction-weighted scattering of all particles is summed over the exposed surface. Experiments were performed at frequencies ranging from 15 MHz to 60 MHz, with glass microbeads and perfluorohexane particles deposited on the surface of agar and Aqualene, a rubber closely matched to water, to confirm the validity of the model.

Covernton, G. A., et al. (2019). "Microplastics in bivalves and their habitat in relation to shellfish aquaculture proximity in coastal British Columbia, Canada." Aquaculture Environment Interactions **11**: 357.
Shellfish aquaculture often uses large amounts of plastic equipment and has been suggested as a potential source of microplastic contamination in the marine environment. To determine the influence of shellfish aquaculture on microplastic concentrations in bivalves and their environment, we compared microplastic particle (MP) concentrations in Manila clams Venerupis philippinarum and Pacific oysters Crassostrea gigas grown on commercial shellfish beaches with those in individuals of the same species grown on nearby non-aquaculture beaches in 6 regions of coastal British Columbia, Canada. MP concentrations did not differ between shellfish aquaculture and non-aquaculture sites for either bivalve species, sediment, or water samples. Plastic presence differed by site and oysters on sites with many synthetic anti-predator nets contained significantly, yet marginally, more MPs than those on sites without (0.05 vs. 0.03 g^{-1} dry-tissue weight on average). However, analysis of suspected MPs using Fourier-transform infrared spectroscopy indicated a predominance of fibres from textiles (including nylon and polyester), which are not typically used in shellfish aquaculture, suggesting that this may be caused by the larger average body weight of oysters grown at non-aquaculture sites rather than by the degradation of aquaculture infrastructure.

Covernton, G. A. and K. Cox (2019). "Commentary on: Abundance and distribution of microplastics within surface sediments of a key shellfish growing region of Canada." PLoS ONE [Electronic Resource]

14(12): e0225945.

This formal comment is in response to "Abundance and distribution of microplastics within surface sediments of a key shellfish growing region of Canada" written by Kazmiruk and colleagues in 2018. This article presents microplastics concentrations in sediment, primarily microbeads, within Baynes Sound, British Columbia, which are some of the highest that have been reported anywhere in the world. The authors cite the local shellfish industry as the likely source of this high degree of contamination and present the industry as a substantial risk to the environment. However, the authors do not sufficiently justify the efficacy of their methodology, and there are several flaws which call into question the legitimacy of their findings. In this commentary, we address the microplastic abundances reported by the authors, and methodological concerns. Furthermore, we provide additional data to elucidate some of this study's more contentious findings. Specifically, we seek to clarify the visual identification of microbeads and microfibres, and the microplastic concentration within shellfish populations, water, and sediment, within the Baynes Sound shellfish growing region.

Covernton, G. A., et al. (2019). "Size and shape matter: A preliminary analysis of microplastic sampling technique in seawater studies with implications for ecological risk assessment." Science of the Total Environment **667**: 124-132.

Microplastic particles (MPs) are widely distributed in seawater. Fibrous MPs (microfibres) are often reported as the most commonly encountered shape of particle. To estimate MP concentrations in seawater, samples are often collected using towed nets (generally 300-350-mum mesh) and may underestimate the amount of microfibres present, which may pass through the mesh due to their narrow width. We compared the potential microplastic particle (PMP) concentration estimates provided by two different seawater sampling methods conducted at three commercial shellfish farms and three unfarmed sites in Baynes Sound, British Columbia, Canada. The methods were: 10-L bucket samples sieved through 63-mum mesh in situ and subsequently filtered through an 8-mum polycarbonate membrane; and 1-L bulk samples collected in jars and subsequently filtered to 8mum. The jar samples yielded PMP concentrations averaging approximately 8.5 times higher than the bucket samples per L of water (at the site level), largely driven by differences in the number of microfibres. There was no significant difference in PNP concentration between shellfish farms and unfarmed sites. An analysis of MP concentrations and mesh sizes reported in the literature suggests that using a 300-350-mum mesh may underestimate total MP concentrations by one to four orders of magnitude compared with samples that are filtered through much smaller mesh sizes (e.g. <100mum), despite the effect of sample volume. Particles <300mum in diameter make up a large component of MPs commonly found in fish and invertebrates. As such, common sampling practices fail to adequately measure a biologically relevant class of MPs, thereby undermining the ability to quantify ecological risk. We suggest that seawater sampling methods be designed to filter to <10mum (the approximate width of many microfibres), either using pressurized pumps for large-volume samples, or by using sufficient replication of small-volume discrete samples.

Cowger, W., et al. (2019). "Anthropogenic litter cleanups in Iowa riparian areas reveal the importance of near-stream and watershed scale land use." Environmental Pollution **250**: 981-989.

Volunteer cleanup operations collect large datasets on anthropogenic litter that are seldom analyzed. Here we assess the influence of land use in both near-stream and watershed scale source domains on anthropogenic litter concentration (standing stock, kg km⁻¹) in riparian zones of Iowa, USA. We utilized riparian litter concentration data on four classes of

anthropogenic litter (metal, recyclable, garbage, and tires) from volunteer cleanup operations. Anthropogenic litter data were tested for correlation with near-stream and watershed scale land uses (developed, road density, agricultural, and open lands). Road density (road length/area) and developed land use (% area) were significantly correlated to anthropogenic litter, but agricultural (% area) and open lands (% area) were not. Metal objects correlated to near-stream road density (r=0.79, p=0.02), while garbage and recyclable materials correlated to watershed scale road density (r=0.69, p=0.06 and r=0.71, p=0.05 respectively). These differences in the important spatial scales of land use may be related to differences in transport characteristics of anthropogenic litter. Larger, denser metal objects may be transported more slowly through the watershed/channelized system and thus, dependent on more proximal sources, whereas smaller, less dense garbage and recyclable material are likely transported more rapidly, resulting in concentrations that depend more on watershed scale supply. We developed a linear regression model that used near-stream road density and the total amount of observed litter to predict an average anthropogenic litter density of 188kgkm⁻¹ and a standing stock of 946t in all Iowa streams (>4th Strahler order). The techniques employed in this study can be applied to other professional and volunteer litter datasets to develop prevention and cleanup efforts, inform investigations of process, and assess management actions.

Cox, J. A., et al. (2014). "Woodchip or weedmat? A comparative study on the effects of mulch on soil properties and blueberry yield." Acta Horticulturae.

Blueberry growers in northern New South Wales, Australia, wanted to replace black plastic weedmat with woodchip fines mulch to reduce plastic waste and improve soil condition. Experiments were established to compare the effects of two mulch treatments on berry yield, plant size, soil compaction and soil microbial activity over three years. Southern highbush Vaccinium x corymbosum 'Star' seedlings were planted on three soil types, with 5 cm of woodchip or plastic weedmat applied to each plot. After three years, woodchip treatment increased berry yield by 81% on one soil type (grey gravelly silty loam), but was not significant on two other soil types (red loam, red silty loam). Canopy volume also increased with woodchip at the grey silty loam site, for a six month period in the red silty loam but not at the red loam site. Soil compaction (bulk density) was reduced with woodchip treatments in two of the three soil types. There was no difference in soil microbial activity. The improvements after woodchip application were most beneficial to compacted soils.

Cox, K. D., et al. (2019). "Human Consumption of Microplastics." Environmental Science & Technology **53**(12): 7068-7074.

Microplastics are ubiquitous across ecosystems, yet the exposure risk to humans is unresolved. Focusing on the American diet, we evaluated the number of microplastic particles in commonly consumed foods in relation to their recommended daily intake. The potential for microplastic inhalation and how the source of drinking water may affect microplastic consumption were also explored. Our analysis used 402 data points from 26 studies, which represents over 3600 processed samples. Evaluating approximately 15% of Americans' caloric intake, we estimate that annual microplastics consumption ranges from 39000 to 52000 particles depending on age and sex. These estimates increase to 74000 and 121000 when inhalation is considered. Additionally, individuals who meet their recommended water intake through only bottled sources may be ingesting an additional 90000 microplastics annually, compared to 4000 microplastics for those who consume only tap water. These estimates are subject to large amounts of variation; however, given methodological and data limitations, these values are likely underestimates.

Cox, T. (2014). "Introducing the Good Scrub Guide." Oryx **48**(1): 13-13.

The article reports on the challenges confronting marine conservation which focuses on plastic pollution. Noted in the 2012 Convention on Biological Diversity is the ingestion of marine debris of 247 species. Highlighted is the merging area of research in micropasltic pollution wherein plastic particles have been found to have implications for the health of oceans. Indicated is the Good Scrub Guide by the Fauna and Flora International (FFI) marine program which addresses microplastic pollution.

Coyne, K. (2010). "Beyond the bottle for better recovery rates." Local Authority Waste & Recycling **18**(11): 18-19.

The article focuses on the state of plastic recovery plants in Great Britain based on the Waste & Resources Action Programme report "Realising the Value of Recovered Plastics - An Update."The report states that plastic usage has grown by 1 percent a year to 5 million tonnes per annum, wherein over half of the consumption is meant for packaging. The report adds that 590,000 tonnes of plastics packaging were processed in 2010, although most of them are plastics recycled by businesses all over Great Britain.

Cózar, A., et al. (2014). "Plastic debris in the open ocean." Proceedings of the National Academy of Sciences of the United States of America **111**(28): 10239.

There is a rising concern regarding the accumulation of floating plastic debris in the open ocean. However, the magnitude and the fate of this pollution are still open questions. Using data from the Malaspina 2010 circumnavigation, regional surveys, and previously published reports, we show a worldwide distribution of plastic on the surface of the open ocean, mostly accumulating in the convergence zones of each of the five subtropical gyres with comparable density. However, the global load of plastic on the open ocean surface was estimated to be on the order of tens of thousands of tons, far less than expected. Our observations of the size distribution of floating plastic debris point at important size-selective sinks removing millimeter-sized fragments of floating plastic on a large scale. This sink may involve a combination of fast nano-fragmentation of the microplastic into particles of microns or smaller, their transference to the ocean interior by food webs and ballasting processes, and processes yet to be discovered. Resolving the fate of the missing plastic debris is of fundamental importance to determine the nature and significance of the impacts of plastic pollution in the ocean.

Cozar, A., et al. (2015). "Plastic accumulation in the Mediterranean sea." PLoS ONE [Electronic Resource] **10**(4): e0121762.

Concentrations of floating plastic were measured throughout the Mediterranean Sea to assess whether this basin can be regarded as a great accumulation region of plastic debris. We found that the average density of plastic (1 item per 4 m2), as well as its frequency of occurrence (100% of the sites sampled), are comparable to the accumulation zones described for the five subtropical ocean gyres. Plastic debris in the Mediterranean surface waters was dominated by millimeter-sized fragments, but showed a higher proportion of large plastic objects than that present in oceanic gyres, reflecting the closer connection with pollution sources. The accumulation of floating plastic in the Mediterranean Sea (between 1,000 and 3,000 tons) is likely related to the high human pressure together with the hydrodynamics of this semi-enclosed basin, with outflow mainly occurring through a deep water layer. Given the biological richness and concentration of economic activities in the Mediterranean Sea, the affects of plastic pollution on marine and human life are expected to be particularly frequent in this plastic accumulation region.

Crecea, V., et al. (2014). "High Resolution Phase-Sensitive Magnetomotive Optical Coherence Microscopy for Tracking Magnetic Microbeads and Cellular Mechanics." IEEE Journal of Selected Topics in Quantum Electronics **20**(2).

We present a real-time multimodal near-infrared imaging technology that tracks externally induced axial motion of magnetic microbeads in single cells in culture. The integrated multimodal imaging technique consists of phase-sensitive magnetomotive optical coherence microscopy (MM-OCM) and multiphoton microscopy (MPM).MPMis utilized for the visualization of multifunctional fluorescent and magnetic microbeads, while MM-OCM detects, with nanometer-scale sensitivity, periodic displacements of the microbeads induced by the modulation of an external magnetic field. Magnetomotive signals are measured from mouse macrophages, human breast primary ductal carcinoma cells, and human breast epithelial cells in culture, and validated with full-field phase-sensitive microscopy. This methodology demonstrates the capability for imaging controlled cell dynamics and has the potential for measuring cell biomechanical properties, which are important in assessing the health and pathological state of cells.

Crestani, S., et al. (2016). "Enhanced target-specific signal detection using an Escherichia coli lysate in multiplex microbead immunoassays with E. coli-derived recombinant antigens." Journal of Immunological Methods **435**: 17-26.

Diverse techniques have been developed to analyze antibody-mediated responses to infections. However, the most common tests, i.e., enzyme-linked immunosorbent assays, require separate reactions for each antigen and consequently necessitate large sample volumes. Luminex technology allows the detection of multiple antibodies in a single experiment, but nonspecific binding can impair the results. Therefore, we examined the use of Escherichia coli lysates to reduce nonspecific binding and improve the results of liquid microarrays based on Luminex technology. Anti-bacteria antibodies were detected in human serum samples, as evidenced by high median fluorescence intensity (MFI) in assays performed with paramagnetic microspheres coupled with E. coli lysates. Moreover, the addition of an E. coli lysate as a blocker reduced the nonspecific binding of antigens produced by E. coli in a concentration-dependent manner. Tris-HCl reduced MFI values in negative samples, but did not affect MFI for positive samples. For microspheres coupled with different antigens, an E. coli lysate blocker significantly improved the fluorescence signals from positive samples. The addition of Tris-HCl and the E. coli lysate induced antigen-specific differences in MFI. This combination of the E. coli lysate blocker and Tris-HCl yielded a statistically significant improvement in MFI in the assays for Chagas disease and hepatitis C virus samples. However, for the Treponema pallidum p47 antigen improvement in MFI was only observed for the preparation with the E. coli blocker at a concentration of 3%. In conclusion, the addition of an E. coli lysate and Tris-HCl to the microarray assay reduced the nonspecific binding of human anti-bacteria antibodies and, therefore, increased the specific MFI.

Cribb, J., et al. (2015). "A high throughput array microscope for the mechanical characterization of biomaterials." Review of Scientific Instruments **86**(2): 023711.

In the last decade, the emergence of high throughput screening has enabled the development of novel drug therapies and elucidated many complex cellular processes. Concurrently, the mechanobiology community has developed tools and methods to show that the dysregulation of biophysical properties and the biochemical mechanisms controlling those properties contribute significantly to many human diseases. Despite these advances, a complete understanding of the connection between biomechanics and disease will require advances in instrumentation that enable parallelized, high throughput assays capable of probing complex signaling pathways, studying biology in physiologically relevant conditions, and capturing specimen and mechanical heterogeneity. Traditional biophysical instruments are unable to meet this need. To address the challenge of large-scale, parallelized biophysical measurements, we have developed an automated array high-throughput microscope system that utilizes passive microbead diffusion to characterize mechanical properties of biomaterials. The instrument is capable of acquiring data on twelve-channels simultaneously, where each channel in the system can independently drive two-channel fluorescence imaging at up to 50 frames per second. We employ this system to measure the concentration-dependent apparent viscosity of hyaluronan, an essential polymer found in connective tissue and whose expression has been implicated in cancer progression.

Crichton, E. M., et al. (2017). "A novel, density-independent and FTIR-compatible approach for the rapid extraction of microplastics from aquatic sediments. (Special Issue: Microplastics in the environment.)." Analytical Methods **9**(9): 1419-1428.

Microplastics have been detected in aquatic sediments around the world, highlighting the propensity of this matrix to serve as a sink for these structural pollutants. More reliable and reproducible extraction protocols for microplastics would facilitate comparisons across studies. A number of different extraction techniques are currently used to separate microplastics from sediment and almost exclusively employ density-based separations, which take advantage of the inherent densities of plastic particles. Some of these techniques are cost-effective but fail to fully recover all plastic types. Other techniques may recover most plastic types, but are more costly and/or hazardous to human or environmental health. We present here a novel, cost-effective oil extraction protocol (OEP) that provides an alternative to density-based approaches by taking advantage of the oleophilic properties of microplastics. Using this technique, we counted microplastic particles in spiked sediment samples using light microscopy and observed 96.1%+or-7.4 recovery for total microplastics, with recovery rates of 92.7%+or-4.3 for fibers and 99%+or-1.4 for particles. Subsequent analysis with Fourier-Transform Infrared Spectrometry (FTIR) revealed that the oil interfered with the FTIR spectrum of microplastics, but that an additional, post-extraction clean-up step using ethyl alcohol (90%) removed residual traces of oil and eliminated the FTIR spectral interference. The application of this new technique to shoreline sediment samples collected from sites in urban Vancouver, British Columbia, Canada, and a remote beach on Vancouver Island, as well as bulk seawater, demonstrated that the oil extraction protocol is effective for environmental samples. This novel OEP represents a cost-effective and reliable alternative to leading density-based techniques.

Critchell, K., et al. (2019). "Predicting the exposure of coastal species to plastic pollution in a complex island archipelago." Environmental Pollution **252**(Part B): 982-991.

Plastic pollution in the marine environment is a pervasive and increasing threat to global biodiversity. Prioritising management actions that target marine plastic pollution require spatial information on the dispersal and settlement of plastics from both local and external sources. However, there is a mismatch between the scale of most plastic dispersal studies (regional, national and global) and the scale relevant to management action (local). We use a fine-resolution hydrodynamic model to predict the potential exposure of coastal habitats and species (mangroves, coral reefs and marine turtles) to plastic pollution at the local scale of a management region (the 1,700 km² Whitsunday Islands, Queensland, Australia). We assessed the potential exposure of mangroves, coral reefs and marine turtles to plastics during the two dominant wind conditions of the region; the trade wind and monsoon wind seasons. We found that in the trade wind season (April to September) all habitats and species had lower exposure than during the monsoon wind season (October to March). In both wind seasons we found a small proportion of coral reef habitat and large area of turtle habitat were in high potential exposure categories. Unlike coral reefs or marine turtles, mangroves had consistent hotspots of high exposure across wind seasons. Local scale management requires data at fine resolution to capture the variability that occurs at this scale. The outputs of our study can inform the development of conservation resources and local scale management action.

Critchell, K. and J. Lambrechts (2016). "Modelling accumulation of marine plastics in the coastal zone; what are the dominant physical processes?" Estuarine, Coastal and Shelf Science **171**: 111-122.

Anthropogenic marine debris, mainly of plastic origin, is accumulating in estuarine and coastal environments around the world causing damage to fauna, flora and habitats. Plastics also have the potential to accumulate in the food web, as well as causing economic losses to tourism and sea-going industries. If we are to manage this increasing threat, we must first understand where debris is accumulating and why these locations are different to others that do not accumulate large amounts of marine debris. This paper demonstrates an advection-diffusion model that includes beaching, settling, resuspension/re-floating, degradation and topographic effects on the wind in nearshore waters to quantify the relative importance of these physical processes governing plastic debris accumulation. The aim of this paper is to prioritise research that will improve modelling outputs in the future. We have found that the physical characteristic of the source location has by far the largest effect on the fate of the debris. The diffusivity, used to parameterise the sub-grid scale movements, and the relationship between debris resuspension/re-floating from beaches and the wind shadow created by high islands also has a dramatic impact on the modelling results. The rate of degradation of macroplastics into microplastics also have a large influence in the result of the modelling. The other processes presented (settling, wind drift velocity) also help determine the fate of debris, but to a lesser degree. These findings may help prioritise research on physical processes that affect plastic accumulation, leading to more accurate modelling, and subsequently management in the future.

Critchfield, A., et al. (2012). "Permeability properties of cervical mucus in women at high risk for preterm birth." American Journal of Obstetrics and Gynecology **1)**: S207.

OBJECTIVE: Cervical mucus is an important defensive barrier to ascending infection during pregnancy. Our OBJECTIVE was to study permeability properties of cervical mucus from women at high risk of preterm birth. STUDY DESIGN: Cervical mucus samples were aspirated from the external cervical os and flash frozen or used fresh (within 4 hours). Two assays were performed: bead permeability and bioinfectivity. For bead permeability, mucus samples were applied to streptavidin coated glass slides. Biotin-labeled, fluorescent polystyrene microbeads (0.2 micron Fluorospheres, 25,000 beads/well) were applied to the mucus samples. After two hours, beads passing through the mucus and bound to the bottom of the slide were visualized with fluorescence microscopy (10x). Controls included mucus samples from women at low risk for preterm birth. For bioinfectivity, mucus samples (50 uL) were applied to 96 well plates pre-plated with HeLa cells. Human Papilloma Virus (HPV) particles containing green fluorescent protein (GFP) reporter vectors were applied the mucus samples. Virus particles passing through the mucus samples infected the HeLa cells. Infected cells expressed GFP which was detected with flow cytometry. RESULT(S): Mucus samples were collected from 25 women with singleton pregnancies (20 - 34 wks) at high risk (n=11) and low risk (n=14) for preterm birth. Mean volume of cervical mucus obtained was 220 uL. Cervical mucus from high risk subjects showed increased permeability to microbeads compared to low risk subjects (5.8 beads/field vs 2.2 beads/field, p = 0.03). The bioinfectivity assay showed no significant difference in GFP expression in HeLa cells exposed to frozen vs fresh cervical mucus (5.3% vs 4.2%, p=0.3). Significantly fewer HeLa cells expressed GFP when exposed to mucus compared to buffer (4.6% vs 73.3%, p = 0.001). CONCLUSION(S): Our results suggest increased permeability of cervical mucus from women at high risk for preterm birth compared to low risk women. Investigation of cervical mucus permeability properties could improve our understanding of cervical barrier function during pregnancy.

Critchfield, A. S., et al. (2013). "Cervical Mucus Properties Stratify Risk for Preterm Birth." PLoS ONE **8 (8) (no pagination)**(e69528).

Background:Ascending infection from the colonized vagina to the normally sterile intrauterine cavity is a well-documented cause of preterm birth. The primary physical barrier to microbial ascension is the cervical canal, which is filled with a dense and protective mucus plug. Despite its central role in separating the vaginal from the intrauterine tract, the barrier properties of cervical mucus have not been studied in preterm birth.Methods and Findings:To study the protective function of the cervical mucus in preterm birth we performed a pilot case-control study to measure the viscoelasticity and permeability properties of mucus obtained from pregnant women at high-risk and low-risk for preterm birth. Using extensional and shear rheology we found that cervical mucus from women at high-risk for preterm birth was more extensible and forms significantly weaker gels compared to cervical mucus from women at low-risk of preterm birth. Moreover, permeability measurements using fluorescent microbeads show that high-risk mucus was more permeable compared with low-risk mucus. Conclusion(s):Our findings suggest that critical biophysical barrier properties of cervical mucus in women at high-risk for preterm birth are compromised compared to women with healthy pregnancy. We hypothesize that impaired barrier properties of cervical mucus could contribute to increased rates of intrauterine infection seen in women with preterm birth. We furthermore suggest that a robust association of spinnbarkeit and preterm birth could be an effectively exploited biomarker for preterm birth prediction. © 2013 Critchfield et al.

Crowther, D. C., et al. (2014). "Anassay for seeded proteinaggregation detects abeta seeds in serum." Alzheimer's and Dementia **4)**: P271.

Background: Many common neurodegenerative disorders are characterised by progressive protein aggregation. In Alzheimer's disease the principal pathologies of interest are amyloid plaques composed of the amyloid-beta peptide (Abeta) and tangles comprised of tau. The spread of pathology within the brain is thought to be mediated by a prionlike seeding process that accelerates the aggregation of susceptible polypeptides in the neighbourhood of existing deposits. Soluble seeds of Abeta may travel widely: between neurones or even to the CSF and peripheral circulation. Method(s): We measure seeded Abeta aggregation in brain and blood extracts from animal models of Alzheimer's disease. Firstly we examine brains from Drosophila melanogaster expressing the Abeta peptide versus non-expressing controls. Secondly we assess brain and serum from aged CRND8 mice and compare them to their non-transgenic littermate controls. Brains are homogenised in PBS followed by dilution to give a protein concentration of 3 mg/ml. Serum is diluted to 3 mg/ml in PBS.Our assay uses microfluidic apparatus to compartmentalise these crude biological extracts into aqueous droplets (50 mm diameter) containing fluorescent-labelled Abeta42 peptide along with molten agarose (37degreeC). The droplets are cooled to room temperature, whereupon the agarose forms a gel, and are then incubated for up to 3 hr. Following this incubation the oil phase is removed and the uncoated agarose microbeads are washed to remove unincorporated fluorescent peptide. Result(s): Seeded aggregates are marked by their having incorporated fluorescent- labelled Abeta during the incubation step. Aggregates that are larger than MW 1000 kDa are retained within the agarose matrix and are detected and quantified by fluorescence activated cytometry (FACS). Over 10,000 beads are assessed for each assay.In the brain extracts we see significantly higher fluorescence signals in microbeads derived from AD-affected organisms as compared to controls. Remarkably this higher fluorescence signal is also seen in the serum samples from affected mice. Conclusion(s): These data indicate that Abeta-seeding activity can be detected in the brain and serum of models of Alzheimer's disease.We are now testing human clinical samples as this assay may provide novel prognostic and/or diagnostic tools in humans.

Cruickshank, G., et al. (2018). "Local delivery of irinotecan to recurrent glioblastoma at reoperation offers a safe therapeutic advantage over systemic delivery." Neuro-Oncology **20 (Supplement 1)**: i1.

Direct drug delivery to a brain tumours offers the surety of access, together with the potential to realise at least therapeutic concentrations. With previously used systemic drugs toxicity and removal mechanisms are avoided. With new formulations drug activation and duration can be explored for low local toxicity, and tumour impact with sequential imaging. In this early study Irinotecan a drug with known efficacy against glioma but with limiting systemic toxicity has been incorporated into biodegradeable hydrogel microspheres and injected into the post-surgical cavity wall in patients with recurrent glioblastoma. 10 patients with focally recurrent GBM were recruited with 9 undergoing injection with up to 3mls of microbeads in alginate suspension in up to 60 ~ 8mm injection tracks after surgical resection (100mg). Patients were assessed for immediate (72hrs) toxicity with clinical assessment and imaging. Pharmacokinetic determination of Irinotecan and SN 38 active metabolite allowed confirmation of activation and comparator with known plasma toxicity profiles. Follow-up was planned for a minimum of 6/12 for SAE but continued to allow overall survival estimation. No overt SAE were determined for this group of patients with imaging and steroid use indicating less local swelling and wound healing issues than have been demonstrated for Carmustine wafers despite early offloading. Phamacokinetic measures (SN38 plasma curves) indicate a much higher activation of Irinotecan (>90%) than expected but shorter period of exposure. Survival curves suggest clinical benefit with 4/9 patient living longer than 8 months warranting further exploration of this safe approach.

Cruz-Aldaco, K., et al. (2014). "Surface adhesion fermentation for lipase production by Mucor griseocyanus." Micologia Aplicada International **26**(1): 9-16.

The lipase production by Mucor griseocyanus was evaluated using surface adhesion fermentation. Plastic particles, covered with fungal biomass, were produced in the first experimental step. Erlenmeyer flasks (250 ml) were used with whey as culture medium, polystyrene foam as support for fungal growth, and olive oil as inducer for lipase activity. Kinetics were monitored during 72 h of culture time. In a second experimental step, an airlift bioreactor was packed with the plastic particles covered with fungal biofilm and used for production of lipases in batch conditions employing whey supplemented with olive oil. Evaluation of operational conditions indicated that the maximum level of activity was obtained at 60 C and at pH 6.0. It was demonstrated that the fungus grown by adhesion on plastic particles produced the highest activity level (133 U L⁻¹) at 60 h, however, fungal biofilms obtained at 72 h of surface adhesion fermentation had a lipolytic activity at 94 U L⁻¹. For this reason, under these culture conditions, the fungal particles were

produced and then packed into the airlift bioreactor where the lipase activity was enhanced. Two sequential batches were evaluated using the same particles of polystyrene foam covered by fungal biomass. The fungal covered particles can be used and reused to produce lipases.

Cruz-Campos, A., et al. (2019). "Performance Evaluation of the Noveos Specific Ige D001 and D002* (House Dust Mite) Assays." Annals of Allergy, Asthma and Immunology **123 (5 Supplement)**: S21.

Introduction: Determination of allergen-specific IgE (sIgE) is beneficial for the evaluation and diagnosis of various hypersensitivity disorders. The NOVEOSTM Immunoassay Analyzer is a novel, high throughput automated platform that utilizes magnetic microbeads in combination with fluorescence and chemiluminescence signals to quantify allergen-sIgE present in human serum. The analytical performance of the NOVEOS devices was evaluated with the NOVEOS sIgE D001, D. pteronyssinus, and D002, D. farinae, assays. Method(s): The NOVEOS sIgE assay precision and functional sensitivity were evaluated in accordance with CLSI EP05-A3. Limit of Blank (LoB) and Limit of Detection (LoD) were estimated in accordance with CLSI EP17-A2. Assay linearity was assessed in accordance with CLSI I/LA20-A3. Cross reactivity of non-IgE immunoglobulin isotypes, endogenous, and exogenous interferences were evaluated in accordance with CLSI EP07-A2. Method comparison of NOVEOS and ImmunoCAPTM assay results was performed in accordance with CLSI EP09-A3 and CLSI EP24-A2. Result(s): The NOVEOS immunoassay analyzer produced overall repeatability <9%CV and within-lab precision <12%CV for the sIgE assay. Functional sensitivity was determined at 0.17 kU/L, while LoB/LoD measured <0.08kU/L. The performance for both allergens exhibited good linearity across the reportable range of the NOVEOS sIgE assay. No significant reactivity was observed for cross reactive, endogenous, and exogenous interferents. The system produced excellent clinical sensitivity to skin prick testing and generated acceptable agreement when compared to a commercially available device on over 100 human serum samples. Conclusion(s): The NOVEOS sIgE D001 and D002 assay on the NOVEOS immunoassay analyzer exhibited strong analytical performance for the determination of sIgE in human serum. Copyright © 2019

Cruz-Rodriguez, N., et al. (2016). "Gene expression signature predicts induction treatment response and clinical outcome in adult Colombian patients with acute lymphoblastic leukemia." Cancer Research. Conference: 107th Annual Meeting of the American Association for Cancer Research, AACR **76**(14 Supplement).

Background. In Colombia ALL in adults represents a public health problem because its incidence and mortality increase annually. Only 61% of Colombian adult patients with ALL achieve complete remission. The median overall survival to the disease is less than 11.3 months and the eventfree survival is 7.34 months. Identification of prognostic factors in patients with ALL is crucial for the proper planning of treatment strategies and the optimal results of therapy. Our goal was to determine gene expression signatures correlated with response to therapy and to evaluate the utility of these expression patterns as predictors of risk prior to therapy of adult Colombian patients with BALL. Methods. This study included 43 adult patients newly diagnosed with Bcell precursor or common BALL. Patients were recruited at the Colombian National Cancer Institute and Hospital Universitario San Ignacio, both in Bogota, Colombia. The leukemic blast population from diagnostic samples was separated with magnetic microbeads coated with either antiCD19 or anti-CD34 antibodies followed by column enrichment using standard procedures and MACS (Miltenyi, Bergisch Gladbach,Germany). Total RNA from purified leukemic cells was isolated using the RNeasy Mini Kit (Qiagen) according to the manufacturer's protocols. We used microarray analysis to identify genes that distinguish poor from good response to induction treatment using differential gene expression analysis and the response group as reference and the Illumina Custom algorithm embedded in the GenomeStudio software (Illumina). The expression profile was validated by realtime PCR (RTPCT) using TaqMan probes. The 2DELTADELTACT method was used to estimate the fold induction of each gene using GAPDH and an internal calibrator as controls. Assays were done in triplicate. Results. We identified 442 genes differentially expressed between 22 leukemia patients who responded and 5 who did not respond to induction chemotherapeutic treatment. Hierarchical analysis with the 99 most differentially expressed genes between the two groups revealed 3 sets of patients that differed in their clinical characteristics giving these genes high prognostic clinical outcome impact capacity. We validated the expression of 7 genes by RT PCR in 43 patients and, in addition to finding a correlation with gene expression profiles, we established correlations with good and poor prognosis from the time of diagnosis. Conclusions. Our study suggests that the response to induction treatment and clinical outcome of patients can be predicted from the onset of the disease and that gene expression profiles can be used to stratify patient risk adequately and accurately. The present study represents the first showing that gene expression profiling could become a clinically relevant tool for stratification in the early course of disease of Colombian adults BALL.

Csaszar, E., et al. (2014). "Real-time monitoring and control of soluble signaling factors enables enhanced progenitor cell outputs from human cord blood stem cell cultures." Biotechnology & Bioengineering **111**(6): 1258-1264.

Monitoring and control of primary cell cultures is challenging as they are heterogenous and dynamically complex systems. Feedback signaling proteins produced from off-target cell populations can accumulate, inhibiting the production of the desired cell populations. Although culture strategies have been developed to reduce feedback inhibition, they are typically optimized for a narrow range of process parameters and do not allow for a dynamically regulated response. Here we describe the development of a microbead-based process control system for the monitoring and control of endogenously produced signaling factors. This system uses quantum dot barcoded microbeads to assay endogenously produced signaling proteins in the culture media, allowing for the dynamic manipulation of protein concentrations. This monitoring system was incorporated into a fed-batch bioreactor to regulate the accumulation of TGF-beta1 in an umbilical cord blood cell expansion system. By maintaining the concentration of TGF-beta1 below an upper threshold throughout the culture, we demonstrate enhanced ex vivo expansion of hematopoietic progenitor cells at higher input cell densities and over longer culture periods. This study demonstrates the potential of a fully automated and integrated real-time control strategy in stem cell culture systems, and provides a powerful strategy to achieve highly regulated and intensified in vitro cell manufacturing systems.

Cseplak, G. (1966). "A new procedure for the recording of the superficial relations of the skin and the relative size of, alterations projecting from the skin. [Czech]." Borgyogyaszati es Venerologia Szemle **42**(6): 257-260.

A dermato-microplastic method is described which makes it possible to take impressions of any given number of superficial alterations of the healthy or diseased skin. The essential procedure is the making of a negative of the surface of the prepared skin by means of the quickly polymerizing substance 'Renit' which is used in dentistry and by taking plaster impressions from the negative which are examined with a strongly magnifying glass. The method is also suitable for medicolegal purposes.

Csizmadia, Z., et al. (2018). "Comparison of chemiluminescent and conventional ELISA techniques in autoantibody detection." Clinical Chemistry and Laboratory Medicine **56 (9)**: eA159.

Because of the presence of high amounts of interfering antibodies, it is important to choose the most accurate immunoserological assay for autoantibody detection to support the diagnosis of autoimmune diseases. The chemiluminescent immunoassay (CIA) is a recent alternative to conventional ELISA tests, allowing highly sensitive, more specific, and less time-consuming parallel autoantibody measurements. We compared our well-established ELISA tests with the new CIA, where antigens are immobilized on magnetic microbeads instead of polystyrene plate wells, enabling a several fold higher surface to give a more sensitive detection of antibody titers. For simple test comparison samples were chosen from our routine diagnostic laboratory serum-bank (n>500), while for clinical confirmation of the CIA anti-dsDNA antibody measurements, we used sera from patients (n>80) with established SLE clinical diagnosis. There was a high concordance between results obtained by ELISA and CIA: anti-dsDNA 75%, anti-Cardiolipin 90%, anti-B2GP 82%, anti-MPO 98%, anti-PR3 91%, anti-tTG 86%. Comparing anti-dsDNA measurements, the CIA laboratory data showed a better correlation with the clinical history of the patients (p-value<0.0001, alpha=0.05). In summary, CIA enables fast, parallel autoantibody measurements with continuous loading of samples, without need of pre-dilution, and repeated measurement of standards. Although ELISA tests and the new CIA method showed high agreement, further clinical evidence based confirmation of the CIA test is needed for the full implementation of the test, and method changes.

Cui, X., et al. (2018). "A fluorescent microbead-based microfluidic immunoassay chip for immune cell cytokine secretion quantification." Lab on a Chip **18**(3): 522-531.

Quantitative and dynamic analyses of immune cell secretory cytokines are essential for precise determination and characterization of the "immune phenotype" of patients for clinical diagnosis and treatment of immune-related diseases. Although multiple methods including the enzyme-linked immunosorbent assay (ELISA) have been applied for cytokine detection, such measurements remain very challenging in real-time, high-throughput, and high-sensitivity immune cell analysis. In this paper, we report a highly integrated microfluidic device that allows for on-chip isolation, culture, and stimulation, as well as sensitive and dynamic cytokine profiling of immune cells. Such a microfluidic sensing chip is integrated with cytometric fluorescent microbeads for real-time and multiplexed monitoring of immune cell cytokine secretion dynamics, consuming a relatively small extracted sample volume (160 nl) without interrupting the immune cell culture. Furthermore, it is integrated with a Taylor dispersion-based mixing unit in each detection chamber that shortens the immunoassay period down to less than 30 minutes. We demonstrate the profiling of multiple pro-inflammatory cytokine secretions (e.g. interleukin-6, interleukin-8, and tumor necrosis factors) of human peripheral blood mononuclear cells (PBMCs) with a sensitivity of 20 pg ml⁻¹ and a sample volume of 160 nl per detection. Further applications of this automated, rapid, and high-throughput microfluidic immunophenotyping platform can help unleash the mechanisms of systemic immune responses, and enable efficient assessments of the pathologic immune status for clinical diagnosis and immune therapy.

Cujic, N., et al. (2016). "Spray drying influence on encapsulation of chokeberry (aronia melanocarpa L.) extract." Arhiv za Farmaciju **ISS)**: 123-124.

INTRODUCTION Chokeberry (Aronia melanocarpa) is a rich source of polyphenols with confirmed health benefits. Nowdays there is increasing interest for chokeberry extracts, very rich sources of antioxidant phenolics, especially anthocyanins, which could be useful in prevention and treatment of cardiovascular diseases, diabetes and many other chronic diseases.

Problem with instability of polyphenols in extracts could be solved using the microencapsulation technology. The main goal of microencapsulation are stability enhancement of bioactive compounds, protection from harmful environmental conditions, shelf life extension, controlled delivery, covering unpleasant taste (bitter taste of polyphenols), and circumvention the damaging effects of gastrointestinal tract. Spray drying is simple, low cost and one of the most convenient microencapsulation method for controlled production of small particles with uniform and desirable size. Encapsulation of 50% chokeberry ethanolic extracts, one prepared from dried berries-CE and one after juice production-CWE, with different carriers were employed. Encapsulation systems were examined and compared in order to choose the optimal one. MATERIALS AND METHODS Spray drying method was applied for microencapsulation of 50% ethanolic chokeberry extracts-CE (2.52mg GAE/ml) and 50% ethanolic chokeberry extract from waste-CWE (4.11mg GAE/ml) (with prior ethanol evaporation) under the below-stated spray-drying conditions. Two different biopolymers: maltodextrin and summed milk, in same concentration (20%, w/v) were used for microencapsulation. They prepared by dissolving a required amount of each encapsulant in previously prepared extracts at 40 degreeC. The resulting solutions were mixed, homogenized prior to spray drying. A spray dryer (Buchi mini B-290, Buchi Labortechnik AG, Switzerland) with a 0.7-mm standard diameter nozzle was used with inlet (130+/-3degreeC) and outlet (56+/-2degreeC) temperatures. Relatively low spraying air flow rate (536 L/h), liquid feed (8 mL/min rate), atomization pressure (6 psi) and low inlet temperature were chosen in order to ensure a good atomization along the liquid feed rate and to obtained a stable powder (especially to ensure anthocyanins stability) with high actual loading. The release profiles for the polyphenols and anthocyanis from microbeads in water were investigated determining the total polyphenol content-TP using Folin-Ciocalteau method and total anthocyanins content-TA using the procedure described in European Pharmacopoeia 6.0. (2008) with slight modifications. Transmission spectra of of obtained spraydried powders were recorded using a IRAffinity-1 Fourier transform infrared spectrophotometer (Schimadzu, Japan) and applying the KBr disc method. Microbeads were mixed with KBr powder and compressed to pastilles. Infrared spectra over the wavelength range 4000 to 600 cm⁻¹ were recorded and the resolution was 4 cm⁻¹. The size of the encapsulated microbeads was deter-mined using Mastersizer 2000 (Malvern Instruments, Worcester-shire, UK). The mean diameter over volume (also called DeBroukere mean) was used as representative diameter. RESULTS AND DISCUSSION Influence of matrix and different extracts on the active compounds stability in obtained microparticles were evaluated. The impact of different type of carriers on phenolics and anthocyanins realise has been observed. For both extracts, better TP realise was achieved with summed milk as a carrier (1.79 mg GAE/g for CE, 2.56 mg GAE/g for CWE, respectively) in comparasion with encapsulated maltodextrin (1.20 mg GAE/g for CE, 2.07 mg GAE/g for CWE, respectively). Better realise of TA was achieved with maltodextrin (0.031% for CE, 0.5663% for CWE, respectively) than with skimmed milk (0.022% for CE, 0.3611% for CWE, respectively). Phenolis and anthocyanins compounds were released very rapidly from spray dried microbeads. Particle size for obtained microparticles ranged from 4.72-11.01mum for both carriers and extracts, which confirmed that spray drying is suitable method for pr duction of small particles with uniform size. In the case with both extracts, microbeads obtained with maltodextrin were smaller (4.27mum for CE, 5.12mum for CWE, respectively) in comparation with skimmed powders (8.50mum for CE, 11.01mum for CWE, respectively). Deserable particle size depends on future application. Larger particles provide more extended realise of encapsulated compounds, while smaller beads have better organoleptic charateristics, which is important for application in food or pharmaceutical products. Optimization of process parameters, spraying air flow rate, rate of liquid speed, atomization process, could provide microbeads with uniform size, desired diameter and high uniformity. FTIR spectrum of encapsulated CE and CWE in maltodextrin and skimmed milk showed several relevant picks. Picks in range about 1000cm⁻¹ could be attributed to the-C-O of cyclic ether and alcoholic groups from polyphenols, especially in the case of maltodextrin. FTIR analysis showed that CE and CWE were successfully incorporated into the particles and it could be concluded that used matrixes are compatible materials for extracts encapsulation. CE and CWE bioactive molecules were incorporated in the biopolymer matrix by intermolecular interactions, they integrity were preserved after spray drying process. CONCLUSIONS This study demonstrates the potential of spray dried microbeads for encapsulation of chokeberry and chokeberry waste polyphenols in order to improve their functionality, stability and bioavailability. Our result showed that stability of polyphenols, especially anthocyanins might be improved using spray drying as microencapsulation tehnology. Chokeberry polyphenol microbeads, due to their antioxidant potential, represent a promising food additive for incorporation into dietary suplements, functional food or pharmaceutical and cosmetic preparations.

Cujic, N., et al. (2016). "Chokeberry (Aronia melanocarpa L.) extract loaded in alginate and alginate/inulin system." Industrial Crops and Products **86**: 120-131.

Chokeberry (Aronia melanocarpa) is a rich source of polyphenols with confirmed health benefits. Microencapsulation tehnique is a promising tool for improving its polyphenols functionality, stability and bioavailability. Electrostatic extrusion process was carried out to obtain microbeads with encapsulated chokeberry extract. The effects of the carrier type (alginate of low and medium viscosity), addition of inulin as filler, and the needle diameter (18, 20, 22 gauges) on the morphological characteristics and release properties of the microbeads were studied. Particles obtained with medium viscosity alginate carrier (1.5% w/v), using inulin as filler (5% w/v) and medium needle size (20 gauges) showed the best results in the release studies. Drying process affected the encapsulation efficiency, the amount of encapsulated polyphenols increased from 0.24 mg GAE/g in hydrogel beads to 3.57 mg GAE/g in freeze dried beads, and the release profile of encapsulated extracts was prolonged to 40 min. SEM micrographs confirmed that the addition of inulin as filler improved the final properties of the microbeads, while FTIR analysis showed that the extract was successfully incorporated into the particles. Due to the extended storage and stability, dry microbeads showed the best potential as a delivery system suitable for pharmaceutical or functional food industry.

Culin, J. and T. Bielic (2016). "Plastic Pollution from Ships." Pomorski Zbornik **51**(1): 57.

The environmental impact of shipping on marine environment includes discharge of garbage. Plastic litter is of particular concern due to abundance, resistance to degradation and detrimental effect on marine biota. According to recently published studies, a further research is required to assess human health risk. Monitoring data indicate that despite banning plastic disposal at sea, shipping is still a source of plastic pollution. Some of the measures to combat the problem are discussed.

Cummings, R. D. (2017). "Glycan functions in development and glycan recognition by lectins and antibodies." Glycoconjugate Journal **34 (Supplement 1)**: S12.

Glycans in human and animal glycoconjugates are bound by a wide variety of glycan-binding proteins (GBPs), including animal cell receptors, microbial adhesins lectins and toxins, as well as functioning indirectly in glycoproteins to facilitate intra-and intermolecular interactions that maintain homeosta-sis and biological integrity. But glycans are also recognized by a wide variety of antibodies in human serum and other fluids, including saliva and cerebrospinal fluid. We have taken a multifaceted approach to explore glycan functions using human and mouse biology and genetics, and to explore protein-glycan interactions using a variety of technologies including shotgun glycomics and glycan microarray and glycans derivatized to microbeads. Our studies show that extended O-glycans are required for recognition by many types of GBPs and that loss of extended O-glycans due to engineered and acquired mutations in the molecular chaperone Cosmc lead to loss of function in almost all cell types, but we have identified many specific changes in lymphocyte function as-sociated with normal O-glycans. In addition, we have identified many antibodies in animals and people that bind to simple or complex glycans, including microbial glycans, and the antisugar antibody repertoire (ASAR) is extensive but unique for each individual and indicates their history of exposure to different types of pathogens and commensal organisms. Overall, these studies reveal the complex recognition of gly-cans by endogenous GBPs and antibodies and the complex ways in which cellular glycans regulate many aspects of development and immunity.

Cunha, C., et al. (2019). "Marine vs freshwater microalgae exopolymers as biosolutions to microplastics pollution." Environmental Pollution **249**: 372-380.

Microalgae can excrete exopolymer substances (EPS) with a potential to form hetero-aggregates with microplastic particles. In this work, two freshwater (Microcystis panniformis and Scenedesmus sp.) and two marine (Tetraselmis sp. and Gloeocapsa sp.) EPS producing microalgae were exposed to different microplastics. In this study, the influence of the microplastic particles type, size and density in the production of EPS and hetero-aggregates potential was studied. Most microalgae contaminated with microplastics displayed a cell abundance decrease (of up to 42%) in the cultures. The results showed that the formed aggregates were composed of microalgae and EPS (homo-aggregates) or a combination of microalgae, EPS and microplastics (hetero-aggregates). The hetero-aggregation was dependent on the size and yield production of EPS, which was species specific. Microcystis panniformis and Scenedesmus sp. exhibited small EPS, with a higher propension to disaggregate, and consequently lower capabilities to aggregate microplastics. Tetraselmis sp. displayed a higher ability to aggregate both low and high-density microplastics, being partially limited by the size of the microplastics. Gloeocapsa sp. had an outstanding EPS production and presented excellent microplastic aggregation capabilities (adhered onto the surface and also incorporated into the EPS). The results highlight the potential of microalgae to produce EPS and flocculate microplastics, contributing to their vertical transport and consequent deposition. Thus, this work shows the potential of microalgae as biocompatible solutions to water microplastics treatment.

Cunha, C., et al. (2019). "Ecotoxicological and biochemical effects of environmental concentrations of the plastic-bond pollutant dibutyl phthalate on Scenedesmus sp." Aquatic Toxicology **215**: N.PAG-N.PAG.

• Dibutyl phthalate (DBP) is a phthalate derived from plastic pollution that is widely found in aquatic environments. • DBP effect on Scenedesmus sp. growth is dose-dependent, with a more negative effect within the first 48 h of exposure. • Environmental concentrations of DBP decreased the microalgal growth and carbohydrates but did not change the pigment and protein concentration. • DBP environmental concentrations decrease the microalgal growth and carbohydrates but did not change the pigment and protein. Phthalate esters are highly present in aquatic plastic litter, which can interfere with the biological processes in the wildlife. In this work, the commonly found freshwater microalga Scenedesmus sp. was exposed to environmental concentrations (0.02, 1 and 100 μg L−1) and to a higher concentration (500 μg L−1) of dibutyl phthalate (DBP), which is an environmental pollutant. The growth, pH variation,

production of photosynthetic pigments, proteins and carbohydrates were evaluated. The main inhibition effect of DBP on the microalgal growth was observed in the first 48 h of the exposure (EC 50 : 41.88 µg L-1). A reduction in the photosynthetic pigment concentration was observed for the 0.02, 1 and 100 µg L-1 conditions indicating that the DBP downregulated the growth rate and affected the photosynthetic process. A significant increase in protein production was only observed under 500 µg L−1 DBP exposure. The extracellular carbohydrates production slightly decreased with the presence of DBP, with a stronger decrease occurring in the 500 µg L-1 condition. These results highlight the environmental risk evaluation and ecotoxicological effects of DBP on the production of biovaluable compounds by microalgae. The results also emphasize the importance of assessing the consequences of the environmental concentrations exposure as a result of the DBP dose-dependent correlation effects. [ABSTRACT FROM AUTHOR]
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Cunliffe, J. (1996). "MUNICIPAL WASTE - TRASH OR TREASURE." Recycling Textile & Plastic Waste: 17-26.
The article discusses the implications of municipal waste found in Great Britain. The country is facing a problem concerning waste disposals, hence rising cost of landfill disposal. The concerned organizations are increasing environmental awareness which focuses on problems associated with land filling such as landfill gas contributing to global warming, water and ground pollution, restoration of the landscape and long term aftercare for the integrity of the site. It is noted that waste management includes reduce, reuse and recycle which contribute to a more sustainable use of natural resources.

Cunningham, E. M. and J. D. Sigwart (2019). "Environmentally Accurate Microplastic Levels and Their Absence from Exposure Studies." Integrative & Comparative Biology **59**(6): 1485-1496.
Microplastics (synthetic polymers; <5 mm) are ubiquitous, in the environment and in the news. The associated effects of microplastics on flora and fauna are currently only established through laboratory-based exposure trials; however, such studies have come under scrutiny for employing excessive concentrations with little environmental relevance. This critical review is intended to summarize key issues and approaches for those who are considering the need for local microplastics research, both in terms of environmental pollution and the impacts on aquatic species. A meta-analysis of results from published experimental (n = 128) and environmental (n = 180) studies allowed us to compare the reported impacts from experiments that expose organisms to microplastics, and the concentrations of environmental microplastics found in the wild. The results of this meta-analysis highlight three issues that should be modified in future work (1) use of extreme dosages, (2) incompatible and incomparable units, and (3) the problem of establishing truly informative experimental controls. We found that 5% of exposure trials examined did not use any control treatment, and 82% use dramatically elevated dosages without reference to environmental concentrations. Early studies in this field may have been motivated to produce unequivocal impacts on organisms, rather than creating a robust, environmentally relevant framework. Some of the reported impacts suggest worrying possibilities, which can now inspire more granular experiments. The existing literature on the extent of plastic pollution also has limited utility for accurately synthesizing broader trends, as has been raised in previous reviews; environmental extraction studies use many different units,

among which only 76% (139/180) could be plausibly converted for comparison. Future research should adopt the units of microparticles/kg (of sediment) or mp/L (of fluid) to improve comparability. Now that the global presence of microplastic pollution is well established, with more than a decade of research, new studies should focus on comparative aspects rather than the presence of microplastics. Robustly designed, controlled, hypothesis-driven experiments based on environmentally relevant concentrations are needed now to understand our future in the new plastic world.

Curren, E. and S. C. Y. Leong (2019). "Profiles of bacterial assemblages from microplastics of tropical coastal environments." Science of the Total Environment **655**: 313-320.

Plastic waste is a global issue of an increasing concern in aquatic ecosystems. Microplastics form a large proportion of plastic pollution in marine environments. Although microplastics are prevalent, their distribution along the coasts of tropical regions is not well studied. Microplastic pieces (1–5 mm) were collected from two distinct regions along the coastlines of Singapore, from the northern coast in the Johor Strait and the southern coast in the Singapore Strait. Microplastics were present in concentrations ranging from 9.20–59.9 particles per kg of dry sand sediment. The majority of microplastics identified were foam particles (55%) and fragments (35%). Microplastics were significantly more abundant on heavily populated beaches compared to pristine beaches. High throughput sequencing was used to profile the communities of bacteria on the surfaces of microplastic particles. The structure of the microbial communities was primarily characterised by Proteobacteria and Bacteroidetes and were distinct across sites. Hydrocarbon-degrading genera such as Erythrobacter were dominant in areas with heavy shipping and pollution. Potential pathogenic genera such as Vibrio and Pseudomonas were also identified. This study highlights the diverse bacterial assemblages present on marine microplastic surfaces and the importance of understanding the bacterial plastisphere. Graphical abstract Unlabelled Image Highlights • Microplastics are prevalent pollutants in tropical coastal ecosystems. • Microplastic abundance influenced by anthropogenic activities • Rich assemblage of microbial communities found on microplastic surfaces • Putatively pathogenic and hydrocarbon degrading bacteria identified • Microplastics act as a vector for the transport of harmful bacteria. [ABSTRACT FROM AUTHOR]

Currie, J. J., et al. (2019). "Nearshore sea surface macro marine debris in Maui County, Hawaii: Distribution, drivers, and polymer composition." Marine Pollution Bulletin **138**: 70-83.

Located within the subtropical convergence zone, the Hawaiian archipelago is subject to high debris loads. This paper represents the first study to determine the spatial and temporal trends of floating macro debris quantities and polymer composition within Maui County waters. Ocean surveys were conducted from 2013 to 2017 and collected 2095 debris items of which 90% were plastic. Attempts to categorize items by source resulted in only 6% likely from land, 12% from ocean-based sources, 50% from either land or ocean, and 32% from unknown sources. Results found a multi-step process for debris accumulation, with temporal trends linked to survey day and year and spatial trends linked to ocean processes. High- and low-density polyethylene and polypropylene accounted for the majority of polymer types. The results of this study

demonstrate minimal debris in Maui originates from land/local sources, and the importance of baseline data to guide further research and mitigation measures. Copyright © 2018

Curtis, B. R. and J. G. McFarland (2006). "Mechanisms of transfusion-related acute lung injury (TRALI): anti-leukocyte antibodies." Critical Care Medicine **34**(5 Suppl): S118-123.

There is abundant evidence that leukocyte antibodies in blood donor products are somehow involved in transfusion-related acute lung injury (TRALI). Human leukocyte antigen (HLA) class I, HLA class II, and neutrophil-specific antibodies in the plasma of both blood donors and recipients have been implicated in the pathogenesis of TRALI. The case for a relationship between leukocyte antibodies and TRALI is more compelling if concordance between the antigen specificity of the leukocyte antibodies in the donor plasma and the corresponding antigen on the cells of the affected recipient is demonstrated. Such antibody-antigen concordance can be investigated by typing the recipient for the cognate leukocyte antigens or by cross-matching the donor plasma against the recipient's leukocytes. Two proposed pathophysiologic mechanisms for TRALI have received the most attention: the antibody hypothesis and the two-event hypothesis. The final common pathway in all of the proposed pathogenic mechanisms of TRALI is increased pulmonary capillary permeability, which results in movement of plasma into the alveolar space causing pulmonary edema. A typical TRALI serologic workup consists of tests for HLA class I and II and neutrophil-specific antibodies. The use of flow cytometry and HLA-coated microbeads is recommended for detection of HLA antibodies in plasma of implicated blood donors and a combination of the granulocyte agglutination test and granulocyte immunofluorescence test for detection of neutrophil-specific antibodies. Genotyping for class I and II HLA and for a limited number of neutrophil antigens may also be helpful in establishing antibody-antigen concordance. [References: 55]

Cushing, K. W., et al. (2017). "Ultrasound Characterization of Microbead and Cell Suspensions by Speed of Sound Measurements of Neutrally Buoyant Samples." Analytical Chemistry **89**(17): 8917-8923.

We present an experimental method including error analysis for the measurement of the density and compressibility of cells and microbeads; these being the two central material properties in ultrasound-based acoustophoretic applications such as particle separation, trapping, and up-concentration. The density of the microparticles is determined by using a neutrally buoyant selection process that involves centrifuging of microparticles suspended in different density solutions, CsCl for microbeads and Percoll for cells. The speed of sound at 3 MHz in the neutrally buoyant suspensions is measured as a function of the microparticle volume fraction, and from this the compressibility of the microparticles is inferred. Finally, from the obtained compressibility and density, the acoustic scattering coefficients and contrast factor of the microparticles are determined, and in a sensitivity analysis, the impact of the measurement errors on the computed acoustic properties is reported. The determination of these parameters and their uncertainties allow for accurate predictions of the acoustophoretic response of the microparticles. The method is validated by determining the density (0.1-1% relative uncertainty) and compressibility (1-3% relative uncertainty) of previously well-characterized polymer microbeads and subsequently applied to determine the density (0.1-1% relative uncertainty), compressibility (1% relative uncertainty), scattering coefficients, and acoustic contrast factors for nonfixed and fixed cells, such as red blood cells, white blood cells, DU-145 prostate cancer cells, MCF-7 breast cancer cells, and LU-HNSCC-25 head and neck squamous carcinoma cells in phosphate buffered saline. The results show agreement with published data obtained by other methods.

Cuthbert, R. N., et al. (2019). "The influence of microplastics on trophic interaction strengths and oviposition preferences of dipterans." Science of the Total Environment **651**(Part 2): 2420-2423.

Microplastic (MP) pollution continues to proliferate in freshwater, marine and terrestrial environments, but with their biotic implications remaining poorly understood. Biotic interactions such as predation can profoundly influence ecosystem structuring, stability and functioning. However, we currently lack quantitative understandings of how trophic interaction strengths and associated behaviours are influenced by MP pollution, and how transference of MPs between trophic levels relates to consumptive traits. We also lack understanding of key life-history effects of MPs, for example, reproductive strategies such as oviposition. The present study examines the predatory ability of non-biting midge larvae, Chaoborus flavicans, towards larvae of Culex pipiens mosquitoes when the latter are exposed to MPs, using a functional response (FR) approach. Transfer of MPs occurred from larval mosquitoes to larval midges via predation. Microplastics transfer was significantly positively related to predation rates. Predation by C. flavicans followed a Type II FR, with average maximum feeding rates of 6.2 mosquito larvae per hour. These and other FR parameters (attack rates and handling times) were not significantly influenced by the presence of MPs. Further, C. pipiens adults did not avoid ovipositing in habitats with high concentrations of MPs. We thus demonstrate that MPs can move readily through freshwater food webs via biotic processes such as predation, and that uptake correlates strongly with consumption rates. Further, as MPs do not deter adult mosquitoes from ovipositing, our experiments reveal high potential for MP exposure and transference through ecosystems.

Cuthbertson, J., et al. (2019). "Current and Emerging Disaster Risks Perceptions in Oceania: Key Stakeholders Recommendations for Disaster Management and Resilience Building." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(3): 05.

Identification and profiling of current and emerging disaster risks is essential to inform effective disaster risk management practice. Without clear evidence, readiness to accept future threats is low, resulting in decreased ability to detect and anticipate these new threats. A consequential decreased strategic planning for mitigation, adaptation or response results in a lowered resilience capacity. This study aimed to investigate threats to the health and well-being of societies associated with disaster impact in Oceania. The study used a mixed methods approach to profile current and emerging disaster risks in selected countries of Oceania, including small and larger islands. Quantitative analysis of the International Disaster Database (EM-DAT) provided historical background on disaster impact in Oceania from 2000 to 2018. The profile of recorded events was analyzed to describe the current burden of disasters in the Oceania region. A total of 30 key informant interviews with practitioners, policy managers or academics in disaster management in the Oceania region provided first-hand insights into their perceptions of current and emerging threats, and identified opportunities to enhance disaster risk management practice and resilience in Oceania. Qualitative methods were used to analyze these key informant interviews. Using thematic analysis, we identified emerging disaster risk evidence from the data and explored new pathways to support decision-making on resilience building and disaster management. We characterized perceptions of the nature and type of contemporary and emerging disaster risk with potential impacts in Oceania. The study findings captured not only traditional and contemporary risks, such as climate change, but also less obvious ones, such as plastic pollution, rising inequality, uncontrolled urbanization, and food and water insecurity, which were perceived as contributors to current and/or future crises, or as crises themselves. The findings provided insights into how to improve disaster management more effectively, mainly through bottom-up approaches and education to increase

risk-ownership and community action, enhanced political will, good governance practices and support of a people-centric approach.

Cuvillier-Hot, V., et al. (2014). "Impact of ecological doses of the most widespread phthalate on a terrestrial species, the ant Lasius niger." Environmental Research **131**: 104-110.

Phthalates are synthetic contaminants released into the environment notably by plastic waste. Semi-volatile, they adsorb to atmospheric particles and get distributed in all ecosystems. Effects of this major anthropogenic pollution in economical species in aquatic habitats have attracted large interest. On the contrary, very few studies have focused on wild terrestrial species. Yet, these lipophilic molecules are easily trapped by insect cuticle; ants and other insects have been shown to permanently bear among their cuticular components a non-negligible proportion of phthalates, meaning that they suffer from chronic exposure to these pollutants. Oral route could also be an additional way of contamination, as phthalates tend to stick to any organic particle. We show here via a food choice experiment that Lasius niger workers can detect, and avoid feeding on, food contaminated with DEHP (DiEthyl Hexyl Phthalate), the most widespread phthalate found in nature. This suggests that the main source of contamination for ants is atmosphere and that doses measured on the cuticle correspond to the chronic exposure levels for these animals. Such an ecologically relevant dose of DEHP was used to contaminate ants in lab and to investigate their physiological impact. Over a chronic exposure (1 dose per week for 5 weeks), the egg-laying rate of queens was significantly reduced lending credence to endocrine disruptive properties of such a pollutant, as also described for aquatic invertebrates. On the contrary, short term exposure (24 h) to a single dose of DEHP does not induce oxidative stress in ant workers as expected, but leads to activation of the immune system. Because of their very large distribution, their presence in virtually all terrestrial ecosystems and their representation at all trophic levels, ants could be useful indicators of contamination by phthalates, especially via monitoring the level of activation of their immune state.

Czarnecka, M., et al. (2013). "Role of CD19^{pos} lymphocytes in human IgE-production in vitro." Experimental Dermatology **22 (3)**: e5.

In vitro, peripheral blood mononuclear cells (PBMC) from patients with extrinsic atopic dermatitis/ atopy syndrome produce IgE. Supposedly, CD19^{pos} plasma cells are the main source. Whereas in mice IgE-producing B cells can be killed by CD8pos T cells, regulation of IgE-producers in humans remains unclear. Heparinised blood of nine adults with exacerbated extrinsic atopic dermatitis / atopy syndrome (IgE > 150 < 15000 kU/l, no immunosuppressive systemic therapy >8 weeks, mean serum IgE-levels 2800 4546 kU/l) were depleted of either C19pos or CD8pos lymphocytes by magnetic beads using two purification cycles following manufacturer's instruction (MS-columns, anti-CD19 or anti-CD8 microbeads, Miltenyi Biotec, Bergisch Gladbach). Cells were incubated in RPMI/10% FCS in 1.8 ml round bottom cryovials for 10 days at 37degreeC. Conditions: (i) all PBMC, (ii) isolated CD19^{pos} cells, (iii) PBMC depleted of CD19^{pos} cells, (iv) PBMC depleted of CD8pos cells, (v) PBMC CD8-depleted and subsequently reconstituted with CD8pos cells. Purification efficacy was monitored by immuno flow cytometry. Cell free supernatants were collected at different time points and stored at -80degreeC until determination of IgE levels using the ImmunoCap100 system (low level range, Phadia, Freiburg). Data were expressed in relation to the maximal IgE-level produced by all PBMC (=100%). A two-tailed student t-test was applied for statistical analysis. IgE-production in vitro was detectable in 6 of 9 of patients. In all cases, isolated CD19^{pos} cells did not show any IgE-production. Unexpectedly, supernatants of PBMC depleted of CD19^{pos} cells contained significant elevated IgE-levels as compared to condition (i) and/or (iii). Thus, under experimental conditions described (i) the source of IgE in vitro from atopic PBMC seem not to be CD19^{pos} plasma cells and (ii) within the CD19^{pos} B memory cell fraction IgE-regulatory activity can be postulated.

Czech, A., et al. (2009). "Increased levels of proinflammatory cytokines are associated with impaired immune activity of natural killer (NK) cells of prediabetic subjects (PS)." Diabetologia **52 (S1)**: S248.

Background and aims: Inflammatory mechanisms are believed to be involved in the pathogenesis of diabetic complications. Diabetic hyperglycemia may suppress the function of peripheral blood NK cells. Recent experimental studies have shown significant differences in immune activity of NK cells of Type 2 diabetic patients in comparison to healthy subjects. The aim of this study was to asses the relation between the plasma concentration of selected proinflammatory cytokines (interleukin 1; IL-1 and interleukin 6; IL-6) and the number and activity of NK cells obtained from PS. Material(s) and Method(s): The study group included 12 newly-diagnosed (according to WHO definition) PS, naive to any hypoglycaemic drugs and 8 normoglycaemic control subjects (CS) matched for sex, BMI and waist circumference. Peripheral blood mononuclear cells (PBMC) were isolated by Ficoll gradient centrifugation. Immunofluorescent phenotyping of NK (CD16⁺) cells in PBMC was performed using specific murine anti-human CD16 PE-conjugated monoclonal antibodies. The K562 human erythroleukemia cell line was used as the standard target for human NK cytotoxicity assay. K562 were labelled with DIO(3,3-dioctadecyloxacarbocyanine perchlorate). Target and effector cells were added to reach effector/target rations: 50:1 ,12:1. Dead target cells were stained with PI (propidium iodide). After 4 hours of incubation data were collected for analysis on the Becton-Dickinson FACScalibur flow cytometer. The data was analyzed using Cell Quest software. Concentrations of IL-1 and IL-6 were determined using fluorescent cytometric microbead assay. Plasma aliquots were incubated with color-coded fluorescent microbeads labeled with antibodies against respective cytokines. The fluorescence intensity was determined using dual-laser detector and cytokines concentrations were read from standard curve. Result(s): PS exhibited higher insulin resistance reflected by HOMA-IR (3.21+/-2.32) compared to control group (1.96+/-1.18, p=0.03). Plasma concentrations of investigated cytokines were significantly higher in the PS compared to CS (IL-1: 1.36+/-1.27 vs 0.35+/-0.31 pg/ml, p=0.01; IL-6: 4.09+/-3.30 vs 2.12+/-1.13 pg/ml, p=0.03). Correlations between cytokines and HOMA-IR were weak and non-significant (all p>0.05). The PS in comparison to healthy subjects had an increased number (12,45+/-5,8% vs 9,63+/-4,7%) but decreased activity (4,4+/-2,0% vs 9,2+/-3,7%) of NK cells (p=0.01). Correlations between cytokines and both the number and activity of NK cells were statistically significant (p<0.05). Conclusion(s): In the prediabetic state the increased number and decreased activity of peripheral NK cells are associated with high excretion of proin-flammatory cytokines (IL-1, IL-6). This supports the hypothesis that inflammation is involved in the pathogenesis of early impairment of NK cell killing function. Inflammation markers are likely to be useful in the screening of metabolically vulnerable individuals.

da Costa Araujo, A. P., et al. (2020). "How much are microplastics harmful to the health of amphibians? A study with pristine polyethylene microplastics and Physalaemus cuvieri." Journal of Hazardous Materials **382**: 121066.

Microplastics (MPs) are critical emerging pollutants found in the environment worldwide; however, its toxicity in aquatic in amphibians, is poorly known. Thus, the aim of the present study is to assess the toxicological potential of polyethylene microplastics (PE MPs) in Physalaemus cuvieri tadpoles. According to the results, tadpoles' exposure to MP PE at concentration 60mg/L for 7 days led to mutagenic effects, which were evidenced by the increased number of abnormalities observed in nuclear erythrocytes. The small size of erythrocytes and their nuclei area, perimeter, width, length, and radius, as well as the lower nucleus/cytoplasm ratio observed in tadpoles exposed to PE MPs confirmed its cytotoxicity. External morphological changes observed in the animal models included reduced ratio between total length and mouth-cloaca distance, caudal length, ocular area, mouth area, among others. PE MPs increased the number of melanophores in the skin and pigmentation rate in the assessed areas. Finally, PE MPs were found in gills, gastrointestinal tract, liver, muscle tissues of the tail and in the blood, a fact that confirmed MP accumulation by tadpoles. Therefore, the present study pioneering evidenced how MPs can affect the health of amphibians.

Da Costa, J. P., et al. (2018). "Degradation of polyethylene microplastics in seawater: Insights into the environmental degradation of polymers." Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering **53**(9): 866-875.

Microplastic contamination of aquatic environments has become an increasingly alarming problem. These, defined as particles <5 mm, are mostly formed due to the cracking and embrittlement of larger plastic particles. Recent reports show that the increasing presence of microplastics in the environment could have significant deleterious consequences over the health of marine organisms, but also across the food chain. Herein, we have studied the effects of artificial seawater on polyethylene (PE)-based beads by exposing them up to eight weeks to saltwater in stirred batch reactors in the dark and examined the structural and morphological changes these endured. Electron microscopy observations showed that artificial seawater induces severe microcracking of the pellets' surfaces. Additionally, Fourier transform infrared spectroscopy (FTIR) analyses evidenced the formation of oxidized groups whenever these particles were exposed to water and an increase in organic matter content of the waters in which the pellets were kept was evidenced by Raman spectroscopy. There were also noticeable consequences in the thermal stability of the polyethylene pellets, as determined by thermogravimetric studies (TGA). Furthermore, the parallel exposure of polyethylene pellets to UV radiation yielded less pronounced effects, thus underscoring its lower preponderance in the degradation of this material. These results highlight the importance of determining the mechanisms of degradation of microplastics in marine settings and what the implications may be for the environment. Overall, the herein presented results show that a relatively short period of time of accelerated exposure can yield quantifiable chemical and physical impacts on the structural and morphological characteristics of PE pellets. Copyright © 2018, © 2018 Taylor & Francis Group, LLC.

da Costa, J. P., et al. (2016). "(Nano)plastics in the environment - Sources, fates and effects." Science of the Total Environment **566-567**: 15-26.

There has been a considerable increase on research of the ecological consequences of microplastics released into the environment, but only a handful of works have focused on the nano-sized particles of polymer-based materials. Though their presence has been difficult to adequately ascertain, due to the inherent technical difficulties for isolating and quantifying them, there is an overall consensus that these are not only present in the environment - either directly released or as the result of weathering of larger fragments - but that they also pose a significant threat to the environment and human health, as well. The reduced size of these particulates (<1 mum) makes them susceptible of ingestion by organisms that are at the base of the food-chain. Moreover, the characteristic high surface area-to-volume ratio of nanoparticles may add to their potential hazardous effects, as other contaminants, such as persistent organic

pollutants, could be adsorbed and undergo bioaccumulation and bioamplification phenomena. In this review, we describe the most relevant sources of nanoplastics and offer some insights into their fate once released into the environment. Furthermore, we overviewthemost prominent effects of these small particulates, while identifying the key challenges scientists currently face in the research of nanoplastics in the environment. Lastly, we give a brief summary of the economic impacts of the pollution caused by plastic litter - a potential key source of nanoplastics - in the oceans, the most common destination of these contaminants. Copyright © 2016 Elsevier B.V.

da Luz, J. M., et al. (2014). "Abiotic and biotic degradation of oxo-biodegradable plastic bags by Pleurotus ostreatus." PLoS ONE [Electronic Resource] **9**(11): e107438.

In this study, we evaluated the growth of Pleurotus ostreatus PLO6 using oxo-biodegradable plastics as a carbon and energy source. Oxo-biodegradable polymers contain pro-oxidants that accelerate their physical and biological degradation. These polymers were developed to decrease the accumulation of plastic waste in landfills. To study the degradation of the plastic polymers, oxo-biodegradable plastic bags were exposed to sunlight for up to 120 days, and fragments of these bags were used as substrates for P. ostreatus. We observed that physical treatment alone was not sufficient to initiate degradation. Instead, mechanical modifications and reduced titanium oxide (TiO2) concentrations caused by sunlight exposure triggered microbial degradation. The low specificity of lignocellulolytic enzymes and presence of endomycotic nitrogen-fixing microorganisms were also contributing factors in this process.

da Luz, J. M., et al. (2013). "Degradation of oxo-biodegradable plastic by Pleurotus ostreatus." PLoS ONE [Electronic Resource] **8**(8): e69386.

Growing concerns regarding the impact of the accumulation of plastic waste over several decades on the environmental have led to the development of biodegradable plastic. These plastics can be degraded by microorganisms and absorbed by the environment and are therefore gaining public support as a possible alternative to petroleum-derived plastics. Among the developed biodegradable plastics, oxo-biodegradable polymers have been used to produce plastic bags. Exposure of this waste plastic to ultraviolet light (UV) or heat can lead to breakage of the polymer chains in the plastic, and the resulting compounds are easily degraded by microorganisms. However, few studies have characterized the microbial degradation of oxo-biodegradable plastics. In this study, we tested the capability of Pleurotus ostreatus to degrade oxo-biodegradable (D2W) plastic without prior physical treatment, such as exposure to UV or thermal heating. After 45 d of incubation in substrate-containing plastic bags, the oxo-biodegradable plastic, which is commonly used in supermarkets, developed cracks and small holes in the plastic surface as a result of the formation of hydroxyl groups and carbon-oxygen bonds. These alterations may be due to laccase activity. Furthermore, we observed the degradation of the dye found in these bags as well as mushroom formation. Thus, P. ostreatus degrades oxo-biodegradable plastics and produces mushrooms using this plastic as substrate.

D'Agostino, C., et al. (2017). "Swelling-induced structural changes and microparticle uptake of gelatin gels probed by NMR and CLSM." Soft Matter **13**(16): 2952-2961.

Gelatin gels are increasingly involved in many industrial applications due to several advantages including cost efficiency and biocompatibility. Generally, their production requires the use of aqueous solvents, which cause significant swelling, due to the ability of solvent molecules to penetrate through the gel microstructure and increase its volume. Since swelling mechanisms and their effect on the gel structure are not fully understood, further investigations are required. In this work, we combine macroscopic measurements of the swelling ratio (SR) with Nuclear Magnetic Resonance (NMR) and Confocal Laser Scanning Microscopy (CLSM) to investigate changes in the gelatin structure as a function of both polymer concentration and swelling time. SR values increase as a function of time until a maximum is reached and then show a slight drop for all the gelatin concentrations after 24 h swelling time, probably due to a network relaxation process. NMR allows determination of mass transport and molecular dynamics of water inside the gelatin pores, while CLSM is used to visualize the penetration of tracers (polystyrene microbeads) with a diameter much larger than the gel pores. Structural parameters, such as average pore size and tortuosity, are estimated. In particular, the pore size decreases for higher polymer concentration and increases during swelling, until reaching a maximum, and then dropping at longer times. The penetration of tracers provides evidence of the heterogeneity of the gel structure and shows that single microcarriers can be loaded in gelatin gels upon swelling.

Dahdouh, N., et al. (2020). "Removal of Methylene Blue and Basic Yellow 28 Dyes from Aqueous Solutions Using Sulphonated Waste Poly Methyl Methacrylate." Journal of Polymers & the Environment **28**(1): 271-283.

This work focuses on two different environmental problems: the recovery of plastic wastes PMMA (W PMMA) and their application in the removal of textile dyes Methylene Blue (MB) and Basic Yellow 28 (BY28) in aqueous solutions. The selected waste plastic was upgraded to produce an adsorbent suitable for dyes removal. For that, the material was grinded cryogenically up to a particle size of less than 100 µm and treated with sulfuric acid. The sulphonated waste PMMA (SW PMMA) was characterized by FTIR, scanning electronic microscopy (SEM) and chemical composition analysis (C, H, N, O and S content). The formation of sulphonic groups in the material after sulphonation reaction has been successfully demonstrated by FTIR, and can be observed mainly in the region 3087 cm−1 to 3657 cm−1, where an intense band bound to the stretching of the SO3H appeared; another absorption band appeared in the region from 1138 to 1271 cm−1 that corresponds to the symmetric stretching of the SO2 group. The effects of solution pH, initial dyes concentration, adsorbent dose and temperature were studied in batch experiments. The obtained data showed that SW PMMA adsorbent exhibit significant adsorption capacities of 97.09 mg g−1 and 222.22 mg g−1 for MB and BY28, respectively. The complete removal of MB and BY28 on the SW PMMA was achieved in less than 45 min. The Langmuir, Freundlich and Temkin models were applied and it was found that the equilibrium data could be satisfactory fitted to Langmuir adsorption isotherm. The kinetic study showed that the pseudo second order kinetic model correlates the experimental data. Furthermore, the thermodynamic parameters were determined for both dyes. As a result, the negative values of Gibbs free energy ΔG° indicated the spontaneity of the adsorption of MB and BY28 by SW PMMA. The negative values of ΔH° revealed the exothermic nature of the process and the negative values of ΔS° suggest the stability of MB and BY28 on the surface of SW PMMA. [ABSTRACT FROM AUTHOR]

Dahl, C. P., et al. (2009). "Increased levels of cytokines, vasoactive peptides, and growth factors in alveolar macrophages in heart failure." European Heart Journal **1)**: 15.

Purpose: Pathophysiologic interactions between the heart and the lungs in heart failure (HF) are well recognised. Increased circulating levels of vasoactive peptides and cytokines known to be synthesised in the heart in HF may directly affect the lungs and potentially also vice versa. The purpose of the present study was to investigate whether expression of different factors known to be increased in the myocardium and/or the circulation in HF is also increased in alveolar macrophages in HF. Method(s): Twenty-two non-smoking HF patients (NYHA functional class II-IV) and 16 healthy controls were included in the study. Lung function and diffusion capacity were investigated by spirometry and DLCO, respectively. Induced sputum was performed after inhalation of hypertonic saline, and alveolar macrophages were isolated from the sputum by use of magnetic microbeads. Gene expression was examined in alveolar macrophages and in peripheral blood by real-time RT-PCR. Result(s): Lung function and diffusion capacity were reduced in HF patients compared to controls with significantly lower FVC (88+/-4 vs. 112+/-3% of predicted value), FEV1 (84+/-4 vs. 104+/-3% of predicted value), and DLCO (69+/-4 vs. 101+/-3% of predicted value) (P<0.05 for all). Real-time RT-PCR demonstrated increased mRNA levels of several important cytokines, chemokines, vasoactive peptides, and growth factors in alveolar macrophages from HF patients compared to controls (P<0.05): endothelin-1 (1.8-fold), adrenomedullin (10-fold), TNFalpha (2.3- fold), IL-1beta (3.9-fold), IL-6 (12-fold), MCP-1 (2.2-fold), IL-8 (4.2-fold), activin A (10.5-fold), and CTGF (3.2-fold). MIP-1alpha mRNA levels were not altered in HF. A similar increase in mRNA levels was not found in peripheral blood, indicating that the increase in gene expression is taking place in the lungs and is not a result of induction in monocytes in the circulation before entering the pulmonary compartment. mRNA levels of adrenomedullin, IL-6, MCP-1, IL-8, and CTGF in alveolar macrophages from HF patients displayed a negative correlation to left ventricular ejection fraction (P<0.05). Conclusion(s): Several important cytokines, chemokines, vasoactive peptides, and growth factors are induced in alveolar macrophages in human HF. Further studies should clarify whether this induction affects pulmonary remodelling and whether the increased synthesis of these factors is reflected by increased release to the circulation and thus potentially may affect the failing myocardium.

Dahlbo, H., et al. (2018). "Recycling potential of post-consumer plastic packaging waste in Finland." Waste Management **71**: 52-61.

Recycling of plastics is urged by the need for closing material loops to maintain our natural resources when striving towards circular economy, but also by the concern raced by observations of plastic scrap in oceans and lakes. Packaging industry is the sector using the largest share of plastics, hence packaging dominates in the plastic waste flow. The aim of this paper was to sum up the recycling potential of post-consumer plastic packaging waste in Finland. This potential was evaluated based on the quantity, composition and mechanical quality of the plastic packaging waste generated by consumers and collected as a source-separated fraction, within the mixed municipal solid waste (MSW) or within energy waste. Based on the assessment 86,000-117,000 tons (18 kg/person/a) of post-consumer plastic packaging waste was generated in Finland in 2014. The majority, 84% of the waste was in the mixed MSW flow in 2014. Due to the launching of new sorting facilities and separate collections for post-consumer plastic packaging in 2016, almost 40% of the post-consumer plastic packaging could become available for recycling. However, a 50% recycling rate for post-consumer plastic packaging (other than PET bottles) would be needed to increase the overall MSW recycling rate from the current 41% by around two percentage points. The share of monotype plastics in the overall MSW plastics fraction was 80%, hence by volume the recycling potential of MSW plastics is high. Polypropylene (PP) and low density polyethylene (LDPE) were the most common plastic types present in mixed MSW, followed by polyethylene terephthalate (PET), polystyrene (PS) and high density polyethylene (HDPE). If all the Finnish plastic packaging waste collected through the three collection types would be available for recycling, then 19,000-25,000 tons of recycled PP and 6000-8000 tons of recycled HDPE would be available on the local market. However, this assessment includes uncertainties due to performing the composition study only on mixed MSW plastic fraction. In order to obtain more precise figures of the recycling potential of post-consumer plastic packaging, more studies should be performed on both the quantities and the qualities of plastic wastes. The mechanical and rheological test results indicated that even plastic wastes originating from the mixed MSW, can be useful raw materials. Recycled HDPE showed a smaller decline in the mechanical properties than recycled PP. The origin and processing method of waste plastic seemed to have less effect on the mechanical quality than the type of plastic. The applicability of a plastic waste for a product needs to be assessed case by case, due to product specific quality requirements. In addition to mechanical properties, the chemical composition of plastic wastes is of major importance, in order to be able to restrict hazardous substances from being circulated undesirably. In addition to quantity and quality of plastic wastes, the sustainability of the whole recycling chain needs to be assessed prior to launching operations so that the chain can be optimized to generate both environmental and economic benefits to society and operators.

Dai, X., et al. (2010). "Microbead electrochemiluminescence immunoassay for detection and identification of Venezuelan equine encephalitis virus." Journal of Virological Methods **169**(2): 274-281.
An electrochemiluminescence (ECL) immunoassay, incorporating chemically biotinylated and ruthenylated antibodies down-selected from a panel of monoclonal and polyclonal reagents, was developed to detect and identify Venezuelan equine encephalitis virus (VEEV). The limit of detection (LOD) of the optimized ECL assay was 10³ pfu/ml VEEV TC-83 virus and 1 ng/ml recombinant (r) VEEV E2 protein. The LOD of the ECL assay was approximately one log unit lower than that of a sandwich enzyme-linked immunosorbent assay (ELISA) incorporating the same immunoreagents. Repetition of ECL assays over time and by different operators demonstrated that the assay was reproducible (coefficient of variation 4.7-18.5% month-to-month; 3.3-8.8% person-to-person). The VEEV ECL assay exhibited no cross-reactivity with two closely related alphaviruses or with 21 heterologous biological agents. A genetically biotinylated recombinant VEEV antibody, MA116SBP, was evaluated for utility for detection of rE2; although functional in the ECL assay, the LOD was two log units higher (100 ng/ml vs 1 ng/ml) using MA116SBP than when chemically biotinylated antibody was used. The ECL assay detected VEEV at the lowest LOD (highest sensitivity) hitherto reported in the published literature and ECL assay results were generated in ~60 min compared to a 6-8 h period required for ELISA. Results have demonstrated a sensitive, rapid, and fully automated ECL immunoassay for detection and identification of VEEV.

Dai, Z., et al. (2018). "Occurrence of microplastics in the water column and sediment in an inland sea affected by intensive anthropogenic activities." Environmental Pollution **242**: 1557-1565.
Microplastics may lose buoyancy and occur in deeper waters and ultimately sink to the sediment and this may threaten plankton inhabiting in various water layers and benthic organisms. Here, we conduct the first survey on microplastics in the water column and corresponding sediment in addition to the surface water in the Bohai Sea. A total of 20 stations covering whole Bohai Sea were selected, which included 6 stations specified for water column studying. Seawater was sampled every 5 m, with maximal depth of 30 m in the water column

using Niskin bottles coupled with a ship-based conductivity, temperature and depth sensor (CTD) system and surface sediment samples were collected using box corer. The results indicated that higher microplastic levels accumulated at a depth range of 5–15 m in the water column in some stations, suggesting the surface water survey was not sufficient to reflect microplastics loading in a water body. Fibers predominated microplastic types in both seawater and sediment of the Bohai Sea, which accounted for 75%–96.4% of the total microplastics. However the relatively proportion of the fibers in the deeper water layers and sediment was lower than that in the surface water. Microplastic shapes are more diverse in the sediment than in the seawater in general. The microplastic sizes changed with depth in the water column and the proportion of the size-fraction < 300 μm increased with depth, probably as a result of rapid biofouling on the small microplastics due to their higher specific surface area. Such depth distribution also implied that sampling with manta net (>330 μm) that commonly used in the oceanographic survey might underestimate microplastics abundance in the water column. Further studies are recommended to focus on the sinking behavior of microplastics and their effects on marine organisms. Graphical abstract Image 1 Highlights • Microplastics levels in the surface sea were closely related with human activities. • A higher amount of microplastics accumulated in the depth of 5–15 m in the Bohai Sea. • Micropalstics with size <300 μm tended to sinking and presenting in the deeper water. • Microplastics abundance was not consistent between water and corresponding sediment. Substantial amount of microplastics accumulated in the deeper water rather than the surface water of the Baohai Sea. [ABSTRACT FROM AUTHOR]

Dakova, I., et al. (2009). "Ion-imprinted polymethacrylic microbeads as new sorbent for preconcentration and speciation of mercury." Talanta **78**(2): 523-529.

Metal ion-imprinted polymer particles have been prepared by copolymerization of methacrylic acid as monomer, trimethylolpropane trimethacrylate as cross-linking agent and 2,2'-azobisisobutyronitrile as initiator, in the presence of Hg(II)-1-(2-thiazolylazo)-2-naphthol complex. The separation and preconcentration characteristics of the Hg-ion-imprinted microbeads for inorganic mercury have been investigated by batch procedure. The optimal pH value for the quantitative sorption is 7. The adsorbed inorganic mercury is easily eluted by 2 mL 4 M HNO₃. The adsorption capacity of the newly synthesized Hg ion-imprinted microbeads is 32.0 micro mol g⁻¹ for dry copolymer. The selectivity of the copolymer toward inorganic mercury (Hg(II)) ion is confirmed through the comparison of the competitive adsorptions of Cd(II), Co(II), Cu(II), Ni(II), Pb(II), Zn(II) and high values of the selectivity and distribution coefficients have been calculated. Experiments performed for selective determination of inorganic mercury in mineral and sea waters showed that the interfering matrix does not influence the extraction efficiency of Hg ion-imprinted microbeads. The detection limit for inorganic mercury is 0.006 micro g L⁻¹ (3 sigma), determined by cold vapor atomic adsorption spectrometry. The relative standard deviation varied in the range 5-9% at 0.02-1 micro g L⁻¹ Hg levels. The new Hg-ion-imprinted microbeads have been tested and applied for the speciation of Hg in river and mineral waters: inorganic mercury has been determined selectively in nondigested sample, while total mercury

e.g. sum of inorganic and methylmercury, has been determined in digested sample.

Dakova, I., et al. (2012). "Synthesis and application of vinylpyridine containing ion-imprinted copolymer gel microbeads for Cu(II) solid-phase extraction." Journal of Separation Science **35**(20): 2805-2812.

The influence of polymer matrix on the extraction efficiency for Cu(II) and selectivity against metal ions such as Ni(II), Cd(II), Pb(II) of Cu(II) imprinted copolymer gels was described. The functional monomers investigated include the weakly basic 4-vinylpyridine (4-VP) and its mixure with the acidic and hydrogen binding methacrylic acid. Copolymer gels were prepared by dispersion cross-linking copolymerization using Cu(II)-4-(2-pyridylazo) resorcinol complex, Cu(II), or 4-(2-pyridylazo)resorcinol as templates. The chemical structure and morphology of the Cu(II)-imprinted microbeads are defined using elemental analysis, Fourier transform infrared spectroscopy, and scanning electron microscopy. Extraction efficiencies of newly synthesized sorbents were studied by batch procedure. The prepared copolymer gel with 4-VP as monomer and Cu(II)-4-(2-pyridylazo)resorcinol complex has higher capacity and selectivity toward Cu(II) than the copolymer gels prepared using the mixture of methacrylic acid and 4-VP. This new sorbent can be used as an effective SPE material for the highly selective preconcentration and separation of Cu(II) in sea water samples. It shows high mechanical and chemical stability. © 2012 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

Dakova, I., et al. (2007). "Solid phase selective separation and preconcentration of Cu(II) by Cu(II)-imprinted polymethacrylic microbeads." Analytica Chimica Acta **584**(1): 196-203.

Ion-imprinted polymer (IIP) particles are prepared by copolymerization of methacrylic acid as monomer, trimethylolpropane trimethacrylate as crosslinking agent and 2,2'-azo-bis-isobutyronitrile as initiator in the presence of Cu(II), a Cu(II)-4-(2-pyridylazo)resorcinol (Cu(II)-PAR) complex, and PAR only. A batch procedure is used for the determination of the characteristics of the Cu(II) solid phase extraction from the IIP produced. The results obtained show that the Cu(II)-PAR IIP has the greatest adsorption capacity (37.4 mumol g⁻¹ of dry copolymer) among the IIPs investigated. The optimal pH value for the quantitative preconcentration is 7, and full desorption is achieved by 1 M HNO<inf>3</inf>. The selectivity coefficients (S<inf>Cu/Me</inf>) for Me = Ni(II), Co(II) are 45.0 and 38.5, respectively. It is established that Cu(II)-PAR IIPs can be used repeatedly without a considerable adsorption capacity loss. The determination of Cu(II) ions in seawater shows that the interfering matrix does not influence the preconcentration and selectivity values of the Cu(II)-PAR IIPs. The detection and quantification limits are 0.001 mumol L⁻¹ (3sigma) and 0.003 mumol L⁻¹ (6sigma), respectively. © 2006 Elsevier B.V. All rights reserved.

D'Alessandro, M., et al. (2018). "Relationships between plastic litter and chemical pollutants on benthic biodiversity." Environmental Pollution **242**(Part B): 1546-1556.

Five Descriptors (D) of Marine Strategy Framework Directive (MSFD): marine litter (D10), non-indigenous species (D2) and organic and inorganic pollutants (D8), were estimated in a coastal area of GSA 16 (Augusta harbour, Central Mediterranean Sea) in order to study their effects on the biodiversity (D1) of the benthic community (D6) and to improve data for the MSFD. Investigation of plastic debris had led to the identification of 38 fragments divided into four categories, among which microplastics resulted as the most abundant. Six non-indigenous species, belonging to Polychaeta (Kirkegaardia dorsobranchialis, Notomastus aberans, Pista unibranchia, Pseudonereis anomala, Branchiomma bairdi) and Mollusca (Brachidontes pharaonis) were found. Biodiversity and benthic indices suggested a generalised, slightly disturbed ecological status. Anthracene, Zinc and Chrome were the most abundant chemical compounds in analysed sediments. Significant correlations were found between the abundance of trace elements vs biotic indices and between plastic debris vs biodiversity and benthic indices. This study represents the first report about the abundance of plastic debris and its relationship to contaminants and infauna in Augusta harbour. Our results can provide useful information for national and international laws and directives.

Dalu, T., et al. (2019). "Assessing factors driving the distribution and characteristics of shoreline macroplastics in a subtropical reservoir." Science of the Total Environment **696**: 133992.

Plastic pollution is a growing problem that threatens all habitat types globally. However, relatively little is known about the extent of macroplastics in African freshwater ecosystems. This study explored the distribution and concentration of different macroplastic debris types in Nandoni reservoir, South Africa over four sites (2 high household- and 2 low household-density) and two seasons (cool-dry, hot-dry). Similarities were observed for macroplastic debris numbers and weights across sites and seasons. Although slight insignificant differences in macroplastics abundances were observed, no significant relationships were recorded between household density (i.e. as proxy for human population density) and macroplastic debris abundances. The amount of plastic debris and 'species' (i.e. gamma-diversity value) decreased with distance from the shoreline, with the highest amount of plastic debris and 'species' being observed at the shoreline in all sites and seasons. Polypropylene was the most dominant (>45%) in terms of abundance for both seasons and sites. The information derived serves as a baseline for future studies on macroplastic distributions along freshwater reservoir shorelines.

Dam, A. H. and D. Kim (2008). "Metal ion-imprinted polymer microspheres derived from copper methacrylate for selective separation of heavy metal ions." Journal of Applied Polymer Science **108**(1): 14-24.

Microbeads of metal ion-imprinted polymers (MIIPs) were prepared by a novel precipitation polymerization technique, in which copper methacrylate monomer and ethylene glycol dimethacrylate crosslinker were copolymerized in a rotary evaporator. The prepared microbeads had mono- or narrow size dispersity, and their sizes increased from 1 to 4 m with decreasing solvent amount or increasing initiator concentration. The absorption capacity and selectivity of the imprinted polymer for copper ion were determined in the presence of various competitive metal ions. As results, adsorption equilibrium was quickly achieved in about 10 min with high absorbability (about 90%). The effects of pH, initial metallic ion concentration, and MIIP bead size on the absorption capacity were investigated. The Cu(II)-imprinted polymers exhibited extremely high selectivity, which was much higher than that of corresponding blank polymers.

Damelin, L. H., et al. (2015). "Alginate microbead-encapsulated silver complexes for selective delivery of broad-spectrum silver-based microbicides." International Journal of Antimicrobial Agents **46**(4): 394-400.

In sub-Saharan Africa, human immunodeficiency virus (HIV) infections are predominantly acquired via heterosexual contact, and women are at greatest risk of being infected. This region also has the highest rates of sexually transmitted infections (STIs) per capita worldwide; STIs are strongly associated with increased HIV transmission. Therefore, there is an urgent requirement for microbicides that are active against HIV and STIs. Silver compounds exhibit broad antimicrobial activity, making them potentially ideal broad-spectrum microbicides. However, for silver compounds to be effective microbicides, they must be active within seminal fluid and the

delivery vehicle used must protect the silver microbicide from vaginal fluid components but selectively release it during intercourse and/or following ejaculation. In this study, silver complexes were synthesised from the ligands saccharin, benzimidazole and 8-hydroxyquinoline and their microbicidal activity was assessed. We show that a silver saccharinate-benzimidazole complex (AgSB) exhibited activity against HIV-1, herpes simplex virus type 2 (HSV-2) and Neisseria gonorrhoeae at concentrations significantly below LD(50) levels for the vaginal mucosal cell line SiHa. Furthermore, we show that alginate microbeads are stable in vaginal fluid simulant but rapidly dissolve in seminal fluid simulant. Finally, we have established that microbead-encapsulated AgSB, dissolved in seminal fluid simulant, is active against the above pathogens, albeit at higher concentrations for HIV-1. This research therefore highlights, for the first time, the potential use of silver complexes encapsulated in alginate microbeads as a novel system for the delivery and selective release of broad-spectrum silver-based microbicides within the vaginal milieu during sexual intercourse/after ejaculation.

Damodar, R. and B. Movva (2014). "Preparation and in-vitro evaluation of metformin HCl tablets containing sustained release beads for increasing therapeutic window." Journal of Bioequivalence and Bioavailability **6**(3): 091-095.

The purpose of present investigation was to develop the dosage form containing metformin for both immediate and sustained release. The SR release tablets of metformin were not useful to control the fasting glucose levels whereas conventional metformin tablets cannot acts for prolonged time, But the tablets prepared by present method useful for control both fasting glucose levels and maintenance dose. Even though many combination therapies available in market as metformin for sustain release and other sulfonylureas for immediate release, The primary concern for considering metformin hydrochloride as monotherapy was its efficient activity, less cost and negligible cardiac risk factors. The immediate release dose was developed by direct compression method and sustained release beads were prepared by inotropic gelation method using sodium alginate and sodium CMC, CaCl<inf>2</inf>. The various batches of directly compressed tablets with different percentages of sustained release beads were prepared and evaluated for various physical properties and dissolution profile. Hardness (kg/cm²) of tablets was decreased and percentage loss in friability is increased as concentration of beads in tablet increased. All the parameters are within range for tablets containing micro beads up to 35% thereafter loss in friability and Hardness (kg/cm²) are not within range. © 2014 Damodar R, et al.

Dandachi, N., et al. (2005). "Critical evaluation of real-time reverse transcriptase-polymerase chain reaction for the quantitative detection of cytokeratin 20 mRNA in colorectal cancer patients." Journal of Molecular Diagnostics **7**(5): 631-637.

We evaluated the usefulness of cytokeratin 20 (CK20) mRNA expression in the quantitative detection of circulating tumor cells in the blood of patients with colorectal cancer (CRC). Blood samples from healthy volunteers (HVs; n = 37), patients with localized (n = 42) and metastatic colorectal cancer (n = 40), and patients with chronic inflammatory bowel disease (CID; n = 15) were examined. After immunomagnetic enrichment using microbeads against human epithelial antigen, total RNA was extracted, reverse transcribed, and analyzed by real-time reverse transcriptase-polymerase chain reaction using the LightCycler instrument. CK20 expression in peripheral blood was found in 46 of 82 (56%) patients with CRC, 8 of 37 (22%) HVs, and 9 of 15 (60%) patients with CID. Levels of CK20 mRNA were significantly higher in blood samples from CRC patients (median 681) than in blood samples from HVs (median 0) (P = 0.001), whereas no difference could be detected between patients with CRC and CID. Although the present technique could not distinguish CRC from CID, the method warrants further efforts to improve sample preparation and tumor cell enrichment, which may render real-time CK20 reverse transcriptase-polymerase chain reaction a feasible technique in identifying circulating tumor cells in peripheral blood of cancer patients.

Danese, E., et al. (2012). "High detection rate of genomic imbalances in CD138-positive enriched plasma cells from multiple myeloma patients." Biochimica Clinica **36 (6)**: 551.

Background: Multiple Myeloma (MM) is a heterogeneous disease, which is characterized by the occurrence of specific genomic abnormalities that are both of diagnostic and prognostic relevance. The detection of these abnormalities through molecular-genetic techniques is hampered by the overall low percentage of proliferating plasma cells (PCs) present in whole bone marrow (BM) aspirates. To overcome the risk of false-negative results, the International Myeloma Working Group has recently suggested to perform interphase FISH (i-FISH) on enriched PCs samples. Aim(s): (a) to develop and optimize a protocol of magnetic cell sorting (MACS) for the selection of CD138-positive PCs from whole BM aspirates; (b) to compare the diagnostic efficacy of i-FISH in enriched PCs with that in whole BM samples. Method(s): 140 samples from patients with MM (n=120) and benign monoclonal gammopathy of undetermined significance (MGUS, n=20) were divided into two groups representing two different phases for analysis: (1) 120 cases referred to our diagnostic centre before June 2012 were evaluated by i-FISH performed on unsorted BM cells from routine chromosomal preparations; (2) 20 cases collected after June 2012 were assessed by i-FISH performed on CD138+ sorted BM cells. Magnetic cell separation of PCs was performed using the Whole Blood CD138 MicroBeads (Miltenyi Biotec, Auburn, CA) according to the manufacturer's protocol. The MACS enrichment was verified by flow cytometric analysis. The i-FISH panel included probes for the identification of t(11;14)(q13;q32), t(4;14)(p16;q32) and 13q14/17p13 aberrations. 300 nuclei were scored for each sample. The detection threshold for gains, losses and translocations was set at 10% for all probes. Result(s): The percentage of plasma cells after magnetic cell separation varied between 30% and 78%. One or more genomic abnormalities were detected in enriched PCs in 10/20 (50%) cases, whereas in whole BM samples these abnormalities were detected in only 23/120 (19%) of the cases (P<0.001). Conclusion(s): MACS-enrichment technique results in a significantly increased detection rate of clinically relevant genomic abnormalities in intherphase cells.

Dangor, Z., et al. (2019). "The association between breastmilk group B Streptococcal capsular antibody levels and late-onset disease in young infants." Clinical Infectious Diseases **06**: 06.

BACKGROUND: Animal-model studies demonstrated less group B streptococcal (GBS) invasive disease and gastrointestinal colonization after enteral administration of serotype-specific capsular antibody. There is however a paucity of information on the association of breastmilk GBS serotype-specific capsular antibody and risk for invasive disease in infants. The aim of this study was to explore the association between natural secretory IgA (sIgA) capsular antibody in breastmilk, and the occurrence of late-onset disease (LOD) in young infants.

METHODS: A matched case-control study was undertaken in infants <3months of age in Johannesburg, South Africa. Breastmilk samples were collected on cases and controls matched for gestational age, maternal age and HIV-status at time of enrolment. Capsular serotype Ia, Ib, III and V sIgA antibody concentrations were measured using the fluorescence based micro-bead immunosorbent assay.

RESULTS: Breastmilk samples were available for 31 LOD (8 serotype Ia and 23 serotype III), 10 serotype Ia and 11 serotype III recto-vaginally colonized matched controls, and 84 and 105 non-colonized

matched controls. Using a Bayesian model to estimate the probability of disease, there was a 90% reduction in the risk of developing serotype Ia and III LOD with sIgA concentrations >=0.14 micro g/mL and >=2.52 micro g/mL, respectively.
CONCLUSION: Breastmilk sIgA capsular antibody was associated with lower risk for LOD in young infants. The ability of GBS polysaccharide-protein conjugate vaccines currently under development to induce sIgA responses warrant investigation as a potential mediator of protection against LOD.

Danhier, P., et al. (2013). "Influence of cell detachment on the respiration rate of tumor and endothelial cells." PLoS ONE [Electronic Resource] **8**(1): e53324.

Cell detachment is a procedure routinely performed in cell culture and a necessary step in many biochemical assays including the determination of oxygen consumption rates (OCR) in vitro. In vivo, cell detachment has been shown to exert profound metabolic influences notably in cancer but also in other pathologies, such as retinal detachment for example. In the present study, we developed and validated a new technique combining electron paramagnetic resonance (EPR) oximetry and the use of cytodex 1 and collagen-coated cytodex 3 dextran microbeads, which allowed the unprecedented comparison of the OCR of adherent and detached cells with high sensitivity. Hence, we demonstrated that both B16F10 melanoma cells and human umbilical vein endothelial cells (HUVEC) experience strong OCR decrease upon trypsin or collagenase treatments. The reduction of cell oxygen consumption was more pronounced with a trypsin compared to a collagenase treatment. Cells remaining in suspension also encounter a marked intracellular ATP depletion and an increase in the lactate production/glucose uptake ratio. These findings highlight the important influence exerted by cell adhesion/detachment on cell respiration, which can be probed with the unprecedented experimental assay that was developed and validated in this study.

Daniel, D. B., et al. (2020). "Assessment of fishing-related plastic debris along the beaches in Kerala Coast, India." Marine Pollution Bulletin **150 (no pagination)**(110696).

An assessment of quantity, composition and seasonal variation of fishing-related plastic debris was conducted in six beaches along the Kerala coast of India during 2017-2018. Plastic items were the most dominant type of waste constituting 73.8% by number and 59.9% by weight. In the total debris recorded, 5540 pieces (36%) weighing 198.4 kg (39.8%) were fishing related trash. On an average 14.4 +/- 12 fishing related items/100 m², corresponding to mean weight of 0.55 +/- 0.7 kg/100 m² was recorded from these beaches. Results indicated that the fishing-related plastic items were concentrated four times more in the beaches with higher fishing intensity, as compared to the other beaches. Also, the concentration of fishing-related plastic was recorded higher in the post-monsoon season compared to the lowest during monsoon, which was significant with p-value < 0.05. The results emphasize the role of fishing activities in the generation of marine litter. Copyright © 2019 Elsevier Ltd

Danis, O., et al. (2019). "Production of PHB from waste materials using Bacillus megaterium and development of electrospun composite nanomats." FEBS Open Bio **9 (Supplement 1)**: 211.

Along with the increasing world population the amount and variety of organic pollutants are continually increasing. Plastic waste is one of the major problems of today's world. Bioplastics are microbially produced polymers that are deposited in the form of storage granules by microorganisms under different conditions. Biopolymers are considered as an alternative to the environmental pollution caused by plastics. Polyhydroxyalkanoates (PHAs) are biodegradable polymers of biological origin. PHAs suggested as a solution to environmental pollution and they are mechanically similar to various thermoplastics. Poly (3-hydroxybutyrate) (PHB) is the most

studied and best characterized PHA derivative. PHB production from different microorganisms including Bacillus megaterium was reported by researchers. Bacillus megaterium is a gram-positive, endosporin-forming, rod-shaped bacterium which was found in the soil, has aerobic life span and considered as saprophytic. Collagen, the most abundant protein in animals, is a biopolymer that is present in all connective tissues of animals. As a result of its unique characteristics such as its biodegradability, weak antigenicity and its excellent biological compatibility, collagen is one of the most suitable biomaterial that can be used in biomedical areas. In this study Bacillus megaterium was screened for the production of PHB using fish industry waste materials. Fish skins and scales obtained from the local fish processing plant used for the isolation and characterization of collagen. Fatty waste material obtained from this process then used for the production of PHB. A nanofiber composite of collagen with PHB was prepared by electrospinning and characterized by FT-IR and SEM. Our results indicate that fish processing plant waste materials are excellent sources for the production of PHB. The obtained nanofiber mats displayed high potential to be used for various biomedical applications.

Danisker, M. (1989). "PLASTIC POLICY." Organic Gardening (08973792) **36**(2): 69-69.
Focuses on the U.S. government's policy regarding plastic materials and their disposal. Number of states requiring degradable plastics in six-pack ring binders or carriers; Proposal of legislation to tax and/or ban plastic packaging; Designation of Jefferson City, Missouri, as the first U.S. city to use degradable plastic bags in a citywide refuse program.

D'Anna, F., et al. (2014). "Effects of soil solarization with different plastic films on yield performance of strawberry protected plantations in Sicily." Acta Horticulturae.
Two main alternatives to replace methyl-bromide soil fumigation are soil solarization, which is feasible in geographical areas with high solar radiation, and the combination of the nematocide 1,3-dichloropropene (1,3-D) and the fungicide chloropicrin (Pic) applied through drip irrigation lines. The objective of this two-year study was to evaluate solarization and fumigation with 1,3-D + Pic as preplant soil treatments for plasticulture strawberry production in the northern coast of Sicily. Plots to be solarized were covered with transparent polyethylene (PE) or with green ethylene-vinylacetate (EVA) film mulches and left undisturbed for 69 and 77 days in 2009 and 2010, respectively. Freshly bare rooted plants and containerized plants were transplanted in the first and second year, respectively. Cultivars 'Candonga' and 'Nora' were tested using standard plasticulture practices. Soil temperatures recorded in PE solarized plots were higher than 37 degrees C for 792 and 750 hours, in 2009 and 2010 respectively, whereas cumulative exposure above 37 degrees C in green-EVA film solarized soil was 615 and 592 hours in the first and second year, respectively. These temperature are considered lethal for several soil pathogens. In both years, regardless of the cultivars tested, total marketable fruit yields in fumigated and solarised plots were significantly higher than in the untreated plots. Our results demonstrated the efficiency of solarization with either transparent-PE or green-EVA mulching films as alternative to 1,3-D + Pic soil preplant treatment. The green-EVA plastic mulch, was designed to be kept on soil after the end of soil solarization during the cropping season because it prevents infestation with weeds and therefore may need not to be replaced by traditional black plastic mulch. The green-EVA film induced both thermal regimes and fruit yields comparable to those obtained under conventional PE film. Therefore, it was concluded that its use would be a feasible option and a considerable reduction of plastic waste.

Danso, D., et al. (2019). "Plastics: Environmental and Biotechnological Perspectives on Microbial Degradation." Applied & Environmental Microbiology **85**(19): 01.

Plastics are widely used in the global economy, and each year, at least 350 to 400 million tons are being produced. Due to poor recycling and low circular use, millions of tons accumulate annually in terrestrial or marine environments. Today it has become clear that plastic causes adverse effects in all ecosystems and that microplastics are of particular concern to our health. Therefore, recent microbial research has addressed the question of if and to what extent microorganisms can degrade plastics in the environment. This review summarizes current knowledge on microbial plastic degradation. Enzymes available act mainly on the high-molecular-weight polymers of polyethylene terephthalate (PET) and ester-based polyurethane (PUR). Unfortunately, the best PUR- and PET-active enzymes and microorganisms known still have moderate turnover rates. While many reports describing microbial communities degrading chemical additives have been published, no enzymes acting on the high-molecular-weight polymers polystyrene, polyamide, polyvinylchloride, polypropylene, ether-based polyurethane, and polyethylene are known. Together, these polymers comprise more than 80% of annual plastic production. Thus, further research is needed to significantly increase the diversity of enzymes and microorganisms acting on these polymers. This can be achieved by tapping into the global metagenomes of noncultivated microorganisms and dark matter proteins. Only then can novel biocatalysts and organisms be delivered that allow rapid degradation, recycling, or value-added use of the vast majority of most human-made polymers.

Dantas, D. V., et al. (2019). "Ingestion of plastic fragments by the Guri sea catfish <i>Genidens genidens</i> (Cuvier, 1829) in a subtropical coastal estuarine system." Environmental science and pollution research international **26**(8): 8344-8351.

One of the most recognized anthropogenic impacts in marine environments is solid waste pollution, especially plastic, which can be ingested by fish, thus interfering with their health. In this context, the aim of this study is to describe the ingestion of plastic fragments and to identify the possible effect of this contamination in the condition factor of Genidens genidens in the Laguna Estuarine System. The stomach contents of 92 G. genidens (26 juveniles and 66 adults) were analyzed. The Index of Relative Importance was performed to identify the contribution of each prey item. Condition factor (CF) was used to analyze the effect of plastic ingestion on the fish's body condition (by comparing individuals in the same ontogenetic phase). For the juveniles, eight items were observed, the most important of which were Penaeidae, followed by Portunidae and plastic. For the adults, 12 items were observed, the most important of which were Penaeidae, Portunidae, Polychaeta, and plastic. The analysis of CF demonstrated higher values for individuals without plastic in the stomach, which indicated a better health condition. The CF of a fish may be affected by variations in the physiological condition, environmental stresses, and nutritional and biological variations, and could be used to compare the body condition or health of a fish species. The ingestion of plastic could significantly influence the worst body condition of the individuals that were analyzed in the present study. The plastic pollution in marine coastal waters is associated with the appropriate waste management levels.

D'Archivio, A. A., et al. (2015). "Artificial neural network prediction of multilinear gradient retention in reversed-phase HPLC: comprehensive QSRR-based models combining categorical or structural solute descriptors and gradient profile parameters." Analytical and bioanalytical chemistry **407**(4): 1181-1190.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis A multilayer artificial neural network (ANN) is used to model the reversed-phase liquid chromatography retention times of 16 selected compounds, including purines, pyrimidines and nucleosides. The analysed data,

taken from literature, were collected in acetonitrile-water eluents under the application of 16 different multilinear gradients. The parameters describing the gradient profile together with solute descriptors are considered as the independent variables of an ANN-based model providing the retention time as response. Categorical variables or, alternatively, a selected set of molecular descriptors of computational origin are adopted to represent the solutes. Network training, validation and testing are performed preliminarily using data of 12, 2 and 4 gradients, respectively and successively, to investigate model performance under more severe calibration conditions, with data of 9, 2 and 7 gradients. The proposed approach allows a quite accurate prediction of retention times of the target analytes in external multilinear gradients. Categorical variables can successfully represent the target solutes when the model is called to transfer retention data from calibration to external gradients. In particular, using a five-dimensional bit string to represent the analytes, mean errors on retention times are 2 and 3 % under the most and less favourable calibration conditions, respectively. A comparable performance is observed if the categorical variables are replaced by five molecular descriptors, selected by a genetic algorithm within a large set of structural variables of computational origin.

Darling, E. M. and D. Di Carlo (2015). "High-Throughput Assessment of Cellular Mechanical Properties." Annual Review of Biomedical Engineering **17**: 35-62.

Traditionally, cell analysis has focused on using molecular biomarkers for basic research, cell preparation, and clinical diagnostics; however, new microtechnologies are enabling evaluation of the mechanical properties of cells at throughputs that make them amenable to widespread use. We review the current understanding of how the mechanical characteristics of cells relate to underlying molecular and architectural changes, describe how these changes evolve with cell-state and disease processes, and propose promising biomedical applications that will be facilitated by the increased throughput of mechanical testing: from diagnosing cancer and monitoring immune states to preparing cells for regenerative medicine. We provide background about techniques that laid the groundwork for the quantitative understanding of cell mechanics and discuss current efforts to develop robust techniques for rapid analysis that aim to implement mechanophenotyping as a routine tool in biomedicine. Looking forward, we describe additional milestones that will facilitate broad adoption, as well as new directions not only in mechanically assessing cells but also in perturbing them to passively engineer cell state. Copyright © 2015 by Annual Reviews. All rights reserved.

Darmody, G., et al. (2015). "Tissue targeting of the European flat oyster, Ostrea edulis, using microencapsulated microbeads as a biological proxy." Aquaculture International **23**(2): 647-659.

Expansion of the aquaculture industry has been accompanied by outbreaks of disease from an ever increasing range of pathogens. Such outbreaks pose serious limitations to the growth and sustainability of the seafood industry, necessitating the development of alternative methods to combat disease. Immunostimulants are currently being pursued as an effective alternative to the use of traditional antibiotics. However, for suspension feeding bivalves, an effective system whereby immunostimulants can be successfully delivered to the site of infection at appropriate times is lacking. In recent years, the process of microencapsulation using non-toxic and biodegradable coatings has been an effective and stable delivery system for the administration of probiotics. In this study, SMA microbeads encapsulated in alginate were used as a biological proxy for the delivery of immunostimulants to the European flat oyster, Ostrea edulis. Chitosan- and poly-L-lysine-coated and uncoated alginate microcapsules were used, and the route of intake and transportation to the various oyster tissue types was assessed histologically.

Darquea, D., et al. (1997). "Development and characterization of a bioselective adsorption matrix for removal of Bacillus cereus spores from buffer and milk." Lebensmittel Wissenschaft & Technologie **30**(8): 786-792.

Cataphote Microbeads class -400 were derivatized. Carbohydrates on the Fc region of monoclonal antibody 183 against B. cereus T spores were oxidized to allow for an oriented antibody immobilization (270 nmsuperscript 2/molecule). The adsorption matrix was characterized for its ability to bind B. cereus in comparison with a control matrix. It was capable of removing 96% of spores in skim milk, compared with 90% removal for the control. It had excellent regeneration ability and was capable of removing 8 x 10⁶ spores/msuperscript 2.

Daryanto, S., et al. (2017). "Can ridge-furrow plastic mulching replace irrigation in dryland wheat and maize cropping systems?" Agricultural Water Management **190**: 1-5.

Dryland crop production requires significant water investments, but problems associated with irrigation have been observed in many dryland regions (e.g., China, Australia and the Mediterranean basin). A key strategy for maintaining crop yields without over-exploiting the scarce water resource is by increasing water use efficiency (WUE). Plastic mulching technology for wheat and maize has been commonly used in China, but their effect on yield, soil water content, evapotranspiration (ET), and WUE has not been compared with traditional irrigation. Using a meta-analysis approach, we quantitatively examined the efficacy of plastic mulching in comparison with traditional irrigation in the same region. By covering the ridges with plastic and channeling rainwater into a very narrow planting zone (furrow), our results showed that plastic mulching resulted in a yield increase comparable to irrigated crops but used 24% less water in comparison with irrigation due primarily to a much greater WUE and better retention of soil water. The higher WUE in plastic-mulched croplands was likely a result of a greater proportion of available water being used for transpiration (T) than evaporation (E). Currently production costs and residual plastic pollution hinder worldwide adoption of the technique, despite being a promising strategy for dryland cropping systems.

Das, A., et al. (2016). "Partial Obstruction of the Endotracheal Tube by the Plastic Coating Sheared from a Stylet." Case Reports in Pediatrics **2016**: 4373207.

A preterm with gestational age of 24 weeks was intubated at day of life 16. The intubation was done in a routine manner with the use of a stylet. It took a significant effort from the clinician to pull the stylet out after intubation. After intubation the respiratory status of the neonate deteriorated requiring significantly greater support. When ventilating and oxygenating the infant was getting progressively difficult, the decision was made to change the endotracheal tube (ETT). The cause for deterioration of respiratory status was then determined to be a sheared piece of plastic from the sheath of the stylet which was lodged in the lumen of the ETT. After removal of the plastic particle, the condition of the infant improved significantly.

Das, B., et al. (2014). "Zinc alginate-carboxymethyl cashew gum microbeads for prolonged drug release: development and optimization." International Journal of Biological Macromolecules **70**: 506-515.

Isoxsuprine HCl-loaded microbeads using sodium alginate (SA)-carboxymethyl cashew gum (CMCG) polymer-blends were developed through ionotropic-gelation technique using ZnSO4 as cross-linker. Effects of polymer-blend ratio and cross-linker concentration on drug encapsulation efficiency (DEE) and cumulative drug release at 7 h (R7 h) were optimized by 3(2) factorial design. Optimized microbeads were of excellent combination of high DEE (79.92+/-2.51%) and suitable sustained drug release pattern over a prolonged period of 7 h (58.67+/-2.26%). The

microbead surface morphology was analyzed by SEM. The physical state of isoxsuprine HCl within the optimized microbead matrix was analyzed by FTIR and DSC. In vitro isoxsuprine HCl release from alginate-CMCG microbeads in phosphate buffer (pH, 6.8) showed prolonged sustained drug release and Korsmeyer-Peppas model (R2=0.9959-0.9992) over 7 h.

Das, D. S., et al. (2014). "Anti-myeloma activity of a novel glutaminase inhibitor CB-839." Blood. Conference: 56th Annual Meeting of the American Society of Hematology, ASH **124**(21).

Background and Rationale: Cancer cells possess different metabolic requirements than normal cells, such as increased fatty acid synthesis and increased rates of glutamine metabolism, which facilitate their growth and survival. Glutamine is one of the key metabolites required by different cancer cell types for their survival. It is a precursor for alpha-keto glutarate (alphaKG) of tricarboxylic acid cycle. Intracellular glutamine is metabolized by a biochemical process glutaminolysis: glutamine is converted to glutamate by glutaminase (GLS), followed by glutamate conversion to alphaKG by glutamate dehydrogenase (GDH). Three mammalian GLS have been identified: the Liver-type (LGA or GLS2), the Kidney-type (KGA) and Glutaminase C (GAC). Elevated GAC mRNA levels have been detected in gliomas, colorectal carcinomas, adenomas and breast tumor cell lines. GLS activity is linked to tumor growth, since its inhibition by small molecule inhibitors or siRNA knockdown suppresses tumor growth in solid tumors. Elevated glutaminolysis confers drug resistance. These findings suggest that targeting GLS activity inhibits oncogenic transformation and overcomes drug resistance. Here we evaluated anti-MM activity of CB-839, a novel potent orally bioavailable inhibitor of both KGA and GAC splice variants of glutaminase Material(s) and Method(s): MM cell lines, patient MM cells, and peripheral blood mononuclear cells (PBMCs) from normal healthy donors were utilized to assess the anti-MM activity of CB-839. All studies involving human samples were performed under approved protocols at Dana-Farber Cancer Institute. Cell viability was assessed by WST-1 (Chemicon International) assay, as per manufacturer's instructions. MM cells from patients were isolated by CD138-positive selection using CD138 microbeads and the auto MACS magnetic cell sorter. Total cell lysates were subjected to immunoblot analysis. HUVEC cell angiogenesis assay and transwell cell migration assays were performed, as previously described (Chauhan et al., Blood, 2010, 115(4): 834-45). Glutamine and glutamate determination kit was purchased from Sigma, USA. Drug source: CB-839 was obtained from Calithera Biosciences, USA Results: KGA and GAC are highly expressed in MM cell lines than in normal PBMCs. We first confirmed the functional specificity of glutamines (GLS) inhibitor CB-839 using MM cells. Specifically, a significant increase in glutamine and a concomitant decrease in glutamate levels were observed in CB-839-treated RPMI-8226 MM cells ($p < 0.05$; n=3). Moreover, treatment of MM cells with CB-839 significantly decreased both basal and active alpha-keto glutarate levels ($p < 0.05$; n=3). Treatment of MM cell lines (MM.1S, MM.1R, RPMI-8226, Dox-40, U266, ARP-1, INA-6, ANBL6.WT, ANBL6.R, and LR5) and primary patient cells for 72h significantly decreased their viability (IC<inf>50</inf> range 1.25 muM-10 muM) ($p < 0.05$; n=3) without markedly affecting PBMCs from normal healthy donors, suggesting specific anti-MM activity and a favorable therapeutic index for CB-839. Conversely, pretreatment of MM cells with alpha-keto glutarate, a downstream product of glutamine breakdown abrogates anti-MM activity of CB-839. Moreover, CB-839 inhibits proliferation of MM cells even in the presence of BM stromal accessory cells. Mechanistic studies show that CB-839 triggered MM cell death occurs in a caspase-dependent manner, associated with induction of autophagy in MM cells via inhibition of PI3K/Akt/mTOR signaling pathway without concurrent activation of mTORC1. CB-839 induced autophagy was evident by increased levels of autophagy markers Beclin-1, Atg-7 and LC3B. Combining CB-839 with a biochemical inhibitor of autophagy 3-methyl adenine or chloroquine triggered

antagonism, suggesting that both autophagy and caspase-mediated apoptotic pathway contribute to anti-MM activity of CB-839. Furthermore, CB-839 blocked migration of MM cells and angiogenesis. Finally, combination of CB-839 with pomalidomide, bortezomib or SAHA induces synergistic anti-MM activity Conclusion(s): Our preclinical studies showing efficacy of CB-839 in MM disease models provide the framework for a clinical trial of CB-839, either alone or in combination, to improve outcome in relapsed and refractory MM patients.

Das, M. (2014). "ENVIRONMENTAL EDUCATION AND ATTITUDE TOWARDS SOCIAL AWARENESS ON PLASTIC POLLUTION OF HIGHER SECONDARY SCHOOL STUDENTS IN HOOGHLY DISTRICT." International Journal of Physical and Social Sciences **4**(7): 315.

Environmental education is the study of the relationships and interactions between natural and human systems. It is interdisciplinary, combining aspects of natural sciences such as ecology and geography with aspects of social sciences such as economics, law and public health. Two National Science Foundation boards have underscored the importance of environmental education and have called for a systematic approach to environmental education a report found that 95% of the public supports environmental education in schools. The present study aims to investigate the concept of environmental awareness in plastic pollution of higher secondary school students of Hooghly District. Concept and attitude of environment awareness in plastic pollution measure by questionnaire was used to assess their environment awareness. The result of analysis shows that there exists significant difference in plastic pollution awareness among higher secondary school student. Urban students are more aware in plastic pollution than rural school student in Hooghly district. Science students are more aware than commerce and arts students in plastic pollution.

Das, P. and P. Tiwari (2018). "The effect of slow pyrolysis on the conversion of packaging waste plastics (PE and PP) into fuel." Waste Management **79**: 615-624.

Packaging plastic waste consisting of low and high-density polyethylene and polypropylene were pyrolyzed in a lab scale semi-batch reactor at a very slow dynamic condition (1degreeCmin⁻¹). Gaseous and liquid products were collected at regular intervals starting from their inception during the degradation process. Detailed analysis was carried out to estimate the properties of plastic derive oil (PDO) obtained at different stages of the pyrolysis process. The pyrolysis temperature has a significant effect on the product compositions. The paraffin concentration increases with increasing pyrolysis temperatures. On the other hand, increased pyrolysis temperature decreases olefin concentration. Olefinic content in the PDO was found comparatively higher when PP was in the feed. Presence of polypropylene in the feed caused the production of PDOs with branch-chain hydrocarbon components with high isoparaffin index and research octane number (RON). The PDOs obtained (for all feed studied) at the early stages of the degradation process have light hydrocarbon liquid fractions belonging to light and middle distillates of petroleum (C₆ - C₂₀). The yield of both light and middle fractions decreased as the pyrolysis reactor temperature reached the maximum value (~400degreeC). Gas evolution pattern depends on both pyrolysis temperature and the feed composition. Propylene was found more dominating among other major components of gases like methane, ethane, ethylene, propane, n-butane, 1-butene, isobutylene and n-pentane etc.

Dasari, P., et al. (2014). "Hormonal regulation of the cytokine microenvironment in the mammary gland." Journal of Reproductive Immunology **106**: 58-66.

The mammary gland is a unique organ that undergoes hormone-driven developmental changes

over the course of the ovarian cycle during adult life. Macrophages play a role in regulating cellular turnover in the mammary gland and may affect cancer susceptibility. However, the immune microenvironment that regulates macrophage function has not been described. Hormonal regulation of the cytokine microenvironment across the ovarian cycle was explored using microbead multiplex assay for 15 cytokines in mammary glands from C57Bl/6 mice at different stages of the oestrous cycle, and in ovariectomised mice administered oestradiol and progesterone. The cytokines that were found to fluctuate over the course of the oestrous cycle were colony-stimulating factor (CSF)1, CSF2, interferon gamma (IFNG) and tumour necrosis factor alpha (TNFA), all of which were significantly elevated at oestrus compared with other phases. The concentration of serum progesterone during the oestrus phase negatively correlated with the abundance of cytokines CSF3, IL12p40, IFNG and leukaemia inhibitory factor (LIF). In ovariectomised mice, exogenous oestradiol administration increased mammary gland CSF1, CSF2, IFNG and LIF, compared with ovariectomised control mice. Progesterone administration together with oestradiol resulted in reduced CSF1, CSF3 and IFNG compared with oestradiol administration alone. This study suggests that the cytokine microenvironment in the mammary gland at the oestrus phase of the ovarian cycle is relatively pro-inflammatory compared with other stages of the cycle, and that the oestradiol-induced cytokine microenvironment is significantly attenuated by progesterone. A continuously fluctuating cytokine microenvironment in the mammary gland presumably regulates the phenotypes of resident leukocytes and may affect mammary gland cancer susceptibility.

Dasgupta, S., et al. (2011). "Characterization of the APC presenting a microbial polysaccharide toregulatory T cells." Inflammatory Bowel Diseases **2)**: S11-S12.

Commensal bacteria harbored in the mammalian gut are possibly reservoirs ofimmunomodulatory molecules having profound effects on the host immune system.Polysaccharide A (PSA) from the human symbiont Bacteroides fragilis is onesuch molecule and has been demonstrated to have potent anti-inflammatory propertiesin various murine models. Induced IL-10 liberated from CD4+T cells is a keyfeature of this immunoregulatory activity. However, little is known about how theseimmunoregulatory T cells are induced in order to control inflammation. Wehypothesized that a subset of Dendritic cells (DCs) may provide the cellular platformfor PSA action. This hypothesis was supported by our initial finding that followingoral gavage with B fragilis in healthy mice, PSA dependent augmentation ofCD4+CD25+FOXP3+ Tregs correlated with the frequency of B220+CD11cint nonconventionalDCs(R2=0.6993, p=0.038) in the MLN. The B220+CD11cint cell populationis primarily Plasmacytoid DCs (PDCs), which characteristically have surfaceexpression of PDCA-1, Siglec H, and Ly6c. These cells have been implicated as tolerogenicDCs in other inflammatory murine models. Interestingly, the tolerogenicrole of PDCs has been described in humans as well. However, while TLR2 ligationhas not been felt to be important to PDC activation, TLR2 ligation by PSA has beendescribed to be essential for this polysaccharide to activate the immune system.To investigate whether PDCs respond to PSA in a TLR2 dependent way, we investigatedthe in vitro interaction between PSA and DCs derived from bone marrowcells stimulated with Flt3L. After 36 hours of culture, PDCA-1+B220+CD11c+ PDCs in the presence of PSA showed substantially higher expression of TLR2compared to media controls. PDCs isolated with PDCA-1 microbeads from a poolof bone marrow derived DCs, significantly augmented the liberation of IL-10 fromCD4T cells in presence of PSA. In a co-culture assay, PSA stimulated liberation ofIL-10 from CD4T cells was significantly reduced when compared to PDCs derivedfrom TLR2^{-/-} mice (p=0.0046).In the intra-rectal TNBS colonic inflammation model, the frequency of SiglecH+B220+CD11b-CD11c+ PDCs and the GMFI of Siglec H correlated inversely withcumulative colitis score (R2=0.4377, p=0.0002 and R2=0.4255, p=0.0003) suggestinga possible immunoregulatory role for PDCs in PSA mediated protection. Interestingly, in TNBS treated TLR2^{-/-}mice who were not protected by PSA, no increasein GMFI of Siglec H was seen. In order to confirm a role for PDCs in PSA mediatedprotection in this colitis model, we depleted PDCs with a monoclonal antibody(anti-PDCA-1) and compared disease score to isotype controls. We observed thatamong control animals not treated with PSA, neither the cumulative disease scorenor the accumulation of potentially pathogenic CD11c-CD11b+ myeloid cells in thecolon was reduced in anti-PDCA-1 treated animals compared to isotype controls. Both these parameters (pathogenic CD11c-CD11b+ myeloid cells in the colon andclinical score) were significantly reduced in PSA treated animals compared to controls(p= < 0.01). However, PSA failed to protect mice when PDCs were depletedwith PDCA-1 mAb treatment. This suggests that in PSA-induced immunoregulationof a model colitis, PDCs have a tolerogenic or immunoregulatory role which maybe critical in generating regulatory features and function in T cells.

Datta, D. and G. Haider (2018). "Enhancing degradability of plastic waste by dispersing starch into low density polyethylene matrix." Process Safety & Environmental Protection: Transactions of the Institution of Chemical Engineers Part B **114**(Part B): 143-152.

The present investigation emphasizes the synthesis and characterization of an extruded biodegradable film developed by dispersion of corn starch in LDPE matrix. Biodegradable films of different composition were prepared and compared with virgin LDPE film. The effect of detergent solution, mustard oil, petroleum oil and saline water was determined as per ASTMD 543-67 to assess its durability. The chemical resistance of the film under 10% HC1 and 10% NaOH was also checked. The developed biodegradable film of composition 60:30:10 by weight of LDPE:starch:additive showed a tensile strength of 16.2 MPa and elongation at break of 140% indicating that only 10-12% loss of tensile strength and 15% loss in impact strength can be observed by incorporating just 30% starch as compared to virgin LDPE film. The application of the biodegradable film as an environmental friendly packaging material can be effectively judged by its decrease in tensile strength and elongation at break by 8% and 2% respectively by addition of just 10% starch under soil burial condition whereas the burst strength has increased by 16% which makes it to be extensively applicable for packaging. [ABSTRACT FROM AUTHOR]

Dauvergne, P. (2018). "Why is the global governance of plastic failing the oceans?" Global Environmental Change Part A: Human & Policy Dimensions **51**: 22-31.

On some measures, the global governance of plastic is improving. Curbside recycling and community cleanups are increasing. Companies like Toyota, Walmart, and Procter & Gamble are reducing waste to landfill. And all around the world, as research consolidates and activism intensifies, towns, cities, and legislatures are banning some uses of plastic, such as for grocery bags and as microbeads in consumer products. Yet the amount of plastic flowing into the oceans is on track to double from 2010 to 2025. Why? Partly, the dispersal, durability, and mobility of microplastics make governance extremely hard. At the same time, the difficulty of governing plastic has been rising as production accelerates, consumption globalizes, pollution sources

diversify, and international trade obscures responsibility. As pressures and complexities mount, the global governance of plastic – characterized by fragmented authority, weak international institutions, uneven regulations, uncoordinated policies, and business-oriented solutions – is failing to rein in marine plastic pollution. In large part, as this article demonstrates, this governance landscape reflects industry efforts to resist government regulation, deflect accountability, and thwart critics, coupled with industry advocacy of corporate self-regulation and consumer responsibility as principles of governance. These findings confirm the need for more hard-hitting domestic regulation of industry as well as an international plastics treaty to scale up local reforms. [ABSTRACT FROM AUTHOR]

Davalos, R. V., et al. (2008). "Performance impact of dynamic surface coatings on polymeric insulator-based dielectrophoretic particle separators." Analytical & Bioanalytical Chemistry **390**(3): 847-855.

Efficient and robust particle separation and enrichment techniques are critical for a diverse range of lab-on-a-chip analytical devices including pathogen detection, sample preparation, high-throughput particle sorting, and biomedical diagnostics. Previously, using insulator-based dielectrophoresis (iDEP) in microfluidic glass devices, we demonstrated simultaneous particle separation and concentration of various biological organisms, polymer microbeads, and viruses. As an alternative to glass, we evaluate the performance of similar iDEP structures produced in polymer-based microfluidic devices. There are numerous processing and operational advantages that motivate our transition to polymers such as the availability of numerous innate chemical compositions for tailoring performance, mechanical robustness, economy of scale, and ease of thermoforming and mass manufacturing. The polymer chips we have evaluated are fabricated through an injection molding process of the commercially available cyclic olefin copolymer Zeonor 1060R. This publication is the first to demonstrate insulator-based dielectrophoretic biological particle differentiation in a polymeric device injection molded from a silicon master. The results demonstrate that the polymer devices achieve the same performance metrics as glass devices. We also demonstrate an effective means of enhancing performance of these microsystems in terms of system power demand through the use of a dynamic surface coating. We demonstrate that the commercially available nonionic block copolymer surfactant, Pluronic F127, has a strong interaction with the cyclic olefin copolymer at very low concentrations, positively impacting performance by decreasing the electric field necessary to achieve particle trapping by an order of magnitude. The presence of this dynamic surface coating, therefore, lowers the power required to operate such devices and minimizes Joule heating. The results of this study demonstrate that iDEP polymeric microfluidic devices with surfactant coatings provide an affordable engineering strategy for selective particle enrichment and sorting.

Davarc, F., et al. (2017). "The influence of solution viscosities and surface tension on calcium-alginate microbead formation using dripping technique." Food Hydrocolloids **62**: 119-127.

Currently, there is a growing interest for encapsulation of bioactive ingredients using calcium alginate microspheres or beads. Diffusion of the Ca in the alginate droplets provokes an ionic gelation and their conversion to hydrogel beads. The main objective of this study is to

investigate the influence of physical properties of alginate and CaCl₂ solutions on alginate droplet formation and penetration into gelling bath, in size and shape of Ca-alginate beads. The droplet formation and penetration in the calcium bath was investigated using a high-speed video recording. Viscosity of alginate solution was modified by changing the alginate concentration (from 10 to 30 g/L) and the viscosity of the bath was modified by using different water/glycerol mixes (0-90% of glycerol) to prepare the CaCl₂ solution. Surface tension of CaCl₂ solution is reduced by adding different concentrations of surfactants (Tween 20) in a range of 0.01-1 g/L. Droplets detach from the tip with a tear shape. In all conditions tested, the droplets reach a spherical shape in less than 15 ms after detachment and less than 25 mm from the tip. Spherical beads are obtained when the kinetic energy is high enough to break the surface resistance of the calcium bath and droplet viscosity high enough to avoid deformations. Penetration depth of alginate droplets were mainly affected by viscosity and surface tension of CaCl₂ solution. When viscosity and surface tension of CaCl₂ solution increases, sphericity decrease and shape deformations are observed. The surfactant addition enhanced penetration and prevented shape deformations of Ca-alginate beads.

Davarpanah, E. and L. Guilhermino (2015). "Single and combined effects of microplastics and copper on the population growth of the marine microalgae Tetraselmis chuii." Estuarine, Coastal and Shelf Science **167**: 269-275.

As the accumulation of microplastics continues to rise in the marine environment, more knowledge on their potential toxic effects on marine organisms is needed to assess their risks to environmental and human health. Thus, the goal of the present study was to investigate the effects of fluorescent red polyethylene plastic micro-spheres 1-5 mu m diameter (used as microplastic model and hereafter indicated as MP), alone and in mixture with copper, on the population growth of the marine microalgae Tetraselmis chuii. Two null hypotheses were tested: (H01) Exposure to MP concentrations in ppb range does not affect the average specific growth rate of T. chuii; (H02) MP do not interact with the toxicity of copper to T. chuii. In laboratory bioassays, T. chuii cultures were exposed for 96 h to MP concentrations ranging from 0.046 to 1.472 mg/l), concentrations of copper alone ranging from 0.02 to 0.64 mg/l, and the same concentrations of copper in the presence of 0.184 mg/l of MP in test media. No significant effects of MP on T. chuii population growth were found ($p > 0.05$), leading to the acceptance of H01. Copper alone significantly decreased the population growth of T. chuii with EC10, EC20 and EC50 of 0.009, 0.023 and 0.139 mg/l, respectively. The corresponding values in the presence of MP were 0.012, 0.029 and 0.145 mg/l, respectively. Moreover, the study found no significant differences between the toxicity curves of copper in the presence and absence of MP ($p > 0.05$), leading to the acceptance of H02. Despite these findings, because microplastics are known to adsorb and accumulate copper, aged pellets more than virgin ones, and the toxicity of smaller particles may be higher, further studies on the combined effects of copper and microplastics on microalgae should be performed, especially under long-term exposures to nano-sized aged microplastics.

Davarpanah, E. and L. Guilhermino (2019). "Are gold nanoparticles and microplastics mixtures more toxic to the marine microalgae Tetraselmis chuii than the substances individually?" Ecotoxicology & Environmental Safety **181**: 60-68.

The widespread use of microplastics and nanomaterials resulting in environmental contamination is of high concern. Microplastics have been found to modulate the toxicity of other environmental contaminants. Thus, the hypothesis that microplastics increase the toxicity

of gold nanoparticles to the marine microalgae Tetraselmis chuii was tested. In a laboratory bioassay, T. chuii cultures were exposed for 96 h to ~5 nm diameter gold nanoparticles (AuNP) and to virgin 1-5 mum diameter microplastics (MP), alone and in mixture. The treatments were: control; citrate-control; AuNP alone (0.1, 0.3 and 3 mg/L); MP alone (0.3, 0.9 and 4 mg/L) and mixture of the two substances in three different concentrations (0.1 mg/L AuNP + 0.3 mg/L MP; 0.3 mg/L AuNP + 0.9 mg/L MP; 3 mg/l AuNP + 4 mg/L MP). The effect criterion was the inhibition of the average specific growth rate. AuNP alone and MP alone did not cause significant decrease of T. chui average specific growth rate up to 3 mg/L and 4 mg/L, respectively. The mixture containing 3 mg/L AuNP + 4 mg/L MP significantly reduced the average specific growth rate of the microalgae. Therefore, this mixture was more toxic to T. chuii than its components individually. Overall, the results of the present study indicated that the MP and AuNP tested have a relatively low toxicity to T. chuii, but the toxicity increases when they are in mixtures containing high concentrations of both substances. These proof-of-concept findings stress the need of more research on the toxicity of mixtures containing microplastics and nanomaterials.

Dave, D. and S. S. Katewa (2006). "Domestic solid waste generation and its disposal in Udaipur city, Rajasthan, India." Nature, Environment and Pollution Technology **5**(2): 225-228.

Domestic waste is becoming serious threat to urban environment especially in dense populated areas. Many diseases and contamination are the results of such pollutants. In light of the above problems, a study was conducted to access the quality and quantity of household waste generated and disposed off in urban areas of Udaipur city. The study was confined to randomly selected 300 families of Udaipur city. The survey revealed that daily disposal of kitchen waste, paper waste and plastic waste came out to be 29480g, 1003g and 1064g respectively. Kitchen waste being degradable does not pose much problems but paper and plastic, disposed in large quantities lead to serious environmental degradation.

Davenport, C., et al. (2016). "A Quick and Efficient Method for the Purification of Endoderm Cells Generated from Human Embryonic Stem Cells." Journal of Visualized Experiments **109**: 03.

The differentiation capabilities of pluripotent stem cells such as embryonic stem cells (ESCs) allow a potential therapeutic application for cell replacement therapies. Terminally differentiated cell types could be used for the treatment of various degenerative diseases. In vitro differentiation of these cells towards tissues of the lung, liver and pancreas requires as a first step the generation of definitive endodermal cells. This step is rate-limiting for further differentiation towards terminally matured cell types such as insulin-producing beta cells, hepatocytes or other endoderm-derived cell types. Cells that are committed towards the endoderm lineage highly express a multitude of transcription factors such as FOXA2, SOX17, HNF1B, members of the GATA family, and the surface receptor CXCR4. However, differentiation protocols are rarely 100% efficient. Here, we describe a method for the purification of a CXCR4+ cell population after differentiation into the DE by using magnetic microbeads. This purification additionally removes cells of unwanted lineages. The gentle purification method is quick and reliable and might be used to improve downstream applications and differentiations.

David, J., et al. (2018). "Quantitative Analysis of Poly(ethylene terephthalate) Microplastics in Soil via Thermogravimetry-Mass Spectrometry." Analytical Chemistry **90**(15): 8793-8799.

The use of plastic materials in daily life, industry, and agriculture can cause soil pollution with plastic fragments down to the micrometer scale, i.e., microplastics. Quantitative assessment of microplastics in soil has been limited so far. Until now, microplastic analyses in soil require laborious sample cleanup and are mostly restricted to qualitative assessments. In this study, we applied thermogravimetry-mass spectrometry (TGA-MS) to develop a method for the direct quantitative analysis of poly(ethylene terephthalate) (PET) without further sample pretreatment. For this, soil samples containing 1.61 +/- 0.15 wt % organic matter were spiked with 0.23-4.59 wt % PET bottle recyclate microplastics. dl-Cysteine was used as the internal standard (IS). Sample mixtures were pyrolyzed with a 5 K min⁻¹ ramp (40-1000 degreeC), while sample mass loss and MS signal intensity of typical PET pyrolysis products were recorded. We found MS signal intensities linearly responding to microplastic concentrations. The most-promising results were obtained with the IS-corrected PET pyrolysis product vinylbenzene/benzoic acid (m/ z = 105, adj. R² = 0.987). The limits of detection and quantification were 0.07 and 1.72 wt % PET, respectively. Our results suggest that TGA-MS can be an easy and viable complement to existing methods such as pyrolysis or thermogravimetry-thermal desorption assays followed by gas chromatography/mass spectrometry detection or to spectral microscopy techniques.

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David, J., et al. (2019). "Introducing a soil universal model method (SUMM) and its application for qualitative and quantitative determination of poly(ethylene), poly(styrene), poly(vinyl chloride) and poly(ethylene terephthalate) microplastics in a model soil." Chemosphere **225**: 810-819.

Methods for analysis of microplastic in soils are still being developed. In this study, we evaluated the potential of a soil universal model method (SUMM) based on thermogravimetry (TGA) for the identification and quantification of microplastics in standard loamy sand. Blank and spiked soils (with amounts of one of four microplastic types) were analyzed by TGA. For each sample, thermal mass losses (TML) in 10degreeC intervals were extracted and used for further analysis. To explain and demonstrate the principles of SUMM, two scenarios were discussed. The first refers to a rare situation in which an uncontaminated blank of investigated soil is available and TML of spiked and blank soils are subtracted. The results showed that the investigated microplastics degraded in characteristic temperature areas and differences between spiked and blank soils were proportional to the microplastics concentrations. The second scenario reflects the more common situation where the blank is not available and needs to be replaced by the

previously developed interrelationships representing soil universal models. The models were consequently subtracted from measured TML. Sparse principal component analysis (sPCA) identified 8 of 14 modeled differences between measured TMLs and the universal model as meaningful for microplastics discrimination. Calibrating various microplastics concentrations with the first principal component extracted from sPCA resulted in linear fits and limits of detection in between environmentally relevant microplastics concentrations. Even if such an approach using calculated standards still has limitations, the SUMM shows a certain potential for a fast pre-screening method for analysis of microplastics in soils.

Davidson, K. and S. E. Dudas (2016). "Microplastic ingestion by wild and cultured Manila clams (Venerupis philippinarum) from Baynes sound, British Columbia." Archives of Environmental Contamination and Toxicology **71**(2): 147-156.

Microplastics, plastic particles <5 mm, are an emerging concern in aquatic ecosystems. Because microplastics are small, they are available to many filter-feeding organisms, which can then be consumed by higher trophic level organisms, including humans. This study documents the quantity of microplastics present in wild and cultured Manila clams (Venerupis philippinarum). Three active shellfish farms and three reference beaches (i.e., non-shellfish farm sites) in Baynes Sound, British Columbia were chosen to examine the microplastic concentrations in wild and cultured Manila clams. Microplastics were isolated using a nitric acid digestion technique and enumerated from 54 clams (27 farmed and 27 non-farmed). Qualitative attributes, such as colour and microplastic type (fiber, fragment, or film) also were recorded. There was no significant difference ($F=1.29$; $df=1,4$; $P=0.289$) between microplastic concentrations in cultured and wild clams. Microplastic concentrations ranged from 0.07 to 5.47 particles/g (from reference beach and shellfish farm clams, respectively). Fibers were the dominant microplastic (90%); colourless and dark gray fibers were the most common colours observed (36 and 26%, respectively). Although this indicates that microplastics are definitely present in seafood consumed by humans, shellfish aquaculture operations do not appear to be increasing microplastic concentrations in farmed clams in this region.

Davidson, T. M. (2012). "Boring crustaceans damage polystyrene floats under docks polluting marine waters with microplastic." Marine Pollution Bulletin **64**(9): 1821-1828.

Boring isopods damage expanded polystyrene floats under docks and, in the process, expel copious numbers of microplastic particles. This paper describes the impacts of boring isopods in aquaculture facilities and docks, quantifies and discusses the implications of these microplastics, and tests if an alternate foam type prevents boring. Floats from aquaculture facilities and docks were heavily damaged by thousands of isopods and their burrows. Multiple sites in Asia, Australia, Panama, and the USA exhibited evidence of isopod damage. One isopod creates thousands of microplastic particles when excavating a burrow; colonies can expel millions of particles. Microplastics similar in size to these particles may facilitate the spread of non-native species or be ingested by organisms causing physical or toxicological harm. Extruded polystyrene inhibited boring, suggesting this foam may prevent damage in the field. These results reveal boring isopods cause widespread damage to docks and are a novel source of microplastic pollution.

Davis, W. and A. G. Murphy (2015). "Plastic in surface waters of the Inside Passage and beaches of the Salish Sea in Washington State." Marine Pollution Bulletin **97**(1-2): 169-177.

We summarize results of two independent studies on plastic pollution in the marine environment that overlap in time and space. One study evaluated the abundance of anthropogenic debris on 37 sandy beaches bordering the Salish Sea in Washington State while the other characterized plastic debris in surface waters of the Salish Sea and the Inside Passage to Skagway, Alaska. Both studies concluded that foam, primarily expanded polystyrene was the dominant pollutant. Plastic was found in surface waters the full length of the Inside Passage but was concentrated near harbors. At the wrack line, an average square meter of Washington's 1180. km of sandy beaches in the Salish Sea had 61 pieces of anthropogenic debris weighing approximately 5. g. The total loading for the entire 1. m wide band is estimated to be 72,000,000 pieces and 5.8. metric tons. Most anthropogenic debris on beaches is generated within the region. Copyright © 2015 Elsevier Ltd.

Davison, P. and R. G. Asch (2011). "Plastic ingestion by mesopelagic fishes in the North Pacific Subtropical Gyre." Marine Ecology, Progress Series **432**: 173-180.

The oceanic convergence zone in the North Pacific Subtropical Gyre acts to accumulate floating marine debris, including plastic fragments of various sizes. Little is known about the ecological consequences of pelagic plastic accumulation. During the 2009 Scripps Environmental Accumulation of Plastics Expedition (SEAPLEX), we investigated whether mesopelagic fishes ingest plastic debris. A total of 141 fishes from 27 species were dissected to examine whether their stomach contents contained plastic particles. The incidence of plastic in fish stomachs was 9.2%. Net feeding bias was evaluated and judged to be minimal for our methods. The ingestion rate of plastic debris by mesopelagic fishes in the North Pacific is estimated to be from 12000 to 24000 tons yr⁻¹. Similar rates of plastic ingestion by mesopelagic fishes may occur in other subtropical gyres.

Davranche, M., et al. (2019). "Are nanoplastics able to bind significant amount of metals? The lead example." Environmental Pollution **249**: 940-948.

The nanoscale size of plastic debris makes them potential efficient vectors of many pollutants and more especially of metals. In order to evaluate this ability, nanoplastics were produced from microplastics collected on a beach exposed to the North Atlantic Gyre. The nanoplastics were characterized using multi-dimensional methods: asymmetrical flow field flow fractionation and dynamic light scattering coupled to several detectors. Lead (II) adsorption kinetics, isotherm and pH-edge were then carried out. The sorption reached a steady state after around 200min. The maximum sorption capacity varied between 97% and 78.5% for both tested Pb concentrations. Lead (II) adsorption kinetics is controlled by chemical reactions with the nanoplastics surface and to a lesser extent by intraparticle diffusion. Adsorption isotherm modeling using Freundlich model demonstrated that NPG are strong adsorbents equivalent to hydrous ferric oxides such as ferrihydrite (log K_{ads}^{freundlich}=8.36 against 11.76 for NPG and ferrihydrite, respectively). The adsorption is dependent upon pH, in response to the Pb(II) adsorption by the oxygenated binding sites developed on account of the surface UV oxidation under environmental conditions. They could be able to compete with Fe or humic colloids for Pb binding regards to their amount and specific areas. Nanoplastics could therefore be efficient vectors of Pb and probably of many other metals as well in the environment.

Dawood, S. (2016). "Sustainable, changeable, digital - the packaging trends of the future." Design Week (Online Edition): 1-1.

The article discusses designers' efforts with the medium to reduce their carbon footprint, help those who are partially-sighted or even immerse consumers in virtual reality specially in food Packaging. It mentions Harvard University professor David Edwards' ideas to wrap food or liquid in an edible coating to reduce packaging waste. It also mentions American start-up Loliware's a

gelatinous, flavoured cup made of seaweed, aimed to cut plastic pollution with its water bottle alternative.

Dawood, S. (2018). "Sadiq Khan's water fountains look to reduce London's plastic waste: The Mayor of London will install 20 water fountains across the capital and make tap water more freely available, in a social design project that aims to discourage the public from buying new bottles." Design Week (Online Edition): 1-1.

The article informs that Sadiq Khan, Mayor of London would install 20 water fountains across the capital and make tap water more freely available, in a social design project that aims to discourage the public from buying new bottles. It mentions campaign aim to eliminate the plastic waste. it also mentions the views of Shirley Rodrigues, deputy mayor for environment and energy, on the same.

Dawson, A., et al. (2018). "Uptake and Depuration Kinetics Influence Microplastic Bioaccumulation and Toxicity in Antarctic Krill (Euphausia superba)." Environmental Science & Technology **52**(5): 3195-3201.

The discarding of plastic products has led to the ubiquitous occurrence of microplastic particles in the marine environment. The uptake and depuration kinetics of ingested microplastics for many marine species still remain unknown despite its importance for understanding bioaccumulation potential to higher trophic level consumers. In this study, Antarctic krill (Euphausia superba) were exposed to polyethylene microplastics to quantify acute toxicity and ingestion kinetics, providing insight into the bioaccumulation potential of microplastics at the first-order consumer level. In the 10 day acute toxicity assay, no mortality or dose-dependent weight loss occurred in exposed krill, at any of the exposure concentrations (0, 10, 20, 40, or 80% plastic diet). Krill exposed to a 20% plastic diet for 24 h displayed fast uptake (22 ng mg-1 h-1) and depuration (0.22 h-1) rates, but plastic uptake did not reach steady state. Efficient elimination also resulted in no bioaccumulation over an extended 25 day assay, with most individuals completely eliminating their microplastic burden in less than 5 days post exposure. Our results support recent findings of limited acute toxicity of ingested microplastics at this trophic level, and suggest sublethal chronic end points should be the focus of further ecotoxicological investigation. [ABSTRACT FROM AUTHOR]

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Dawson, A. L., et al. (2018). "Turning microplastics into nanoplastics through digestive fragmentation by Antarctic krill." Nature communications **9**: 1-8.

Microplastics (plastics <5 mm diameter) are at the forefront of current environmental pollution research, however, little is known about the degradation of microplastics through ingestion. Here, by exposing Antarctic krill (Euphausia superba) to microplastics under acute static renewal conditions, we present evidence of physical size alteration of microplastics ingested by a planktonic crustacean. Ingested microplastics (31.5 µm) are fragmented into pieces less than 1 µm in diameter. Previous feeding studies have shown spherical microplastics either; pass unaffected through an organism and are excreted, or are sufficiently small for translocation to occur. We identify a new pathway; microplastics are fragmented into sizes small enough to cross physical barriers, or are egested as a mixture of triturated particles. These findings suggest that current laboratory-based feeding studies may be oversimplifying interactions between zooplankton and microplastics but also introduces a new role of Antarctic krill, and potentially other species, in the biogeochemical cycling and fate of plastic.

Dawson, I. G. J. (2019). "Taking responsibility: self-attribution for risk creation and its influence on the motivation to engage in risk management behaviors."

Many risks (eg, climate change, poor health, plastic pollution) can be the result of human behaviors. Although anthropogenic risk creation is rarely intentional, it is still possible that in many circumstances individuals will recognize some degree of personal responsibility for creating the risk and, therefore, may perceive a moral obligation to manage that risk (eg, reducing carbon emissions, eating a low-fat diet, boycotting single-use plastics). However, the extent to which risk management behaviors are motivated by self-attribution for risk creation has received little empirical attention. To address this issue, a study was conducted in which participants responded to three scenarios (road safety, environmental, animal welfare) that each described a situation in which a particular risk developed and in which the participants liability for creating the risk varied. Participants then responded to measures of self-attribution for risk creation, perceived risk, objective liability, guilt, moral standards and willingness to manage the risk. A multiple regression showed that the only significant predictor of the participants willingness to manage the risk was self-attribution for risk creation. Moreover, further analysis showed that the positive relationship between self-attribution for risk creation and the willingness to manage the risk was moderated by perceived risk. Hence, individuals who accept greater responsibility for creating a risk may be more willing to engage in actions to manage that risk, and his/her willingness is also likely to increase as his/her perception of the risk increases. These findings provide new insights into the motivational forces underlying risk management behaviors and highlights important directions for future research and risk communication strategies. 2019, 2019 Informa UK Limited, trading as Taylor & Francis Group.

Day, C. E., et al. (2009). "A novel method for isolation of human lung T cells from lung resection tissue reveals increased expression of GAPDH and CXCR6." Journal of Immunological Methods **342**(1-2): 91-97.

Lung T lymphocytes are important in pulmonary immunity and inflammation. It has been difficult to study these cells due to contamination with other cell types, mainly alveolar macrophages. We have developed a novel method for isolating lung T cells from lung resection tissue, using a combination of approaches. Firstly the lung tissue was finely chopped and filtered through a nylon mesh. Lymphocytic cells were enriched by Percoll density centrifugation and the T cells purified using human CD3 microbeads, resulting in 90.5%+/-1.9% (n=11) pure lymphocytes. The T cell yield from the crude cell preparation was 10.8+/-2.1% and viability, calculated using propidium iodide (PI) staining and trypan blue, was typically over 95%. The purification process did not affect expression of CD69 or CD103, nor was there a difference in the proportion of CD4 and CD8 cells between the starting population and the purified cells. Microarray analysis and real time RT-PCR revealed upregulation of GAPDH and CXCR6 of the lung T cells as compared to blood-derived T cells. This technique highly enriches lung T cells to allow detailed investigation of the biology of these cells.

de Bomfim, A. S. C., et al. (2019). "Effect of different degradation types on properties of plastic waste obtained from espresso coffee capsules." Waste Management **83**: 123-130.

In terms of large use of plastic products, a necessity exists to minimize effects of the waste produced on environment by recycling, reuse and application in new products. In Brazil, the espresso coffee capsules are an emerging plastic waste, representing 0.9% of the coffee

consumed in 2017. Therefore, Nescafe Dolce Gusto espresso coffee capsules were chosen in order to understand the polypropylene stabilization and degradation initiators with the purpose of recycling by applying in a composite material, as home composting product. In this context, the plastic capsule wastes were exposed to chemical, thermal, accelerated weathering (ultraviolet radiation+humidity) and natural weathering in order to analyze the influence of exposure and possibilities of a real application in a composting environment. Masses of the samples were monitored before and during the weathering conditions. Thermal (TGA and DSC) and chemical (FTIR) analysis were carried out before and after exposure. No changes in thermal stability were observed, however, samples conditioned in acid solution presented thermal degradation event beginning at 131degreeC. In addition, all samples presented a similar behavior of melting and crystallization points, which did not change with exposure. FTIR analysis showed a disappearance of CC and CO bonds on samples exposed to natural weathering and basic solution conditioning. It also showed formation of chromophores groups on samples exposed to accelerated weathering. The visual analysis showed huge differences in samples exposed to accelerated weathering and acid solution, which were the most damaged. On the other hand, samples exposed to natural weathering, thermal and basic conditioning did not presented significantly changes supported by the TGA and FTIR results.

De Carlo, R. M., et al. (2015). "Evaluation of different QuEChERS procedures for the recovery of selected drugs and herbicides from soil using LC coupled with UV and pulsed amperometry for their detection." Analytical and bioanalytical chemistry **407**(4): 1217-1229.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Seven quick, easy, cheap, effective, rugged and safe (QuEChERS)-based procedures, differing in both the extraction and clean-up steps, were investigated for the recovery of bentazone (BTZ), atrazine (ATZ), carbamazepine (CBZ), phenytoin (PNT) and its metabolite 5-(p-hydroxyphenyl-),5-phenylhydantoin (HPPH) from soil. Target analytes were chosen for their extensive use and/or occurrence in soil, as well as for their medium-high polarity characteristics (log K ^sub OW^ values in the range 0.88-2.80), which have been reported as a critical parameter for the recovery from soil with QuEChERS approaches. Liquid chromatography coupled with UV and pulsed amperometric (PA) detection at a glassy carbon electrode was used as instrumental technique. The recovery data obtained within each tested procedure were discussed for each compound investigated, highlighting different behaviour depending on the specific physicochemical characteristics of the analytes. The optimized QuEChERS conditions consisted of the extraction of analytes with CH^sub 3^CN:H2O 70:30, 5 % CH^sub 3^COOH, followed by a dispersive solid-phase extraction (d-SPE) clean-up step with C18 sorbent. This method, in which water is directly added to the soil together with acetonitrile and salts, allowed the rehydration step to be avoided, which can be as long as 30 min. Matrix effects were evaluated for both the detection techniques at different concentration levels, and they were below 24 % for both the detection technique used. The recoveries were evaluated at three concentration levels by a matrix-matched calibration and were in the ranges of 83-113 % (relative standard deviations (RSD)[less than or equal to]14 %) and 88-109 % (RSD[less than or equal to]11 %) for UV and PA detection, respectively, highlighting very good performances of the method, even for the more polar analytes. Method detection limits ranged from 4 [mu]g/kg (BTZ) to 493 [mu]g/kg (PNT) and from 4 [mu]g/kg (HPPH) to 11 [mu]g/kg (BTZ) for UV and PA detection, respectively. The method was finally compared with a microwave-assisted extraction procedure which provided less satisfactory extraction performances than the optimized

QuEChERS procedure. [Figure not available: see fulltext.]

de Carvalho, D. G. and J. A. Baptista Neto (2016). "Microplastic pollution of the beaches of Guanabara Bay, Southeast Brazil." Ocean & Coastal Management **128**: 10-17.

Plastic debris is widely recognized as an important marine environmental pollutant. Plastics pollution of coastal areas is a growing concern, with research efforts focusing on macroplastic (>5 mm) and microplastic fractions. Currently, a large proportion of the plastics found in the ocean are in the form of microplastics (<5 mm). Due to their buoyant and persistent properties, microplastics have the potential to be widely dispersed via hydrodynamic processes and ocean currents. Guanabara Bay has been identified as one of the most polluted environments on the Brazilian coastline, mainly due to the presence of heavy metals and hydrocarbons. The aim of this work was to investigate, using field surveys, the abundance, composition and distribution of microplastics and small plastic fragments on the beaches of Guanabara Bay, located in southeastern Brazil. Microplastic concentrations ranged from 12 to 1300 particles per m2on the beaches. Fibres, fragments, styrofoam and pellets accounted for 8766 particles, with microplastic fragments representing 56% of the total detected debris, followed by styrofoam fragments (26.7%), pellets (9.9%) and fibres (7.2%).

de Chalain, T. and J. H. Phillips (1997). "Design and development of a fascioperiosteal flap for use in experimental cranial surgery in a porcine model." Journal of Craniofacial Surgery **8**(6): 501-505.

As part of an ongoing program of research on reconstructive techniques applicable to the growing craniofacial skeleton, this study aimed to characterize a pedicled fasciocutaneous flap on the scalp of a porcine model. Twelve juvenile Yorkshire white pigs were used. The anatomy of the porcine scalp was determined by fresh cadaveric dissection, radiocontrast dye injection, and resin casting of the vascular supply. No direct analogue of the human superficial temporal artery, the key to the superficial and deep temporal fascial flaps in humans, could be demonstrated in the pig. Thus, a fascioperiosteal flap, pedicled on an occipital leash of vessels, was designed. After a 14-day surgical delay, this flap, which covered the entire cranial width, from the nuchal crest to the glabella (7-10 cm long x 3-4 cm wide), could be elevated and split into a periosteal and a fascial layer. A cartilage construct placed between these layers could be kept alive for 4 weeks with no evidence of necrosis. The flap would allow mobilization of the construct to distant sites on the head and neck. An extensive literature survey showed a dearth of suitable cranial flap options in animal models. Accordingly, the pig cranium was examined with a view to finding a fascial flap analogous to the human temporoparietal flap, suitable for use in ear reconstruction. Cadaver dissections of the pig scalp, examining both the fascial layers and blood supply, were performed in three pigs; in an additional three pigs, the vascular supply to the scalp and cranium was injected with a radiocontrast gel, and, after dissecting suitable flaps, x-ray exposure was used to demonstrate the microvascular supply of these flaps. In an additional two pigs, the cranial vascular tree was filled with a plastic resin, and the soft tissues were then removed by thermal and chemical digestion. Finally, a group of three pigs were used to test the functional efficacy of a bilayered, occipitally based fascioperiosteal flap, whose design evolved from the foregoing work. Fluoresceine and disulphine blue were used to demonstrate the vascularity of these flaps before and after a surgical delay procedure. Function of these flaps, as carriers of a reconstructive construct, was shown by implanting autologous cartilage for 3 weeks and then demonstrating complete survival of the implant by fine section and histology. No clinically useful equivalent of the superficial temporal artery in humans could be identified in pigs, thus rendering the porcine superficial temporal artery flap of little use. However, a useful flap, comprising the pericranium and the subgaleal fascia, based on the

occipital vasculature, could be raised with relative ease.

De Coen, W. M., et al. (1998). "The use of biomarkers in Daphnia magna toxicity testing. III. Rapid toxicity testing of pure chemicals and sediment pore waters using ingestion and digestive enzyme activity." Chemosphere **37**(13): 2677-2694.

In this study, 4 rapid (90 min) toxicity tests were developed using ingestion and digestive enzyme activity of Daphnia magna juveniles. Ingestion activity was assessed using fluorescent labelled latex micro-beads and digestive enzyme activity (trypsin, beta -galactosidase and esterase) was measured in homogenates using chromogenic (N-benzoyl-L-arginine-4-nitroanilide) and fluorogenic (4-methylumbelliferyl-B-D-galactoside and fluorescein diacetate) substrates. All assays and toxicity endpoints were evaluated for their potential use as routine toxicity testing tools for pure chemicals and sediment pore waters. The observed high correlation coefficients (r super(2)>0.9) between the short-term toxicity values and the acute toxicity endpoint (24h EC sub(50)) for pure chemicals suggests that these biomarker-based assays are good predictors of acute toxicity levels to D. magna. In the sediment pore water toxicity tests, ingestion activity was generally more sensitive than the conventional endpoint, while the enzymatic endpoints were less sensitive than the 24h immobility criterion. The use and limitations of the developed toxicity tests are discussed in the light of their application in ecotoxicity monitoring programmes.

De Falco, F., et al. (2018). "Evaluation of microplastic release caused by textile washing processes of synthetic fabrics." Environmental Pollution **236**: 916-925.

A new and more alarming source of marine contamination has been recently identified in micro and nanosized plastic fragments. Microplastics are difficult to see with the naked eye and to biodegrade in marine environment, representing a problem since they can be ingested by plankton or other marine organisms, potentially entering the food web. An important source of microplastics appears to be through sewage contaminated by synthetic fibres from washing clothes. Since this phenomenon still lacks of a comprehensive analysis, the objective of this contribution was to investigate the role of washing processes of synthetic textiles on microplastic release. In particular, an analytical protocol was set up, based on the filtration of the washing water of synthetic fabrics and on the analysis of the filters by scanning electron microscopy. The quantification of the microfibre shedding from three different synthetic fabric types, woven polyester, knitted polyester, and woven polypropylene, during washing trials simulating domestic conditions, was achieved and statistically analysed. The highest release of microplastics was recorded for the wash of woven polyester and this phenomenon was correlated to the fabric characteristics. Moreover, the extent of microfibre release from woven polyester fabrics due to different detergents, washing parameters and industrial washes was evaluated. The number of microfibres released from a typical 5 kg wash load of polyester fabrics was estimated to be over 6,000,000 depending on the type of detergent used. The usage of a softener during washes reduces the number of microfibres released of more than 35%. The amount and size of the released microfibres confirm that they could not be totally retained by wastewater treatments plants, and potentially affect the aquatic environment.

De Felice, B., et al. (2018). "Polystyrene microplastics did not affect body growth and swimming activity in <i>Xenopus laevis</i> tadpoles." Environmental science and pollution research international **25**(34): 34644-34651.

A growing number of studies have highlighted the contamination and the effects towards organisms of diverse microplastics (μPs) in the marine environment. Surprisingly, although the

main sources of µPs for marine environments are inland surface waters, the information on the occurrence and the effects of µPs in freshwater ecosystems is still scant. Thus, the aim of the present work is to investigate the ingestion and possible adverse effects due to the exposure to polystyrene µPs (PSµPs; Ø = 3 µm) on tadpoles of the Amphibian Xenopus laevis. Larvae at the developmental stage 36, prior to mouth opening, were exposed under semi-static conditions to 0.125, 1.25, and 12.5 µg mL−1 of PSµPs, and allowed to develop until stage 46. At the end of the exposure, the digestive tract and the gills from exposed and control tadpoles were microscopically examined, as well as changes in body growth and swimming activity. PSµPs were observed in tadpoles' digestive tract, but not in the gills, from each tested concentration. However, neither body growth nor swimming activity were affected by PSµPs exposure. Our results demonstrated that PSµPs can be ingested by tadpoles, but they did not alter X. laevis development and swimming behavior at least during early-life stages, also at high, unrealistic concentrations.

de Haan, W. P., et al. (2019). "Floating microplastics and aggregate formation in the Western Mediterranean Sea." Marine Pollution Bulletin **140**: 523-535.

Pollution by large-sized plastics and microplastic debris is widespread in all Earth environments, also threatening marine ecosystems worldwide. In this study we determine the load of microplastics in the Western Mediterranean Sea and evaluate their aggregation potential into marine aggregates. We report average microplastic abundances of 0.10+/-0.09itemsm⁻² (max: 0.50itemsm⁻²). Abundances and chemical composition of microplastics are subject to temporal changes as a function of human activities in the areas of influence and shifting meteorological and sea-state conditions. We find that microplastics were on average smaller in mass than other studies conducted in the Mediterranean Sea indicating longer exposure times in the environment. The microplastic aggregation potential was determined by inspecting formed biogenic aggregates either during sample collection or in the laboratory. Smaller and more angular microplastics dominated in marine aggregates, representing an average 40% in abundance and 25% in mass of microplastics.

De Luca, L., et al. (2016). "Characterization and prognostic relevance of circulating microvesicles in chronic lymphocytic leukemia." Blood. Conference: 58th Annual Meeting of the American Society of Hematology, ASH **128**(22).

Background: Thecross talk between neoplastic cells and microenvironment is mediated by direct cell-to-cell contacts, secretion of soluble factors and release of extracellular vesicles (EVs). EVs deriving from tumor cells in chronic lymphocytic leukemia (CLL) may affect the surrounding microenvironment, playing a key role on survival of neoplastic clone. Of note, EVs are increased in CLL patients compared to normal subjects. In this study, we performed a comprehensive characterization of serum EVs from previously untreated CLL patients, investigating, in particular, phenotype and absolute number, in order to test their possible prognostic significance. Patients and Methods: Serum samples of 1 31 newly diagnosed CLL and from 28 healthy subjects were analyzed. One milliliter of serum was processed with serial ultracentrifugations. Each sample of EV-enriched pellet, from patients and controls, was freshly analyzed by FACS Calibur (Becton Dickinson BD) cytometer using Cell Quest software (BD). The system was calibrated using standard microbeads with a diameter of 0.3-0.9-3 mum to define the size limit for microvesicles (MV), a subtype of EVs. To determine the number of MV/muL serum, TruCOUNT beads (BD) were added immediately prior to analysis by flow cytometry. MV morphology was characterized by transmission electron microscope (TEM). MV were then

labeled with fluorochrome-conjugated monoclonal antibodies (anti-CD19, CD3, CD94, CD20, CD2, CD56, CD52, CD37) and their specific isotypic controls. Finally, MV were correlated with the main clinical and biological disease's characteristics, including clinical outcome. Result(s): Flow cytometric analysis of MVs showed a size within 1mm, based on forward and side scatter evaluation and the use of standard beads. The analysis was carried out on MV population isolated by the gating strategy. MV were also visualized by TEM, showing a spheroid morphology. We found a significantly higher mean number of MV in CLL patients with respect to healthy subjects (p<0.001) (Fig.1A). Moreover, by stratifying CLL patients for Rai stage, those with advanced clinical stages (III-IV) had a significantly higher number of MV with respect to patients with Rai stages 0 and I-II (p<0.01) (Fig.1B). To confirm the neoplastic cell source, MV were analyzed for the expression of lineage-specific antigens. In particular, B cells released preferentially CD19+ and CD37+ MV as compared to CD20. As observed for the total number of MV, significant increased amounts of CD19+, CD20+ and CD37+ MV were found in advanced clinical stages. Absolute MV number cut-off selected by ROC analysis distinguished Rai stage 0 patients with shorter time to treatment (TTT) from those with more stable disease (median 75 months vs not reached, P<0.01). Likewise, in the entire cohort, two groups of patients with different TTT (median 78 months vs not reached, P<0.01) (Fig.1C) and different overall survival (OS) (median 127 months vs not reached, P=0.02) (Fig.1D) were identified. At multivariate analysis, serum MV independently predicted for TTT (along with Rai stage, lymphocyte count and CD38 expression) and OS (along with Rai stage). Conclusion(s): Our study indicates that: (i) MV number is higher in CLL patients as compared to normal controls; (ii) CD19 and CD37 are the most represented B-cell antigens on CLL derived MV; (iii) total MV levels are associated with high tumor burden; (iv) total MV levels predict for TTT in Rai 0 patients, as well as for TTT and OS in all stage patients. These observations suggest that MV may represent a new biomarker for CLL.

De Lucia, C. and P. Pazienza (2019). "Market-based tools for a plastic waste reduction policy in agriculture: A case study in the south of Italy." Journal of Environmental Management **250**: 109468.

The 2018 European Strategy for Plastics in a Circular Economy identifies a set of actions to reduce plastic waste in the EU in the near future. To implement this strategic view, appropriate policy tools need to be identified within Member Countries. The present work aims at investigating farmers' attitudes towards the use of traditional market-based tools (i.e. subsidies and tax-credits) as well as other initiatives such as a pay-back mechanism under an Extended Producer Responsibility (EPR) to reduce plastic waste in agriculture. We analyse the case of the province of Foggia, an area which is recognised as being the largest plain in southern Italy. We consider a survey of 1,783 farmers and a multinomial regression model to infer on the probability of adopting the above policy tools. Key results suggest that the choice of each policy tool would be affected by the type of plastic waste generated. In particular, plastic packaging and plastic films would be likely to affect the probability to opt for a subsidy. In contrast, other types of plastic waste mainly generated by cereal crops activities (e.g. plastic bags and bottles for fertilisers and chemicals) would favour the adoption of a tax-credit mechanism. As for other aspects, horticulture production and the proximity to a collection site for waste disposal would increase the probability of adopting an EPR policy to contribute to plastic waste reduction.

de Lucia, G. A., et al. (2014). "Amount and distribution of neustonic micro-plastic off the western Sardinian coast (Central-Western Mediterranean Sea)." Marine Environmental Research **100**: 10-16.

A plethora of different sampling methodologies has been used to document the presence of micro-plastic fragments in sea water. European Marine Strategy suggests to improve standard

techniques to make future data comparable. We use Manta Trawl sampling technique to quantify abundance and distribution of micro-plastic fragments in Sardinian Sea (Western Mediterranean), and their relation with phthalates and organoclorine in the neustonic habitat. Our results highlight a quite high average plastic abundance value (0.15 items/m(3)), comparable to the levels detected in other areas of the Mediterranean. "Site" is the only factor that significantly explains the differences observed in micro-plastic densities. Contaminant levels show high spatial and temporal variation. In every station, HCB is the contaminant with the lowest concentration while PCBs shows the highest levels. This work, in line with Marine Strategy directives, represents a preliminary study for the analysis of plastic impact on marine environment of Sardinia.

De Pablo, J. L., et al. (2013). "What is the real cutoff for annexin v for capacitated sperm samples?" Fertility and Sterility **1)**: S448.

OBJECTIVE: To evaluate the Annexin V cutoff point for capacitated sperm samples. DESIGN: Analytic Retrospective Observational trial. MATERIALS AND METHODS: Participants age ranged from 18 to 45. All of them were involved in assisted reproduction treatments at Quiron Bilbao. The technique of double density gradient centrifugation has great potential in sperm preparation for assisted reproduction and was used to prepare the sperm samples. The proportion of apoptotic spermatozoa was assessed by using flow cytometry in 34 samples from fertile patients whose seminal values were above reference values established by WHO 2010. When the result is considered abnormal after the flow cytometry, colloidal super-paramagnetic microbeads conjugated with Annexin V may be applied to separate dead and apoptotic spermatozoa by using magnetic-activated cell soting (MACS). RESULT(S): Preliminary results show that the nonpathological percentage of sperm with apoptosis after capacitation is 15%. The cutoff point corresponds to the 90 percentile, with a mean value of 8% and a standard deviation of 4,47%. CONCLUSION(S): These preliminary results suggest that the ideal cutoff point to decide if we have to filter the sperm or not by using Annexin V columns is 15%. The filtrate in these pathological samples tries to reduce the percentage of apoptotic spermatozoa. The selection of nonapoptitic spermatozoa may be used to enhance sperm quality and could significantly improve the outcome of assisted fertilization. The Annexin V molecule has a specific affinity for phosphatidylserine and coupled with a fluorochrome such as FITC is used, together with Propidium Iodide (PI) as a supravital coloring. In our clinical practice, we consider using Annexin V FITC/PI instead of using Tunel since MACS uses Annexin V to separate dead and apoptotic cells. We do believe that is necessary to develop a protocol based on capacited samples because these are the samples that we use to perform ICSI. Moreover, an Annexin V cutoff point should be implemented.

de Poulpiquet, A., et al. (2016). "Dual Enzymatic Detection by Bulk Electrogenerated Chemiluminescence." Analytical Chemistry **88**(12): 6585-6592.

The combination of enzymes, as recognition elements for specific analytes, and of electrogenerated chemiluminescence (ECL) as a readout method has proven to be a valuable strategy for sensitive and specific analytical detection. However, ECL is intrinsically a 2D process which could potentially limit the analysis of inhomogeneous samples. Here, we show how a bulk ECL signal, generated by thousands of carbon microbeads remotely addressed via bipolar electrochemistry, are implemented as a powerful tool for the concomitant ECL sensing and imaging of two enzymatic substrates. We selected two enzymes (glucose dehydrogenase and choline oxidase) that react with their respective model substrates and produce in situ chemical species (beta-nicotinamide adenine dinucleotide (NADH) and H2O2) acting as coreactants for the ECL emission of different luminophores ([Ru(bpy)3](2+) at lambda = 620 nm and luminol at lambda = 425 nm, respectively). Both enzymes are spatially separated in the same capillary. We demonstrate thus the simultaneous quantitative determination of both glucose and choline over a wide concentration range. The originality of this remote approach is to provide a global chemical view through one single ECL image of inhomogeneous samples such as a biochemical concentration gradient in a capillary configuration. Finally, we report the first proof-of-concept of dual biosensing based on this bulk ECL method for the simultaneous imaging of both enzymatic analytes at distinct wavelengths.

De Smit, E., et al. (2016). "Longitudinal expression profiling of T lymphocytes in patients with active to quiescent giant cell arteritis." Clinical and Experimental Ophthalmology **44 (Supplement 1)**: 99-100.

Purpose: The immunopathogenesis of Giant Cell Arteritis (GCA) is poorly understood. The gold standard for diagnosis is a temporal artery biopsy. We aim to identify a less invasive method to diagnose GCA. Transcriptional profiling of blood measures the RNA in circulating nucleated cells. T Lymphocytes are key mediators of the adaptive immunity and are implicated in GCA. We sought to identify clinically useful predictive biomarkers by studying the transcriptome of purified T lymphocytes in patients with GCA. Method(s): Patients presenting with symptoms, signs and inflammatory markers consistent with GCA were enrolled. Serial blood samples were taken over 12 months. CD4+ and CD8+ T cells were isolated using magnetic antibody-coupled microbeads (Miltenyi). Samples were stored in RLT buffer (Qiagen). Aliquots were checked for cell purity. Batch RNA extractions were performed and sent for RNA sequencing. Result(s): Fifteen incident patients with active GCA and 15 age-matched controls were recruited. A total of 219 MACS events were performed, isolating between 2 and 10 million CD4+ and CD8+ cells (purity 94-99%). RNA extractions were performed using Qiagen RNAeasy kit, with good purity (A260/280 1.8-2.2). Samples were sent to the Translational Research Institute at QUT for sequencing using the illumina platform. Conclusion(s): This is the first translational study in GCA to investigate the T cell transcriptome. We have demonstrated good cell isolation technique, cell purity and RNA quality. It is likely that changes in the transcriptome over the course of the disease will provide insights into the pathogenesis and allow for a predictive biomarker for GCA diagnosis.

de Souza Machado, A. A., et al. (2019). "Microplastics Can Change Soil Properties and Affect Plant Performance." Environmental Science & Technology **53**(10): 6044-6052.

Microplastics can affect biophysical properties of the soil. However, little is known about the cascade of events in fundamental levels of terrestrial ecosystems, i.e., starting with the changes in soil abiotic properties and propagating across the various components of soil-plant interactions, including soil microbial communities and plant traits. We investigated here the effects of six different microplastics (polyester fibers, polyamide beads, and four fragment types: polyethylene, polyester terephthalate, polypropylene, and polystyrene) on a broad suite of proxies for soil health and performance of spring onion (Allium fistulosum). Significant changes were observed in plant biomass, tissue elemental composition, root traits, and soil microbial activities. These plant and soil responses to microplastic exposure were used to propose a causal model for the mechanism of the effects. Impacts were dependent on particle type, i.e., microplastics with a shape similar to other natural soil particles elicited smaller differences from control. Changes in soil structure and water dynamics may explain the observed results in which polyester fibers and polyamide beads triggered the most pronounced impacts on plant traits and function. The findings reported here imply that the pervasive microplastic contamination in soil may have consequences for plant performance and thus for

agroecosystems and terrestrial biodiversity.

de Souza Machado, A. A., et al. (2018). "Impacts of Microplastics on the Soil Biophysical Environment." Environmental Science & Technology **52**(17): 9656-9665.

Soils are essential components of terrestrial ecosystems that experience strong pollution pressure. Microplastic contamination of soils is being increasingly documented, with potential consequences for soil biodiversity and function. Notwithstanding, data on effects of such contaminants on fundamental properties potentially impacting soil biota are lacking. The present study explores the potential of microplastics to disturb vital relationships between soil and water, as well as its consequences for soil structure and microbial function. During a 5-weeks garden experiment we exposed a loamy sand soil to environmentally relevant nominal concentrations (up to 2%) of four common microplastic types (polyacrylic fibers, polyamide beads, polyester fibers, and polyethylene fragments). Then, we measured bulk density, water holding capacity, hydraulic conductivity, soil aggregation, and microbial activity. Microplastics affected the bulk density, water holding capacity, and the functional relationship between the microbial activity and water stable aggregates. The effects are underestimated if idiosyncrasies of particle type and concentrations are neglected, suggesting that purely qualitative environmental microplastic data might be of limited value for the assessment of effects in soil. If extended to other soils and plastic types, the processes unravelled here suggest that microplastics are relevant long-term anthropogenic stressors and drivers of global change in terrestrial ecosystems.

De Tullio, G., et al. (2013). "The functional attitude and the predictive role of an unconventional subset of T cells in clinical outcome of lymphoma patients: alphabeta-double negative T cells, preliminary data of a prospective study." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Graphic Background Many aspects of lymphoma pathophysiology indicate mutual interactions between the host immune system and lymphoma cells. These interactions may either promote or control lymphomagenesis. An unconventional subset of CD4-CD8- double-negative T cells (DNTs) has been recently described to contribute specifically to anti-tumor immunity. Indeed, DNTs are involved in immune regulation and tolerance as well as in host defense and inflammation, acting as regulatory T cells and/or cytotoxic T cells. DNTs are T lymphocytes which express either alphabeta or gammadelta T-cell receptors (TCR) and lack CD4, CD8 and CD56. In healthy human donors and murine models, they constitute about 1-5% of the lymphocytes in peripheral blood and in lymphoid organs. No data are available on the role of DNT cells in human anti-lymphoma immunity. Information from murine models suggests that expanded DNT cells would not impair host immunity against lymphoma and would perhaps stimulate it. DNT cells have also demonstrated to have a direct in vitro anti-tumor activity against lymphoma. Few data are available on the prognostic significance of DNTs in lymphomas, on their interaction with other immune cells, and on their functional attitude. Aims The aim of this study was to assess the frequency and the functional attitude of circulating DNTs in Lymphoma patients and healthy donors as controls, in order to assess the role of DNTs on clinical outcome and progression. Methods To test this population as prognostic factor on clinical outcome and progression of lymphoma disease, peripheral blood (PB) and bone marrow (BM) samples of 46 Lymphoma patients (pts), with non-Hodgkin's Lymphomas and classical Hodgkin Lymphoma were selected and prospectively collected at diagnosis and after one month till the end of chemo- or immuno-chemotherapy therapy. Blood samples were collected also at the time of relapse or progression. As control PB samples of 16 healthy donors were collected. Circulating

DNT subsets (TCRalphabeta+ and TCRgammadelta+) were characterized for their ontogeny, tolerogenic or cytotoxic attitude and TCR clonality by staining with the following conjugated monoclonal antibodies (MoAbs) for surface and intracellular markers: CD3, CD4, CD8, CD56, CD45, TCRalphabeta, CD45Ra, CD45Ro, CCR7, CD27, CD28, CD30, CD69, GITR, CD95, CD178, CD152, IFN-gamma, TNF-alpha, granzyme B, and perforin. Isotype-matched MoAbs were used as staining controls. For functional studies, DNTs were purified from PBMCs of patients through a negative selection by using specific MACS microbeads and then cultured for 2 weeks in complete medium supplemented with anti-CD3 (OKT3), rhIL-2 and rhIL-4. Data were acquired using an 8-colour flow cytometer and analyzed using Kaluza software. Data were compared among the groups using the Mann-Whitney non-parametric test or Kruskal-Wallis one-way analysis of variance. The study was approved by the local Ethics Committee and all patients provided their informed consent in accordance with the Declaration of Helsinki. Results The percentage (mean + SE) of DNTs in BM (2.367 +/- 0.5891) of Lymphoma pts was lower than in PB samples (3.421 +/- 0.981). Moreover we observed a significant decrease (p = 0.006) of circulating alphabeta-DNTs in pts with untreated lymphoma (23.7 +/- 3.7) as compared with healthy controls (31.3 +/- 3.4), and their number seemed to be modulated by disease relapse/progression or disease treatment. (fig.1). In Hodgkin's Lymphoma circulating alphabeta-DNTs were significantly increased as compared with other histotypes (p = 0.0001) (fig.2). Circulating alphabeta-DNTs were significantly decreased (p=0.006) in serial samples collected after treatment or at the time of disease relapse. Interestingly, after ex vivo expansion, DNTs acquired an immunomodulatory cytokine profile, characterized by the secretion of IFN-gamma and granzyme B which are known as central components of anti-tumor immune responses (fig.3). (Figure presented) Conclusions To date, no data have been reported on DNT phenotypic and functional charact rization in Lymphoma patients. Our study has demonstrated for the first time that alphabeta-DNTs could play an important role in both the development and the progression of lymphomas. In addition, based on our preliminary results, it is likely that ex-vivo expanded DNTs exert an anti-tumor activity thus suggesting their possible use as a new strategy for adoptive immune-therapy.

De Tullio, G., et al. (2013). "Role of circulating ab-double negative t cells (DNT) in lymphoma patients: Preliminary results of a prospective study." Haematologica **1)**: 416-417.

Background: Numerous aspects of lymphoma pathophysiology indicate mutual interactions between the host immune system and lymphoma cells. These interactions may either promote or control lymphomagenesis. An unconventional subset of CD4-CD8- double-negative T cells (DNTs) has been recently described to specifically contribute to anti-tumor immunity.Indeed, DNTs are involved in immune regulation and tolerance as well as in host defence and inflammation, acting as both regulatory T cells and/or cytotoxic T cells.DNTs are T lymphocytes expressing either abeta or gammadelta T-cell receptor (TCR) and lacking of CD4,CD8 and CD56.In healthy human donors and murine models, they constitute about the 1-5% of lymphocytes in the peripheral blood and in lymphoid organs. No data are available on the role of DNT cells in human anti-lymphoma immunity. Translating information from murine models expanded DNT cells would not impair host immunity against lymphoma and perhaps stimulate it.On the other hand,DNT cells also demonstrated to have a direct in vitro anti-tumor activity against lymphoma. Few data are available on the prognostic significance of DNTs in lymphomas,on their interaction with other immune cells and on their functional attitude. Aim(s): The aim of this study is to assess the frequency and the functional attitude of circulating DNTs in Lymphoma patients and healthy donors as controls, in order to evaluate the role of DNTs on clinical outcome Methods: For phenotypic and functional characterization of DNTs peripheral blood samples of 30 Lymphoma patients and 16 healthy donors wereprospectively collected.The staining of circulating DNT subset was performed with the following conjugated monoclonal antibodies (MoAbs) for surface and intracellular markers: CD3, CD4, CD8, CD56, CD45, TCRabeta, CD45Ra, CD45Ro, CCR7, CD27, CD28, CD30, CD69, GITR, CD95, CD178, CD152, IFN-gamma, TNF-a, granzymeB, perforin. Isotype-matched MoAbs will be used as staining controls. For functional studies, DNTs were purified from PBMCs of pts through a negative selection by using specific MACS microbeads and then cultured for 2 week in complete medium supplemented with anti-CD3 (OKT3), rhIL-2 and rhIL-4. Data was acquired using a 8-colour flow cytometer and analyzed using Kaluza software. Data were compared among the groups using the Mann-Whitney non parametric test or Kruskal-Wallis one-way analysis of variance.The study was approved by the local Ethics Committeeand all patients provided their informed consent in accordance with the Declaration of Helsinki. Result(s): We observed a significant decrease (P=0.006) of abeta-DNTs in the PB of patients with untreated lymphoma (20.5+/-4.8 SE,) (Mean+/-SE) as compared with healthy controls (31.3+/-3.4),and their number correlated with disease relapse/progression (Figure 1 A and B).In Hodgkin's Lymphoma patients the abeta-DNTs frequencies were significantly increased as compared with other histotypes (Figure 1 D). Interestingly, after ex vivo expansion, DNTs, acquired a immunomodulatory cytokine profile, characterized by the secretion of IFN-gamma and granzyme B which are known as central component of anti-tumor immune responses (Figure 1 C). Summary and Conclusion(s): To date,no data has been reported on DNTs phenotypic and functional characterization in Lymphoma pts. Our study has demonstrated for the first time that abeta-DNTs may play an important role in both the development and the progression of lymphomas. In addition, based on our preliminary results,it is likely that ex-vivo expanded DNTs exert an antitumor activity,thus suggesting their possible use as new strategy for adoptive immune-therapy. (Figure Presented).

De Vries, L., et al. (2016). "Tofacitinib and a selective Janus kinase 1 inhibitor are equally potent in suppressing human macrophage function and T-cell proliferation." Journal of Crohn's and Colitis **10 (Supplement 1)**: S96-S97.

Background: Nonselective Janus kinase (JAK) inhibitors such as tofacitinib have shown efficacy in treatment of ulcerative colitis. Tofacitinib inhibits JAK1, JAK2, JAK3, and TYK2. Side effects observed in patients (eg, neutropenia, anaemia) are attributed to JAK2 signalling. These side effects, have led to the development of selective JAK inhibitors. It is unclear whether selective JAK1 or JAK3 inhibition is sufficient in suppressing inflammatory responses. We aimed to investigate the potency of a selective JAK1 inhibitor (JAK1i, GSK2586186), a JAK3 inhibitor (JAK3i, GSK2864192A), and tofacitinib (CP-690,550-10, Pfizer) to supress innate and adaptive immune responses in vitro. Method(s): Peripheral blood mononuclear cells (PBMCs), monocytes, and lymphocytes were isolated from buffy coats using Ficoll and Percoll separation. CD14+ monocytes (n = 6) were isolated with CD14+ micro beads and stimulated with LPS (100 ng/ml) and IFNgamma (10 ng/ml) for 6 hours in presence or absence of JAK1i, JAK3i, or tofacitinib (10-1000 nM). Cytokine and chemokine production by monocytes was measured in the supernatant by ELISA. Lymphocytes (n = 3) were stimulated with anti-CD3/CD28 beads in the presence or absence of JAK1i, JAK3i, or tofacitinib in a concentration ranging from 10 to 10.000 nM. Cell viability was assessed using an MTS colorimetric assay. In addition, JAK1i, JAK3i, and tofacitinib (10- 10.000 nM) were added in a mixed lymphocyte reaction (MLR), in which PBMCs of 2 donors are mixed in a 1:1 ratio and cultured for 6 days. In both experiments, T-cell proliferation was measured with a Tritium proliferation assay. Result(s): In human CD14+ monocyte-derived macrophages, JAK1i and tofacitinib, but not JAK3i, decreased CXCL10 secretion at 1000 nM (resp. p = 0.021, p = 0.021, p = 0.416), whereas TNFalpha, and IL6 secretion was unaffected by all inhibitors. When assessing the effect of tofacitinib, JAK1i, and JAK3i on T-cell proliferation using anti-CD3/CD28 beads, JAK1i, and tofacitinib equally inhibited T-cell proliferation at 1000 nM (resp. p = 0.010 and p = 0.006). JAK3i inhibited T-cell proliferation at 4000 nM (p = 0.004). At these doses, T-cell viability was not affected. In a MLR, JAK1i, and tofacitinib inhibited T-cell proliferation at 100 nM (both p = 0.000). JAK3i to inhibited T-cell proliferation at 2000 nM (p = 0.022). Conclusion(s): In vitro, JAK1i and tofacitinib, but not JAK3i, inhibit CXCL10 secretion produced by IFNgamma/LPS triggered human monocyte- derived macrophages and proliferation of human T-cells in a dose-dependent manner. JAK3i inhibits T-cell proliferation at a higher dose, without affecting T-cell viability. (Table Presented).

De Vries, L. C., et al. (2016). "Tofacitinib and a selective janus kinase 1 inhibitor are equally potent in suppressing human macrophage function and T cell proliferation." Gastroenterology **1)**: S386-S387.

INTRODUCTION Non-selective Janus Kinase (JAK) inhibitors such as tofacitinib have shown efficacy in treatment of ulcerative colitis. Tofacitinib inhibits JAK1, JAK2, JAK3 and TYK2. Side effects observed in patients (e.g. neutropenia, anaemia) are attributed to JAK2 signalling. These side effects, have led to the development of selective JAK inhibitors. It is unclear whether selective JAK1 or JAK3 inhibition is sufficient in suppressing inflammatory responses. We aimed to investigate the potency of a selective JAK1 inhibitor (JAK1i, GSK2586186), a JAK3 inhibitor (JAK3i, GSK2864192A) and tofacitinib (CP-690,550-10, Pfizer) to supress innate and adaptive immune responses in vitro. METHODS peripheral blood mononuclear cells (PBMC's), monocytes and lymphocytes were isolated from buffy coats using Ficoll and Percoll separation. CD14+ monocytes (n=6) were isolated with CD14+ micro beads and stimulated with LPS (100 ng/ml) and IFNgamma (10 ng/ml) for 6 hours in presence or absence of JAK1i, JAK3i or tofacitinib (10-1000 nM). Cytokine and chemokine production by monocytes was measured in the supernatant by ELISA. Lymphocytes (n=3) were stimulated with anti-CD3/CD28 beads in the presence or absence of JAK1i, JAK3i or tofacitinib in a concentration ranging from 10 to 10.000 nM. Cell viability was assessed using an MTS colorimetric assay. In addition, JAK1i, JAK3i and tofacitinib (10-10.000 nM) were added in a mixed lymphocyte reaction (MLR), in which PBMC's of 2 donors are mixed in a 1:1 ratio and cultured for 6 days. In both experiments, T cell proliferation was measured with a Tritium proliferation assay. RESULTS In human CD14+ monocyte-derived macrophages, JAK1i and tofacitinib, but not JAK3i decreased CXCL10 secretion at 1000 nM (resp. p=0.021, p=0.021, p=0.416), while TNFalpha, and IL6 secretion was unaffected by all inhibitors. When assessing the effect of tofacitinib, JAK1i and JAK3i on T cell proliferation using anti- CD3/CD28 beads, JAK1i and tofacitinib equally inhibited T cell proliferation at 1000 nM (resp. p=0.010 and p=0.006). JAK3i inhibited T cell proliferation at 4000 nM (p=0.004). At these doses, T cell viability was not affected. In a MLR, JAK1i and tofacitinib inhibited T cell proliferation at 100 nM (both p=0.000). JAK3i to inhibited T cell proliferation at 2000 nM (p=0.022). CONCLUSION In vitro, JAK1i and tofacitinib, but not JAK3i inhibit CXCL10 secretion produced by IFNgamma/LPS triggered human monocyte-derived macrophages and inhibit proliferation of human T cells in a dose dependent manner. JAK3i inhibits T cell proliferation at a higher dose, without affecting T cell viability.

De Witte, M., et al. (2015). "Immune reconstitution and clinical outcome after alpha/beta T-cell depleted allogeneic stem cell transplantation from matched related and unrelated donors." Blood **126 (23)**: 4313.

Introduction: The outcome of allo-SCT in patients with hematological malignancies is still hampered by GVHD and relapse. Specific depletion of alphabeta T- cells is proposed to result in a decreased incidence of aGVHD, whereas the remaining innate cells such as NK cells and gammadeltaT cells may provide control of infected and transformed cells the first months post SCT. This strategy has been pioneered in haploindentical transplantation with promising results. Within this study, we extend alphabetaT- cell depleted allo-SCT to patients with a matched related and unrelated donor. The primary aim is to develop an allogeneic SCT protocol with a low incidence of aGVHD without an increased incidence of infections or relapse to serve as a platform for post-allo interventions such as a pre-emptive DLI or transfer of genetically modified T cells. Method(s): Patients with hematological malignancies (including AML, ALL, MM, NHL) who received an alphabetaT-cell depleted allo-SCT of a HLA matched sibling (MRD) or HLA matched (9 or 10/10) unrelated donor (MUD) were analysed. alphabetaT-cell reduction was performed by negative selection with anti-alphabetaTCR antibodies in combination with magnetic microbeads, using the automated CliniMACS device (Miltenyi Biotec, Bergisch Gladbach, Germany). The maximal contamination with alphabetaT-cells was 5x105/kg. The conditioning regimen consisted of: ATG (Genzyme) 6 mg/m² + fludarabine 120 mg/m² + busilvex AUC=90. Immune suppression consisted of 28 days of mycophenolic acid. A cohort of 32 patients was retrospectively analyzed for clinical parameters including immune reconstitution, engraftment, infections, GVHD, relapse, NRM and OS and compared to an historical control cohort of recipients of a T cell replete allo-SCT. In addition in a subset of patients NGS of the TCRbeta chain was performed using the Illumina/MiSeq sequencing platform after isolation diverse immune subsets within the alphabetaT-cell repertoire. Result(s): The combination of ATG/fludarabine/busilvex was well tolerated with hematological recovery within 3 weeks. Primary engraftment (chimerism > 95%) was observed in all patients (n=32). Immune reconstitution primarily consisted of NK cells. In addition, gammadeltaT cells were detectable at normal numbers the first half year post SCT, whereas the adaptive immune repertoire showed a delayed reconstitution. As compared to the historical control cohort, the incidence of CMV (54% vs 38%; p = 0,48) and EBV (32% vs 9%' p=0,148) infections did not show a significant increase. The incidence of aGVHD > grade II within 100 days in patients of a alphabetaT-cell depleted allo-SCT was 0%. During this relative short time of follow-up (1-14 months) 2 patients developed a relapse (both > 6 months) and 2 patients deceased (one with mucormycosis, one with GVHD post DLI). With NGS of the TCRbeta repertoire, a surprising diversity was observed in defined immune subsets ranging from clonal expansion of regulatory T cells to broad repertoires in effector memory cells. Conclusion(s): alphabetaT-cell depletion in MRD/MUD results in a swift reconstitution of innate cells (NK cells and gammadeltaT-cells) the first 6 months post transplantation, followed by a subsequent reconstitution of the adaptive immune repertoire. The diversity appears to be different for diverse subsets of the alphabetaT-cell repertoire, which remains to be confirmed in an extended pool of patients. The incidence of severe aGVHD is low, without a significant increase in infections or relapse shortly post allo-SCT. These results will be confirmed during extended follow-up and in a planned prospective multicenter study.

De Witte, M., et al. (2016). "Clinical outcome and immune reconstitution in alpha/beta T-cell depleted allogeneic stem cell transplantation from matched related and unrelated donors." Haematologica **101 (Supplement 1)**: 287-288.

Background: The outcome of allo-SCT in patients with hematological malignancies is still hampered by GVHD and relapse. Specific depletion of alphabeta Tcells is proposed to result in a decreased incidence of aGVHD, whereas the remaining innate cells such as NK cells and gammadeltaT cells may provide control of infected and transformed cells the first months post SCT. This strategy has been pioneered in haploindentical transplantation with encouraging results. Within this study, we extend alphabetaT- cell depleted allo-SCT to patients with a matched related and unrelated donor. Aim(s): The primary aim is to develop an allogeneic SCT protocol with a low incidence of aGVHD without an increased incidence of infections or relapse to serve as a platform for post-allo interventions such as a pre-emptive DLI or transfer of genetically modified T cells. Method(s): 55 Patients with hematological malignancies (including AML, ALL, MM, NHL, MPN) who received an alphabetaT-cell depleted allo-SCT of a HLA matched sibling (MRD) or HLA matched (9 or 10/10) unrelated donor (MUD) were analysed. alphabetaT-cell reduction was performed by negative selection with anti- alphabetaTCR antibodies in combination with magnetic microbeads, using the automated CliniMACS device (Miltenyi Biotec, Bergisch Gladbach, Germany). The maximal contamination with alphabetaT-cells was 5x105/kg. The conditioning regimen consisted of: ATG (Genzyme) 6 mg/m²+fludarabine 120 mg/m²+busilvex AUC=90. Part of the patients received mycophenolic acid as GVHD prophylaxis for 28 days. Patients were retrospectively analyzed for clinical parameters including immune reconstitution, engraftment, infections, GVHD, relapse, NRM and OS and compared to an historical control cohort of recipients of T cell replete allo-SCT. A retrospective cohort of recipients of T cell replete allografts was used for comparison. In addition in a subset of patients NGS of the TCRbeta chain was performed using the Illumina/MiSeq sequencing platform after isolation of diverse immune subsets within the alphabetaT-cell repertoire. Result(s): alphabetaT-cell depletion with anti-alphabetaTCR antibodies resulted in a 4.1 (1.7- 5.2) log depletion of alphabetaT cells and a recovery of 77% (43-98%) of the CD34+ cells. The median contamination with alphabetaT-cells was 16x10³/kg (0.8x10³/kg - 200x10³/kg) and infused number of CD34+ cells were 6.8x10⁶/kg (1.2 x10⁶/kg - 10.4x10⁶/kg). The combination of ATG/fludarabine/busilvex was well tolerated with hematological recovery within 3 weeks. Primary engraftment (chimerism >95%) was observed in all patients (n=55). Immune reconstitution primarily consisted of NK cells. In addition, gammadeltaT cells were detectable at normal numbers the first half year post SCT, whereas the adaptive immune repertoire showed a delayed reconstitution. The incidence of CMV infections was 54% in patients after alphabetaT cell depleted allo-SCT without MMF, 23% in patients after alphabetaT cell depleted allo-SCT with MMF and 38% in T cell replete allo-SCT control cohort. The incidence of EBV infections was 30,8%; 9,5% and 8,7% respectively. The incidence of aGVHD >grade II within 100 days in patients of a alphabetaT-cell depleted allo-SCT was 0%. During this short time of follow-up (1-20 months) we observed no significant differences in EFS, NRM and OS as compared to historical control cohorts. With NGS of the TCRbeta repertoire, a surprising diversity was observed in defined immune subsets ranging from clonal expansion of regulatory T cells to broad repertoires in effector memory cells. Summary/Conclusions: Here we present the clinical outcome of a large cohort (n=55) of patients having received an alphabetaT-cell depleted allograft of MRD/MUD. We observe a swift reconstitution of innate cells (NK cells and gammadeltaTcells) the first 6 months post transplantation, followed by a subsequent reconstitution of the adaptive immune repertoire. The incidence of severe aGVHD was 0%, without a significant increase in infections or relapse shortly post allo- SCT. These results will be confirmed during extended follow-up and in a planned prospective multicenter study.

De Witte, M., et al. (2015). "Alpha/beta T-cell depleted allogeneic stem cell transplantation from matched related and unrelated donor grafts in patients with poor risk leukemia." Biology of Blood and Marrow Transplantation **1)**: S277-S278.

Introduction: The outcome of allo-SCT in patients with poor risk leukemia is still hampered by GVHD and relapse. The innate immune system has been reported to contribute to tumor control, with lower incidence of GVHD. Specific depletion of alphabetaT-cells - key players in the development of GVHD - will render NK cells and gd T cells within the allograft. Recently reported results have shown the great promise of this approach in haploidentical transplantations. Within this study, we aim to extend alphabetaT-cell depleted allo- SCT to patients with a MRD or MUD. Method(s): Patients with either 'poor-risk' or 'very poor-risk' leukemia were included in this phase I study. Either HLA matched siblings (MRD) or HLA matched (9 or 10/10) unrelated donors (MUD) were eligible. abT-cell reduction was performed by negative selection with anti-abTCR antibodies in combination with magnetic microbeads, using the automated CliniMACS device (Miltenyi Biotec, Bergisch Gladbach, Germany). The maximal contamination with abT-cells for all dose levels was 5x10⁵/kg. The conditioning regimen consisted of: ATG (Genzyme) 4 or 6 mg/m² + fludarabine 120 mg/m² + busilvex AUC=90 followed by alphabetaT-cell depleted grafts from matched related or unrelated donors. No additional immune suppression was given after allo-SCT. Result(s): Products for 15 patients have been successfully processed and used for alphabetaT-cell depleted allo-SCT between 2013 and 2014. A ~4 log depletion of alphabetaT-cells has been observed in the product with a recovery of ~75% of CD34+ cells. The combination of ATG/fludarabine/busilvex was well tolerated with a hematological recovery within 3 weeks. Primary engraftment (chimerism > 95%) was observed in all patients. Immune reconstitution primarily consisted of innate cells (NK cells and gd T cells) the first 6 months post transplantation. In addition, no increase in CMV or EBV reactivations has been observed so far under the profound "innate control." Up to date, none of the patients developed aGVHD > grade II. Conclusion(s): ATG Busulfan Fludarabine is a low toxicity platform for abTCR-depleted transplantations, resulting in a swift reconstitution of innate cells (NK cells and gd T cells) the first 6 months post transplantation. This transplantation strategy can serve as a tool for future immunological interventions such as a pre-emptive DLI or transfer of genetically modified T cells.

De Witte, M. D., et al. (2016). "Clinical outcome and immune reconstitution in alphabeta T-cell depleted allogeneic stem cell transplantation from matched related and unrelated donors." <u>Bone Marrow Transplantation</u> **1)**: S335-S336.

Introduction: Specific depletion of alphabeta T- cells is proposed to result in a decreased incidence of aGVHD, whereas the remaining innate cells such as NK cells and gammadeltaT cells may provide control of infected and transformed cells the first months post SCT. This strategy has been pioneered in haploindentical transplantation with encouraging results (1). Here we extend alphabetaT- cell depleted allo-SCT to patients with a matched related and unrelated donor. Material (or patients) and methods: 55 patients with hematological malignancies (including AML, ALL, MM, NHL, MPN) received an alphabetaT-cell depleted allo-SCT of a HLA matched sibling (MRD) or HLA matched (9 or 10/10) unrelated donor (MUD). alphabetaT-cell reduction was performed by negative selection with anti-alphabetaTCR antibodies in combination with magnetic microbeads, using the automated CliniMACS device (Miltenyi Biotec, Bergisch Gladbach, Germany). The maximal contamination with alphabetaT-cells was 5x10⁵/kg. The conditioning regimen consisted of: ATG (Genzyme) 6 mg/m²+fludarabine 120 mg/ m²+busilvex AUC = 90. Part of the patients received mycophenolic acid as GVHD prophylaxis for 28 days. Patients were retrospectively analyzed for clinical parameters including immune reconstitution, engraftment, infections, GVHD, relapse, NRM and OS and compared to an historical control cohort of recipients of T cell replete allo-SCT. In addition in a subset of patients NGS of the TCRbeta chain was performed using the Illumina/MiSeq sequencing platform after isolation of diverse immune subsets within the alphabetaT-cell repertoire. Result(s): alphabetaT-cell depletion with anti-alphabetaTCR antibodies resulted in a 4.1 (range 1.7-5.2) log depletion of alphabetaT cells, resulting in a median contamination of 16x10³alphabetaT-cells/kg (0.8x10³/kg - 200x10³/kg). Primary engraftment (chimerism>95%) was observed in all patients (n = 55). Immune reconstitution primarily consisted of NK cells. In addition, gammadeltaT cells were detectable at normal numbers the first half year post SCT, whereas the adaptive immune repertoire showed a delayed reconstitution. The incidence of CMV infections was 54% in patients after alphabetaT-cell depleted allo-SCT without MMF, 23% in patients after alphabetaT cell depleted allo-SCT with MMF and 38% in T cell replete allo-SCT control cohort. The incidence of EBV infections was 30,8%; 9,5% and 8,7% respectively. The incidence of aGVHD>grade II within 100 days in patients of a alphabetaT-cell depleted allo-SCT was 0% (figure 1). During this short time of follow-up (1-20 months) we observed no significant differences in EFS, NRM and OS as compared to historical control cohorts. With NGS of the TCRbeta repertoire, a surprising diversity was observed in defined immune subsets ranging from clonal expansion of regulatory T cells to broad repertoires in effector memory cells. Conclusion(s): alphabetaT-cell depletion in allografts of MRD/MUD results in a swift reconstitution of innate cells (NK cells and gammadeltaT-cells), followed by a subsequent reconstitution of the adaptive immune repertoire. The incidence of severe aGVHD is 0%, without a significant increase in infections or relapse shortly post allo-SCT. These results will be confirmed during extended follow-up and in a planned prospective multicenter study. (Figure presented).

Dean, B. Y., et al. (2018). "Factors influencing microplastic abundances in nearshore, tributary and beach sediments along the Ontario shoreline of Lake Erie." Journal of Great Lakes Research **44**(5): 1002-1009.

Sediment samples were collected from nearshore, tributary and beach environments within and surrounding the northern part of Lake Erie, Ontario to determine the concentrations and distribution of microplastics. Following density separation and microscopic analysis of 29 samples, a total of 1178 microplastic particles were identified. Thirteen nearshore samples contained 0-391 microplastic particles per kg dry weight sediment (kg⁻¹), whereas 4 tributary samples contained 10-462 kg⁻¹ and 12 beach samples contained 50-146 kg⁻¹. The highest concentrations of nearshore microplastics were from near the mouths of the Detroit River in the western basin and the Grand River in the eastern basin, reflecting an urban influence. The highest microplastic concentrations in beach samples were determined from Rondeau Beach in the central basin where geomorphology affects plastics concentration. The Welland Canal sample in the eastern basin contained the greatest concentration of microplastics of the tributary samples, which is consistent with high population density and shipping traffic. The overall abundance of microplastic in northern Lake Erie nearshore, tributary and beach samples is 6 times lower than in sediment sampled from northern Lake Ontario. The nearshore and beach sample results potentially reflect the transport patterns of floating plastics modeled for Lake Erie, which predict that the majority of plastic particles entering the lake are transported to southern shoreline regions rather than northern areas.

Dean, J. M., et al. (2010). "Microglial MyD88 signaling regulates acute neuronal toxicity of LPS-stimulated microglia in vitro." Brain, behavior, and immunity **24**(5): 776-783.

Although the role of microglial activation in neural injury remains controversial, there is increasing evidence for a detrimental effect in the immature brain, which may occur in response to release of neurotoxic substances including pro-inflammatory cytokines. However, the signaling mechanisms involved in microglial-induced neuronal cell death are unclear. Microglia

isolated from the brains of wild-type (WT) or MyD88 knockout (KO) mice were exposed to PBS or the TLR4-ligand LPS (100 ng/mL) for 2, 6, 14, or 24 h, and the microglia-conditioned medium (MCM) collected. Detection of multiple inflammatory molecules in MCM was performed using a mouse 22-plex cytokine microbead array kit. Primary neuronal cultures were supplemented with the 14 or 24 h MCM, and the degree of neuronal apoptosis examined after exposure for 24 h. Results showed a rapid and sustained elevation in multiple inflammatory mediators in the MCM of WT microglia exposed to LPS, which was largely inhibited in MyD88 KO microglia. There was a significant increase in apoptotic death measured at 24 h in cultured neurons exposed to CM from either 14 or 24 h LPS-stimulated WT microglia ($p<.05$ vs. WT control). By contrast, there was no increase in apoptotic death in cultured neurons exposed to CM from 14 or 24 h LPS-stimulated MyD88 KO microglia ($p=.15$ vs. MyD88 KO control). These data suggest that MyD88-dependent activation of microglia by LPS causes release of factors directly toxic to neurons.

Decker, T. (2018). "Achtung Plastik! Wie Verbraucher(innen) beim Einkaufen Plastikmüll reduzieren können." Gaia **27**(3): 330-331.

Das Plastikproblem und die damit verbundenen Umweltauswirkungen werden von der Öffentlichkeit rege diskutiert. Wie Plastik schon beim Einkaufen von Lebensmitteln und Kleidung vermieden werden kann, untersucht das Projekt Verbraucherreaktionen bei Plastik und dessen Vermeidungsmöglichkeiten am Point of Sale, das im Rahmen der Sozial-ökologischen Forschung vom Bundesministerium für Bildung und Forschung gefördert wird.

Decordier, I., et al. (2002). "Elimination of micronucleated cells by apoptosis after treatment with inhibitors of microtubules." Mutagenesis **17**(4): 337-344.

Two major mechanisms responsible for chromosome segregation errors are non-disjunction and chromosome loss, both leading to aneuploidy. Previous studies in our laboratory showed the existence of thresholds for the induction of chromosome non-disjunction and chromosome loss and the induction of apoptosis by microtubule inhibitors. From a mechanistic point of view one can expect that apoptosis contributes to the elimination of cells with premutagenic/mutagenic lesions. If aneuploid cells were eliminated by the induction of apoptosis below the threshold concentrations for chromosome loss and non-disjunction, the defined thresholds would not be applicable to cells unable to undergo apoptosis. The aim of this study was to investigate whether apoptosis was induced directly or indirectly as a response to aberrant chromosome segregation below the thresholds for the induction of chromosome loss and non-disjunction, as previously defined by us. Therefore, human lymphocytes were exposed in vitro to five concentrations of nocodazole and five concentrations of carbendazim representing the threshold concentrations for chromosome non-disjunction and chromosome loss, two concentrations below the lowest threshold and one concentration between the two threshold values. After 48 h exposure to the aneugens, induction of apoptosis was analysed by the annexin-V test. The frequencies of chromosome non-disjunction and chromosome loss were estimated in cytokinesis-blocked human lymphocytes in combination with FISH; this methodology was applied to whole cell cultures as well as to apoptotic and viable cell fractions obtained using magnetic annexin microbead cell sorting. Our results suggest that elimination of aneuploid cells does occur. However, the efficiency of disappearance of micronucleated cells is higher than for cells presenting chromosome non-disjunction. The correlation found between early apoptotic events and micronucleus formation could account, at least in part, for the specific elimination of aneuploid cells.

Decrop, D., et al. (2016). "Optical Manipulation of Single Magnetic Beads in a Microwell Array on a Digital Microfluidic Chip." Analytical Chemistry **88**(17): 8596-8603.

The detection of single molecules in magnetic microbead microwell array formats revolutionized the development of digital bioassays. However, retrieval of individual magnetic beads from these arrays has not been realized until now despite having great potential for studying captured targets at the individual level. In this paper, optical tweezers were implemented on a digital microfluidic platform for accurate manipulation of single magnetic beads seeded in a microwell array. Successful optical trapping of magnetic beads was found to be dependent on Brownian motion of the beads, suggesting a 99% chance of trapping a vibrating bead. A tailor-made experimental design was used to screen the effect of bead type, ionic buffer strength, surfactant type, and concentration on the Brownian activity of beads in microwells. With the optimal conditions, the manipulation of magnetic beads was demonstrated by their trapping, retrieving, transporting, and repositioning to a desired microwell on the array. The presented platform combines the strengths of digital microfluidics, digital bioassays, and optical tweezers, resulting in a powerful dynamic microwell array system for single molecule and single cell studies.

Deegan, A. J., et al. (2015). "Tracking calcification in tissue-engineered bone using synchrotron micro-FTIR and SEM." Analytical and bioanalytical chemistry **407**(4): 1097-1105.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis One novel tissue engineering approach to mimic in vivo bone formation is the use of aggregate or micromass cultures. Various qualitative and quantitative techniques, such as histochemical staining, protein assay kits and RT-PCR, have been used previously on cellular aggregate studies to investigate how these intricate arrangements lead to mature bone tissue. However, these techniques struggle to reveal spatial and temporal distribution of proliferation and mineralization simultaneously. Synchrotron-based Fourier transform infrared microspectroscopy (micro-FTIR) offers a unique insight at the molecular scale by coupling high IR sensitivity to organic matter with the high spatial resolution allowed by diffraction limited SR microbeam. This study is set to investigate the effects of culture duration and aggregate size on the dynamics and spatial distribution of calcification in engineered bone aggregates by a combination of micro-FTIR and scanning electron microscopy (SEM)/energy-dispersive X-ray spectroscopy (EDX). A murine bone cell line has been used, and small/large bone aggregates have been induced using different chemically treated culture substrates. Our findings suggest that bone cell aggregate culturing can greatly increase levels of mineralization over short culture periods. The size of the aggregates influences mineralisation rates with larger aggregates mineralizing at a faster rate than their smaller counterparts. The micro-FTIR mapping has demonstrated that mineralization in the larger aggregates initiated from the periphery and spread to the centre, whilst the smaller aggregates have more minerals in the centre at the early stage and deposited more in the periphery after further culturing, implying that aggregate size influences calcification distribution and development over time. SEM/EDX data correlates well with the micro-FTIR results for the total mineral content. Thus, synchrotron-based micro-FTIR can accurately track mineralization process/mechanism in the engineered bone. [Figure not available: see fulltext.]

Deepak, A., et al. (2019). "Awareness of plastic hazards among dental students." Drug Invention Today **11**(7): 1556-1558.

Aim: The aim of this study is to create and assess the awareness of plastic hazards among dental students. Material(s) and Method(s): A prospective, cross-sectional questionnaire-based survey study was carried out at Saveetha Dental College on the awareness of plastic hazards. A well-structured questionnaire was prepared, distributed, and collected when it was filled by the undergraduate student. The questionnaire mainly evaluated the undergraduates basic awareness of the subject of plastic hazards, its effects and management of the hazard. The result was then statistically analyzed and processed. Result(s): Most of the participants in the settings had the awareness of hazards of plastic bag usage. Plastics are commonly used by the people due to their easy availability and ease of handling goods. Females were found to use plastics more often than males in shopping, carrying goods, etc. The results were graphically represented and then analyzed. Conclusion(s): Plastic pollution can lead to various health problems such as lung diseases, skin diseases, reproductive problems, and growth and maturation problems. Therefore, reducing the use of plastic and increasing the use of biodegradable and jute bags can reduce plastic pollution. However, there is a need for spreading the awareness of using alternative strategies. Copyright © 2019 JPR Solutions. All rights reserved.

Deepak, S. (2013). "Generation of hospital waste: an awareness impact on health and environmental protection." National Journal of Community Medicine **4**(1): 185-188.

World is generating more and more waste as the population of people in the world & Hospitals are increasing day by day. Health care activities are a means of protecting health, curing patients and saving lives. Waste generating from hospitals, health centers and medicals are no exceptions. Medical waste contains toxic chemicals, can be infectious and pose contamination risks both to public health and environment. But they also generate waste, out of which 25 percent entail risks, either of infection, of trauma or radiation exposure. In addition the inappropriate treatment or disposal of the waste can lead to environmental contamination or pollution. Seventy five percent of the hospital waste is similar to household waste and do not entail any particular hazard. In general, PVC plastic waste represents the large amount in hospital waste. In this paper we are addressing the issue of incineration of medical waste and to control the surface water mercurial pollution, their impacts on health, environment and their remediation.

DeGregory, P. R., et al. (2016). "Quantitative electrochemical metalloimmunoassay for TFF3 in urine using a paper analytical device." Analyst **141**(5): 1734-1744.

We report a paper-based assay platform for the detection of the kidney disease marker Trefoil Factor 3 (TFF3) in human urine. The sensor is based on a quantitative metalloimmunoassay that can determine TFF3 concentrations via electrochemical detection of environmentally stable silver nanoparticle (AgNP) labels attached to magnetic microbeads via a TFF3 immunosandwich. The paper electroanalytical device incorporates two preconcentration steps that make it possible to detect concentrations of TFF3 in human urine at the low end of the target TFF3 concentration range (0.03-7.0 mug mL(-1)). Importantly, the paper device provides a level of accuracy for TFF3 determination in human urine equivalent to that of a commercial kit. The paper sensor has a dynamic range of ~2.5 orders of magnitude, only requires a simple, one-step incubation protocol, and is fast, requiring only 10 min to complete. The cost of the materials at the prototypic laboratory scale, excluding reagents, is just US$0.42.

Dehaut, A., et al. (2016). "Microplastics in seafood: benchmark protocol for their extraction and characterization." Environmental Pollution **215**: 223-233.

Pollution of the oceans by microplastics (<5 mm) represents a major environmental problem. To date, a limited number of studies have investigated the level of contamination of marine organisms collected in situ. For extraction and characterization of microplastics in biological samples, the crucial step is the identification of solvent(s) or chemical(s) that efficiently dissolve organic matter without degrading plastic polymers for their identification in a time and cost effective way. Most published papers, as well as OSPAR recommendations for the development of a common monitoring protocol for plastic particles in fish and shellfish at the European level, use protocols containing nitric acid to digest the biological tissues, despite reports of polyamide degradation with this chemical. In the present study, six existing approaches were tested and their effects were compared on up to 15 different plastic polymers, as well as their efficiency in digesting biological matrices. Plastic integrity was evaluated through microscopic inspection, weighing, pyrolysis coupled with gas chromatography and mass spectrometry, and Raman spectrometry before and after digestion. Tissues from mussels, crabs and fish were digested before being filtered on glass fibre filters. Digestion efficiency was evaluated through microscopical inspection of the filters and determination of the relative removal of organic matter content after digestion. Five out of the six tested protocols led to significant degradation of plastic particles and/or insufficient tissue digestion. The protocol using a KOH 10% solution and incubation at 60 degrees C during a 24 h period led to an efficient digestion of biological tissues with no significant degradation on all tested polymers, except for cellulose acetate. This protocol appeared to be the best compromise for extraction and later identification of microplastics in biological samples and should be implemented in further monitoring studies to ensure relevance and comparison of environmental and seafood product quality studies.

Dehaut, A., et al. (2019). "Current frontiers and recommendations for the study of microplastics in seafood." TrAC - Trends in Analytical Chemistry **116**: 346-359.

For seventy years, mass plastic production and waste mismanagement have resulted in huge pollution of the environment, including the marine environment. The first mention of seafood contaminated by microplastics was recorded in the seventies, and to date numerous studies have been carried out on shellfish, fish and crustaceans. Based on an ad hoc corpus, the current review aims to report on the numerous practices and methodologies described so far. By examining multiple aspects including problems related to the definition of the term microplastic, contamination at the laboratory scale, sampling and isolation, and quantification and identification, the aim was to point out current limitations and the needs to improve and harmonise practices for future studies on microplastics in seafood. A final part is devoted to the minimum information for publication of microplastics studies (MIMS). Based on the aspects discussed, MIMS act as a starting point for harmonisation of analyses. Copyright © 2018 Elsevier B.V.

Dehghan, R., et al. (2016). "Evidence for decreased expression of APPL1 associated with reduced insulin and adiponectin receptors expression in PCOS patients." Journal of Endocrinological Investigation **39**(9): 1075-1082.

Purpose: To investigate the expression of Adaptor protein containing a PH domain, PTB domain and leucine zipper motif 1 (APPL1), insulin receptor (INSR), adiponectin and adiponectin receptors (adipoR1 and R2) and their possible associations in granulosa cells (GCs) of 22 polycystic ovary syndrome (PCOS) women compared to the 22 non-PCOS controls with normal ovulatory function matched for BMI (body mass index). Method(s): In this study, 44 infertile women aged 18-40 years undergoing in vitro fertilization (IVF) protocol were recruited. After follicular fluid collection, GCs were isolated and then purified with MACS (Micro Beads conjugated to monoclonal anti-human CD45 antibodies). RNA was extracted from GCs and quantitative real-time PCR (qRT-PCR) was performed to assess APPL1 gene expression. Result(s): Expression of APPL1, insulin receptor and adiponectin system genes was significantly decreased in PCOS group compared to the controls. Conclusion(s): Reduction of APPL1, insulin receptor and adiponectin system genes in GCs could be involved in the development of PCOS. Copyright © 2016, Italian Society of Endocrinology (SIE).

Dehghani, S., et al. (2017). "Microplastic pollution in deposited urban dust, Tehran metropolis, Iran." Environmental Science & Pollution Research **24**(25): 20360-20371.

Environmental pollutants such as microplastics have become a major concern over the last few decades. We investigated the presence, characteristics, and potential health risks of microplastic dust ingestion. The plastic load of 88 to 605 microplastics per 30 g dry dust with a dominance of black and yellow granule microplastics ranging in size from 250 to 500 mum was determined in 10 street dust samples using a binocular microscope. Fluorescence microscopy was found to be ineffective for detecting and counting plastic debris. Scanning electron microscopy, however, was useful for accurate detection of microplastic particles of different sizes, colors, and shapes (e.g., fiber, spherule, hexagonal, irregular polyhedron). Trace amounts of Al, Na, Ca, Mg, and Si, detected using energy dispersive X-ray spectroscopy, revealed additives of plastic polymers or adsorbed debris on microplastic surfaces. As a first step to estimate the adverse health effects of microplastics in street dust, the frequency of microplastic ingestion per day/year via ingestion of street dust was calculated. Considering exposure during outdoor activities and workspaces with high abundant microplastics as acute exposure, a mean of 3223 and 1063 microplastic particles per year is ingested by children and adults, respectively. Consequently, street dust is a potentially important source of microplastic contamination in the urban environment and control measures are required.

Dehnad, A., et al. (2016). "Development of immune-biomarkers of pulmonary tuberculosis in a rabbit model." Tuberculosis **101**: 1-7.

Tuberculosis (TB) causes extensive morbidity and mortality worldwide with approximately 10 million new cases of active disease emerging mostly from a pool of two billion individuals latently infected with Mycobacterium tuberculosis (M. tb) every year. The underlying host immune responses that drive M. tb infection to active disease or latency are not well understood. We propose that identification and characterization of host immune biomarkers will be helpful to better understand the mechanisms that drive this process, and may, in addition, lead to the development of better diagnostic tools for TB. We have previously reported the profiles of plasma immune biomarkers in pulmonary TB patients in endemic countries, and in M. tb-infected nonhuman primates. However, biomarker profiling for a cost-effective and user-friendly animal model relevant to human disease, such as rabbit, has not been developed. One challenge in the analysis of circulating cytokines/chemokines for rabbit model of TB is the limited availability of validated immune-reagents. Here we report the use of a commercially available multiplex microbead human cytokine/chemokine panels as development platform for rabbit immune reagents. The results demonstrate their utility to determine circulating analytes and define their profiles related to TB in the rabbit model. In addition, we report the profiles of circulating anti-M. tb antibodies in the plasma of rabbits with active pulmonary TB. These studies show that the pattern of expression of circulating immune biomarkers correlate with TB pathology in rabbits, and are similar to those defined in pulmonary TB patients.

Deibel, D. (1988). "Filter feeding by Oikopleura vanhoeffeni : Grazing impact on suspended particles in cold ocean waters." Marine biology. Berlin, Heidelberg **99**(2): 177-186.

Because of the abundance and size of Oikopleura vanhoeffeni its quantitative role as a suspension feeder in cold ocean waters needs to be defined. To minimize the effect of manipulation and containment, and to assess the effect of naturally occurring factors on clearance rate, the author used an in situ latex microbead technique in Logy Bay, Newfoundland, from February 1985 to June 1986. Individual clearance rates ranged from 8-944 ml h super(-1), increasing exponentially with increasing trunk length. At densities of 4-110 m super(-3), O. vanhoeffeni populations removed from < 1 to 13% of the standing stock of ingestible food particles each day. The median percentage daily ration (mu g C x mu g C super(-1) x d super(-1) x 100%) of 64% accounted for observed house production rates (1 to 2 d super(-1), with each house = 23% of body carbon).

Dekiff, J. H., et al. (2014). "Occurrence and spatial distribution of microplastics in sediments from Norderney." Environmental Pollution **186**: 248-256.

The spatial distribution of small potential microplastics (SPM) (<1 mm) in beach sediments was studied on a 500 m stretch of the North Sea island of Norderney. Their correlation with visible plastic debris (VPD) (>1 mm) was also examined. Small microparticles were extracted from 36 one kg sediment samples and analysed by visual microscopic inspection and partly by thermal desorption pyrolysis gas chromatography/mass spectrometry. The smallest particle size that could be analysed with this method was estimated to be 100 mum. The mean number of SPM at the three sampling sites (n = 12) was 1.7, 1.3 and 2.3 particles per kg dry sediment, respectively. SPM were identified as polypropylene, polyethylene, polyethylene terephthalate, polyvinylchloride, polystyrene and polyamide. The organic plastic additives found were benzophenone, 1,2-benzenedicarboxylic acid, dimethyl phthalate, diethylhexyl phthalate, dibutyl phthalate, diethyl phthalate, phenol and 2,4-di-tert-butylphenol. Particles were distributed rather homogenously and the occurrence of SPM did not correlate with that of VPD.

Del Angel-Mosqueda, C., et al. (2015). "Epidermal growth factor enhances osteogenic differentiation of dental pulp stem cells in vitro." Head & Face Medicine **11**: 29.

INTRODUCTION: Epidermal growth factor (EGF) and basic fibroblast growth factor (bFGF) play an important role in extracellular matrix mineralization, a complex process required for proper bone regeneration, one of the biggest challenges in dentistry. The purpose of this study was to evaluate the osteogenic potential of EGF and bFGF on dental pulp stem cells (DPSCs).

MATERIAL AND METHODS: Human DPSCs were isolated using CD105 magnetic microbeads and characterized by flow cytometry. To induce osteoblast differentiation, the cells were cultured in osteogenic medium supplemented with EGF or bFGF at a low concentration. Cell morphology and expression of CD146 and CD10 surface markers were analyzed using fluorescence microscopy. To measure mineralization, an alizarin red S assay was performed and typical markers of osteoblastic phenotype were evaluated by RT-PCR.

RESULTS: EGF treatment induced morphological changes and suppression of CD146 and CD10 markers. Additionally, the cells were capable of producing calcium deposits and increasing the mRNA expression to alkaline phosphatase (ALP) and osteocalcin (OCN) in relation to control groups (p < 0.001). However, bFGF treatment showed an inhibitory effect.

CONCLUSION: These data suggests that DPSCs in combination with EGF could be an effective stem cell-based therapy for bone tissue engineering applications in periodontics and oral implantology.

del Moral, P. M. and D. Warburton (2010). "Explant Culture of Mouse Embryonic Whole Lung, Isolated Epithelium, or Mesenchyme Under Chemically Defined Conditions as a System to Evaluate the Molecular

Mechanism of Branching Morphogenesis and Cellular Differentiation." Methods in Molecular Biology **633**: 71-79.

Lung primordial specification as well as branching morphogenesis, and the formation of various pulmonary cell lineages, requires a specific interaction of the lung endoderm with its surrounding mesenchyme and mesothelium. Lung mesenchyme has been shown to be the source of inductive signals for lung branching morphogenesis. Epithelial-mesenchymal-mesothelial interactions are also critical to embryonic lung morphogenesis. Early embryonic lung organ culture is a very useful system to study epithelial-mesenchymal interactions. Both epithelial and mesenchymal morphogenesis proceed under specific conditions that can be readily manipulated in this system (in the absence of maternal influence and blood flow). More importantly this technique can be readily done in a serumless, chemically defined culture media. Gain and loss of function can be achieved using expressed proteins, recombinant viral vectors, and/or analysis of transgenic mouse strains, antisense RNA, as well as RNA interference gene knockdown. Additionally, to further study epithelial-mesenchymal interactions, the relative roles of epithelium versus mesenchyme signaling can also be determined using tissue recombination (e.g., epithelial and mesenchymal separation) and microbead studies.

Del Sole, A. and A. Fonda (2004). "[Disposal of waste glass in sanitary departments: a sample survey in the Lazio region]." Annali di Igiene **16**(4): 569-578.

As a result of Italian law, DPR 15/7/2003 n. 254, about hospital waste, and given that little has been written about recycling waste glass in hospitals, a survey of 28 health departments in Lazio was performed. The objectives were: to estimate the mean quantity of clear vitreous waste in one year, to estimate how vitreous waste is administered, to estimate the extent of the use of plastic instead of glass, to analyse the costs and benefits of glass use and/or plastic use and to evaluate staff training about hospital waste disposal. The average production of clear vitreous waste was 0.28 kilogram per day per hospital bed occupied. (This would be the theoretical maximum quantity of glass to be recycled). Among the 28 departments studied, 82% separated waste products but only 36% disposed of glass in accordance with the law. The estimated possible savings on glass phleboclysis in 2002 year were 35,000 euro. Staff training could avoid this conspicuous waste of money. Fifteen departments also used plastic phleboclysis; of these, in 2 departments plastic waste is separated in the wards, but unfortunately this material is later disposed of in the bins for general solid urban waste. The other thirteen hospitals dispose of waste plastic as infectious material. Using glass phleboclysis instead of plastic phleboclysis would save about 680,000 euros per year. The disposal of glass waste material in practice was not found to follow the principles taught in the training courses. Theoretic data about glass production, estimated in this survey, refers only to clear glass and it is an underestimate of that of all glass used in departments. The quantity of glass actually recycled has been about 0.14 kilogram per day per hospital bed occupied and thus only 50% of the theoretical quantity (0.28 kilogram per day per hospital bed occupied). This percentage could be improved by effective training. Ideally, the disposal of waste glass would follow the legal requirements and be monitored locally.

Delamaire, M., et al. (1997). "Impaired leucocyte functions in diabetic patients." Diabetic Medicine **14**(1): 29-34.

This study evaluates polymorphonuclear neutrophil (PMN) cell performance in 61 diabetic patients free of infection (40 Type 1, 21 Type 2), using tests that explore all the functional steps of PMN: (1) adherence: expression of adhesion molecules, CD 11a, CD 11b, CD 11c; nylon fiber adherence test; (2) chemotaxis under agarose towards the bacterial oligopeptide FMLP and complement fractions, used as attracting agents; (3) phagocytosis of opsonized latex microbeads; (4) bactericidal activity: chemiluminescence assessment of the oxidative killing potential before and after stimulation by opsonized zymosan and PMA; nitroblue tetrazolium reduction test.

De-la-Torre, G. E. (2019). "Microplastics: an emerging threat to food security and human health." Journal of Food Science and Technology.

Microplastic presence in seafood and foodstuff have been documented globally in recent studies. Consequently, human exposure to microplastics through the ingestion of contaminated food is inevitable and pose a risk to food security and human health. In this review, microplastics and related xenobiotics are defined, global evidence of microplastic pollution in seafood is reviewed, the impacts to commercial marine species and food security are discussed, and the current knowledge of its direct effects on human health is reviewed. In addition, limited information regarding food security and scientific gaps are identified. Although microplastics in the marine environment and its effects on marine organisms have been well documented, more research is needed to completely understand the implications of microplastics over food security and human health. Further research must focus on monitoring and eliminating microplastics along the food supply chain and determining the extent to which food security is affected by microplastic pollution. © 2019, Association of Food Scientists & Technologists (India).

Delgado-Blanca, I., et al. (2019). "Novel sequential separation and determination of a quaternary mixture of fungicides by using an automatic fluorimetric optosensor." Food Additives & Contaminants. Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment **36**(2): 278-288.

A versatile flow-through multi-optosensor is proposed for the separation and spectrofluorimetric determination of mixtures of four widely used pesticides: carbendazim, thiabendazole, carbaryl and o-phenylphenol at micro g g⁻¹ levels in fruits. The flow system is based on the online pre-concentration and separation of the pesticides on a solid sensing microzone, followed by the sequential measurement of their native fluorescence. The separation of the pesticides takes place on a solid support located in the same flow cell, on which analytes are temporarily immobilized and separated from the matrix due to their different retention/desorption kinetics when they interact with the C₁₈ silica gel microbeads. Suitable analytical parameters were obtained for the selected analytes, with method detection and quantification limits ranging between 0.1-0.5 and 0.2-1.6 micro g g⁻¹, respectively. These values comply with the maximum residue limits (MRLs) established by the Codex Alimentarius for these commodities; in addition, carbendazim, thiabendazole and ortho-phenylphenol comply with the MRLs of The European Union. The developed method was applied to the analysis of citrus fruits by performing recovery studies. Recoveries between 85% and 115% were obtained in all cases, and the results were confirmed by a liquid chromatography-mass spectrometry reference method.

Delion, M., et al. (2019). "CFTR malfunction is linked to mucus abnormal properties in cystic fibrosis." Journal of Cystic Fibrosis **18 (Supplement 1)**: S5.

Objectives: Gel-forming mucins (mainly MUC5B and MUC5AC in the lungs) are high-molecular-weight glycoproteins responsible for the viscoelastic properties of mucus and play a key role in CF pathogenesis. In CF airways, abnormal mucus properties drive mucus stasis and airway obstruction but the pathophysiologic link with CFTR malfunction is unclear.

Understanding the biochemical changes caused by CFTR malfunction is critical to identify therapeutic targets aimed to reverse mucus abnormalities in CF. Method(s): Human bronchial epithelial (HBE) and nasal epithelial (HNE) cells were collected from normal and CF subjects. Modulation of CFTR activity was ensured by either correction by small molecules (Vx770-Vx809) or inhibition with the inhibitor CFTR<inf>Inh172</inf>. Impact on mucin properties was assessed using biochemical assays (Western blotting, HPLC, IHC) and scanning electron microscopy (SEM). Change in mucociliary transport (MCT) was assessed using fluorescent microbeads tracking. Result(s): CFTR rescue in HBE cells significantly decreased total mucin concentration and increased ciliary beat amplitude suggesting a physical change in the mucin network surrounding the cilia. MUC5B crosslinking was also decreased as shown by electrophoretic mobility. In CF-HBE cells, duration and velocity of MCT were significantly reduced compared to non-CF cells but partially restored by Vx770-809 treatment. In addition, changes in CFTR function strongly affected mucin secretion in HNE cells. CFTR rescue significantly reduces mucins secretion. Inversely, CFTR inhibition resulted in mucin hyperconcentration in non-CF nasal cells, with a change in MUC5B/MUC5AC ratio and a tighter mucus network. Conclusion(s): CFTR function affects mucin secretion and molecular weight/size. Alteration of MUC5B/MUC5AC ratio and mucin network organization both likely affect the biophysical properties of airway mucus. Hence, treatments directly targeting mucus like mucolytics could be a promising therapeutic strategy.

Delva, L., et al. (2018). "EVALUATION OF POST-CONSUMER MIXED POLYOLEFINES AND THEIR INJECTION MOULDED BLENDS WITH VIRGIN POLYETHYLENE." Environmental Engineering & Management Journal (EEMJ) **17**(2): 427-434.

Recycling of solid plastic waste composed of post-consumer mixed polyolefines (polypropylene and polyethylene) was carried out by injection moulding of secondary material streams. The materials have been characterized by melt flow index (MFI), tensile, bending and impact measurements, density and differential scanning calorimetry (DSC). The sink-float technique was used to separate the polyethylene fraction, which was then blended into virgin polyethylene at different ratios and processed anew. The mechanical and physicochemical properties were likewise determined and these results were compared to theoretical values, predicted by the law-of-mixtures. It was found that the different postconsumer mixed polyolefines were of similar quality and had comparable properties. Furthermore, it was demonstrated that the tensile and bending properties of blends consisting of recycled separated polyethylene and virgin polyethylene follow the law-of-mixtures, while the impact strength does not and is in fact strongly reduced by the presence of different phases within the injection moulded part. [ABSTRACT FROM AUTHOR]

Delves, A. K. (1996). "INDUSTRIAL WASTE WATER MINIMISATION AND TREATMENT." Recycling Textile & Plastic Waste: 43-50.

The article discusses industrial approaches for waste water minimization in the textile industries in Great Britain. It covers topics including the production of nylon 6.6 yarn, end of pipe solutions, water and waste management at source, environmental systems and auditing, waste

water minimization on infinity dyeing and planning for continuous improvement. It is emphasized that the quality management system should be made to work and be subject to frequent audits to maintain the status qou. The water supplies must be metered at each function for energy conservation.

Demitri, C., et al. (2017). "Encapsulation of Lactobacillus kefiri in alginate microbeads using a double novel aerosol technique." Materials Science & Engineering. C, Materials for Biological Applications **77**: 548-555.

Alginate micro beads containing Lactobacillus kefiri (the principal bacteria present in the kefir probiotic drink) were produced by a novel technique based on dual aerosols spaying of alginate based solution and CaCl₂ as cross linking agent. Carboxymethylcellulose (CMC) has been also added to the alginate in order to change the physic-chemical properties (viscosity and permeability) of the microbeads. Calcium alginate and CMC are biopolymers that can be used for developing oral drug-delivery systems. These biopolymers have been reported to show a pH-dependent swelling behaviour. Calcium alginate and CMC have also been known to possess an excellent mucoadhesive property. The loaded microbeads have been characterized in terms of morphology, chemical composition and stability in different conditions mimicking the gastric environment. In this study, we demonstrate the feasibility of a continuous fabrication of alginate microbeads in a range of 50-70mum size, encapsulating L. kefiri as active ingredient. The technique involves the use of a double aerosols of alginate based solution and CaCl₂ as crosslinking agent. Moreover, the encapsulation process was proved to be effective and not detrimental to bacteria viability. At the same time, it was verified the protective efficacy of the microcapsules against the gastric environment using both SGF pH1.2 (fasted state) and pH2.2 (feed state).

Deng, G., et al. (2010). "Single cell analysis of primary and disseminated tumor cells isolated from tissue and blood." Cancer Research. Conference: 101st Annual Meeting of the American Association for Cancer Research, AACR **70**(8 SUPPL. 1).

Background: Cancer evolves through the accumulation of multiple genetic alterations. How such alterations are related to tumor growth and metastatic dissemination is being widely investigated. Tissue level analyses, however, may be confounded by tumor cell heterogeneity and contamination by wildtype stromal and immune cells. Single cell analysis of tumor cells may contribute to a better understanding of tumorigenesis and metastasis. Single cell analyses using flow cytometry or microdissected cells from tissues require large numbers of cells, expensive equipment, laborious technical training, and the analyzed single cell information may be impacted by technical processing artifacts. We developed an efficient, reliable and simple new method to isolate fresh single tumor cells from tissues and blood for mutational analysis and to evaluate additional biomarkers. Material(s) and Method(s): Tumor tissues and blood samples were obtained from breast cancer patients after informed consent. Primary or metastatic tissue was used for preparation of single cell suspensions for subsequent isolation. Single cells were isolated using EpCAM-conjugated microbeads and the MagSweeper, a device invented by our group. Individual microbead-labeled single cells were easy to observe and extract. Single cells were placed into individual PCR tubes for further DNA and RNA analyses. Single cell DNA mutational analysis was performed by sequencing using multiplex pre-amplification followed by PCR amplification. Multiplex RNA expression analyses were performed by qRT-PCR from single tumor cells. Enriched and unenriched single cell suspensions were used for biomarker evaluation and results were compared with normal tissues. Tumor cells with mutations were compared on a single cell level among multiple compartments: primary tumor, blood, and metastatic tumor. Results and Discussion: Single cells were isolated from suspensions prepared from primary and metastatic tumor tissues, EpCAM-enriched and unenriched single cells microscopically observed without requiring additional treatment and used for immunostaining for tumor cells identification. Some single cells not bound to EpCAM microbeads still met tumor cell criteria (cytokeratin positive, CD45 negative, and DAPI positive). The percentage of EpCAM -positive and cytokeratin-positive was determined in the single cell suspensions. Single cell DNA showing a single nucleotide mutation in the PIK3CA gene was identified in individual tumor cells from different tissues but not white blood cells. Results from our model indicate that isolating single tumor cells from tumor tissues or blood provides more detailed information about different tumor compartments in individual cancer patients. Comparison of individual tumor cells from primary and/or metastatic sites to tumor cells in blood should provide further insight into the metastatic process.

Deng, M., et al. (2000). "Immunomagnetic separation of Cryptosporidium parvum oocysts using MACS MicroBeads and high gradient separation columns." Journal of Microbiological Methods **40**(1): 11-17.

The MACS immunomagnetic separation (IMS) system was evaluated for concentrating Cryptosporidium parvum. Oocysts were first labelled with fluorescein isothiocyanate (FITC) or rabbit anti-C. parvum antibodies, then linked to MicroBeads coated with anti-FITC or anti-rabbit IgG, and separated through a high gradient separation column. Results indicated that over 95% of oocysts were recovered and their fluorescence and infectivity were retained. The presence of MicroBeads showed no effect on genomic DNA extraction and subsequent polymerase chain reaction (PCR)-based analyses, as sensitivity of PCR (10 oocysts) and the band pattern of randomly amplified polymorphic DNA (RAPD) were identical to those using DNAs extracted from normally purified oocysts. IMS-PCR consistently detected as few as 10 oocysts from 100 ml of apple juice or homogenized milk and IMS-IFA could detect 100 oocysts from 1 g of deer manure, demonstrating the efficiency of IMS in recovering oocysts from environmental and food samples.

Deng, Y. and Y. Zhang (2019). "Response to Uptake of microplastics and related health effects: a critical discussion of Deng et al., Scientific reports 7: 46687, 2017." Archives of Toxicology **93**(1): 213-215.

Deng, Y., et al. (2017). "Tissue accumulation of microplastics in mice and biomarker responses suggest widespread health risks of exposure." Scientific Reports **7**: 46687.

Microplastics (MPs) are a significant environmental health issue and increasingly greater source of concern. MPs have been detected in oceans, rivers, sediments, sewages, soil and even table salts. MPs exposure on marine organisms and humans has been documented, but information about the toxicity of MPs in mammal is limited. Here we used fluorescent and pristine polystyrene microplastics (PS-MPs) particles with two diameters (5 μm and 20 μm) to investigate the tissue distribution, accumulation, and tissue-specific health risk of MPs in mice. Results indicated that MPs accumulated in liver, kidney and gut, with a tissue-accumulation kinetics and distribution pattern that was strongly depended on the MPs particle size. In addition, analyses of multiple biochemical biomarkers and metabolomic profiles suggested that MPs exposure induced disturbance of energy and lipid metabolism as well as oxidative stress. Interestingly, blood biomarkers of neurotoxicity were also altered. Our results uncovered the distribution and accumulation of MPs across mice tissues and revealed significant alteration in several biomarkers that indicate potential toxicity from MPs exposure. Collectively, our data provided new evidence for the adverse consequences of MPs.

Deng, Y., et al. (2018). "Evidence that microplastics aggravate the toxicity of organophosphorus flame retardants in mice (Mus musculus)." Journal of Hazardous Materials **357**: 348-354.

This study was performed to reveal the health risks of co-exposure to organophosphorus flame retardants (OPFRs) and microplastics (MPs). We exposed mice to polyethylene (PE) and polystyrene (PS) MPs and OPFRs [tris (2-chloroethy) phosphate (TCEP) and tris (1,3-dichloro-2-propyl) phosphate (TDCPP)] for 90 days. Biochemical markers and metabolomics were used to determine whether MPs could enhance the toxicity of OPFRs. Superoxide dismutase (SOD) and catalase (CAT) increased ($p < 0.05$) by 21% and 26% respectively in 10 µg/L TDCPP + PE group compared to TDCPP group. Lactate dehydrogenase (LDH) in TDCPP + MPs groups were higher (18%-30%) than that in TDCPP groups ($p < 0.05$). Acetylcholinesterase (AChE) in TCEP + PE groups were lower (10%-19%) than those in TCEP groups ($p < 0.05$). These results suggested that OPFR co-exposure with MPs induced more toxicity than OPFR exposure alone. Finally, in comparison to controls we observed that 29, 41, 41, 26, 40 and 37 metabolites changed significantly ($p < 0.05$; fold-change > 1.2) in TCEP, TCEP + PS, TCEP + PE, TDCPP, TDCPP + PS and TDCPP + PE groups, respectively. Most of these metabolites are related to pathways of amino acid and energy metabolism. Our results indicate that MPs aggravate the toxicity of OPFRs and highlight the health risks of MP co-exposure with other pollutants.

Denizli, A., et al. (1999). "Diamine-plasma treated and Cu(II)-incorporated poly(hydroxyethylmethacrylate) microbeads for albumin adsorption." Journal of Biomaterials Science, Polymer Edition **10**(3): 305-318.

Poly(2-hydroxyethylmethacrylate) (PHEMA) microbeads prepared by suspension polymerization were treated with diamine-plasmas (i.e. ethylene-diamine (EDA) and hexamethylene diamine (HMDA)) in a glow-discharge reactor in which the exposure time and glow-discharge power were changed between 5 and 30 min and 5 and 20 W, respectively. The amount of nitrogen deposition increased both with increase in exposure time and glow-discharge power. The maximum amounts of nitrogen deposition on the microbeads were 22.3 and 23.4 micromol g(-1) with the EDA- and HMDA-plasmas. Then, Cu(II) ions were incorporated onto the PHEMA microbeads by chelating with the nitrogen-carrying functional groups. Different amounts of Cu(II) ions (2.4-6.8 mg g(-1)) were incorporated on the PHEMA microbeads by changing the initial concentration of Cu(II) ions. Bovine serum albumin (BSA) adsorption onto the unmodified PHEMA, diamine-plasma treated PHEMA, and diamine-plasma treated Cu(II)-incorporated PHEMA microbeads was investigated. The non-specific adsorption of BSA on the unmodified microbeads was very low (0.22 mg BSA g(-1)). Deposition of nitrogen increased the BSA adsorption (9.3 mg g(-1) for EDA-plasma and 12.7 mg g(-1) for HMDA-plasma). Cu(II)-incorporation significantly increased the BSA adsorption (154 mg g(-1) for EDA-plasma and 178 mg g(-1) for HMDA-plasma). Further increases in the albumin adsorption capacities of the polymer microbeads (185 mg g(-1) for EDA-plasma and 208 mg g(-1) for HMDA-plasma) were observed when human plasma was used. More than 92% of the adsorbed albumin molecules was desorbed in 1 h in the desorption medium containing 0.5 M NaSCN at pH 8.0. Repeated adsorption-desorption cycles showed the feasibility of these plasma-modified polymer microbeads.

Denizli, A., et al. (1993). "Nonspecific adsorption and covalent coupling of heparin on polyacrylate based microbeads." Biomaterials, Artificial Cells, & Immobilization Biotechnology **21**(2): 183-198.

Polyacrylate based microbeads were prepared by copolymerization of four different acrylate monomers, namely 2-hydroxyethylmethacrylate (HEMA), ethyleneglycoldimethacrylate (EGDMA), methylmethacrylate (MMA) and dimethylaminoethylmethacrylate (DMEAMA). These beads were further activated with CNBr at alkaline pH. The extend of nonspecific adsorption and covalent coupling of heparin on these beads were investigated in a batch reactors at different temperatures. The effects of initial concentrations of activation agent and heparin were also studied. Nonspecific heparin adsorption on the microbeads containing DMAEMA was significantly higher than the others. Nonspecific adsorption decreased with increasing temperature. Heparin was covalently coupled on CNBr activated microbeads. The amount of coupled heparin increased by increasing concentration of CNBr.

Denizli, A., et al. (1998). "Bilirubin removal from human plasma in a packed-bed column system with dye-affinity microbeads." Journal of Chromatography. B, Biomedical Sciences & Applications **707**(1-2): 25-31.

A dye-ligand. Cibacron Blue F3GA. was covalently coupled with the poly(EGDMA-HEMA) microbeads. The affinity sorbent carrying 16.5 micromol Cibacron Blue F3GA per gram polymer was then used to remove bilirubin from human plasma in a packed-bed column system. Bilirubin adsorption from human plasma on the unmodified poly(EGDMA-HEMA) microbeads was 0.32 mg/g, while much higher adsorption values, up to 24.2 mg/g, were obtained with the dye-attached microbeads. The bilirubin adsorption capacity of the microbeads decreased with an increase in the recirculation rate of plasma. Bilirubin adsorption increased with increasing temperature, and the maximum adsorption achieved at 37 degrees C (32.5 mg bilirubin/g polymer). Bilirubin molecules interacted directly with the immobilized Cibacron Blue F3GA molecules. Contribution of albumin adsorption on bilirubin adsorption was also significant.

Denizli, A. and E. Piskin (1995). "DNA-immobilized polyhydroxyethylmethacrylate microbeads for affinity sorption of human immunoglobulin G and anti-DNA antibodies." Journal of Chromatography B: Biomedical Applications **666**(2): 215-222.

Polyhydroxymethacrylate (PHEMA) microbeads were prepared by a suspension polymerization technique and activated by CNBr in an alkaline medium (pH 11.5). DNA molecules were immobilized onto CNBr-activated PHEMA beads. The amount of immobilized DNA was controlled by changing the medium pH and the initial concentrations of CNBr and DNA. The maximum DNA immobilization was observed at pH 5.0. Non-specific adsorption on the plain PHEMA microbeads was less than 0.1 mg/g. Much higher values, up to 2.75 mg/g, were achieved with the CNBr-activated PHEMA microbeads. Human immunoglobulin G (HIgG) adsorption onto PHEMA microbeads containing different amounts of DNA on their surfaces from aqueous solutions containing different amounts of HIgG at different pH values was investigated. The maximum HIgG adsorption was observed at pH 7.0. Non-specific HIgG adsorption onto the plain PHEMA microbeads was low (about 0.167 mg/g). Higher adsorption values, up to 7.5 mg/g, were obtained with the DNA-PHEMA beads. HIgG and anti-DNA antibody removal from the blood plasma obtained from a healthy donor and a patient with systemic lupus erythematosus (SLE) were also investigated. The maximum amounts of HIgG adsorbed from aqueous solution and human plasma onto the DNA-PHEMA microbeads were 7.35 and 23.46 mg/g, respectively. Anti-DNA antibody adsorption value was 40 mg/g.

Denizli, A., et al. (1995). "Protein A immobilized polyhydroxyethylmethacrylate beads for affinity sorption of human immunoglobulin G." Journal of Chromatography B: Biomedical Applications **668**(1): 13-19.

Protein A immobilized polyhydroxyethylmethacrylate (PHEMA) microbeads were investigated for the specific removal of HIgG from aqueous solutions and from human plasma. PHEMA microbeads were prepared by a suspension polymerization technique and activated by CNBr in an alkaline medium (pH 11.5). Protein A was then immobilized by covalent binding onto these microbeads. The amount of immobilized protein A was controlled by changing pH and the initial concentrations of CNBr and protein A. The maximum protein A immobilization was observed at pH 9.5. Up to 3.5 mg protein A/g PHEMA was immobilized on the CNBr activated PHEMA microbeads. The maximum HIgG adsorption on the protein A immobilized PHEMA microbeads was observed at pH 8.0. The non-specific HIgG adsorption onto the plain PHEMA microbeads was low (about 0.167 mg of HIgG/g PHEMA). Higher adsorption values (up to 6.0 mg of HIgG/g PHEMA) were obtained in which the protein A immobilized PHEMA microbeads were used. Much higher amounts of HIgG (up to 24.0 mg of HIgG/g PHEMA) were adsorbed from human plasma.

Denizli, A., et al. (1996). "Congo red and Cu(II) carrying poly(ethylene glycol dimethacrylate-hydroxyethyl methacrylate) microbeads as specific sorbents. Albumin adsorption/desorption." Journal of Chromatography A **731**(1-2): 57-63.

Poly(ethylene glycol dimethacrylate-hydroxyethyl methacrylate) [poly(EGDMA-HEMA)] microbeads, in the size range 150-200 mum, were produced by a modified suspension copolymerization of EGDMA and HEMA. Congo Red was attached covalently to the poly(EGDMA-HEMA) microbeads, then Cu(II) ions were incorporated within the microbeads by chelating with the immobilized dye molecules. Different amounts of Cu(II) ions [0.5-2.9 mg Cu(II)/g polymer] were conjugated on the microbeads by changing the initial concentration of Cu(II) ions, pH and ionic strength. Bovine serum albumin (BSA) adsorption on these microbeads from aqueous solutions containing different amounts of BSA at different pH and ionic strengths was investigated in batch reactors. The non-specific BSA adsorption on the poly(EGDMA-HEMA) microbeads was almost zero. Congo Red derivatization significantly increased the BSA adsorption (up to 90 mg BSA/g polymer). A further increase in the adsorption capacity (up to 136 mg BSA/g polymer) was observed when Cu(II) ions were incorporated. More than 90% of the adsorbed BSA was desorbed in 1 h in a desorption medium containing 0.5 M NaSCN at pH 8.0.

Denkbas, E. B., et al. (1995). "Silicone-based microcarriers: preparation and BHK cell culture." CHEM ENG J BIOCHEM ENG J **58**(1): 65-70.

Spherical polymeric microbeads were produced by suspension cross-linking of hydroxyl-terminated polydimethylsiloxane prepolymers. Dimethylsiloxane-ethyleneoxide copolymer, dibutyltin dilaurate and methyltriethoxysilane were used as surfactant, catalyst and cross-linker, respectively. The surfaces of the microbeads were further modified by exposure of 3-amino-propyltriethoxysilane plasma in a glow-discharge apparatus. These silicone-based microbeads were used as microcarriers in culturing of baby hamster kidney (BHK) cells both in stationary and in submerged culture conditions. High attachment and growth were achieved on the glow-discharge treated silicone microbeads with moderate surface wettabilities (contact angle: 43-46 degree).

Deokar, S., et al. (2017). "Adsorptive Removal of Diuron Herbicide on Carbon Nanotubes Synthesized from Plastic Waste." Journal of Polymers & the Environment **25**(2): 165-175.

In this study, carbon nanotubes (CNTs) were synthesized from waste polyethylene bottles and their use as an adsorbent for the removal of diuron herbicide from aqueous solution was evaluated. Batch adsorption was performed by varying adsorbent dosage, initial concentration, contact time, and temperature. Kinetic models applied to experimental data indicated that the pseudo-second-order model had the best fit. The equilibrium data were analyzed using different

isotherm models. The adsorption capacity of CNTs for diuron removal, determined using the Hill isotherm, was approximately 40.37 mg/g at 303 K. From thermodynamic studies, the values of ΔH° (kJ/mol) and ΔS° [kJ/(mol K)] were calculated as −17.307 and −0.0528, respectively, which suggested that the adsorption process was exothermic. The negative values of ΔG° at three different temperatures indicated that adsorption of diuron on CNTs was favorable. [ABSTRACT FROM AUTHOR]

Deplaine, G., et al. (2011). "The sensing of poorly deformable red blood cells by the human spleen can be mimicked in vitro." Blood **117**(8): e88-95.

Retention of poorly deformable red blood cells (RBCs) by the human spleen has been recognized as a critical determinant of pathogenesis in hereditary spherocytosis, malaria, and other RBC disorders. Using an ex vivo perfusion system, we had previously shown that retention of Plasmodium falciparum-infected RBCs (Pf-RBCs) occur in the splenic red pulp, upstream from the sinus wall. To experimentally replicate the mechanical sensing of RBCs by the splenic microcirculation, we designed a sorting device where a mixture of 5- to 25-mum-diameter microbeads mimics the geometry of narrow and short interendothelial splenic slits. Heated RBCs, Pf-RBCs, and RBCs from patients with hereditary spherocytosis were retained in the microbead layer, without hemolysis. The retention rates of Pf-RBCs were similar in microbeads and in isolated perfused human spleens. These in vitro results directly confirm the importance of the mechanical sensing of RBCs by the human spleen. In addition, rigid and deformable RBC subpopulations could be separated and characterized at the molecular level, and the device was used to deplete a stored RBC population from its subpopulation of rigid RBCs. This experimental approach may contribute to a better understanding of the role of the spleen in the pathogenesis of inherited and acquired RBC disorders.

Derakhti, S., et al. (2017). "A new strategy for the Ca-alginate microbeads synthesis with the similar physical characteristics to the microcarriers in cell culture." Iranian Journal of Biotechnology **ISSUE)**: 142.

Background and Aim: Ca-alginate hydrogels have been widely applied in cell culture due to advantages they have such as biocompatibility, low cost and simplicity of preparation procedures. Small size gel beads (<300mum) are favored for anchorage dependent cell culture, as they undergo a lower level of shear stress and provide a higher surface area to volume ratio. However, production of the small microbeads has been failed by conventional techniques. In this study, we aimed to develop a strategy in the traditional electro spray method to produce the Ca-alginate microbeads with the sizes similar to the commercial microcarriers. Method(s): We employed electro spray method to create micro droplets of high viscous sodium alginate solution by applying constant DC voltage. The droplets fell into the calcium chloride solution and formed the hydrogels. The beads sizes were measured under various conditions of the flow rate and concentration of alginate solution and also the DC voltage to meet the conditions, which led us to obtain the microbeads with the desired sizes. Result(s): Among the tested variables, the flow rate of alginate solution was found to be the predominant factor, since the sizes of the beads significantly decreased by reducing this parameter. The reduction of the alginate solution concentration also led to decrement in the microbeads sizes but in lesser extent compared to flow rate. In the voltage range we worked (7-12 KV), the beads sizes were approximately independent of the voltage. Finally, we could produce spherical microbeads with the proximate mean size of 210mum by incorporation of alginate solution 1.25 % (w/v) with the flow rate of 0.5 ml/h under the voltage of 8kV in calcium chloride solution. Conclusion(s): Our findings suggested that it is possible to synthesis Ca-alginate hydrogels with the sizes similar to the commercial microcarriers by electro spray method. Further decrease in the beads sizes would be reachable by application of apparatus which could provide lower flow rates.

Derman, B. A., et al. (2019). "Pilot Study of Regulatory T-Cell Depletion in the Setting of Autologous Stem Cell Transplantation for Multiple Myeloma." Biology of Blood and Marrow Transplantation **25 (3 Supplement)**: S405-S406.

Introduction: High dose melphalan with autologous stem cell transplantation (ASCT) is a therapy mainstay in multiple myeloma (MM). However, the median PFS after ASCT is under 5 years even with contemporary agents. This may be due to immune dysfunction after ASCT. Regulatory T cells (Tregs, CD4⁺CD25⁺FoxP3⁺) reconstitute rapidly after ASCT, can inhibit antitumor immune responses, and are a target for non-cross-resistant therapy in the MRD-positive state. Method(s): We conducted a randomized pilot study to evaluate 2 methods of Treg depletion in MM patients undergoing ASCT. No Treg depletion was performed in the control ASCT arm. An anti-CD25 mAb (basiliximab 20 mg IV) was given day +1 post-ASCT in the in vivo Treg depletion (IVTRD) arm. In the ex vivo Treg depletion (EVTRD) arm, CD4⁺CD25⁺ Tregs were depleted from ASC grafts with anti-CD25 microbeads and CliniMACS device (Miltenyi). Primary endpoints were: 1) evaluate efficiency of Treg depletion, 2) measure kinetics of Treg depletion and recovery and 3) determine toxicities with the two methods of Treg depletion. Secondary endpoints were engraftment rates and disease response. Result(s): Fifteen patients were enrolled, 5 in each arm. One patient in the IVTRD arm was removed from study due to mobilization failure. ASC were collected following filgrastim/plerixafor. The conditioning regimen consisted of melphalan 200 mg/m². All patients engrafted; median times to neutrophil/platelet engraftment were similar between arms. 4/5 patients in the EVTRD arm had neutropenic fever (vs 2/5 in control ASCT arm and 2/4 in IVTRD arm). Engraftment syndrome occurred in 1 patient in the EVTRD arm. Conclusion(s): Median ex vivo depletion of CD4⁺CD25⁺ Tregs from 5 ASC grafts was 93% (figure 1). Baseline frequencies of peripheral blood (PB) CD4⁺FoxP3⁺ Tregs were similar between all arms (p=NS). A reduction in Treg frequency was seen in the EVTRD arm compared to controls at day +14 (p=0.0001) and +21 (p=0.025, figure 2). The IVTRD arm had lower Treg frequency at day +28 compared to controls (p=0.053). These data suggest that in vivo and ex vivo Treg depletion are feasible and result in significant reduction and delay in Treg recovery post-ASCT for MM. These methods could serve as a platform for using post-transplant immunotherapies to improve post-ASCT outcomes. Copyright © 2018

DeRomano, O. (1978). "Irrigation Apparatus." U.S. Patent No. 4 094,466, 3 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 971, No 2, p 590, June 13, 1978.

A device for underground drainage and irrigation of soil includes a porous element which can be engaged about a distribution pipe at a perforation or opening in the pipe. Apertures in a pipe distribution system can be provided in two ways. In the first instance, a space may be provided between the ends of two separate, aligned pieces of pipe. The porous filter or diffusion member can be in the form of a flange connector joining the two adjacent pipe sections. Or the flow passages or apertures are formed by perforating a pipe at selected locations. The location and

size of the perforations are selected according to the desired characteristics of the system. The apertures are selected according to the desired characteristics of the system. The apertures are then covered by a porous element permitting flow to be dispersed across the aperture and through the element. The individual porous elements are comprised of a quantity of small plastic particles, as for example, pellets of polyvinylchloride, sintered by application of heat, pressure or a bonding agent. The sintering leaves interstitial spaces to allow passage of fluid through the element. (Sinha-OEIS)

Derraik, J. G. B. (2002). "The Pollution of the Marine Environment by Plastic Debris: A Review." Marine Pollution Bulletin **44**(9): 842.

An overview is provided of the extent of plastic debris contamination of the marine environment. Data from the literature are cited to illustrate the ingestion of plastics by marine biota, the ingestion of PCBs via ingestion of plastics, the problem of marine mammal entanglement in plastic debris, and the possible pathway for alien species invasion due to drifting plastic debris. The data show that there is overwhelming evidence that plastic pollution is a threat to marine biodiversity, which is also threatened by overfishing, climate change, and other forms of marine pollution. Efforts to address the problem through international legislation are discussed briefly, and recommendations for reducing the amount of plastic debris are proposed.

Desai, S., et al. (2008). "Biomanufacturing of Microcapsules for Drug Delivery and Tissue Engineering Applications." IIE Annual Conference. Proceedings: 507.

This paper presents a biomanufacturing approach for generating bio-polymer microbeads that can be used for localized drug delivery and tissue engineering applications. Calcium alginate microbeads were produced using specialized micro jetting technique with tight size distributions. The rheological properties of the polymer were studied to gain a better understanding of the fluid's behavior during the jetting process. A designed experiment with multiple levels of bio-polymer concentrations was conducted to ascertain the significant factors affecting the diameter and stability of the microbeads. This study demonstrates a method of utilizing specialized micro jetting technology to manufacture consistent microbeads for variety of biomedical applications.

Desaules, C., et al. (2008). "A new HLA-DR4 allele, DRB1*0474, with an unusual residue at position 77." Tissue Antigens **72**(5): 500-501.

We report here a new DR4 allele, DRB1*0474, identified in a volunteer hematopoietic stem cell donor of the Swiss National Registry. DRB1*0474 differs from DRB1*040701 by two nucleotide residues resulting in a single Thr -> Asn substitution at codon 77. © 2008 The Authors.

Desbois, L., et al. (2012). "A microfluidic device for on-chip agarose microbead generation with ultralow reagent consumption." Biomicrofluidics **6**(4): 44101.

Water-in-oil microdroplets offer microreactors for compartmentalized biochemical reactions with high throughput. Recently, the combination with a sol-gel switch ability, using agarose-in-oil microdroplets, has increased the range of possible applications, allowing for example the capture of amplicons in the gel phase for the preservation of monoclonality during a PCR reaction. Here, we report a new method for generating such agarose-in-oil microdroplets on a microfluidic device, with minimized inlet dead volume, on-chip cooling, and in situ monitoring of biochemical reactions within the gelified microbeads. We used a flow-focusing microchannel network and successfully generated agarose microdroplets at room temperature using the "push-pull" method. This method consists in pushing the oil continuous phase only, while suction is applied to the device outlet. The agarose phase present at the inlet is thus aspirated in the device, and segmented in microdroplets. The cooling system consists of two copper wires embedded in the microfluidic device. The transition from agarose microdroplets to microbeads provides additional stability and facilitated manipulation. We demonstrate the potential of this method by performing on-chip a temperature-triggered DNA isothermal amplification in agarose microbeads. Our device thus provides a new way to generate microbeads with high throughput and no dead volume for biochemical applications.

DesBordes, C. K. and J. G. Welch (1984). "Influence of specific gravity on rumination and passage of indigestible particles." Journal of Animal Science **59**(2): 470-475.

Indigestible plastic particles (0.5 x 0.16 cm) with different specific gravities (0.90, 0.96, 1.17, 1.42, 1.77 and 2.15) were given in single doses of 4000 particles of each sp. gr. intraruminally to 4 fistulated steers and orally to 4 dry cows. With steers the average total 10-day recoveries differed and values in increasing order of sp. gr. were 17.1, 22.4, 85.2, 58.6, 58.8 and 60.4%. The ruminated fractions also differed and were 12.9, 17.1, 52.1, 1.7, 5.3 and 2.4% of the particles ingested. With cows the average total 10-day particle recovery varied with sp. gr. and was 46.2, 46.1, 92.2, 93.7, 96.2 and 78.6% with increasing sp. gr. The ruminated particles differed and averaged 39.2, 39.5, 53.4, 12.9, 11.7 and 5.5% of the ingested particles. In experiment 3 (cows), the average total 10-day particle recovery reflected sp. gr. and was 37.8, 35.4, 87.4, 94.2, 96.6 and 85.0%. Recovery percentages of ruminated particles differed and were 31.4, 30.2, 71.5, 29.5, 18.7 and 8.4. Highest recovery of particles of sp. gr. 1.17, 1.42, 1.77 and 2.15 occurred on day 2. In all three experiments the particles of lower sp. gr. of 0.90 and 0.96 showed low and relatively uniform passage during the entire 10-day recovery period.

Desforges, J.-P., et al. (2015). "Ingestion of Microplastics by Zooplankton in the Northeast Pacific Ocean." Archives of Environmental Contamination & Toxicology **69**(3): 320-330.

Microplastics are increasingly recognized as being widespread in the world's oceans, but relatively little is known about ingestion by marine biota. In light of the potential for microplastic fibers and fragments to be taken up by small marine organisms, we examined plastic ingestion by two foundation species near the base of North Pacific marine food webs, the calanoid copepod Neocalanus cristatus and the euphausiid Euphausia pacifia. We developed an acid digestion method to assess plastic ingestion by individual zooplankton and detected microplastics in both species. Encounter rates resulting from ingestion were 1 particle/every 34 copepods and 1/every 17 euphausiids (euphausiids > copepods; $p = 0.01$). Consistent with differences in the size selection of food between these two zooplankton species, the ingested particle size was greater in euphausiids (816 ± 108 µm) than in copepods (556 ± 149 µm) ($p = 0.014$). The contribution of ingested microplastic fibres to total plastic decreased with distance from shore in euphausiids ($r = 70$, $p = 0.003$), corresponding to patterns in our previous observations of microplastics in seawater samples from the same locations. This first evidence of microplastic ingestion by marine zooplankton indicate that species at lower trophic levels of the marine food web are mistaking plastic for food, which raises fundamental questions about potential risks to higher trophic level species. One concern is risk to salmon: We estimate that consumption of microplastic-containing zooplankton will lead to the ingestion of 2-7 microplastic particles/day by individual juvenile salmon in coastal British Columbia, and ≤91 microplastic particles/day in returning adults. [ABSTRACT FROM AUTHOR]

Desforges, J. P. W., et al. (2014). "Widespread distribution of microplastics in subsurface seawater in the NE Pacific Ocean." Marine Pollution Bulletin **79**(1-2): 94-99.

We document the abundance, composition and distribution of microplastics in sub-surface seawaters of the northeastern Pacific Ocean and coastal British Columbia. Samples were acid-digested and plastics were characterized using light microscopy by type (fibres or fragments) and size (<100, 100-500, 500-100 and >1000mum). Microplastics concentrations ranged from 8 to 9200particles/m³; lowest concentrations were in offshore Pacific waters, and increased 6, 12 and 27-fold in west coast Vancouver Island, Strait of Georgia, and Queen Charlotte Sound, respectively. Fibres accounted for ~75% of particles on average, although nearshore samples had more fibre content than offshore (p<0.05). While elevated microplastic concentrations near urban areas are consistent with land-based sources, the high levels in Queen Charlotte Sound appeared to be the result of oceanographic conditions that trap and concentrate debris. This assessment of microplastics in the NE Pacific is of interest in light of the on-coming debris from the 2011 Tohoku Tsunami. © 2013 Elsevier Ltd.

Deshmukh, S., et al. (2014). "Acoustic radiation forces at liquid interfaces impact the performance of acoustophoresis." Lab on a Chip **14**(17): 3394-3400.

Acoustophoresis is a method well suited for cell and microbead separation or concentration for downstream analysis in microfluidic settings. One of the main limitations that acoustophoresis share with other microfluidic techniques is that the separation efficiency is poor for particle-rich suspensions. We report that flow laminated liquids can be relocated in a microchannel when exposed to a resonant acoustic field. Differences in acoustic impedance between two liquids cause migration of the high-impedance liquid towards an acoustic pressure node. In a set of experiments we charted this phenomenon and show herein that it can be used to either relocate liquids with respect to each other, or to stabilize the interface between them. This resulted in decreased medium carry-over when transferring microbeads (4% by volume) between suspending liquids using acoustophoresis. Furthermore we demonstrate that acoustic relocation of liquids occurs for impedance differences as low as 0.1%.

Deshmukh, S. S., et al. (2013). "Formulation and Evaluation of Mucoadhesive Microbeads of Domperidone." Journal of Current Pharma Research **3**(4): 999-1009.

Hydroxy propyl methyl cellulose and citric acid were used in preparation of solid dispersion by kneading method. The drug release was found to be dependent on concentration of polymer in solid dispersion and modification of micro environmental pH by citric acid in dissolution medium. Amorphous dispersed form of domperidone was due to homogeneous dispersion of drug in carriers by kneading method. Mucoadhesive microbeads containing domperidone was prepared by Ionotropic gelation method. Beads was prepared, employing mucoadhesive polymer carbopol 934 in different ratio with sodium alginate. The drug release from formulation C10 was almost zero order which favors development of a sustained release formulation to improve short biological half life of drug which is 7 hour. [PUBLICATION ABSTRACT]

Deshpande, A., et al. (2015). "An attempt to study the bacterialdegradation of polythene bag and rubber band using Vellore (Dumpsites) enriched soil." International Journal of Pharmacy and Technology **7**(3):

9623-9629.

Plastic materials pose a major problem despite being used in day to day lives. They cannot be degraded in a short span of time and thus plastic pollution is a matter of concern all over the world. A thin plastic bag itself requires 10-20 years to degrade, while a plastic bottle requires about 100 years for biodegradation (http://cmore.soest.hawaii.edu/cruises/super/biodegradation.htm). There is a need to understand in depth about the natural processes involved in breaking down of plastic so that new and better methods can be introduced based on the preexisting methods which speed up the process of degradation ^[1]. A thorough experimentation was carried out to find out if the microorganisms in soil can help in the process. The end result was the appearance of small pores on the plastic materials ^[2]. This proved that microorganisms play an important role in the degradation and breakdown of the bonds of plastic materials. Copyright © 2015, International Journal of Pharmacy and Technology. All rights Reserved.

Detert, S., et al. (2018). "The atrial appendage as a suitable source to generate cardiac-derived adherent proliferating cells for regenerative cell-based therapies." Journal of Tissue Engineering and Regenerative Medicine **12**(3): e1404-e1417.

Cardiac-derived adherent proliferating (CardAP) cells obtained from endomyocardial biopsies (EMBs) with known anti-fibrotic and pro-angiogenic properties are good candidates for the autologous therapy of end-stage cardiac diseases such as dilated cardiomyopathy. However, due to the limited number of CardAP cells that can be obtained from EMBs, our aim is to isolate cells with similar properties from other regions of the heart with comparable tissue architecture. Here, we introduce the atrial appendage as a candidate region. Atrial appendage-derived cells were sorted with CD90 microbeads to obtain a CD90low cell population, which were subsequently analysed for their surface marker and gene expression profiles via flow cytometry and micro array analysis. Enzyme-linked immunosorbent assays for vascular endothelial growth factor and interleukin-8 as well as tube formation assays were performed to investigate pro-angiogenic properties. Furthermore, growth kinetic assays were performed to estimate the cell numbers needed for cell-based products. Microarray analysis revealed the expression of numerous pro-angiogenic genes and strong similarities to CardAP cells with which they also share expression levels of defined surface antigens, that is, CD29+, CD44+, CD45−, CD73+, CD90low, CD105+, and CD166+. High secretion levels of vascular endothelial growth factor and interleukin-8 as well as improved properties of vascular structures in vitro could be detected. Based on growth parameters, cell dosages for the treatment of more than 250 patients are possible using one appendage. These results lead to the conclusion that isolating cells with regenerative characteristics from atrial appendages is feasible and permits further investigations towards allogenic cell-based therapies.

Detert, S., et al. (2018). "The atrial appendage as a suitable source to generate cardiac-derived adherent proliferating cells for regenerative cell-based therapies." Journal Of Tissue Engineering & Regenerative Medicine **12**(3): e1404-e1417.

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Detree, C. and C. Gallardo-Escarate (2018). "Single and repetitive microplastics exposures induce immune system modulation and homeostasis alteration in the edible mussel Mytilus galloprovincialis." Fish & Shellfish Immunology **83**: 52-60.

Seashore invertebrates such as mussels are exposed to multiple bouts of pollution related to human activities. Plastic debris originating from land-based activities are a concerning issue as they may be fragmented in smaller pieces (microplastics, <5 mm diameter) which have an excellent potential for uptake by a large variety of animals. Here, we set out to explore the whole transcriptome profiling of Mytilus galloprovincialis associated with temporal variability of microplastics concentrations. Mussels were submitted to (i) a single 18 days-exposure to a concentration of microplastics found during pollution events (4.6 E+5 polyethylene microbeads L⁻¹), (ii) a recovery period to investigate the reversibility of microplastics effects and (iii) a repeated exposure to microplastics to evidence acclimation to microplastics pollution events. Overall, 18 days-exposure to microplastics was mostly associated with disruption of mussel global homeostasis resulting in the production of stress and immune-related proteins and as a consequence, a diminution of energy allocated to growth. During the recovery period, a contrasting response was observed with the activation of apoptotic processes and the up-regulation of immune-receptors and stress-related proteins (glutathione peroxidase, hsp70) in mussels previously exposed to microplastics. These divergent responses, suggest that the establishment of compensatory mechanism as an attempt to recover, is not sufficient to counteract physiological stress induced by the first exposure. Finally, the differences observed in gene expression between single and repeated exposures to microplastics suggest, under the experimental conditions tested, that mussels may be able to establish a stress-memory upon microplastics exposure.

Deun, K. V., et al. (2008). "Short-chain fatty acids and l-lactate as feed additives to control Campylobacter jejuni infections in broilers." Avian Pathology **37**(4): 379.

The usefulness of butyrate, acetate, propionate and l-lactate for the control of Campylobacter jejuni infections in broilers was assessed. For this purpose, the effect of these acids on the growth of C. jejuni in broth and intestinal mucous was determined, as well as their influence on the invasiveness of C. jejuni in intestinal epithelial cells. From these in vitro obtained results, one acid was retained for use as a feed additive in an in vivo trial. Butyrate was the most successful of the short-chain fatty acids, with 12.5 mM being bactericidal for C. jejuni at pH 6.0. Propionate and acetate had a bacteriostatic effect at 50mM. None of the short-chain fatty acids had a bactericidal effect at pH 7.5 at a maximum concentration of 50 mM. Mucous increased the minimum bactericidal concentration of butyrate, but not the bacteriostatic concentrations of propionate or acetate. When C. jejuni was incubated in growth subinhibitory concentrations of butyrate, acetate or propionate or 25 mM l-lactate, no alteration in the invasive capabilities of C. jejuni in Caco-2 cells was observed. The addition of butyrate-coated micro-beads to the feed was unsuccessful to reduce C. jejuni caecal colonization in a seeder model using 2-week-old broilers. In conclusion, despite the marked bactericidal effect of butyrate towards C. jejuni in vitro, butyrate-coated micro-beads do not protect broilers from caecal colonization with C. jejuni in the applied test conditions. This might be partially ascribed to the protective effect of mucous and the rapid absorption of butyrate by the enterocytes. [PUBLICATION ABSTRACT]

Devriese, L. I., et al. (2015). "Microplastic contamination in brown shrimp (Crangon crangon, Linnaeus 1758) from coastal waters of the Southern North Sea and Channel area." Marine Pollution Bulletin **98**(1/2): 179-187.

This study assessed the capability of Crangon crangon (L.), an ecologically and commercially important crustacean, of consuming plastics as an opportunistic feeder. We therefore determined the microplastic content of shrimp in shallow water habitats of the Channel area and Southern part of the North Sea. Synthetic fibers ranging from 200 micro m up to 1000 micro m size were detected in 63% of the assessed shrimp and an average value of 0.68+or-0.55 microplastics/g w. w. (1.23+or-0.99 microplastics/shrimp) was obtained for shrimp in the sampled area. The assessment revealed no spatial patterns in plastic ingestion, but temporal differences were reported. The microplastic uptake was significantly higher in October compared to March. The results suggest that microplastics >20 micro m are not able to translocate into the tissues.

Devriese, L. I., et al. (2017). "Bioaccumulation of PCBs from microplastics in Norway lobster (Nephrops norvegicus): an experimental study." Chemosphere **186**: 10-16.

Plastic debris acts as a sorbent phase for hydrophobic organic compounds like polychlorinated biphenyls (PCBs). Chemical partitioning models predict that the ingestion of microplastics with adsorbed chemicals in the field will tend not to result in significant net desorption of the chemical to the organism's tissues. This is expected due to the often limited differences in fugacity of the chemical between the indigestible plastic materials and the tissues, which are typically already exposed in the same environment to the same chemicals as the plastic. However laboratory trials validating these model predictions are scarce. In this study, PCB-loaded microplastics were offered to field-collected Norway lobsters (Nephrops norvegicus) during in vivo feeding laboratory experiments. Each ingestion experiment was repeated with and without loading a mixture of ten PCB congeners onto plastic microspheres (MS) made of polyethylene (PE) and polystyrene (PS) with diameters of either 500-600 micro m or 6 micro m. We observed that the presence of chemicals adsorbed to ingested microplastics did not lead to significant bioaccumulation of the chemicals in the exposed organisms. There was a limited uptake of PCBs in Nephrops tail tissue after ingestion of PCB-loaded PE MS, while almost no PCBs were detected in animals exposed to PS MS. In general, our results demonstrated that after 3 weeks of exposure the ingestion of plastic MS themselves did not affect the nutritional state of wild Nephrops.

Dewan, P. A., et al. (2002). "Plastic particle migration during intravenous infusion assisted by a peristaltic finger pump in an animal model." Pediatric Surgery International **18**(5-6): 310-314.

The contamination of intravenously administered fluid with foreign material has always been of

major concern, but the in-vivo impact of silicone embolisation from administration of fluid via a peristaltic finger pump (PFP) has not previously been assessed. To determine whether silicone particles enter the lungs and to review the histological response, 10 rabbits received an IV infusion of 0.9% saline at 10 ml/kg per hour over a 72-h period, via an IVAC 591 PFP. The lungs were analysed for silicone particles with scanning electron microscopy (SEM) and energy-dispersive X-ray analysis (EDXA). These results were compared with a control group of non-infused animals. Silicone particles were found in 8 of 10 animals in the experimental group and in 2 of 9 control animals, indicating that silicone particles are dislodged during pump-assisted IV infusions. The difference between the control and infused animals was statistically significant using Fisher's exact test (P = 0.023). However, silicone plastic particles in control animals suggest that there is also environmental exposure to silicone in addition to those particles that come from a therapeutic source. The additional finding of elemental silicon (which is one of the constituents of silicone plastic) in both infused and control animals in which silicone plastic was not found indicates that not all elemental silicon in animals reflects the presence of silicone plastic. The clinical significance of each of these two findings is yet to be determined. © Springer-Verlag 2002.

DeWitte, M. A., et al. (2014). "Development of an alpha/beta T-cell depleted allogeneic stem cell transplantation protocol form matched related and unrelated donor grafts in patients with poor risk leukemia." Blood. Conference: 56th Annual Meeting of the American Society of Hematology, ASH **124**(21).

Introduction: The outcome of allo-SCT in patients with poor risk leukemia is still hampered by GVHD and relapse. The innate immune system has been reported to contribute to tumor control, with lower incidence of GVHD. Specific depletion of alphaalpha T- cells - key players in the development of GVHD - will render NK cells and gammadelta T cells within the allograft. Recently reported results have shown the great promise of this approach in haploindentical transplantations. Within this study, we aim to extend alphaalphaT- cell depleted allo-SCT to patients with a MRD or MUD. Method(s): Patients with either 'poor-risk' or 'very poor-risk' leukemia were included in this phase I study. Either HLA matched siblings (MRD) or fully matched HLA matched (10/10) unrelated donors (MUD) were eligible. abT-cell reduction was performed by negative selection with anti-abTCR antibodies in combination with magnetic microbeads, using the automated CliniMACS device (Miltenyi Biotec, Bergisch Gladbach, Germany). The maximal contamination with alphaalphaT-cells for all dose levels was 5x10⁵/kg. Three conditioning regimens have been investigated (I): fludarabine 120 mg/m² + cyclophosfamide 4800 mg/m², (II): fludarabine 120 mg/m² + busilvex AUC=90 and (III): ATG (Genzyme) 4 mg/m² + fludarabine 120 mg/m² + busilvex AUC=90 followed by alphaalphaT- cell depleted grafts from matched related or unrelated donors. Within cohort II and III, no additional immune suppression was given after allo-SCT. Result(s): Products for 14 patients have been successfully processed and used for alphaalphaT-cell depleted allo-SCT between 2011 and 2013. A ~4 log depletion of alphaalphaT-cells has been observed in the product with a recovery of ~75% of CD34⁺ cells. In cohort I and cohort II, 60% and 25% primary graft failures were observed, whereas in cohort III primary engraftment (chimerism > 95%) was observed in all patients. The combination of ATG/fludarabine/busilvex was well tolerated with a hematological recovery of within 3 weeks. In all 14 patients immune reconstitution primarily consisted of innate cells (NK cells and gammadelta T cells) the first 6 months post transplantation. In addition, no increase in CMV or EBV reactivations has been observed so far under the profound "innate control". Conclusion(s): ATG Busulfan Fludarabine is a low toxicity platform for

abTCR-depleted transplantations, resulting in a swift reconstitution of innate cells (NK cells and gammadelta T cells) the first 6 months post transplantation. This transplantation strategy can serve as a tool for future immunological interventions such as a low dose DLI or genetically modified T cells.

Dey, P., et al. (2012). "Locust bean gum and its application in pharmacy and biotechnology: An overview." International Journal of Current Pharmaceutical Research **4**(1): 7-11.

Locust bean gum is a versatile biopolymer which finds its application in various fields. The conventional use of Locust bean gum as an excipient in drug products generally depends on the thickening, gel forming and stabilizing properties. A need for prolonged and better control of drug administration has increased the demand for tailor made polymers. Various significant works have been carried out in combination with the other polymers to make the formulation sustained and targeted. Recently a new work has been carried out by its chemical modification specifically its carboxymethylation derivative to improve its physico -chemical characteristics in terms of increased aqueous solubility. This derivatized gum can be used for the preparation of sustained release micro beads. Even locust bean gum has also finds its application in the field of biotechnology specifically in tissue engineering for the manufacturing of tissue scaffolds. Thus the gum has wide application in the both pharmaceutical and biotechnological field.

Dhall, R. and D. L. Kreitzman (2016). "Advances in levodopa therapy for Parkinson disease: Review of RYTARY (carbidopa and levodopa) clinical efficacy and safety." Neurology **86**(14 Suppl 1): S13-24.

Parkinson disease (PD) is a slowly progressive, incurable, neurodegenerative disorder with progressive motor symptoms that can be managed with treatments. Levodopa is generally recognized as the most effective and widely used treatment for PD. It improves function and quality of life, morbidity, and mortality, and therefore reduces individual and societal costs. Levodopa has a relatively short half-life, however, and is quickly metabolized in the plasma, leading to fluctuations, including wearing-off of effect and inconsistent symptomatic relief as well as development of dyskinesias, with both wearing off and dyskinesias worsening with advancing disease. Immediate-release and controlled-release formulations have been used with success, but motor fluctuations remain a problem. RYTARY (levodopa and carbidopa, IPX066) is an oral extended-release therapy composed of carbidopa-levodopa microbeads designed to dissolve at various rates that allows for quick absorption and sustained levodopa release over an extended period. In development studies, RYTARY improved symptoms in patients with both early and advanced PD and offered significantly improved Unified Parkinson Disease Rating Scale scores and "on" times, without worsening troublesome dyskinesias when compared to other levodopa formulations. Tolerability and safety were comparable to other formulations. This section reviews the data that support the use of RYTARY in the treatment of PD.

Dhanda, A., et al. (2012). "Is primary biliary cirrhosis a steroid sensitive autoimmune disease?" Gut **2)**: A118.

Introduction: Primary biliary cirrhosis (PBC) is a classic T cell mediated autoimmune disease: an autoantigen has been described and high levels of antigen specific liver infiltrating auto-reactive CD4+ T cells found. However, unlike in other autoimmune conditions steroid therapy is not considered effective in PBC although there is existing evidence that it can improve histological and biochemical parameters.1 We sought further evidence that PBC is a steroid sensitive disease by using two in vitro measures of steroid sensitivity. Method(s): We have applied an in vitro dexamethasone (Dex) inhibition of lymphocyte proliferation assay (DILPA), which correlates well with clinical steroid sensitivity and outcome in ulcerative colitis2 and alcoholic hepatitis,3 to 20 patients with PBC diagnosed by liver biochemistry, antibodies and liver histology (when performed). The DILPA assesses peripheral blood mononuclear cell (PBMC) sensitivity to treatment with steroids in vitro. We also examined the role of CD14+ monocytes, which produce pro-inflammatory cytokines to recruit T cells to the tissue of inflammation. PBMCs were isolated from peripheral blood by density gradient centrifugation over Ficoll. CD14+ cells were obtained by positive microbead selection and cultured with 300?ng/ml lipopolysaccharide in the presence or absence of Dex 1x10-6M for 24 h. Supernatants were then collected and interleukin (IL)-1beta, IL-6 and TNFalpha were measured by cytokine bead array (BD biosciences) according to manufacturer's instructions. Suppression of cytokine production by Dex was calculated. Result(s): In 20 patients with PBC, just one individual demonstrated in vitro steroid resistance by DILPA, and peripheral lymphocytes were sensitive to steroids in all other study subjects. Suppression of lymphocyte proliferation by Dex was significantly greater in patients with PBC compared to 37 healthy volunteer controls (86% vs 76%, p=0.04). Furthermore, Dex induced a 40%-100% suppression of IL-1beta, IL-6 and TNFalpha (mean 75%, 74% and 79%, respectively) in the supernatants of CD14+ monocyte cultures. This suggests that both peripheral blood lymphocytes and monocytes in patients with PBC are steroid sensitive. Conclusion(s): Using a validated measure of lymphocyte steroid sensitivity and a further assessment of monocyte steroid sensitivity we have demonstrated that PBC is a steroid sensitive disease. Together with existing clinical studies of glucocorticoids in PBC1 our in vitro evidence suggests that steroid treatment should not be dismissed outright as it may provide a useful option in selected patients with PBC.

Dhawan, A. (2015). "Clinical human hepatocyte transplantation: Current status and challenges." Liver Transplantation **21**(Supplement 1): S39-S44.

Dhawan, R., et al. (2019). "Recycling of plastic waste into tiles with reduced flammability and improved tensile strength." Process Safety & Environmental Protection: Transactions of the Institution of Chemical Engineers Part B **124**: 299-307.

• Lightweight tiles were inventively fabricated by simple and novel process. • Utilization of waste plastic bags as matrix reinforced with fly ash as filler. • The obtained tiles demonstrates good thermal stability and tensile strength of 9.68 MPa. • Composites tiles possess linear burning rate of 4.36 mm/min. • Resistance to acids and bases with negligible water absorption. This paper is focused on finding effective alternative for disposal of waste plastic bags by designing tiles with better mechanical strength, reduced flammability level, resistant against strong acids and bases and organic solvents, so that tiles can be used for designing structures for paver tiles for societal usage. In recent years the plastic consumption has increased manifolds leading to accumulation of plastic waste in large amount. Waste plastic bags being non-biodegradable and its extreme durability make its disposal process difficult. Plastic solid waste (PSW) present challenges and opportunities to the societies regardless of their technological advances and sustainability awareness. Traditional technologies for waste plastic disposal have failed to cope up with the increased generation of plastic waste. Also, the disposal of fly ash, waste by-product generated by combustion of coal in thermal power plants, is a serious problem both in terms of land use and environmental pollution. In this study, waste plastic matrix reinforced with fly ash (FA) and a flame retardant at different loadings (wt %) 5, 10, 15, 20 using twin screw extruder were molded into composite tiles and their characteristics were evaluated. Effect of different filler loading on waste plastic matrix was investigated. Composite (LFTP3) having appropriate ratios of fly ash and flame retardant showed reduced flammability with linear burning rate of 4.36 mm/minute and improved tensile strength of 9.68

MPa. Morphological and structural properties of all the composites were also investigated along with their flammability, resistance to different acids and bases and organic solvents, water absorption and mechanical strength. [ABSTRACT FROM AUTHOR]

Di, G., et al. (2013). "Phagocytosis and respiratory burst activity of haemocytes from the ivory snail, Babylonia areolata." Fish & Shellfish Immunology **35**(2): 366-374.

Haemocytes from the ivory snail, Babylonia areolata phagocytized Saccharomyces cerevisiae and Vibrio parahaemolyticus after 30 min. Haemocytes phagocytized V. parahaemolyticus at a greater rate than they phagocytized S. cerevisiae. The phagocytic rate (PP) of V. parahaemolyticus by granulocytes to was a little higher than that of S. cerevisiae. The phagocytic index (PI) of V. parahaemolyticus by granulocytes was significantly higher than that of S. cerevisiae. The same was true of hyalinocytes. The PP of granulocytes was significantly higher than that of hyalinocytes for each pathogen. No difference in PI was observed in granulocytes and hyalinocytes. Two defense mechanisms of B. areolata were quantified using flow cytometry. Haemocyte phagocytosis was quantified using fluorescent microbeads and respiratory burst activity was measured using H₂O₂ increases detected by 2', 7'-dichlorofluorescein diacetate. Both phagocytosis and respiratory burst activity of the haemocytes increased over time. After 90 min the phagocytic rate no longer increased. In the case of respiratory burst, the greatest increase in fluorescence occurred between 30 and 120 min, no further increase was seen after 120 min. These results showed unequivocally that a native (unstimulated) haemocyte oxidative burst was active in B. areolata. The aim of this study was to further the knowledge of immunology in gastropods.

Di, M., et al. (2019). "Corrigendum to "Pollution in drinking water source areas: Microplastics in the Danjiangkou Reservoir, China" [Environ. Toxicol. Pharmacol. 65 (January) 2019 82-89]." Environmental Toxicology & Pharmacology **66**: 133.

Di, M., et al. (2019). "Manuscript prepared for submission to environmental toxicology and pharmacology pollution in drinking water source areas: Microplastics in the Danjiangkou Reservoir, China." Environmental Toxicology & Pharmacology **65**: 82-89.

As the source of water for the South-to-North Water Diversion Project of China, the water quality of the Danjiangkou Reservoir (DJKR) is related to the safety of drinking water for billions of residents. Consequently, microplastics in surface water and sediment samples of the DJKR were investigated in this study. Microplastics were observed in all water and sediment samples with abundances varying from 467 to 15,017 n/m3 and 15 to 40 n/kg wet weight, respectively. Microplastics were rich in colour and dominated by fibrous items. Small-sized particles (< 2 mm) were more frequently observed than other sizes. Analysis by micro-Raman spectroscopy showed that polypropylene was the major polymer type. These systematic results demonstrated that the DJKR is suffering from the pollution of microplastics, which should be paid more attention based on its potential threat to the aquatic organisms and residents impacted by the drinking water source pollution. [ABSTRACT FROM AUTHOR]

Di, M. and J. Wang (2018). "Microplastics in surface waters and sediments of the Three Gorges Reservoir, China." Science of the Total Environment **616-617**: 1620-1627.

We investigated microplastic pollution levels in surface waters and sediments from the Three Gorges Reservoir (TGR). The TGR is the largest reservoir in China and is located across the Chongqing municipality and Hubei Province. Microplastic abundance in the surface water ranged from 1597 to 12,611n/m³ and in the sediments was 25 to 300n/kg wet weight (ww). In the surface waters, the contamination was more serious in urban areas, and in the sediments, countrysides were the most heavily polluted areas. Fibers were the most abundant microplastics, the dominant color was transparent, and small-sized particles were predominant. Of all the microplastics identified by micro-Raman spectroscopy, polystyrene was the most common type (38.5%) followed by polypropylene (29.4%) and polyethylene (21%). Compared with low-density microplastics, the high-density ones were more likely to be deposited from the water into the sediment. Several contaminants adsorbed by microplastics, such as organic solvents and pharmaceutical intermediates, were observed and qualitatively analyzed by Raman spectroscopy. The results of this study could provide valuable background information for microplastic pollution in the TGR.

Di Maio, F., et al. (2010). "The W2Plastics Project: Exploring the Limits of Polymer Separation." Open Waste Management Journal **3**: 90-98.

The efficient large-scale recycling of plastic waste is of increasing interest from an ecological and economic point of view but it represents a goal that has yet to be achieved by the recycling industry. The W2Plastics project aims at a fundamental change of the present status of plastics recycling by creating a breakthrough technology for the recycling of polyolefin's from complex wastes, i.e., wastes such as Waste from Electric and Electronic Equipment (W II), Construction and Demolition Waste (CDW), household waste and Automotive Shredder Residue (ASR). Polyolefin's are a very important family of polymers, constituting more than a third of the total plastics consumption in Europe (EU) and complex wastes provide the vastest, presently unused potential resource of secondary polyolefin's. In spite of that, Polyolefin's (PP, LDPE, HDPE) are the least recycled plastics materials. Only one million ton out of 14 million tons yearly sold in EU is being recycled. Nowadays, Polyolefin recyclers focus mainly on the relatively pure post-industrial or single-product wastes, since these wastes can be made into high-purity product materials by existing and cost-effective process technology. Post-industrial wastes are increasingly exported outside the EU, however, and so the Polyolefin recycling industry and their end-users are forced to look for alternative resources. In principle, post-consumer wastes, such as W II, CDW, household waste and ASR provide such a resource. They are a five to ten times larger reservoir of polyolefin's than do post-industrial wastes, but these wastes are also much more complex mixtures of materials and hence much more difficult to recycle. Technologies that are to address these resources need to be extremely powerful, since they must be relatively simple to be cost-effective, but also accurate enough to create high-purity products and able to valorise a substantial fraction of the materials that are present in the waste into useful products of consistent quality in order to be economical. The European FP7 Project: W2Plastics is developing a number of novel concepts, in particular Magnetic Density Separation (MDS) and

Ultrasound process and quality control by HyperSpectral Imaging (HSI), into a new technology to recover high-purity polyolefin's from complex wastes at low cost. The unique promise of this new concept derives from its ability to accurately separate many different materials in a single process step, resulting in an environmentally friendly and cheap process.

Di Maio, L., et al. (2018). "Data on thermal conductivity, water vapour permeability and water absorption of a cementitious mortar containing end-of-waste plastic aggregates." Data in Brief **18**: 1057-1063.

The data presented in this article are related to the research article entitled "Hygro-thermal and durability properties of a lightweight mortar made with foamed plastic waste aggregates" (Coppola et al., 2018) [1]. This article focuses the attention on thermal conductivity, water vapour permeability and water absorption of a lightweight cementitious mortar containing foamed end-of-waste plastic aggregates, produced via foam extrusion process [2]. Thermal conductivity, water vapour permeability and water absorption data are made available to allow comparison and/or extend the analysis. Experimental investigations showed that the presence of plastic aggregates decreased thermal conductivity, water vapour resistance and capillary water absorption.

Di Mauro, R., et al. (2017). "Abundant plankton-sized microplastic particles in shelf waters of the northern Gulf of Mexico." Environmental Pollution **230**: 798-809.

Accumulation of marine debris is a global problem that affects the oceans on multiple scales. The majority of floating marine debris is composed of microplastics: plastic particles up to 5 mm in diameter. With similar sizes and appearances to natural food items, these small fragments pose potential risks to many marine organisms including zooplankton and zooplanktivores. Semi-enclosed seas are reported to have high concentrations of microplastics, however, the distribution and concentration of microplastics in one such system, the Gulf of Mexico, remains unknown. Our study documented and characterized microplastics in continental shelf waters off the Louisiana coast in the northern Gulf of Mexico, using bongo nets, neuston nets, and Niskin bottles. Additionally, we compared the size distributions of microplastics and zooplankton collected using the nets. Plastics were manually sorted from the samples, documented, and measured using digital microscopy. Confirmation of putative plastics was carried out by hydrofluoric acid digestion and a subsample was analyzed using FTIR microscopy. Estimated concentrations of microplastics collected on the inner continental shelf during this study are among the highest reported globally. Total microplastic concentrations ranged from 4.8 to 8.2 particles m⁻³ and 5.0-18.4 particles m⁻³ for the bongo and neuston samples, respectively. Niskin bottles collected smaller plastic particles than the nets and indicated total microplastic concentrations (primarily fibers) from 6.0E4 - 15.7E4 particles m⁻³. Microplastic concentrations were greater than the abundances of all but four of the five most abundant taxa from bongo nets and were not statistically different from the abundances of any of the most numerous taxa from neuston nets. Sizes of microplastics and zooplankton partially or completely overlapped, suggesting the potential for confusion with natural prey. Copyright © 2017 Elsevier Ltd

Dias, B. F. d. S. Marine debris: understanding, preventing and mitigating the significant adverse impacts on marine and coastal biodiversity. CBD Technical Series; 2016. (83):78 pp. many ref. Montreal, Convention on Biological Diversity.

This document provides an update to the review of the impacts of marine debris that was previously undertaken by the Scientific and Technical Advisory Panel of the GEF (GEF-STAP) in

collaboration with the Secretariat of the Convention on Biological Diversity (SCBD), and published as CBD Technical Series 67 in 2012. This document follows a similar format and should be referred to in combination with the aforementioned document. The first chapter of this document reviews the state of knowledge of the various impacts of marine debris on marine and coastal biodiversity. It provides an update of the total number of species known to be affected by marine debris, which is now almost 800 (including effects of ghost fishing reported in recent years). The proportion of cetacean and seabird species affected by marine debris ingestion has risen substantially to 40 and 44%, respectively. The latest research on the physical and toxicological effects of microplastic is summarized along with evidence of trophic transfer in planktonic food chains in the laboratory and direct uptake of microplastics by invertebrates in the marine environment. Results of studies of plastic marine debris as a novel habitat for unique microbial communities and a potential vector for disease are also provided. The report also addresses the ability of large macrodebris items to transport invasive alien species across oceans, based on evidence from recent records of tsunami debris stranding along the west coast of North America. The impacts of lost, abandoned or discarded fishing gear on marine biodiversity, including long-term effects of ghost fishing and habitat degradation mainly from plastic-based gear, are also discussed. Recent estimates of the socioeconomic costs of marine debris are also provided to complement the information available in CBD Technical Series 67. The second chapter provides a review of policy options and approaches that are in place or have been proposed to address the impacts of marine debris. This includes a summary of the latest research to monitor and model the distribution and abundance of debris in the marine environment. The responses of management and regulatory bodies at the global or regional level indicate that the issue of marine debris is gaining recognition as a significant ecological and socioeconomic problem that may also have implications for human health. Different types of policy approaches and research needs to tackle predominantly land-based sources of marine debris are described. These include, among others: (i) packaging and plastics reduction; (ii) improved product and packaging design; (iii) potential use of waste as a resource; (iv) deposit return programmes; (v) economic instruments such as fees for single-use items; (vi) regulatory measures to prevent marine debris; (vii) bans for certain items (e.g., plastic bags, microbeads); (viii) engaging with industry and corporations on sustainability, including plastics disclosure policies; and (ix) support for innovation in new materials, manufacturing, recycling and product design using alternatives.

Dias, B. Z., et al. (2017). "PHYSICAL, MECHANICAL AND FIRE PROPERTIES OF THERMOPLASTIC COMPOSITES PRODUCED FROM RECYCLED PLASTIC MATRICES AND FILLED WITH LIGNOCELLULOSIC RESIDUES: A REVIEW." The Journal of Solid Waste Technology and Management(2).

Recycled plastic matrices and lignocellulosic residues are currently used to produce thermoplastic composites on a commercial scale. Nevertheless, some of the effects of these residues are unknown or not completely understood. Thus, the aim of this study was to investigate the effects of using recycled plastic matrices and incorporating lignocellulosic residues into thermoplastic composites on their mechanical properties, water absorption, discolouration, oxidation and flammability. The method used consisted of a review of scientific papers, prioritising studies published after the year 2000. Papers were grouped by the type of composite analysed (produced from recycled plastic matrices and filled with lignocellulosic residues) as well as the properties studied. The analysed studies indicate that plastic waste is a promising source of raw material for thermoplastic composite production as it imparts with respect to several properties (such as flexural and tensile strength and stability against discoloration) the same performance achieved by virgin plastic-based composites. On the other

hand, increasing the composites' lignocellulosic filler content tends to improve their stability against oxidation, for example, but appears to decrease their time to ignition, which in turn is of major interest because such materials are currently used as building components.

Dickinson, C. H. and D. Parkinson (1970). "Effects of mechanical shaking and water tension on survival and distribution of fungal inoculum in glass microbead media." Canadian Journal of Microbiology **16**(7): 549-552.

Dickson, A., et al. (2017). "Fluorescence imaging of cambial zones to study wood formation in Pinus radiata D. Don." Trees: Structure and Function **31**(2): 479-490.
Stem microcores from fast-growing trees, such as Pinus radiata (D. Don) with wide zones of cambium and differentiating xylem and very wide growth rings, pose a challenge for microscopy, as they are difficult to handle and easily damaged compared to slower growing species. A novel procedure has been developed which captures high-resolution images directly from the block face of large samples embedded in plastic resin without the need for sectioning or staining. Microcores of differentiating xylem of P. radiata growing in the central North Island of New Zealand were embedded in a low viscosity acrylic resin. The surface of the entire resin block was abraded and polished to expose cross sections of the wide zone of wood formation in these fast-growing trees without damage or distortion. Autofluorescence imaging was performed using a confocal laser scanning microscope. This avoided the need for staining and allowed the determination of the beginning of lignification based on lignin autofluorescence. Image analysis was used to determine the widths of: (a) the cambium, cell expansion, and wall-thickening zone (CET) and (b) the wall lignification zone (LT). A fast-growing tree had wider CET and LT zones than a slow-growing tree. This was due to the fast-growing tree producing more tracheids than the slow-growing tree, rather than by the production of larger tracheids.

Diepens, N. J. and A. A. Koelmans (2018). "Accumulation of Plastic Debris and Associated Contaminants in Aquatic Food Webs." Environmental Science & Technology **52**(15): 8510-8520.
We present a generic theoretical model (MICROWEB) that simulates the transfer of microplastics and hydrophobic organic chemicals (HOC) in food webs. We implemented the model for an Arctic case comprised of nine species including Atlantic cod and polar bear as top predator. We used the model to examine the effect of plastic ingestion on trophic transfer of microplastics and persistent HOCs (PCBs) and metabolizable HOCs (PAHs), spanning a wide range of hydrophobicities. In a scenario where HOCs in plastic and water are in equilibrium, PCBs biomagnify less when more microplastic is ingested, because PCBs biomagnify less well from ingested plastic than from regular food. In contrast, PAHs biomagnify more when more microplastic is ingested, because plastic reduces the fraction of PAHs available for metabolization. We also explore nonequilibrium scenarios representative of additives that are leaching out, as well as sorbing HOCs, quantitatively showing how the above trends are strengthened and weakened, respectively. The observed patterns were not very sensitive to modifications in the structure of the food web. The model can be used as a tool to assess prospective risks of exposure to microplastics and complex HOC mixtures for any food web, including those with relevance for human health.

Dierkes, G., et al. (2019). "Quantification of microplastics in environmental samples via pressurized liquid extraction and pyrolysis-gas chromatography." Analytical & Bioanalytical Chemistry **411**(26): 6959-6968.
The quantification of microplastics (MP) in environmental samples is currently a challenging

task. To enable low quantification limits, an analytical method has been developed combining pressurized liquid extraction (PLE) and pyrolysis GC-MS. The automated extraction includes a pre-extraction step via methanol followed by a subsequent PLE using tetrahydrofuran. For the most frequently used synthetic polymers polyethylene (PE), polypropylene (PP), and polystyrene (PS), limits of quantification were achieved down to 0.007 mg/g. Recoveries above 80% were attained for solid matrices such as soil and sediments. The developed method was applied for MP quantification in environmental samples such as sediment, suspended matter, soil, and sewage sludge. In all these matrices, PE and PP were detected with concentrations ranging from 0.03 to 3.3 mg/g. In sewage sludge samples, all three polymers were present with concentration levels ranging between 0.08 +/- 0.02 mg/g (PP) and 3.3 +/- 0.3 mg/g (PE). However, especially for solid samples, the analysis of triplicates revealed elevated statistical uncertainties due to the inhomogeneous distribution of MP particles. Thus, care has to be taken when milling and homogenizing the samples due to the formation of agglomerates. Graphical abstract.

Digka, N., et al. (2018). "Microplastics in mussels and fish from the Northern Ionian Sea." Marine Pollution Bulletin **135**: 30-40.

Microplastic ingestion by marine organisms presents an emerging threat to marine ecosystems; microplastics in different marine species are currently reported worldwide. This study aims to assess microplastic ingestion in four, highly commercial, marine species from Greek waters in the Northern Ionian Sea (Mediterranean Sea). Microplastics were found in mussels (Mytilus galloprovincialis) and all three fish species (Sardina pilchardus, Pagellus erythrinus, Mullus barbatus) examined. The frequency of occurrence of ingested microplastics was 46.25% in mussels, while among fish species, S. pilchardus showed the highest frequency of microplastic ingestion (47.2%). Microplastic abundance ranged from 1.7-2 items/individual in mussels and from 1.5-1.9 items/individual in fish. The majority of ingested microplastics were fragments, while their color and size varied. Fourier Transform Infrared Spectroscopy (FT-IR) indicated polyethylene as the most common polymer type in mussels and fish. Results can be used to set baseline levels for the assessment of microplastic pollution in the Ionian Sea.

Dignum, H. M., et al. (2004). "Quantification of CD38 expression in B-cell chronic lymphocytic leukemia (B-CLL): a comparison between antibody binding capacity (ABC) and relative median fluorescence (RMF)." Leukemia & Lymphoma **45**(6): 1167-1173.

We have previously shown that quantification of CD38 expression using microbeads of specific antibody binding capacity (ABC) improves the prognostic value of CD38 expression in B-cell chronic lymphocytic leukemia, particularly for Binet Stage A patients. Quantification of CD38 expression using beads is expensive, time consuming and could be difficult to implement in a routine clinical laboratory. The calculation of relative median fluorescence (RMF) using the median fluorescence intensities of the test and control samples, is even more simply and cheaply obtained by flow cytometry and could be used as an alternative way of quantifying antigen expression. The present study demonstrates that RMF is an effective prognostic indicator in B-CLL that correlates closely with ABC in predicting disease-specific survival and time to progression for all patients. RMF predicted overall survival and time to progression in all patients (P < 0.0001 for both), in Binet Stage A patients (P < 0.0001 for both) and in Stage A patients under 60 years (P = 0.0299 and P = 0.0143, respectively). ABC predicted overall survival and time to progression in all patients (P < 0.0001 for both) in Stage A patients (P = 0.0024 and P < 0.0001, respectively) and in Stage A patients under 60 (P = 0.0379 and P = 0.0032, respectively). RMF is more effective than percentage CD38 positivity > 30% or > 20% in predicting disease-specific survival in Stage A patients of all ages (CD38 < > 30%: P = 0.0853, CD38 < > 20%: P = 0.0894) and in those under 60 years old (CD38 < > 30%: P = 0.5438, CD38 < > 20%: P = 0.2872). Also, RMF is more effective in predicting time to progression of Binet Stage A patients less than 60 years (P = 0.0143), while percentage CD38 positivity of 30%, 20% or 7% did not achieve statistical significance (P = 0.1103, = 0.0547, = 0.3399, respectively). We suggest that CD38 RMF could be used clinically as an alternative to ABC to identify patients with B-CLL that are likely to progress and require early treatment.

Dikareva, N. and K. S. Simon (2019). "Microplastic pollution in streams spanning an urbanisation gradient." Environmental Pollution **250**: 292-299.

Microplastic pollution has received considerable attention in marine systems, but recent work shows substantial plastic pollution also occurs in freshwater ecosystems. Most freshwater research has focused on large rivers and lakes, but small streams are the primary interface between land, where plastic is used, and drainage networks. We examined variation in the amount and form of plastic occurring in small streams spanning an urbanisation gradient. All streams contained microplastics with concentrations similar to that found in larger systems (up to 303 particles m^{-3} in water and 80 particles kg^{-1} in sediment). The most abundant types were fragments and small particles (63–500 µm). Chemical types of plastic were quite variable and often not predictable based on size, form and colour. Variation in microplastic abundance across streams was high, but only partially explained by catchment scale parameters. There was no relationship between human population density or combined stormwater overflows and microplastic abundance. Residential land cover was related to microplastic abundance, but explanatory power was low. Our results suggest local-scale factors may be more important than catchment-scale processes in determining microplastic pollution in small streams. Image 1 • Sediments and water of urban streams were assessed for microplastic pollution. • Level of contamination of small streams is comparable to large rivers. • Catchment scale parameters can partially explain patterns of spatial distribution. • Local-scale processes might be important factors at predicting microplastic pollution. Small urban streams deliver microplastics from land to the sea at the level comparable with large rivers but factors that contribute the most to the pollution are not evident. [ABSTRACT FROM AUTHOR]

Dilek, Y., et al. (2016). "The detection of circulating tumor cells (CTCs) in patients with colorectal cancer by flow cytometry." FEBS Journal **283 (Supplement 1)**: 300.

Colorectal cancer (CRC) is one of the leading causes of mortality worldwide. Metastasis is associated with the presence of circulating tumor cells (CTCs) in the peripheral blood of cancer patients. CTC cut-off values have been shown to predict for poorer overall survival in metastatic breast (>=5), prostate (>=5), and colorectal (>=3) cancer based on assessment of 7.5 ml of blood. In our study, CTCs were detected in blood samples of colorectal cancer patients, using with our modified convenient method for the strategies of CTC enrichment and detection. 7.5 mL peripheral blood samples were firstly collected and peripheral blood mononuclear cells (PBMCs) were isolated from the fresh blood samples by ficoll gradient separation. Next, the leukocytes in PBMCs were removed by magnetic microbeads conjugated with CD45 for a negative selection. Finally, the retained cells were labeled with anti-epithelial cell adhesion molecule (anti-EpCAM), cytokeratins (CK8, CK19) and the leukocyte-specific marker as anti-CD45. All samples were analyzed by BD FACS Aria III flow cytometry. In total, 10 patients and 7 healthy people were included in this study. The results showed that CTCs were not detected in the blood samples of healhty volunteers, but 3-13 CTCs were detected with CK14, 15, 16, 19-based gating strategy in the blood samples of colorectal cancer patients. It is accepted that the cut off value is 3 CTCs for colorectal cancer and CTC is negative if it is below this value or CTC is considered as a positive, if it is equal to or above this value, which might be an indication for poor prognosis. Thus CTC's detection may serve a representative surrogate tumor biomarker for real-time monitoring of disease status and tailoring personalized therapy.

Dilkes-Hoffman, L., et al. (2019). "Public attitudes towards bioplastics – knowledge, perception and end-of-life management." Resources, Conservation & Recycling **151**: N.PAG-N.PAG.

• The general public's knowledge of bioplastics is low. • However, the perception, particularly of biodegradable plastics, is positive. • Biodegradable plastics are rated as better for the environment than normal plastics and easily recyclable plastics. • The majority of respondents would dispose of biodegradable plastics in the recycling bin. • Potential issues associated with the introduction of bioplastics are discussed. The aim of this research was to understand current knowledge and perceptions regarding bioplastics. Results were gathered through an online survey of 2518 nationally representative Australians. The results indicate that the Australian public's knowledge of bioplastics is low, but perception, particularly of biodegradable plastics, is positive. Biodegradable plastics were perceived as better for the environment than 'normal plastics' and even 'easily recyclable' plastics. The majority of respondents (58%) said they were unsure whether biodegradable plastics can have negative environmental impacts. Sixty-eight percent of people say they would like to see more of the plastic items they use be biodegradable. If this becomes the case, there will be an increased stream of bioplastics entering the recycling system with 62% of people saying they would dispose of bioplastic items in the recycling bin. In light of the results presented in this work, potential issues relating to the introduction of bioplastics are raised and the role that governments and local councils can play in driving the development of the standards, labelling and waste management options that will need to be introduced alongside the introduction of wider bioplastic materials use are discussed. [ABSTRACT FROM AUTHOR]

Dilkes-Hoffman, L. S., et al. (2019). "Public attitudes towards plastics." Resources, Conservation and Recycling **147**: 227-235.

Understanding and engaging the public is key for ensuring the success of government and industry initiatives aimed at addressing the problem of plastic waste. However, there has been little focus on documenting the general public's attitudes towards plastics. This study examines public beliefs and attitudes towards plastics in Australia and provides insight on a global level. The research was conducted using an online survey of a nationally representative sample (2518 respondents). Overall, the survey results indicate that the public view plastics as a serious environmental issue. Plastic in the ocean had the highest mean rating for seriousness out of nine environmental issues, followed by two other issues relating to plastic waste production and

disposal. Whilst there was an association of plastics with food packaging and convenience, there was more of a negative association with the use of plastic overall. Eighty percent of respondents indicated a desire to reduce plastic use and the majority of respondents believe that paper and glass are more environmentally friendly packaging materials than plastics. However, the results showed that many respondents do not translate their aspiration to reduce plastic use into action. Overall, while a majority of the Australian public are concerned about plastics as an environmental issue, they place the bulk of the responsibility for reducing the use of disposable plastic on industry and government. Copyright © 2019 Elsevier B.V.

DiMinno, G., et al. (1986). "A myeloma paraprotein with specificity for platelet glycoprotein IIIa in a patient with a fatal bleeding disorder." Journal of Clinical Investigation **77**(1): 157-164.

Impaired platelet aggregation, normal shape change, and agglutination and normal ATP secretion and thromboxane synthesis in response to high concentrations of thrombin or arachidonic acid were found in a patient with multiple myeloma and hemorrhagic tendency. The purified IgG1 kappa or its F(ab1)2 fragments induced similar changes when added in vitro to platelet-rich plasma from normal subjects. In addition, the paraprotein inhibited adhesion to glass microbeads, fibrin clot retraction, and binding of radiolabeled fibrinogen or von Willebrand factor to platelets exposed to thrombin or arachidonic acid without affecting intraplatelet levels of cAMP. The radiolabeled para-protein bound to an average of 35,000 sites on normal platelets but it bound to less than 2,000 sites on the platelets from a patient with Glanzmann's thrombasthenia. Immunoprecipitation studies showed that the platelet antigen identified by the paraprotein was the glycoprotein IIIa. Furthermore, binding of radiolabeled prostaglandin E1 (PGE1) to resting platelets as well as binding of von Willebrand factor to platelets stimulated with ristocetin were entirely normal in the presence of patient's inhibitor. These studies indicate that bleeding occurring in dysproteinemia may be the result of a specific interaction of monoclonal paraproteins with platelets. In addition, our data support the concept that the interaction of fibrinogen and/or von Willebrand factor with the platelet glycoprotein IIb-IIIa complex is essential for effective hemostasis.

Dimitrakakis, E., et al. (2009). "Determination of heavy metals and halogens in plastics from electric and electronic waste." Waste Management **29**(10): 2700-2706.

Abstract: The presence of hazardous substances and preparations in small waste electrical and electronic equipment (sWEEE) found in the residual household waste stream of the city of Dresden, Germany has been investigated. The content of sWEEE plastics in heavy metals and halogens is determined using handheld X-ray fluorescence analysis (HXRF), elemental analysis by means of atomic absorption spectrometry (AAS) and ion exchange chromatography (IEC). Mean value of results for heavy metals in samples (n =51) by AAS are 17.4mg/kg for Pb, 5.7mg/kg for Cd, 8.4mg/kg for Cr. The mass fraction of an additive as shown by HXRF (n =161) can vary over a wide range. Precise deductions as regards sWEEE plastics content in hazardous substances and preparations cannot be made. Additional research would be expedient regarding the influence of hazardous substances to recycling processes, in particular regarding the contamination of clean fractions in the exit streams of a WEEE treatment plant. Suitable standards for calibrating HXRF for use on EEE plastics or complex electr(on)ic components do not exist and should be developed. [Copyright &y& Elsevier]

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Ding, J., et al. (2019). "Microplastics in the Coral Reef Systems from Xisha Islands of South China Sea." Environmental Science & Technology **53**(14): 8036.

The impacts of microplastics on coral reefs are gaining attention due to findings that microplastics affect coral health. This work investigated the distribution and characteristics of microplastics in the seawater, fish, and corals in 3 atolls from the Xisha Islands of South China Sea. In the seawater samples, microplastics were detected in the outer reef slopes, reef flats, and lagoons with abundances ranging from 0.2 to 11.2, 1.0 to 12.2, and 1.0 to 45.2 items L–1, respectively. Microplastic abundance was 0–12.0 items individual–1 (0–4.7 items g–1) in fish and 1.0–44.0 items individual–1(0.02–1.3 items g–1) in coral. The predominant shape and polymer of microplastics in seawater, fish, and coral were fibrous rayon and polyethylene terephthalate (PET). Microplastic sizes primarily ranged from 20–330 μm in both the seawater and fish, while there were relatively more 1–5 mm microplastics in the corals. The shape, size, color, and polymer type distribution patterns of microplastics in seawater more closely resembled those in fish gills than those in fish gastrointestinal tracts or coral samples. This study shows that microplastics are abundant in these coral reef systems and they are captured by fish or "trapped" by corals.

Ding, J., et al. (2018). "Accumulation, tissue distribution, and biochemical effects of polystyrene microplastics in the freshwater fish red tilapia (Oreochromis niloticus)." Environmental Pollution **238**: 1-9.

While the presence of microplastics (MPs) in marine environments has been detected worldwide, the importance of MPs pollution in freshwater environments has also been emphasized in recent years. However, the body of knowledge regarding the biological effects of MPs on freshwater organisms is still much more limited than on marine organisms. The aim of the present study was to evaluate the accumulation and tissue distribution of MPs in the freshwater fish red tilapia (Oreochromis niloticus), as well as the biochemical effects of MPs on O. niloticus. During 14 days of exposure to 0.1 micro m polystyrene-MPs at concentrations of 1, 10, and 100 micro g L⁻¹, the MPs concentrations in various tissues of O. niloticus generally increased over time following the order gut > gills > liver ~ brain. Moreover, the acetylcholinesterase (AChE) activity in the fish brain was inhibited by MPs exposure, with a maximum inhibition rate of 37.7%, suggesting the potential neurotoxicity of MPs to freshwater fish. The activities of cytochrome P450 (CYP) enzymes [7-ethoxyresorufin O-deethylase (EROD) and 7-benzyloxy-4-trifluoromethyl-coumarin O-dibenzyloxylase (BFCOD)] in the fish liver exhibited clear temporal variabilities, with significant decreases followed by elevations compared to the control. The alterations of the EROD and BFCOD activities indicate the potential involvement of CYP enzymes for the metabolism of MPs. The activity of antioxidative enzyme superoxide dismutase (SOD) in the liver was significantly induced throughout the exposure period, while the malondialdehyde (MDA) content did not vary with MPs exposure, suggesting that the antioxidative enzymatic system in O. niloticus could prevent oxidative damage. These results highlight the ingestion and accumulation of MPs in different tissues of freshwater fish, which lead to perturbations in fish biological systems and should be considered in environmental risk assessment.

Ding, L., et al. (2019). "Microplastics in surface waters and sediments of the Wei River, in the northwest of China." Science of the Total Environment **667**: 427-434.

Microplastic pollution is an increasingly important environment problem. Many studies show the occurrence of microplastics in our environmental system. However, the freshwater system is less understood, especially in northwest China. We investigated the occurrence and characteristics of microplastics in the Wei River Basin, which is located in northwestern China. The Wei River is the largest tributary of the Yellow River and runs through three major provinces. In the Wei River, the concentration of microplastics in the surface waters varied from 3.67 to 10.7 items /L and in the sediments, the abundance of microplastics varied from 360 to 1320 items/kg. Fiber (50.1%)was the dominant types in water samples and sediments. The small size (<0.5mm)(68.1%)were the main size of microplastics in Wei River. The types of microplastics were polyethylene, Polyvinyl chloride and polystyrene, as identified using a Fourier transform infrared spectrometer. This study could be a valuable reference for better understanding the microplastics pollution in inland northwestern China.

Ding, X., et al. (2005). "Inducible nitric oxide synthase-dependent DNA damage in mouse model of inflammatory bowel disease." Cancer science **96**(3): 157-163.

Increased cancer risk occurs in inflammatory bowel disease (IBD) undergoing long-term chronic inflammation. To evaluate whether inducible nitric oxide synthase (iNOS)-dependent DNA damage plays a role in the carcinogenic process triggered by IBD, we prepared a mouse model of IBD induced by transfer of CD45RBhighCD4+ T cells lacking regulatory T cells to female severe combined immunodeficiency (SCID) mice. CD45RBhighCD4+ T cells were isolated from mouse spleen after staining with fluorescein isothiocyanate (FITC)-conjugated anti-CD45RB monoclonal antibody, followed by anti-FITC-conjugated microbeads. This IBD mouse model showed that the bodyweight increased with aging to a lesser extent than non-treated controls, and that the intestine was shortened. Pathological findings of this mouse model, which showed severe inflammation in colon tissues, were similar to IBD patients. Double immunofluorescence technique revealed that both 8-nitroguanine and 8-oxo-7,8-dihydro-2'-deoxyguanosine (8-oxodG) were formed mainly in epithelial cells of the IBD mouse model. 8-Nitroguanine was formed in most of 8-oxodG-immunoreactive nuclei of epithelial cells. iNOS, proliferating cell nuclear antigen and p53 protein were also expressed in the colon epithelium. These results indicate that nitrative DNA damage, as well as oxidative DNA damage, is induced in colon epithelial cells of the IBD mouse model followed by proliferation of these cells, which may contribute to colon carcinogenesis.

Ding, X., et al. (2004). "Fabrication of microarrays on fused silica plates using the laser-induced backside wet etching method." Langmuir **20**(22): 9769-9774.

A novel approach in the fabrication of microarrays of dye and protein on fused silica plates using the laser-induced backside wet etching (LIBWE) technique is described. The surface of fused silica plates was initially precoated using trimethoxysilane self-assembled monolayers (SAMs) and then etched using the LIBWE method to obtain the desired microstructures on the plate surface. Using this technique, the SAMs on the nonirradiated areas were able to survive the LIBWE process and were used as templates for the subsequent deposition of dye molecules or proteins via chemical bonding or physical adsorption. In the case of fused silica plates precoated with fluorinated SAMs, the LIBWE method is used to remove the SAMs to expose the etched silica surfaces, on which a thin layer of pyranine molecules can be site-selectively deposited using an aqueous solution of pyranine. In another application, an ethanol solution of rhodamine 6G was preferentially deposited onto the nonirradiated areas. In yet another application, bovine serum albumin was preferentially deposited onto the laser-irradiated areas; in this case, the fused silica plates were precoated with poly(ethylene oxide) SAMs. Interestingly, when an aqueous suspension of polystyrene (PS) microbeads was cast onto the fused silica precoated with the fluorinated SAMs, hexagonally close-packed PS microbeads were deposited into the etched cavities. Depositions of the dye, protein, and microbeads were confirmed by visualization using a fluorescence microscope and scanning electron microscope.

Ding, Y., et al. (2019). "Numerical prediction of the short-term trajectory of microplastic particles in Laizhou Bay." Water **11**(11).

Microplastic particles are easily captured by microorganisms and enter the food chain, which poses a threat to ecological health. These particles are abundant in coastal areas because of the influence of anthropic activities and the interaction between the sea and land. Although much research on microplastics has been done, predicting the transportation of microplastic particles in coastal zones is still a challenge. In this paper, the trajectories of microplastic particles released from four river mouths around Laizhou Bay are investigated using the lattice Boltzmann method coupled with the Lagrangian particle-tracking method, involving inter-particle and particle-wall collisions. The trajectories of particles released from four river mouths are recorded within 30 days.

Dini, C., et al. (2014). "Characterization and stability analysis of biopolymeric matrices designed for phage-controlled release." Applied Biochemistry & Biotechnology **174**(6): 2031-2047.

Alginate and low methoxylated pectin gel matrices emulsified with oleic acid were studied for phage oral delivery. Matrix structural analysis revealed that emulsified pectin (EP) gel microbeads were harder and more cohesive than those of emulsified alginate (EA). EP showed high swelling capacity and slower matrix degradation in aqueous media, suggesting that oleic acid is mainly located on the surface of EP microbeads. EA and EP matrices having p-nitrophenyl palmitate (C-16 ester) as tracer dissolved into oleic acid and in the presence of lipase confirmed this hypothesis which is consistent with EP better phage protective capability. Surface analysis of gel microbeads by scanning electron microscopy revealed strong differences between EP and EA gel microbeads. Phage release kinetics was tested using semi-empirical mathematical models. Experimental curve best fitted the Korsmeyer-Peppas model, predicting transport mechanisms according to the high swelling and degradation of EP. The proposed encapsulation model represents an innovative technology for phage therapy, which can be extrapolated to other therapeutic purposes, using a simple environmentally friendly synthesis procedure and cheap food-grade raw materials.

Dinsdale, R. M. and M. Almemark (1999). "Composition and biodegradability of products of wet air oxidation of polyester." Environmental Science & Technology **33**(22): 4092.

Examines the composition and biodegradability of products of wet air oxidation (WAO) of polyester. Concepts on the chemical and biological systems to treat polluting organic compounds; Use of the WAO system in the treatment of waste and prevent air pollution; Legislations and increasing environmental concerns on plastic recycling.

Dinter, F., et al. (2019). "Simultaneous detection and quantification of DNA and protein biomarkers in spectrum of cardiovascular diseases in a microfluidic microbead chip." Analytical & Bioanalytical Chemistry **411**(29): 7725-7735.

The rapid and simultaneous detection of DNA and protein biomarkers is necessary to detect the outbreak of a disease or to monitor a disease. For example, cardiovascular diseases are a major cause of adult mortality worldwide. We have developed a rapidly adaptable platform to assess biomarkers using a microfluidic technology. Our model mimics autoantibodies against three

proteins, C-reactive protein (CRP), brain natriuretic peptide (BNP), and low-density lipoprotein (LDL). Cell-free mitochondrial DNA (cfmDNA) and DNA controls are detected via fluorescence probes. The biomarkers are covalently bound on the surface of size- (11-15 mum) and dual-color encoded microbeads and immobilized as planar layer in a microfluidic chip flow cell. Binding events of target molecules were analyzed by fluorescence measurements with a fully automatized fluorescence microscope (end-point and real-time) developed in house. The model system was optimized for buffers and immobilization strategies of the microbeads to enable the simultaneous detection of protein and DNA biomarkers. All prime target molecules (anti-CRP, anti-BNP, anti-LDL, cfmDNA) and the controls were successfully detected both in independent reactions and simultaneously. In addition, the biomarkers could also be detected in spiked human serum in a similar way as in the optimized buffer system. The detection limit specified by the manufacturer is reduced by at least a factor of five for each biomarker as a result of the antibody detection and kinetic experiments indicate that nearly 50 % of the fluorescence intensity is achieved within 7 min. For rapid data inspection, we have developed the open source software digilogger, which can be applied for data evaluation and visualization. Graphical abstract.

Diogene, J., et al. (2015). "Special Issue: Non-regulated environmental contaminants in seafood: contributions of the ECsafeSEAFOOD EU project. (Special Issue: Non-regulated environmental contaminants in seafood: contributions of the ECsafeSEAFOOD EU project.)." Environmental Research **143**(Part B): 1-137.

This special issue contains 15 articles focusing on marine environmental contamination; consumers' health risk-benefit perception of seafood and attitude toward the marine environment; environmental contaminants of emerging concern in seafood; a critical view on microplastic quantification in aquatic organisms; occurrence of pharmaceuticals and endocrine disrupting compounds in macroalgaes, bivalves, and fish from coastal areas in Europe; toxic elements and speciation in seafood samples from different contaminated sites in Europe; Ostreopsis cf. ovata dynamics in the NW Mediterranean Sea in relation to biotic and abiotic factors; contribution to the risk characterization of ciguatoxins; integrated risk index for seafood contaminants (IRISC); exposure of the population of Catalonia (Spain) to musk fragrances through seafood consumption; benefits and risks associated with consumption of raw, cooked, and canned tuna (Thunnus spp.) based on the bioaccessibility of selenium and methylmercury.

Dionne, S., et al. (2017). "The effect of vitamin D on macrophage function and polarization in Crohn's disease." Journal of Crohn's and Colitis **11 (Supplement 1)**: S119-S120.

Background: Defective bacterial clearance by macrophages is be-lieved to play an important role in Crohn's disease (CD). Phenotypes of macrophages include inflammatory M1 and anti-inflammatory M2. Vitamin D has been shown to reduce colitis severity but the mechanisms remain unclear. The effect of Vitamin D on M1 and M2 macrophages in IBD has not been investigated. The aim was to identify possible differences in M1 and M2 macrophages between CD patients and controls and to determine the effect of 1,25 vit D on macrophage function and phenotype markers. Method(s): PBMC were isolated from peripheral blood of 45 CD patients and 33 controls not taking vitamin D supplements. REB approval and patient consent was obtained. Monocytes were isolated using CD14 microbeads. M1 and M2 type macrophages were generated by culturing of monocytes in the presence of GM-CSF and M-CSF, respectively. Cytokines were determined by ELISA following stimulation with 100 ng/ml LPS. Phagocytosis was determined by measuring the uptake of FITC-latex beads using flow cytometry. Chemotaxis assays were performed in transwell plates. Expression of M1 and M2 markers was determined by qPCR. Result(s): No difference in chemotaxis or phagocytosis was observed in CD macrophages compared to controls. M2 displayed greater phagocytic activity than M1 (94.6% vs 80.3%). Phagocytosis was not altered after treatment with 1,25D. M1 migrated in slightly higher numbers toward CCL2 and fMLP compared to M2. Vit D slightly increased migration of both types toward fMLP (+18-26%). LPS-induced production of TNFalpha, IL-12p40 and IL-10 was comparable between macrophages in CD and controls. M1 produced higher amounts of IL-12p40 and TNFalpha compared to M2 (p<0.0005 and p<0.05, respectively) whereas IL-10 production was greater in M2 (1566 vs 152 pg/ml, p<0.005). Preincubation with 1,25D greatly decreased IL-12p40 production by M1 (-64.9%, p<0.0005) as well as that by M2 (-100%, p<0.05). 1,25D also decreased TNFalpha production by M1 (-49.6%, p<0.05) and IL-10 by M2 (-28.2%, p<0.05). M2 macrophages preferentially express F13A1, PTGS2, CD163, CXCL10, CD14 and MMP2, whereas TGFbeta, CCL1 and CYP27B1 expression was higher in M1. Marker expression was similar between CD and control macrophages. M1 and M2 markers were not differentially modulated by vit D. Conclusion(s): Peripheral blood derived macrophage chemotaxis and phagocytosis in CD is similar to those from controls. The main effect of 1,25D was to markedly decrease pro-inflammatory cytokine pro-duction from M1 macrophages. However, 1,25D did not modulate macrophage polarization to the anti-inflammatory M2 phenotype. This study was supported by a grant from the Dairy Farmers of Canada.

DiPaolo, B. C., et al. (2010). "Stretch magnitude and frequency-dependent actin cytoskeleton remodeling in alveolar epithelia." American Journal of Physiology - Cell Physiology **299**(2): C345-353.

Alveolar epithelial cells (AEC) maintain integrity of the blood-gas barrier with gasket-like intercellular tight junctions (TJ) that are anchored internally to the actin cytoskeleton. We hypothesize that stretch rapidly reorganizes actin (<10 min) into a perijunctional actin ring (PJAR) in a manner that is dependent on magnitude and frequency of the stretch, accompanied by spontaneous movement of actin-anchored receptors at the plasma membrane. Primary AEC monolayers were stretched biaxially to create a change in surface area (DeltaSA) of 12%, 25%, or 37% in a cyclic manner at 0.25 Hz for up to 60 min, or held tonic at 25% DeltaSA for up to 60 min, or left unstretched. By 10 min of stretch PJARs were evident in 25% and 37% DeltaSA at 0.25 Hz, but not for 12% DeltaSA at 0.25 Hz, or at tonic 25% DeltaSA, or with no stretch. Treatment with 1 muM jasplakinolide abolished stretch-induced PJAR formation, however. As a rough index of remodeling rate, we measured spontaneous motions of 5-mum microbeads bound to actin focal adhesion complexes on the apical membrane surfaces; within 1 min of exposure to DeltaSA of 25% and 37%, these motions increased substantially, increased with increasing stretch frequency, and were consistent with our mechanistic hypothesis. With a tonic stretch, however, the spontaneous motion of microbeads attenuated back to unstretched levels, whereas PJAR remained unchanged. Stretch did not increase spontaneous microbead motion in human alveolar epithelial adenocarcinoma A549 monolayers, confirming that this actin remodeling response to stretch was a cell-type specific response. In summary, stretch of primary rat AEC monolayers forms PJARs and rapidly reorganized actin binding sites at the plasma membrane in a manner dependent on stretch magnitude and frequency.

Dipper, A., et al. (2018). "Reducing plastic waste, carbon footprint and cost: Inhaler recycling at Musgrove Park Hospital." European Respiratory Journal. Conference: European Respiratory Society International Congress, ERS **52**(Supplement 62).

Background: Wasted medication costs the NHS 300 million per year (Trueman, P et al. Evaluation of the Scale, Causes and Costs of Waste Medicines. YHEC/School of Pharmacy, University of London. 2010). As potent greenhouse gases, hydrofluorocarbons (HFCs) in metered

dose inhalers (MDIs) produce 8% of the NHS' carbon footprint (Hillman, T et al. BMJ 2013; 346: f3359). Aim(s): To collect inhaler devices for recycling, quantify wasted doses and their environmental impact. Method(s): We collected inhalers over 90 days at our district general hospital. Number, device type and remaining doses were recorded. Devices without a counter were listed as either 'empty' or 'doses remaining'. We calculated the financial cost of wasted doses and the carbon footprint of MDIs. All devices were sent to the 'Complete the Cycle' recycling scheme. Result(s): There were 481 inhalers collected with 34 device types. 41 capsule devices were excluded. Of returned inhalers, 77.3% had doses remaining. 43 (9.8%) were full, costing 1209. There were 8546 unused doses from 201 inhalers with counters. 71.8% of dry powder inhalers (DPIs) and 79.9% of MDIs had doses remaining. Assuming the MDIs as 50% full on average, our collection represented 2.63 tonnes of equivalent CO2 (CO2e) emissions which may otherwise have been released into the environment, equivalent to 120 return journeys from London to Paris by Eurostar, or 10.8 return flights. Conclusion(s): There were significant remaining doses in returned inhalers, likely underestimating true inhaler waste. Waste prevention and considering alternatives to inhaled HFCs in addition to recycling are essential as healthcare systems strive to reduce carbon emissions with everconstrained budgets.

Direskeneli, H., et al. (2010). "Identification of JAK1 as a candidate inflammatory signalling pathway by genome-wide expression profiling in monocytes from patients with Behcet's disease." Arthritis and Rheumatism **10)**: 2200.

Purpose: Both innate and adaptive immune responses are observed in Behcet's Disease (BD). We aimed to obtain a global view of the immune/inflammatory activity in BD compared to Familial Mediterranean Fever (FMF), a classical, autoinflammatory disease. Method(s): Twenty-eight patients with BD (F/M: 9/19, mean age: 33.4 years), 13 with FMF (F/M: 9/4, mean age: 30.4 years) and 21 healthy controls (HC) (F/M: 11/10, mean age: 30.6 years) were enrolled to the study. Whole-genome microarray profiling was performed with human U133 (Plus 2.0) microarrays on an Affymetrix platform using CD14+ monocyte and CD4+T lymphocyte subsets isolated by microbeads from peripheral blood mononuclear cells. Data was analysed with Genespring (Version 10.0) software. RT-PCR was performed for the validation of JAK1 expression. Result(s): Among 28792 transcripts analysed, in CD14+ monocytes, 1188 transcripts reached a significant difference level with a minimum 2-fold difference observed in 279 genes. In CD4+T-lymphocytes, 2880 transcripts showed significant difference with at least 2-fold difference in 109 genes. In CD14+ monocytes of BD patients, oxysterol binding protein-like-8 (OSBPL8)(3.8 fold), cell-division-cycle-27 homolog (S. cerevisiae) (CDC27)(3.1 fold), myeloid/lymphoid or mixed-lineage leukemia-3 (MLL3) (3.1 fold), PHD finger protein-3 (PHF3)(2.9 fold) and BCL2-associated x protein (BAX)(2.7 fold) had the highest expressions. However, in principal component analysis, Januse-kinase-1 (JAK1)(2.6 fold) and metallothionein 1X, (MT1X)(2.1 fold) appeared to be the dominant molecules associated with immune/inflammatory signalling pathways. Validation by RT-PCR also showed an increased JAK1 expression (fold increase compared to GAPDH: BD: 9.5 vs FMF: 5.1 vs HC: 7.3, p=0.07, BD vs FMF: p=0.04). Discussion(s): Whole-genome microarray analysis demonstrated a selective activation of BD monocytes compared to FMF, suggesting their critical role between innate and adaptive immune responses. Activation of JAK1 through various cytokines such as IL-2, IL-6, IL-15 and interferon-gamma may be one of the dominant signaling pathways driving inflammation in BD.

Dirks, C. G., et al. (2013). "Lung transplant recipients suspected of antibody mediated rejection treated with plasmapheresis have a poor prognosis." Journal of Heart and Lung Transplantation **1)**: S264.

Purpose: No standard criteria exists for antibody mediated rejection (AMR) in lung transplant recipients and there is no consensus of treatment of suspected AMR. We report the outcome in patients suspected of AMR, based on radiological, pathological and immunological criteria, treated with plasmapheresis. Methods and Materials: Retrospective single center study of lung transplant recipients who were treated with plasmapheresis from 2007 to 2011 due to the suspicion of AMR. A tentative diagnosis of AMR was based on 1) >20% decline in FEVi, 2) transbronchial biopsies showing diffuse alveolar or interstitial damage with or without acute cellular rejection, 3) No infection as a plausible cause of damage, 4) Presence of extensive ground-glass pattern on HR-CT, 5) detection of Donor specific HLA antibodies (DSA) by solid-phase HLA microbead assay (Luminex). Result(s): Eleven patients were identified with suspicion of AMR and treatment with plasmapheresis. 7/11 patients had more than 20% decline in FEV1. All patients fulfilled criteria 2, 3, and 4 and Luminex analysis was performed in 8/11 patients with detection of Donor specific HLA antibodies and with a positive Donor specific B-cell cross-match in 4/11 patients. Biopsies demonstrated a wide spectrum of morphology: DAD (4),NSIP (3), COP (3), OB (3), AIP (1), positive C4D (1). Two patients with DAD and one with COP had grade A2/ A3. All 11 transplant recipients were treated with plasmapheresis and subsequently Rituximab or Alemtuzumab. Eight patients died within 9 months from the last plasmapheresis. Conclusion(s): Although treated aggressively with plasmapheresis and other immunmodulating therapies the outcome of suspected AMR was poor. No specific pathological pattern was found in this small study and a tentative diagnosis of AMR based solely on CT and transbronchial biopsies is probably difficult to distinguish from the recently defined Restrictive Allograft Syndrome. More specific criteria for AMR in lung transplantation are needed.

Dittlein, D., et al. (2012). "Keratinocyte derived mediators and their influence on T cell effector functions." Experimental Dermatology **21 (3)**: e30.

Regarding the important role of human skin in host defence, a clear knowledge about the crosstalk of keratinocytes and infiltrating immune cells is of great relevance. Especially the secretion of mediators may provide keratinocytes a tool to influence specifically the fate of T cells. Recent data demonstrated that co-cultures of keratinocytes and CD4+ T cells result in a differed cytokine profile and proliferation potential. However, nothing is known about possible individual effects on the CD4+ T cell subtypes. This prompted us to study the modulating effect of keratinocyte derived mediators on three different T cell lines Th1, Th2, and Th17. For this purpose primary human keratinocytes were cultured under steady state as well as under inflammatory conditions provoked by IFN-gamma stimulation (300 U/ml). Cell free supernatants were collected and to eliminate donor specific effects the supernatants of three different keratinocyte donors were mixed. For generation of T cell lines, naive CD4+ T cells were isolated by microbead untouch technique from human blood and subsequently polarised to Th1, Th2 and Th17 cells within 7 days. Keratinocyte supernatants were added to the fully polarised T cell lines and after 72 h of incubation T cell supernatants were taken to quantify cytokine production by ELISA (IFN-gamma, IL-10, IL-4, IL-17 and IL-22). To determine the proliferation potential of the T cells 3H thymidine incorporation assays were performed. Especially in the case of supernatants generated by unstimulated keratinocytes the results showed a strikingly clear inhibitory effect on IL-10 as well as IL-22 production in all T cell lines. For the Th2 cell line an inhibition of IL-4 secretion was observed as well as for Th1 cells the tendency of a decreased IFN-gamma secretion was seen when co-incubated with keratinocyte supernatants. In contrast secretion of IL-17 by Th17 cells seems to be supported by the presence of keratinocyte supernatant. In conclusion, keratinocytes are critically involved in defining the threshold of inflammatory processes in the skin by inhibiting T cell proliferation and cytokine production.

Diwakar, G., et al. (2012). "Evaluation of melanin transfer mechanism in keratinocytes using fluorescent microbeads." <u>Pigment Cell and Melanoma Research</u> **25 (5)**: 682.

Melanin uptake by keratinocytes is a physiological response triggered by environmental or hormonal stimuli. The mechanism of melanin transfer that is accepted by most is the process of melanosome phagocytosis by the keratinocytes. Many attempts have been made to capture this process using melanocytekeratinocyte cocultures, however, quantification of melanosomes captured by keratinocytes remains a challenging task. Reliable and accurate quantification of captured melanosomes is essential to discover and compare efficacy of novel inhibitors of this process. Here we describe a novel approach using fluorescent microbeads to understand melanosome phagocytosis by keratinocytes. XB-2 keratinocytes were incubated with carboxylate-modified 1 lmred fluorospheres (103 beads/cell) for 4 h and washed 3x in PBS and subjected to flow cytometric analysis. The number of fluorescent events accounted for nearly 50% of total events, indicating keratinocytes were ingesting the fluorospheres, i.e. pseduomelanosomes. Niacinamide, a known phagocytosis inhibitor, was used as a control to evaluate pseudomelanosome transfer. Pretreatment with niacinamide prior to microbead treatment resulted in significantly reduced microbead uptake by the keratinocytes, as evidenced by decreased fluorescent events and fluorescence intensity. Combining Artemisia extract previously shown to inhibit microbead uptake (Barnet) with niacinamide enhanced microbead transfer inhibition. Fluorescence and time lapse microscopy of keratinocyte ingested beads further revealed that the beads localized around the keratinocyte perinuclear cytoplasmic area similar to the nuclear capping of keratinocytes by melanosomes. We conclude that this fluorophore-keratinocyte model could be used as an initial screening method to find novel ingredients that inhibit the melanosome phagocytosis mechanism.

Djalilian, A. R., et al. (2018). "Exosomes from corneal mesenchymal stem cells modulate the immunophenotype of macrophages." <u>Investigative Ophthalmology and Visual Science. Conference</u> **59**(9).

Purpose : Mesenchymal stem cells (MSCs) have been under study for their therapeutic immunomodulatory properties. At ARVO 2017 we reported that cornea derived mesenchymal stem cells can modulate the immunophenotype of macrophages in a distinct manner. We demonstrated that the modulatory effects are mediated through MSC secreted factors. In this study, we focused on exosomes / extra-cellular vesicles derived from MSCs to determine their specific modulatory effects on macrophages. Methods : Peripheral blood mononuclear cells were isolated from the buffy coats by density-gradient separation. Monocytes were isolated using anti-human CD14 microbeads. Purified CD14+ monocytes were plated in cell culture plates at a concentration of 10 per well in IMDM media supplemented with 10% human serum blood type AB. Monocytes were cultured for 7 days to differentiate into macrophages. On day +7, macrophages were supplemented with fresh media and either co-cultured with human corneal MSCs (in transwells) to obtain MSC educated macrophages (MEMs), or else treated with exosomes isolated from human corneal MSCs to get exosome educated macrophages (EEMs). After 3 days, the macrophages were collected and subjected to flow cytometry. Results : Corneal MSCs were found to produce extracellular vesicles that primarily consisted of exosome-sized vesicles. By flow cytometry, macrophages educated using corneal MSCs (cMEM) or corneal exosomes (cEEM) showed similar but a distinct surface marker profile. For the M2 markers, the mean fluorescent intensity (MFI) of CD206, PD-L2 and CD39 for both MEM and EEM were significantly elevated compared to controls, however CD206, PDL1, PD-L2 was also significantly higher in the EEMs compared to the MEMs. Interestingly, in contrast both CD163

and CD16 were significantly lower in the EEMs compared to the MEMs. For the M1 markers, HLA-DR, there was no difference in surface expression in either the MEMs or EEMs, while CD86 was significantly lower in the MEMs compared to both controls and EEMs. Conclusions : These results demonstrate the distinct modulatory effects of cornea MSCs and cornea MSC derived exosomes on macrophages. Further functional and gene expression studies are underway to better characterize the exosomes and exosome educated macrophages. Likewise, additional studies are needed to determine the therapeutic potential of cornea MSC exosomes in ocular inflammatory disorders.

Dmytriw, A. A. (2019). "The microplastics menace: An emerging link to environment and health." Science of the Total Environment: 135558.

do Sul, J. A. I. and M. F. Costa (2013). "Plastic pollution risks in an estuarine conservation unit." Journal of Coastal Research **1**(65): 48.

Plastics enter the marine environment mostly from land-based sources, often via estuaries. However, studies related to plastic debris pollution remain rare within these environments. An estuarine beach comprised within a Marine Conservation Unit (MCU) in the Northeast coast of Brazil was studied during one year regarding plastic pollution. Petroleum derived products were >95% of all items, as commonly reported for other coastal and marine habitats. Monthly totals of marine debris presented an average of 10.8 plus or minus 1.63 items.100m super(-2), much lower than reported in the literature for other estuarine beaches. Three main sources were identified: fisheries, local users and human settlements along the river basin. The most frequent (56%) size category was 11-100cm super(2), but fragmented items alone were 83% of observed items. The main impact on the estuarine and visiting biota expected is the ingestion of plastic items and fragments, which was corroborated by recent works on estuarine fishes. Interactions with fishing gear are highlighted in the context of this MCU. To protect the traditional livelihoods in the Goiana Estuary, the guarantee of a healthy ecosystem, inclusive free from plastic pollution, must be included in management plans.

Dobaradaran, S., et al. (2018). "Characterization of plastic debris and association of metals with microplastics in coastline sediment along the Persian Gulf." Waste Management **78**: 649-658.

This study reports number, size and color distribution, and metal contents of microplastics as well as adherent sediments along the Persian Gulf. Samples were collected from 9 stations in summer 2015 with a sampling time interval of 10 days. Plastic size of 2-5 mm, and <=0.25 mm with 45 and 33% and white and colorless plastics with 62 and 33% had the highest abundance considering number per m², respectively. In general, the majority of collected plastics (79%) were smaller than 5 mm (defined size for microplastics). The mean Al, Fe, Mn, Cd, Cr, Ni, Pb, Cu contents of plastic fragments were 115, 531, 32.2, 0.035, 0.915, 2.03, 4.59, and 3.6 mug g⁻¹, respectively while the mean Al, Fe, Mn, Cd, Cr, Ni, Pb, Cu contents of sediments were 186, 3050, 127, 0.81, 5.01, 14.5, 48.6 and 5.43 mug g⁻¹ respectively. There were significant differences between the abundance of plastic items as well as the all examined metal concentrations of microplastics and sediments at different sampling times. As there is no regular cleanup program in the studied areas, significant differences between plastic items number at different sampling times (with higher plastic items number at the first day of sampling) showed that a large number of plastic items may enter from beaches to the sea and become available to marine organisms. Copyright © 2018

Doberstein, S. K., et al. (1995). "Fluorescent erythrocyte ghosts as standards for quantitative flow cytometry." Cytometry **20**(1): 14-18.

We report here a quick and inexpensive method for preparing standards of known fluorochrome content for calibration and quantitation of flow cytometry fluorescence signals. Erythrocyte ghosts prepared by hypotonic lysis are filled with solutions containing fluorescently labeled dextran. Standards prepared by this technique have a narrow range of fluorescence and a linear response of fluorescence to fluorochrome content up to 2 x 10(6) fluorochrome molecules/cell. The volume of ghost standard particles is roughly 70 femtoliters (fl)/cell. The fluorescence of ghost standards is nearly identical to that of commercially available microbead standards of similar fluorochrome content. Ghost standards have stable fluorescence for at least 3 weeks at 4 degrees C. These standards can be made with any fluorochrome or combination of fluorochromes over a wide concentration range.

Dock, J., et al. (2017). "Human immune compartment comparisons: Optimization of proliferative assays for blood and gut T lymphocytes." Journal of Immunological Methods **445**: 77-87.

The accumulation of peripheral blood late-differentiated memory CD8 T cells with features of replicative (cellular) senescence, including inability to proliferate in vitro, has been extensively studied. Importantly, the abundance of these cells is directly correlated with increased morbidity and mortality in older persons. Of note, peripheral blood contains only 2% of the total body lymphocyte population. By contrast, the gut-associated lymphoid tissue (GALT) is the most extensive lymphoid organ, housing up to 60% of total body lymphocytes, but has never been assessed with respect to senescence profiles. We report here the development of a method for measuring and comparing proliferative capacity of peripheral blood and gut colorectal mucosa-derived CD8 T cells. The protocol involves a 5-day culture of mononuclear leukocyte populations, from blood and gut colorectal mucosa respectively, labeled with 5-(and 6)-carboxyfluorescein diacetate succinimidyl ester (CFSE) and 5-bromo-2'-deoxyuridine (BrdU) and stimulated with anti-CD2/3/28-linked microbeads. Variables tested and optimized as part of the protocol development include: mode of T cell stimulation, CFSE concentration, inclusion of a second proliferation marker, BrdU, culture duration, initial culture concentration, and inclusion of autologous irradiated feeder cells. Moving forward, this protocol demonstrates a significant advance in the ability of researchers to study compartment-specific differences of in vitro proliferative dynamics of CD8 T cells, as an indicator of replicative senescence and immunological aging. The study's two main novel contributions are (1) Optimization and adaptation of standard proliferative dynamics blood T cell protocols for T cells within the mucosal immune system. (2) Introduction of the novel technique of combining CFSE and BrdU staining to do so.

Dodson, G. Z., et al. (2020). "Microplastic fragment and fiber contamination of beach sediments from selected sites in Virginia and North Carolina, USA." Marine Pollution Bulletin **151 (no pagination)**(110869).

Microplastic particles (<5 mm) constitute a growing pollution problem within coastal environments. This study investigated the microplastic presence of estuarine and barrier island beaches in the states of Virginia and North Carolina, USA. Seventeen sediment cores were collected at four study sites and initially tested for microplastic presence by pyrolysis-gas chromatography-mass spectrometry. For the extraction, microplastic particles were first separated from the sediment using a high-density cesium chloride solution (1.88 g/mL). In a second step, an oil extraction collected the remaining microplastic particles of higher densities. Under the light microscope, the extracted microplastic particles were classified based on their morphologies into fragments and fibers. Raman microspectroscopy chemically identified a subset of microplastic particles as polypropylene, polyethylene terephthalate, poly(4-vinylbiphenyl), polystyrene, polyethylene, and nylon. The results show a concentration of microplastic particles (1410 +/- 810 per kg of dry sediment) even in protected and ostensibly unpolluted estuarine and beach sediments of Virginia and North Carolina. Copyright © 2019

Doh, I. J., et al. (2019). "A Portable Spark-Induced Breakdown Spectroscopic (SIBS) Instrument and its Analytical Performance." Applied Spectroscopy **73**(6): 698-708.

A compact spark-induced plasma spectroscopic device was developed to detect elements used in a variety of applications. The system consists of a spark generator connected to tungsten electrodes, a custom-built delay generator, and two spectrometers that together cover the ultraviolet visible (UV-Vis) range (214-631 nm). The system was evaluated by qualitatively and quantitatively sampling copper standards. Prominent spectral peaks were identified using the NIST database for atomic emissions. The effectiveness of the proposed system was also tested with a lanthanide sample (gadolinium) and provided qualitative identification of the characteristic peaks. A semi-quantitative measurement for silicon and gold was performed using variable amounts of each particulate. Silica microbeads in solution were applied to paper wafers, while gold nanoparticles were sputter-coated onto silicon wafers.

Doherty, S. B., et al. (2012). "Application of whey protein micro-bead coatings for enhanced strength and probiotic protection during fruit juice storage and gastric incubation." Journal of Microencapsulation **29**(8): 713-728.

Context: Coated whey protein micro-beads may improve probiotic protection and provide delayed cell-release mechanisms. Objective(s): Lactobacillus rhamnosus GG was encapsulated in whey protein micro-beads by droplet extrusion with coating via electrostatic deposition: primary-polysaccharide and secondary-whey protein. Material(s) and Method(s): Storage studies were performed in cranberry and pomegranate juice (pH 2.4; 28 days; 4 and 25degreeC) followed by simulated ex vivo porcine gastric (pH 1.6) and intestinal (pH 6.6) digestion. Results and discussion: After storage and simulated gastro-intestinal digestion, free cells, cells suspended in protein and cells encapsulated in alginate micro-beads, illustrated complete probiotic mortality, while coated micro-beads enhanced probiotic viability after juice storage (8.6+/-0.1 log10CFUmL ⁻¹). Beads also showed significant binding of hydrophobic molecules. Coated micro-beads illustrated high gastric survival (9.5+/-0.1 log10CFUmL⁻¹) with 30min delayed intestinal release relative to non-coated micro-beads. Conclusion(s): Micro-bead coatings could be applied in delayed cell-release for targeted intestinal probiotic delivery. © 2012 Informa UK Ltd All rights reserved.

Doherty, S. B., et al. (2011). "Development and characterisation of whey protein micro-beads as potential matrices for probiotic protection." Food Hydrocolloids **25**(6): 1604-1617.

This study evaluated the efficacy of whey protein isolate (WPI) as an encapsulation matrix for the maintenance of Lactobacillus rhamnosus GG viability during simulated gastro-intestinal studies. Micro-bead characteristics were investigated using microscopy, chromatography, laser diffractometry and zeta potential analysis. Heat-treated WPI (11%, w/v) blended with stationary phase cultures demonstrated an instant gelation impetus in acetate buffer (0.5 M), tempered to 35 degrees C in the presence of Tween-20 (0.04%). Atomic force microscopy (AFM) demonstrated that micro-bead extrusion at pH 4.6 fuelled strong cohesive interactions within protein-probiotic amalgams; an electrostatic alliance further highlighted by zeta potential analysis. Optimization of encapsulation conditions generated self-supporting structures (200+or-1.2 micro m) with high micro-bead strength and individual loading capacity of

2.7x10⁴ cfu/micro-bead. Plate enumeration demonstrated that micro-bead extrusion had no detrimental effect on cell viability due to the perpetuation of stationary phase concentrations (10⁹ cfu/mL). This finding was further validated by LIVE/DEAD microscopy staining, which visualized the homogenous distribution of live probiotics throughout micro-bead matrices. Following 3 h in vitro stomach incubation (pH 1.8; 37 degrees C), micro-beads laden with 10¹⁰ cfu demonstrated acid-stability and peptic-resistance, characteristics required for optimum probiotic refuge. However, enzyme-activated intestinal conditions catalysed a synergistic response engaging rapid matrix disintegration and controlled probiotic release. Matrix digestion was monitored by chromatography, which witnessed the sequential release of peptides <2 kDa after 30 min. In conclusion, this study led to the development and design of a protein encapsulation polymer based on congruent matrix interactions for reinforced probiotic protection during challenging situations for their targeted delivery to intestinal absorption sites.

Dohnert, N., et al. (2010). "The proliferation behaviour of human vascular umbilical cord cells for cardiovascular tissue engineering under static and dynamic conditions." European Journal of Medical Research **1)**: 226.

Background: A crucial factor for the tissue engineering of heart valves is to establish the optimal conditions for cell culture. In our laboratory, we are trying to improve the proliferation of human vascular umbilical cord cells, the myofibroblasts. This is very important for the planning of follow-up studies and ultimately for the construction of a heart valve from these cells. In this study we compared the possibillity of dynamic cultivation with the common static cultivation method. Further, we tested whether the static cell culture could be improved by modifying the culture medium. Mat erial s und Methods: To compare the static and dynamic cell culture methods the adherent myofibroblasts were seeded onto micro beads in a rotating bioreactor (RCCS-D, Synthecon) and cells were counted at defined intervals. In parallel a static culture from the same cell source was seeded and counted. In a further analysis the cells were seeded in culture flasks for three passages with five different concentrations of ascorbic acid as additive to the culture medium (from 0.1 to 5 mmol/L); one flask remained without the additive. Every passage (n=6) was tested using a WST assay, which showed the cell proliferation as an absorbtion difference calculated by an ELISA reader. The procedure was carried out during four consecutive days for every passage. Result(s): The results showed that the dynamic cell culture did not improve the cell proliferation. The myofibroblasts were not suited to this method of cultivation. We also found a significant difference in cell proliferation between the myofibroblasts with and without ascorbic acid in the medium in static culture. A concentration of 0.1 mmol/l proved to be the best possible concentration out of the five, although every result in proliferation was better with ascorbic acid than in its absence. Conclus ion: We found that myofibroblasts do not proliferate in an adequate way when seeded onto micro beads in a rotating bioreactor. The use of ascorbic acid is important for further studies to improve the cell proliferation in vitro, which would upgrade the process and reduce the time required for the fabrication of heart valves. In addition these results can be taken into account in protocols for future experiments, thus improving the handling of myofibroblasts from the umbilical cord in tissue engineering.

Doker, S., et al. (2013). "Arsenic speciation in water and snow samples by adsorption onto PHEMA in a micro-pipette-tip and GFAAS detection applying large-volume injection." Talanta **103**: 123-129.

A miniaturized solid phase extraction procedure has been developed for ultra-trace determination of inorganic arsenic species. Arsenic(III) as pyrrolidinedithiocarbamate complex was selectively adsorbed on 30 mg poly(hydroxyethyl methacrylate) (PHEMA) micro beads, which is simply packed into a micro-pipette-tip. The adsorbed arsenic was quantitatively eluted by 700 muL 0.25 M NH(3) and determined by graphite furnace atomic absorption spectrometry (GFAAS). Injection of larger volume (i.e., 50 muL v.s. conventional 10-20 muL) eluent into graphite furnace and the use of Mg(NO(3))(2) as chemical modifier have improved atomic absorption signal intensity (sensitivity as characteristic mass of 25 pg) and precision (RSD of 2.6%, c=10 mug L(-1), n=11). Total arsenic amount was determined after reduction of arsenic(V) to arsenic(III) by thiourea-HCl system. As(V) concentration was calculated by the difference between As(III) and total arsenic. The detection limit (3s) of the method was found as 10 ng L(-1) As(III) with an enrichment factor of 86. The relative standard deviation and relative error for six replicate determinations of 0.5 mug L(-1) As(III) were found to be 4.0% and -0.7%, respectively. The method was successfully applied to drinking water, snow and reference water (SEM-2011) samples. When the samples were spiked with 0.5 and 1.0 mug L(-1) As(III) and As(V), the recoveries varied between 96 and 100%.

Dolci, L. S., et al. (2009). "Development of a new device for ultrasensitive electrochemiluminescence microscopy imaging." Analytical Chemistry **81**(15): 6234-6241.

Electrochemiluminescence (ECL) is widely used in biosensors and immunoassays thanks to the high sensitivity and specificity of the electrochemically triggered luminescence signal. So far, no applications have been reported on the use of ECL as a probe for ultrasensitive low-light microscope imaging. This work reports the development of a new transparent electrochemical cell for ECL imaging suitable for single cell analysis. The system is based on the use of a microscope placed in a dark box equipped with a CCD camera and a potentiostat. Transparent conducting glass coated with fluorine-doped tin oxide (FTO) has been used, and a three electrode configuration has been designed. The electrochemical cell was optimized using 8 microm diameter polystyrene beads coated with a Ru(bpy)(3)(2+) complex in order to simulate living cells. The Ru(bpy)(3)(2+) immobilized on the microbeads can be imaged and quantified at a concentration as low as 1 x 10(-19) mol/microm(2). Microscope imaging showed that the ECL signal was detected only in correspondence to the beads present on the electrode surface, and the probe could be accurately localized with a spatial resolution of 0.4 microm. The new ECL imaging device can be used in conjunction with other chemiluminescence-based imaging methods for ultrasensitive multiplex imaging on cells and tissues.

Dominghetti, A. W., et al. (2016). "Nitrogen loss by volatilization of nitrogen fertilizers applied to coffee orchard." Ciencia e Agrotecnologia **40**(2): 173-183.

Ammonia volatilization (N-NH₃) is one of the main pathways of Nitrogen loss reducing nitrogen use efficiency in coffee orchard. This work aimed at quantifying ammonia volatilization (N-NH₃) losses from N-sources to be used in coffee plantations fertilization in Brazil. The experiment was conducted in the field on a dystrophic red latosol (Ferralsol in FAO's classification) at the Coffee Research Sector, University of Lavras, MG, Brazil. The experimental design was of complete randomized blocks with three repetitions of the following treatments: conventional urea, ammonium nitrate and urea + 0.15% Cu and 0.4% B, urea + anionic polymers, urea + elementary sulfur (S⁰) + polymers, and urea + plastic resin. These N sources were split into three doses of 150 kg ha⁻¹ and band applied. The N-NH₃ losses by volatilization and variations of pH (H₂O) were measured, before and after N application. The N-sources contributed to reduce the soil pH, measured after the third nitrogen fertilization. The N-NH₃ losses by volatilization (average from three applications) was as follows: urea + anionic polymers (35.8%)

> conventional urea (31.2%)=urea + S⁰ + polymers (31.0%) > urea + 0.15% Cu + 0.4% B (25.6%) > urea + plastic resin (8.6%)=ammonium nitrate (1.0%).

Domingues, M. T., et al. (2014). "Short-term effect of alginate-biochar microbeads in corn germination." International Proceedings of Chemical, Biological and Environmental Engineering **77**: 31-34.

Biochar is the solid by-product of biomass pyrolysis. It is a promising soil conditioner and can be a material with high aggregate economic value, since its performance can improve plant's nutrient utilization and reduce the usage of conventional fertilizers. Biochar can be used in the formulation of new types of fertilizers as polymeric microbeads. These microbeads can be enriched with biochar and nutrients in its matrix to form fertilizers of slow release of nutrients. Thus, as a promising agricultural material, it is important to assess the environmental hazards caused by the implementation of these microbeads. In this context, seeds were sown in a soil-less Petri dish with microbeads produced with biochar from sugarcane enriched with or without phosphate. The seeds germination and its vitality were evaluated by the first germination count (FGC) and the germination speed index (GSI). The short-term effects showed that the microbeads, in general, assessed by the means of FGC, GSI and mass gain showed the best performance, suggesting that the environment created by these materials provided the best chemical and physical interaction with the embryonic axes.

Domogalla-Urbansky, J., et al. (2019). "Raman microspectroscopic identification of microplastic particles in freshwater bivalves (<i>Unio pictorum</i>) exposed to sewage treatment plant effluents under different exposure scenarios." Environmental science and pollution research international **26**(2): 2007-2012.

We investigated the uptake of microplastic (MP, <5 mm) particles by using freshwater bivalves (Unio pictorum) as biological samplers in the environment. They were exposed either directly to the biologically purified sewage of a North Bavarian sewage treatment plant (STP) or placed in a small river up- and downstream of the wastewater discharge for 28 days and 6 months, respectively. A control group was maintained in a pond. After acid digestion, the soft tissue was analyzed for MP particles by means of Raman microspectroscopy (RM, over 3000 particles individually measured), which allows for identification and quantification of particles down to 1 μm. Only in the bivalve collective exposed to STP effluents MP was found, however a very small amount (maximum of nine MP particles in the bivalve sample exposed for 6 months). In the bivalves up- and downstream of the wastewater discharge and in control organisms from a pond, no microplastic was identified. The amount of microplastic particles was small in absolute terms and small in relative terms (ca. 1:100 (6 months) and below 1:1000 (28 days)) as hundreds of particles per sample were analyzed which turned out to be non-plastic. Including the results for the river, this indicates a rather low MP contamination level for organisms in close vicinity to a sewage treatment plant.

Dong, C. D., et al. (2020). "Polystyrene microplastic particles: In vitro pulmonary toxicity assessment." Journal of Hazardous Materials **385**: 121575.

Microplastics (MPs) have become a global environmental concern. Recent studies have shown that MPs, of which the predominant type is often polystyrene (PS; known as PS-MPs), can extend to and affect remote, sparsely inhabited areas via atmospheric transport. Although exposure to inhaled MPs may induce lung dysfunction, further experimental verification of the pulmonary toxic potential of MPs and the mechanism underlying the toxicity is needed. Here we used normal human lung epithelial BEAS-2B cells to clarify the association between pulmonary toxicity and PS-MPs.

Dong, H., et al. (2016). "A microchip for integrated single-cell genotoxicity assay." Talanta **161**: 804-811.

With the development of large-scale biologic databases, precision medicine is becoming a frontier in biomedical research. As a main focus of precision medicine study, cancer has been widely accepted as a disease born out of inherited genetic variations or accumulating genomic damage. At the single-cell level, microfluidics or lab-on-a-chip technology for cancer study is an emerging tool for improving risk assessment, diagnostic categories and therapeutic strategies. This work presents a multi-layer microchip for single-cell gene expression profiling. Treated by three drug reagents (i.e. methyl methanesulfonate, docetaxel and colchicine) with varied concentrations and time lengths, individual human breast cancer cells (MCF-7) are then lysed on-chip, and the released mRNA templates are captured and reversely transcribed into cDNA on microbead surface. Three genes (GAPDH, CDKN1A, AURKA) are amplified and quantified simultaneously through triplex real-time polymerase chain reactions (qPCR). Readout per run is set to be eighteen, and can be further improved following same approach. The microchip is able to integrate all steps of single-cell gene expression profiling, and provide precision study of drug induced genotoxicity with reduced reagents consumption per reaction and instrumental cost.

Dong Huy, G., et al. (2011). "A novel separation and enrichment method of 17beta-estradiol using aptamer-anchored microbeads." Bioprocess and Biosystems Engineering **34**(2): 189-195.

The estrogenic compound 17beta-estradiol (E2) is widely studied for its potential endocrine disruption effects. Due to the low level of E2 present in the environment, it is highly desirable to develop a sensitive and efficient separation and enrichment method for E2 analysis. In this paper, we proposed a novel E2 preconcentration method using anti-E2 aptamer-anchored isothiocyanate-modified beads (NCS beads). The glass beads are chemically modified with primary amino group, and then treated with phenylene diisothiocyanate (PDITC) to generate an isothiocyanate group, which is reactive towards the amine group. The amino-modified anti-E2 aptamer can be easily covalently immobilized onto the as-prepared NCS beads. The experimental results demonstrated that the aptamer affinity microbeads could selectively retain and separate E2 compound. The effects of the operation parameters on retention of E2, including washing condition, eluting condition, the number of beads, and the incubation time were investigated. Moreover, high-performance liquid chromatography with preconcentration of E2 on the aptamer affinity microbeads was applied to detect the E2 in the spiked water samples and obtained a good recovery. © 2010 Springer-Verlag.

Dong, L., et al. (2018). "Reversible and long-term immobilization in a hydrogel-microbead matrix for high-resolution imaging of Caenorhabditis elegans and other small organisms." PLoS ONE **13**(3).

The nematode Caenorhabditis elegans is an important model organism for biomedical research and genetic studies relevant to human biology and disease. Such studies are often based on high-resolution imaging of dynamic biological processes in the worm body tissues, requiring well-immobilized and physiologically active animals in order to avoid movement-related artifacts and to obtain meaningful biological information. However, existing immobilization methods employ the application of either anesthetics or severe physical constraints, by using glue or specific microfluidic on-chip mechanical structures, which in some cases may strongly affect physiological processes of the animals. Here, we immobilize C. elegans nematodes by taking advantage of a biocompatible and temperature-responsive hydrogel-microbead matrix. Our gel-based immobilization technique does not require a specific chip design and enables fast and reversible immobilization, thereby allowing successive imaging of the same single worm or of small worm populations at all development stages for several days. We successfully demonstrated the applicability of this method in challenging worm imaging contexts, in particular by applying it for high-resolution confocal imaging of the mitochondrial morphology in worm body wall muscle cells and for the long-term quantification of number and size of specific protein aggregates in different C. elegans neurodegenerative disease models. Our approach was also suitable for immobilizing other small organisms, such as the larvae of the fruit fly Drosophila melanogaster and the unicellular parasite Trypanosoma brucei. We anticipate that this versatile technique will significantly simplify biological assay-based longitudinal studies and long-term observation of small model organisms.

Dong, L., et al. (2013). "Promoting low-carbon city through industrial symbiosis: A case in China by applying HPIMO model." Energy Policy **61**: 864-873.

Abstract: China launched low-carbon city strategy to respond global climate change. Industrial symbiosis (IS) could generate both economic and environmental benefits in clustered industries and communities. This research shed light on how industrial symbiosis contributes to city's low-carbon development. An urban-level hybrid physical input and monetary output (HPIMO) model which covers physical energy inputs and air pollutants emissions, is established for addressing case study in a Chinese typical industrial city (Liuzhou). Based on current energy consumption and industrial symbiosis and the application of HPIMO model, scenarios related to industrial symbiosis, including waste plastics recycling, scrap tires recycling, flying ash recycling and biomass utilization are explored. Results show that compared with business-as-usual (BAU) scenario, IS can reduce solid wastes and further contribute to the co-benefits of energy saving, CO2 emissions reduction and air pollutants reduction. The finding is critical for national low-carbon strategy. Finally, policy implications to support the ever-improvement of IS promotion in China are proposed and discussed. [Copyright &y& Elsevier]

Dong, S., et al. (2018). "Combinational effect of titanium dioxide nanoparticles and nanopolystyrene particles at environmentally relevant concentrations on nematode Caenorhabditis elegans." Ecotoxicology and Environmental Safety **161**: 444-450.

The possible adverse effects of nanoplastics have received the great attention recently; however, their effects at environmentally relevant concentration on organisms are still largely unclear. We here employed Caenorhabditis elegans to investigate the combinational effects of titanium dioxide nanoparticles (TiO₂-NPs) and nanopolystyrene particles at environmentally relevant concentrations on organisms. In wild-type nematodes, prolonged exposure to nanopolystyrene particles (1 micro g/L) could enhance the toxicity of TiO₂-NPs (1 micro g/L) in decreasing locomotion behavior and in inducing intestinal reactive oxygen species (ROS) production. Meanwhile, combinational exposure to TiO₂-NPs (1 micro g/L) and nanopolystyrene particles (1 micro g/L) altered the molecular basis for oxidative stress in wild-type nematodes. Moreover, prolonged exposure to nanopolystyrene particles (0.1 micro g/L) could further enhance the toxicity of TiO₂-NPs (1 micro g/L) in decreasing locomotion behavior and in inducing intestinal ROS production in sod-3 mutant nematodes. Our data suggest the potential role of nanopolystyrene particles at environmentally relevant concentrations in enhancing the toxicity of ENMs in the environment.

Dong, X., et al. (2019). "Controlled delivery of basic fibroblast growth factor (bFGF) using acoustic droplet vaporization stimulates endothelial network formation." Acta Biomaterialia **97**: 409-419.
The challenge of translating pro-angiogenic growth factors for therapeutic purposes has stimulated a myriad of biomaterials-based, delivery approaches. Many techniques rely on incorporating a growth factor into a hydrogel. The kinetics of release can be tuned based on the physiochemical properties of the growth factor and scaffold. We have developed an acoustically-responsive scaffold (ARS), whereby release of a growth factor is non-invasively and spatiotemporally controlled in an on-demand manner using focused ultrasound. An ARS consists of a fibrin matrix doped with a growth factor-loaded, sonosensitive emulsion. In this study, we used an ARS to investigate the impact of basic fibroblast growth factor (bFGF) release on endothelial tubule formation. The co-culture model of angiogenic sprouting consisted of endothelial cell-coated microbeads and dispersed fibroblasts. bFGF release correlated with the acoustic pressure applied while sprout length correlated with both the volume of bFGF-loaded emulsion in the ARS and acoustic pressure. Minimal bFGF release and sprouting were observed in the absence of ultrasound exposure. Staggering the release of bFGF via multiple ultrasound exposures did not affect sprouting. Additionally, sprouting did not display a dependence on the distance between each microbead and the ARS. Overall, these results highlight the potential of using ultrasound to control regenerative processes via the controlled delivery of a growth factor. STATEMENT OF SIGNIFICANCE: Due to the ineffectiveness of conventional routes of administration, implantable hydrogels are often used as matrices to deliver growth factors (GFs). Spatial control of release is typically realized using anisotropic constructs while temporal control is obtained by modifying matrix properties and GF-scaffold interactions. In this study, we demonstrate how focused ultrasound can be used to non-invasively and spatiotemporally control release of basic fibroblast growth factor (bFGF), in an on-demand manner, from a composite hydrogel. The acoustically-responsive scaffold (ARS) consists of a bFGF-loaded, monodispersed double emulsion embedded within a fibrin matrix. We demonstrate how controlled release of bFGF can stimulate endothelial network formation. These results may be of interest to groups working on controlled release strategies for GFs, especially in the context of stimulating angiogenesis.

Dong, X., et al. (2019). "Sorption of Tonalide, Musk Xylene, Galaxolide, and Musk Ketone by microplastics of polyethylene and polyvinyl chloride." Marine Pollution Bulletin **144**: 129-133.
The effects of time, temperature, and salinity on the adsorption of Tonalide (AHTN), Musk Xylene (MX), Galaxolide (HHCB), and Musk Ketone (MK) by microplastics of polyethylene (PE) and polyvinyl chloride (PVC) are studied.

Dong, Y., et al. (2019). "Adsorption mechanism of As(III) on polytetrafluoroethylene particles of different size." Environmental Pollution **254**: N.PAG-N.PAG.
Microplastics exhibit active environmental behavior and unique surface characteristics, and act as carriers for the migration of trivalent arsenic (As(III)) in the environment. Herein, the mechanism by which polytetrafluoroethylene (PTFE) microplastic particles adsorb As(III) is systematically determined. The larger the size of PTFE particles, the smaller the specific surface area, the higher the point of zero charge (PZC), and the more unfavorable adsorption of As(III); the highest adsorption amount can reach 1.05 mg g^{-1}. The adsorption process can be divided into three stages by the intraparticle diffusion model: external mass transfer, intraparticle diffusion, and dynamic equilibrium, of which the external mass transfer stage is the adsorption

rate-limiting stage. The Langmuir isotherm model better represented the equilibrium adsorption results. The adsorption of As(III) by PTFE was an exothermic process, and because the increase in temperature broke the hydrogen bond, the amount of adsorption was decreased, which was not conducive to spontaneous adsorption. In the pH range of 3–7, as the pH value increased, the amount of As(III) adsorbed by PTFE gradually decreased, which may be related to the change in PZC for PTFE and the protonation of As(III). The H on the surface hydroxyl group of the PTFE exhibited a very large positive potential (+82.37 kcal mol−1). Thus, it can attract the arsenic oxyanion, and As(III) was subsequently adsorbed on the surface of the PTFE through the hydrogen bond on the hydroxyl group. Electrostatic force and non-covalent interaction were the key mechanisms affecting the PTFE adsorption. Image 1 • Polytetrafluoroethylene (PTFE) microplastic particles have high adsorption capacity on As(III) (1.05 mg g−1). • The adsorption of As(III) by PTFE is an exothermic process. • The hydrogen atom in the surface hydroxyl group of the PTFE exhibited a very large positive electrostatic potential. • Electrostatic force and non-covalent interaction are the key mechanisms affecting the As(III) adsorption by PTFE. The key mechanisms of As(III) adsorption by PTFE is electrostatic force and non-covalent interaction. [ABSTRACT FROM AUTHOR]

Dong, Y., et al. (2019). "Microplastic particles increase arsenic toxicity to rice seedlings." Environmental Pollution **259**: 113892.

Hydroponic experiments were conducted to study the effects of microplastic particles of polystyrene (PS) and polytetrafluoroethylene (PTFE) on arsenic (As) content in leaves and roots of rice seedlings, and the changes in root vigor and physiological and biochemical indicators under single or combined PS and PTFE with As(III) treatment. Rice biomass decreased with increasing concentrations of PS, PTFE, and As(III) in the growth medium. The highest root (leaf) biomass decreases were 21.4% (10.2%), 25.4% (11.8%), and 26.2% (16.2%) with the addition of 0.2 g L⁻¹ PS, 0.2 g L⁻¹ PTFE, and 4 mg L⁻¹ As(III), respectively. Microplastic particles and As(III) inhibited biomass accumulation by inhibiting root activity and RuBisCO activity, respectively. The addition of As(III) and microplastic particles (PS or PTFE) inhibited photosynthesis through non-stomatal and stomatal factors, respectively; furthermore, net photosynthetic rate, chlorophyll fluorescence, and the Chl a content of rice were reduced with the addition of As(III) and microplastic particles (PS or PTFE). Microplastic particles and As(III) induced an oxidative burst in rice tissues through mechanical damage and destruction of the tertiary structure of antioxidant enzymes, respectively, thereby increasing O₂⁻ and H₂O₂ in roots and leaves, inducing lipid peroxidation, and destroying cell membranes. When PS and PTFE were added at 0.04 and 0.1 g L⁻¹, respectively, the negative effects of As(III) on rice were reduced. Treatment with 0.2 g L⁻¹ PS or PTFE, combined with As(III), had a higher impact on rice than the application of As(III) alone. PS and PTFE reduced As(III) uptake, and absorbed As decreased with the increasing concentration of microparticles. The underlying mechanisms for these effects may involve direct adsorption of As, competition between As and microplastic particles for adsorption sites on the root surface, and inhibition of root activity by microplastic particles.

Dong, Y., et al. (2020). "As(III) adsorption onto different-sized polystyrene microplastic particles and its mechanism." Chemosphere **239 (no pagination)**(124792).

We systematically investigated the surface characteristics of polystyrene microplastic particles (PSMPs) prepared by ball milling to impart a porous surface structure and special surface characteristics, and studied the mechanism of adsorption of As(III) onto PSMPs. The sizes of the PSMPs prepared by ball milling for 2, 4, and 8 h were in the ranges of 0.1-1, 1-10, and 10-100 mum, respectively. That is, the longer the milling time is, the larger the specific surface area of the particles is. Moreover, the higher the point of zero charge is, the higher the adsorbed amount of As(III) is. The highest adsorption rate of As(III) onto PSMPs was found to be 1.12 mg g⁻¹. After 1200 min, the adsorption reached equilibrium, and a pseudo-second-order model better fitted the As(III) adsorption kinetics. The Langmuir and Freundlich models could well describe the adsorption isotherms. Furthermore, hydrogen bonds between As(III) and PSMPs were broken at high temperatures, resulting in a decrease in As(III) adsorption onto PSMP, which indicated that the adsorption process was exothermic. Increases in the pH and concentrations of interfering nitrate and phosphate ions in the solution led to inhibited As(III) adsorption of PSMPs. The electrostatic potential of most areas of the PSMP surface was positive, and the H atom on the carboxyl group exhibited a very large positive potential (+56.6 kcal/mol), and thus attracted arsenic oxyanions. Thus, it was determined that As(III) adsorbed to the surface of PSMPs through hydrogen bonding with the carboxyl group. Electrostatic forces and non-covalent interactions are the key mechanisms affecting the adsorption of As(III) onto PSMPs. This work provides a clear theoretical basis for the behavior of the PSMP as an arsenic carrier and might aid to improve the environmental toxicity of arsenic. Copyright © 2019 Elsevier Ltd

Dong, Y., et al. (2014). "Determination of Cattle Foot-and-Mouth Disease Virus by Micro-ELISA Method." Analytical Sciences **30**(3): 359.

The development of foot-and-mouth disease virus (FMDV) detection methods is crucial for animal food security, tackling regional FMDV epidemic, and global FMDV prognostic control. For these purposes, a fast and sensitive analysis method is required. In this study, we developed a microchip-based ELISA (enzyme-linked immunosorbent assay), micro-ELISA, to realize FMDV detection. Nickel(II) chelating chemistry was utilized to immobilize recombinant protein (antigen) on polystyrene micro-beads in order to determine FMDV antibodies in cattle serum samples. In addition, reaction protocol and conditions were investigated. As a result, the FMDV detection was successfully demonstrated with only a 10-µL sample volume in 25-minute assay time. Analytical sensitivity was evaluated by a maximum nominal positiveness percentage value (NPPV) of 303 and a dilution factor of 32×. The method's inter-run and intra-run CV (coefficients of variance) values were 15.5 and 17.1%, respectively, which were fully compatible with the OIE (World Organization for Animal Health) principle of validation of diagnosis assays for infectious diseases. The developed method should become a powerful tool for determining other animal contagious diseases and/or zoonosis.

Dong, Z., et al. (2018). "Size-dependent transport and retention of micron-sized plastic spheres in natural sand saturated with seawater." Water Research **143**: 518-526.

A series of one-dimensional column experiments were conducted to investigate the transport and retention of micron-sized plastic spheres (MPs) with diameters of 0.1-2.0mum in seawater-saturated sand. In seawater with salinity of 35 PSU (practical salinity units), the mass percentages recovered from the effluent (M_{eff}) of the larger MPs increased from

13.6% to 41.3%, as MP size decreased from 2.0mum to 0.8mum. This occurred because of the gradual reduction of physical straining effect of MPs in the pores between sands. The smaller MPs (0.6, 0.4, and 0.1mum) showed the stronger inhibition of MPs mobility, with M_{eff} values of 11.5%, 11.9%, and 9.8%, respectively. This was due to the lower energy barriers (from 108 k_BT to 16 k_BT) between the smaller MPs and the sand surface, when compared with the larger MPs (from 296 k_BT to 161 k_BT). In particular, the aggregation of MPs (0.6 or 0.4mum) triggered a progressive decrease in MP concentration in the effluent. Retention experiments showed that the vertical migration distance of most MP colloids was 0-4cmat the inlet of column. For 0.6 or 0.4mumMPs, the particles were concentrated over a 0-2cm vertical distance. Moreover, the salinity (35-3.5 PSU) did not affect the transport of the larger MPs (2.0-0.8mum). However, as seawater salinity decreased from 35 PSU to 17.5 or 3.5 PSU, the aggregation of the smaller MPs (0.6-0.1mum) was dramatically inhibited or completely prevented. Meanwhile, ripening of the sand surface by the MPs (0.6 and 0.4mum) no longer occurred. By contrast, all MPs in deionized water (0 PSU) achieved complete column breakthroughs because of the strong repulsive energy barrier (from 218 k_BT to 4192 k_BT) between the MPs and the sand surface. Consequently, we find that the transport and retention of MPs in sandy marine environment strongly relies on both the MP size and the salinity levels.

Dong, Z., et al. (2019). "Cotransport of nanoplastics (NPs) with fullerene (C₆₀) in saturated sand: Effect of NPs/C₆₀ ratio and seawater salinity." Water Research **148**: 469-478.

Nanoplastics (NPs) have been identified as newly emerging particulate contaminants. In marine environments, the interaction between NPs and other engineered nanoparticles remains unknown. This study investigated the cotransport of NPs with fullerene (C₆₀) in seawater-saturated columns packed with natural sand as affected by the mass concentration ratio of NPs/C₆₀ and the hydrochemical characteristics. In seawater with 35 practical salinity units (PSU), NPs could remarkably enhance C₆₀ dispersion with a NPs/C₆₀ ratio of 1. NPs behaved as a vehicle to facilitate C₆₀ transport by decreasing colloidal zeta-potential and forming stable primary heteroaggregates. As the NPs/C₆₀ ratio decreased to 1/3, NPs mobility was progressively restrained because of the formation of large secondary aggregates. When the ratio continuously decreased to 1/10, the stability and transport of colloids were governed by C₆₀ rather than NPs. Under this condition, the transport trend of binary suspensions was similar to that of single C₆₀ suspension, which was characterized by a ripening phenomenon. Seawater salinity is another key factor affecting the stability and associated transport of NPs and C₆₀. In seawater with 3.5 PSU, NPs and C₆₀ (1:1) in binary suspension exhibited colloidal dispersion, which was driven by a high-energy barrier. Thus, the profiles of the cotransport and retention of NPs/C₆₀ resembled those of single NPs suspension. This work demonstrated that the cotransport of NPs/C₆₀ strongly depended on their mass concentration ratios and seawater salinity.

Dong, Z., et al. (2019). "Role of surface functionalities of nanoplastics on their transport in seawater-saturated sea sand." Environmental Pollution **Part 1. 255 (no pagination)**(113177).

Capsule: Surface functionalities of nanoplastics (NP) strongly influenced NP transport and retention in seawater-saturated sea sand. The transport and retention of nanoplastics (NP, 200 nm nanopolystyrene) functionalized with surface carboxyl (NPC), sulfonic (NPS), low-density amino (negatively charged, NPA⁻), and high-density amino (positively charged, NPA⁺) groups in seawater-saturated sand with/without humic acid were examined to explore the role of NP surface functionalities. The mass percentages of NP recovered from the effluent (M<inf>eff</inf>) with a salinity of 35 practical salinity units (PSU) were ranked as follows: NPC (19.69%) > NPS (16.37%) > NPA⁺ (13.33%) > NPA⁻ (9.78%). The homoaggregation of NPS and NPA⁻ was observed in seawater. The transport of NPA⁻ exhibited a ripening phenomenon (i.e., a decrease in the transport rate with time) due to the high attraction of NP with previously deposited NP, whereas monodispersed NPA⁺ presented a low M<inf>eff</inf> value because of the electrostatic attraction between NPA⁺ and negatively charged sand. Retention experiments showed that the majority of NPC, NPS and NPA⁺ accumulated in a monolayer on the sand surface, whereas NPA⁻ accumulated in multiple layers. Suwannee River humic acid (SRHA) could remarkably improve the transportability of NPC, NPS, and NPA⁻ by increasing steric repulsion. The strong attraction between NPA⁺ and the deposited NPA⁺ in the presence of SRHA triggered the weak ripening phenomenon. As seawater salinity decreased from 35 PSU to 3.5 PSU, the increase in electrostatic repulsion of NP-NP and NP-sand enhanced the transport of NPC, NPS, and NPA⁻, and the ripening of NPA⁻ breakthrough curves disappeared. In deionized water, NPC, NPS, and NPA⁻ achieved complete column breakthrough because the electrostatic repulsion between NP and sand intensified. However, the M<inf>eff</inf> values of NPA⁺ in 3.5 PSU seawater and deionized water presented limited increments of 15.49% and 23.67%, respectively. These results indicated that the fate of NP in sandy marine environments were strongly affected by NP surface functionalities, seawater salinity, and coexisting SRHA. Copyright © 2019 Elsevier Ltd

Donnelly, E. L. (2012). Prey and plastic ingestion of Pacific Northern Fulmars (Fulmarus glacialis) collected in Monterey Bay, California.

Marine plastic pollution affects seabirds that mistake it for prey or incidentally ingest it with prey. Northern Fulmars (Fulmarus glacialis) and seabirds that feed at the water's surface ingest the most plastic. This can cause health issues, including satiety that possibly leads to inefficient foraging. The objectives of this study were to examine fulmar body condition, identify cephalopod diet and ingested plastic, predict foraging areas, and determine if prey number and size was correlated with ingested plastics in Pacific Northern Fulmars (Fulmarus glacialis rodgersii). Cephalopod prey were identified, measured, and enumerated; plastic and marine debris were categorized, enumerated, and weighed from beach-cast Northern Fulmars wintering in Monterey Bay, California, during 2003 and 2007. Fulmars ate mostly Gonatid squids (Gonatus pyros, G. onyx , and G. californiensis) in similar size classes for both years. There was a significant negative correlation between pectoral muscle index and average size of cephalopod beaks per stomach, a significant increase in multiple plastic categories between years, and no significant correlation between the number and mass of plastic compared with the number and size of prey for either year. Although there was no correlation between plastic and prey, other issues with ingested plastics (contaminant accumulation, endocrine disruption, and micro plastics) should be further examined as plastic pollution increases in the world's oceans.

Donnelly-Greenan, E. L., et al. (2014). "Prey and plastic ingestion of Pacific Northern Fulmars (Fulmarus glacialis rogersii) from Monterey Bay, California." Marine Pollution Bulletin **85**(1): 214-224.

Marine plastic pollution affects seabirds, including Pacific Northern Fulmars (Fulmarus glacialis rodgersii), that feed at the surface and mistake plastic for prey or incidentally ingest it. Direct and indirect health issues can result, including satiety and possibly leading to inefficient foraging. Our objective was to examine fulmar body condition, identify cephalopod diet to species, enumerate and weigh ingested plastic, and determine if prey number and size were correlated with ingested plastics in beach-cast fulmars wintering in Monterey Bay California (2003, n=178: 2007, n=185). Fulmars consumed mostly Gonatus pyros, G. onyx, and G. californiensis of similar size for both years. We found a significant negative correlation between pectoral muscle index and average size of cephalopod beaks per stomach; a significant increase in plastic categories between 2003 and 2007; and no significant correlation between number and mass of plastic compared with number and size of prey for either year.

Donohue, M. J., et al. (2019). "Evaluating exposure of northern fur seals, Callorhinus ursinus, to microplastic pollution through fecal analysis." Marine Pollution Bulletin **138**: 213-221.

Environmental microplastics are widely documented in marine life and bioaccumulation may present risks to marine predators. Investigations of microplastics in marine mammals are increasing, though none have examined animals routinely consumed by humans. Here, we investigate microplastic exposure in the northern fur seal (Callorhinus ursinus), a species consumed by humans, using fecal material. We examined 44 feces (scat) at sites encompassing the seals' eastern Pacific range. Multiple contamination control measures were implemented, including field and laboratory controls. Fragments were the most common microplastic recovered, in 55% (24/44) of scat and no controls (range 1 to 86 fragments/scat, mean 16.6, sd 19.1). Microplastic fibers were recovered from 41% of scats (18/44), though some controls contained fibers confounding fiber results. Fecal analysis documented northern fur seal exposure to microplastics throughout their eastern Pacific range. Copyright © 2018

Doring, M. and F. A. Siebert (2010). "A method to check the design and specification of seeds in low-dose-rate brachytherapy." Brachytherapy **1)**: S61-S62.

Purpose: Using ¹²⁵Ior ¹⁰³Pd in LDR brachytherapy for prostate implants is a worldwide well-established method. An important factor for the success of the treatment is the exact knowledge of the dose distribution. Each seed type has its own dosimetric characteristics. These can be expressed for example by the TG-43 calculation method that allow for an accurate dose calculation. Due to the different design of the seed models they have an own dosimetric characterization. When using a modern seed treatment planning system the user must rely on that the design of the seeds and the TG-43 data set that is based on this design. It is a consumption that the individual seeds are within the seed types hardware specification. The internal design of six different seed models (Bebig S06, Bebig S17, BrachySeed, IBt, Oncura 6734, Theragenics Modell 200) was investigated and the resulting dimensions can be compared with their specifications. Material(s) and Method(s): To analyze the design of the sources non- radioactive seeds were at first casted in a plastic resin in a cuboid form of about 20 mm x 10 mm x 5 mm size. The casted seeds were manually grinded in longitudinal direction of the seeds until the half of the source was cut. In this way it was possible to visualize the internal design of the seeds over the whole source length. To check that the seed is grinded exactly halfway and consistently over the whole seed length thin marker plates with well known thickness were casted directly beneath the sources. When the grinding procedure reaches the marker this was an indicator that the source was cut halfway. After this process a microscope with an attached digital camera was used to take pictures of the cut seed. Because the images were scaled, absolute dimensions could be obtained. The measurements were carried out three times per seed by one observer and the mean value was used for further analysis. To ensure that the preparation method is reproducible the procedure of casting and grinding was performed four times by the same observer for one seed model (IBt Intersource-125). Result(s): The four times replicated investigations of the IBt seed type resulted in a mean length of 4.41

mm (SD: 0.06 mm) and 0.80 mm (SD: 0.01 mm) for the diameter. These values are close to the source specifications of 4.5 mm length and 0.8 mm diameter. The following seed lengths and diameters were measured for the other seed types: Bebig S06: (4.51 mm, 0.80 mm), Bebig S17: (4.53 mm, 0.82), BrachySeed: (4.22 mm, 0.79 mm), IBt: (4.44 mm, 0.80 mm), Oncura 6734: (4.62 mm, 0.78 mm), Theragenics: (4.43 mm, 0.90 mm). Some of the internal seed dimensions were already analyzed and compared with published data. For example, the length and diameter of the gold marker in the Bebig S06 model are specified with 3.5 and 0.17 mm. In this study 3.51 mm (SD: 0.00) respectively 0.18 mm (SD: 0.01) were obtained from the opened sources. In Figure 1 the cut Bebig S06 seed is shown for illustration. For the titanium wall thickness of this seed model the dimension of 0.05 mm was determined what exactly corresponds with the specification published in the TG-43 report. Conclusion(s): In this study we presented a method to check the internal dimensions of the design of LDR ¹²⁵I and ¹⁰³Pd sources. The preliminary results show no difference to the specification of the seeds.

Doros, A. (2010). "[Interventional radiological treatment of hepatocellular carcinoma]." Orvosi Hetilap **151**(30): 1204-1208.

During the last years, interventional radiological treatment of hepatocellular cancer has changed dramatically. The percutaneous ethanol infiltration is partly replaced by thermoablative methods, mainly by radiofrequency ablation. Cooled-tip electrodes and volumetric therapy planning increased the treatment success. Embolisation beads made vessel occlusion more precise and predictable, while the development of the drug eluting beads led to the most effective way of chemoembolisation. The so called radioembolisation with Yttrium 90 isotopes filled into glass microbeads is slowly gaining acceptance worldwide. Thermoablation and embolisation or chemoembolisation are the main tools for downstaging tumors, or avoiding disease progression in liver transplant recipients on the waiting list. All of these therapeutic options have their well established places in well known and worldwide accepted protocols, such as the algorithm of the Barcelona group (BCLC). In the near future, further results can be expected from the combination of available treatments, including sorafenib medication. [References: 17]

Dorr, I., et al. (1994). "Selecting somatic hybrid plants using magnetic protoplast sorting." Bio/Technology **12**(5): 511-515.

A magnetic cell sorter (MACS) technique designed for animal cells was used to produce large numbers of potato somatic hybrids. Selected biotinylated lectins are used to mediate, via streptavidin, the binding of superparamagnetic microbeads to the protoplasts of one fusion partner. The other partner contains the selectable marker neomycin phosphotransferase II (NPT II). After fusion, the protoplast mixture is sorted by MACS, which retains protoplasts labelled with magnetic microbeads. This fraction is incubated on kanamycin-containing medium, where only hybrid cells grow into calluses. The protoplast staining with lectins, the protoplast separation with MACS and the regeneration of hybrid calluses into plants were optimized. With MACS treatment, the percentage among regenerated plants of hybrids between two clones of Solanum tuberosum increased from 8 to 36%. In the interspecific somatic hybridization S. tuberosum x S. bulbocastanum, the increase was from 28 to 82%. Hybrid plants were identified by DNA fingerprinting and had the morphology and cytology expected for fusion products. The large number of plants which can be obtained should enable selection of hybrids with desired chromosome number, morphology and seed fertility.

Doucette, A., et al. (2000). "Protein concentration and enzyme digestion on microbeads for MALDI-TOF

peptides mass mapping of proteins from dilute solutions." Analytical Chemistry **72**(14): 3355-3362.

A method for generating peptide mass maps from dilute protein samples is presented. The method involves the concentration of proteins from aqueous solution by adsorption onto reversed-phase polymeric microbeads. These beads are then washed extensively to remove contaminants, after which the bound proteins are digested with trypsin. Analysis of the digestion products is performed by MALDI-TOF mass spectrometry following direct deposition of the beads on a MALDI target, along with the matrix solution. The procedure is demonstrated using solutions of cytochrome c, lysozyme, and bovine serum albumin. The results of these digests are compared to trypsin digestions of the protein samples without sample preconcentration. Comparative results are also presented for protein solutions contaminated with 2 M NaCl, 2 M urea, or sodium dodecyl sulfate at concentrations up to 0.02%. These results reveal that, with the microbead preconcentration procedure, peptide mass maps can routinely be generated from highly contaminated samples with a protein concentration of only 100 nM.

Douglas, A. C., et al. (2013). "Akt2 regulates mitophagy in breast cancer cell lines." Cancer Research. Conference: 104th Annual Meeting of the American Association for Cancer Research, AACR **73**(8 SUPPL. 1).

The PI3K-Akt signaling pathway is involved in the regulation of cell growth, proliferation, metabolism, and death by apoptosis and autophagy. There are three isoforms of Akt (1, 2, and 3) that share over 70% sequence identity and two activating phosphorylation sites. The activation of Akt by insulin or insulin-like growth factor (IGF-1) results in rapid phosphorylation of two amino acid residues that are conserved among all three Akt isoforms. Phosphorylation of threonine 308 (Thr308) leads to roughly 100-fold higher activity, while phosphorylation at serine 474 (Ser474) potentiates the activity another 10-fold. The two phosphorylation events are independent of one another and while phosphoinositide-dependent kinase 1 (PDK1) is accepted as the activating kinase for Thr308, the kinase that phosphorylates Ser474 has only recently been confirmed as the target of rapamycin in complex with Rictor and Sin1 (mTORC2). Among the three Akt isoforms, Akt2 is a particularly promising breast cancer therapeutic target, as its ablation most profoundly affects the long-term cell survival rate. Ablation of Akt2 induces autophagy, which increases cancer cell survival and resistance in response to chemotherapy. In this work, we examined the possibility that Akt2 may specifically regulate autophagic destruction of the mitochondria (mitophagy) via the mitophagy activator PINK1. This point of regulation may represent an attractive therapeutic target to decrease autophagy and increase cancer cell death. Insulin signaling promotes the phosphorylation of Akt by mTORC2 via the PTEN-induced putative kinase (PINK1). PINK1 is a serine/threonine mitochondrial kinase that has been linked to familial Parkinson's disease. PINK1 was originally classified in a screen for transcriptional upregulation of genes upon overexpression of PTEN in two endometrial cancer cell lines, but in the same publication high levels of PINK1 mRNA were present in ovarian tumours that were lacking PTEN. No further investigations into this relationship have been described and it remains unclear as to the relationship between PTEN, Akt, and PINK1, and how regulation occurs at the transcriptional or posttranslational level. Normally PINK1 regulates mitochondrial quality control by targeting defective mitochondria for autophagy (referred to as mitophagy) via the ubiquitin E3 ligase Parkin. We have identified an interaction between Akt2 and the major regulator of mitophagy (PINK1). We suggest that Akt2 normally inhibits mitophagy, and that inhibition of Akt leads to selective autophagic destruction of the mitochondria. We next wanted to determine whether Akt2 activation is required for its mitochondrial localization. Mitochondria isolations were performed using magnetic labelling of the mitochondria with Anti-TOM22 microbeads. The results suggest that the key activating

residues of Akt2 may not be required for mitochondrial localization.

Doyen, P., et al. (2019). "Occurrence and identification of microplastics in beach sediments from the Hauts-de-France region." Environmental Science & Pollution Research **26**(27): 28010-28021.
The present work was carried out to quantify microplastics (MP) from three sandy beaches along the Cote d'Opale coastline located in the Hauts-de-France region of northern France. Three different study sites located along the English Channel were investigated due to different levels of anthropopression and hydrodynamic conditions. Sediments were collected at three different tide lines: high tide line (HTL), middle of the intertidal zone (IZ), and low tide line (LTL), to investigate the effects of tide line on microplastic contamination. Particles and fibers were counted and colors were recorded; polymer identification was then performed using pyrolysis-gas chromatography-mass spectrometry (Py-GC/MS). Particle and fiber abundances ranged from 23.4 +/- 18.9 to 69.3 +/- 30.6 items kg⁻¹ dry weight sediment, with a trend towards fiber predominance, were observed. No difference in particle and fiber abundance was found between the different beaches and tide lines, except for Boulogne-sur-Mer, where the particle number was significantly different between tide lines. Major polymers identified were polyethylene (36.6%) and polypropylene (10.7%). This citizen science project provided preliminary data about the abundance and polymeric nature of MP along the Cote d'Opale coastline.

Doyle, D., et al. (2019). "Low levels of microplastics recorded from the common periwinkle, Littorina littorea on the west coast of Ireland." Marine Pollution Bulletin **149 (no pagination)**(110645).
Microplastics (MPs) are an environmental pollutant of increasing concern. However, little research has assessed MP levels in intertidal gastropods. The authors explored MP abundance in the gastropod Littorina littorea from four sites within Galway Bay, West Ireland. To do this, 50 L. littorea were collected from four rocky shores of varying wave exposure, with two sites located in the north of the bay and two in the south. An additional 50 individuals were taken from a commercial exporter, to determine MP levels in L. littorea intended for human consumption. MPs were recovered from 60.4% of the individuals and the average MP level was 2.14 MPs/gram of wet soft body mass. MP levels differed significantly between sites, with the two northern sites having the highest levels. Oceanographic conditions within Galway Bay are likely responsible for the observed variation in MP abundance, with the North Sound of the bay potentially facilitating deposition. Copyright © 2019

Doyle, M. J., et al. (2011). "Plastic particles in coastal pelagic ecosystems of the Northeast Pacific ocean." Marine Environmental Research **71**(1): 41-52.
The purpose of this study was to examine the distribution, abundance and characteristics of plastic particles in plankton samples collected routinely in Northeast Pacific ecosystems, and to contribute to the development of ideas for future research into the occurrence and impact of small plastic debris in marine pelagic ecosystems. Plastic debris particles were assessed from zooplankton samples collected as part of the National Oceanic and Atmospheric Administration's (NOAA) ongoing ecosystem surveys during two research cruises in the Southeast Bering Sea in the spring and fall of 2006 and four research cruises off the U.S. west coast (primarily off southern California) in spring, summer and fall of 2006, and in January of 2007. Nets with 0.505 mm mesh were used to collect surface samples during all cruises, and sub-surface samples during the four cruises off the west coast. The 595 plankton samples processed indicate that plastic particles are widely distributed in surface waters. The proportion of surface samples from each cruise that contained particles of plastic ranged from 8.75 to

84.0%, whereas particles were recorded in sub-surface samples from only one cruise (in 28.2% of the January 2007 samples). Spatial and temporal variability was apparent in the abundance and distribution of the plastic particles and mean standardized quantities varied among cruises with ranges of 0.004-0.19 particles/m3, and 0.014-0.209 mg dry mass/m3. Off southern California, quantities for the winter cruise were significantly higher, and for the spring cruise significantly lower than for the summer and fall surveys (surface data). Differences between surface particle concentrations and mass for the Bering Sea and California coast surveys were significant for pair-wise comparisons of the spring but not the fall cruises. The particles were assigned to three plastic product types: product fragments, fishing net and line fibers, and industrial pellets; and five size categories: <1 mm, 1-2.5 mm, >2.5-5 mm, >5-10 mm, and >10 mm. Product fragments accounted for the majority of the particles, and most were less than 2.5 mm in size. The ubiquity of such particles in the survey areas and predominance of sizes <2.5 mm implies persistence in these pelagic ecosystems as a result of continuous breakdown from larger plastic debris fragments, and widespread distribution by ocean currents. Detailed investigations of the trophic ecology of individual zooplankton species, and their encounter rates with various size ranges of plastic particles in the marine pelagic environment, are required in order to understand the potential for ingestion of such debris particles by these organisms. Ongoing plankton sampling programs by marine research institutes in large marine ecosystems are good potential sources of data for continued assessment of the abundance, distribution and potential impact of small plastic debris in productive coastal pelagic zones.

Drain, S., et al. (2010). "Multidrug resistance gene expression in plasma cell myeloma." Haematologica **2)**: 387-388.

Background: Multi-drug resistance (MDR) is a phenomenon that can lead to impaired treatment efficacy in all forms of malignancy. The most prominent forms of MDR are mediated by the drug effluxing actions of certain adenosine tri-phosphate binding cassette (ABC) transport proteins. Recent debates in plasma cell myeloma (PCM) have questioned which of the many ABC transporters are to be implicated in the course of this disease and also in the treatment of PCM post relapse. rs1045642 is a SNP within ABCB1 which is thought to affect the activity of the protein product (P-glycoprotein) and has demonstrated significant associations with overall survival in PCM1. Aims. This study was designed to investigate the expression of the MDR associated genes; ABCB1, ABCB4, LRP, ABCC1 and ABCG2 in PCM. We also wished to determine the impact of rs1045642 on ABCB1 mRNA levels in PCM. Method(s): 89 patients with a confirmed diagnosis of PCM were studied with ethical consent approved via ORECNI. Of these patients, 81 were biopsied at diagnosis of either MGUS or MM and 8 at relapse. Tumour cells were separated from bone marrow biopsies using CD138+magnetic microbeads and RNA was extracted using Trizol. mRNA expression was determined for each gene using relative quantification and taqman validated assays. Results are expressed as a fold change from expression in normal plasma cells. Result(s): Of the 5 genes investigated, ABCB4 (MDR-3) has demonstrated the greatest increase in PCM patients at diagnosis with a mean fold change of 26. In relapsed samples, all genes apart from ABCB1 have demonstrated a substantial decrease in mean fold change with ABCB4 mean fold change reduced to 9. ABCB1 mean fold change was increased from 0.6 at diagnosis to 2.8 in relapsed samples. MDR gene expression was not significantly associated with currently available prognostic factors in PCM (B2M, Albumin, Ig class and light chain restriction). rs1045642 does not affect ABCB1 mRNA levels in PCM patient samples. Conclusion. This study suggests that ABCB4 may be the most prominent contributor to MDR and initial treatment failure in newly diagnosed PCM. ABCB1, however, appears to haveincreased mRNA levels in relapsed samples suggesting that P-gp may be a more prominent

contributor to treatment strategies, post relapse, in PCM. MDR gene expression may be an independent factor affecting treatment within this patient cohort. rs1045642 does not alter ABCB1 mRNA levels in PCM suggesting that effects of this SNP manifest at the protein level. Further work will investigate the expression and activity of P-glycoprotein in PCM and will determine the clinical effect of rs1045642 on P-gp.

Driedger, A. G. J., et al. (2015). "Plastic debris in the Laurentian Great Lakes: a review." Journal of Great Lakes Research **41**(1): 9-19.

Pollution by plastic debris is an increasing environmental concern in the Laurentian Great Lakes where it affects open-water, shoreline, and benthic environments. Open-water surveys reveal that, in certain areas of the Great Lakes, surface water densities of plastics are as high as those reported for areas of litter accumulation within oceanic gyres. Data from volunteer beach cleanups show that typically more than 80% of anthropogenic litter along the shorelines of the Great Lakes is comprised of plastics. The distribution of plastics in bottom sediments of the Great Lakes is essentially unknown. Sources of plastic debris to the Great Lakes include microplastic beads from consumer products, pellets from the plastic manufacturing industry, and waste from beach-goers, shipping, and fishing activities. Many plastics degrade slowly in the environment and may have long-term adverse ecological and economic impacts, including the dispersal of persistent organic pollutants. Plans to combat and curtail plastic debris pollution in the Great Lakes will come at a significant economic cost, likely in excess of $400 million annually. Here, we review the current state of knowledge on plastic pollution in the Great Lakes, identify knowledge gaps, and suggest future research directions.

Dris, R., et al. (2017). "A first overview of textile fibers, including microplastics, in indoor and outdoor environments." Environmental Pollution **221**: 453-458.

Studies about microplastics in various environments highlighted the ubiquity of anthropogenic fibers. As a follow-up of a recent study that emphasized the presence of man-made fibers in atmospheric fallout, this study is the first one to investigate fibers in indoor and outdoor air. Three different indoor sites were considered: two private apartments and one office. In parallel, the outdoor air was sampled in one site. The deposition rate of the fibers and their concentration in settled dust collected from vacuum cleaner bags were also estimated. Overall, indoor concentrations ranged between 1.0 and 60.0 fibers/m³. Outdoor concentrations are significantly lower as they range between 0.3 and 1.5 fibers/m³. The deposition rate of the fibers in indoor environments is between 1586 and 11,130 fibers/day/m² leading to an accumulation of fibers in settled dust (190-670 fibers/mg). Regarding fiber type, 67% of the analyzed fibers in indoor environments are made of natural material, primarily cellulosic, while the remaining 33% fibers contain petrochemicals with polypropylene being predominant. Such fibers are observed in marine and continental studies dealing with microplastics. The observed fibers are supposedly too large to be inhaled but the exposure may occur through dust ingestion, particularly for young children.

Dris, R., et al. (2015). "Microplastic contamination in an urban area: a case study in Greater Paris. (Special Issue: Microplastics in the environment.)." Environmental Chemistry **12**(5): 592-599.

This study investigates the microplastic contamination of both urban compartments (wastewater and total atmospheric fallout) and surface water in a continental environment. These first investigations on an urban environment confirm the presence of microplastics in sewage, fresh water and total atmospheric fallout and provide knowledge on the type and size distribution of microplastics in the 100-5000- micro m range. For the first time, the presence of

microplastics, mostly fibres, is highlighted in total atmospheric fallout (29-280 particles m⁻² day⁻¹). High levels of fibres were found in wastewater (260-320x10³ particles m⁻³). In treated effluent, the contamination significantly decreased to 14-50x10³ particles m⁻³. In the River Seine, two sampling devices were used to collect both large and small microplastic particles: (i) a plankton net (80- micro m mesh), and (ii) a manta trawl (330- micro m mesh). Sampling with the plankton net showed a predominance of fibres, with concentrations ranging from 3 to 108 particles m⁻³. A greater diversity of both microplastic shapes and types was found during manta trawl sampling but at much lower concentrations (0.28-0.47 particles m⁻³). This combined approach could be relevant and implemented in future studies to provide an accurate overview of microplastic distribution in freshwater.

Dris, R., et al. (2018). "Synthetic and non-synthetic anthropogenic fibers in a river under the impact of Paris Megacity: Sampling methodological aspects and flux estimations." Science of the Total Environment **618**: 157-164.

Processed fibers are highly present in our daily life and can be either natural, artificial (regenerated cellulose) and synthetic (made with petrochemicals). Their widespread use lead inevitably to a high contamination of environment. Previous studies focus on plastic particles regardless of their type or shape as long as they are comprised between 330mum and 5mm. On the contrary, this study focuses exclusively on fibers using a smaller mesh size net (80mum) to sample freshwater. Moreover, all processed organic fibers are considered, irrespective to their nature. First, the short term temporal variability of the fibers in the environment was assessed. While exposing the sampling net during 1min a coefficient of variation of approx. 45% (with n=6) was determined. It was of only 26% (n=6) when the exposure was of 3min. The assessment of the distribution through the section showed a possible difference in concentrations between the middle of the water surface and the river banks which could be attributed to the intense river traffic within the Paris Megacity. The vertical variability seems negligible as turbulence and current conditions homogenize the distribution of the fibers. A monthly monitoring showed concentrations of 100.6+/-99.9fibers.m⁻³ in the Marne River and of: 48.5+/-98.5, 27.9+/-26.3, 27.9+/-40.3 and 22.1+/-25.3fibers.m⁻³ from the upstream to downstream points in the Seine River. Once these concentrations are converted into fluxes, it seems that the impact generated by the Paris Megacity cannot be distinguished. Investigations on the role of sedimentation and deposition on the banks are required. This study helped fill some major knowledge gaps regarding the fibers in rivers, their sampling, occurrence, spatial-temporal distribution and fluxes. It is encouraged that future studies include both synthetic and none synthetic fibers.

Dris, R., et al. (2016). "Synthetic fibers in atmospheric fallout: A source of microplastics in the environment?" Marine Pollution Bulletin **104**(1-2): 290-293.

Sources, pathways and reservoirs of microplastics, plastic particles smaller than 5mm, remain poorly documented in an urban context. While some studies pointed out wastewater treatment plants as a potential pathway of microplastics, none have focused on the atmospheric compartment. In this work, the atmospheric fallout of microplastics was investigated in two different urban and sub-urban sites. Microplastics were collected continuously with a stainless steel funnel. Samples were then filtered and observed with a stereomicroscope. Fibers accounted for almost all the microplastics collected. An atmospheric fallout between 2 and 355 particles/m(2)/day was highlighted. Registered fluxes were systematically higher at the urban than at the sub-urban site. Chemical characterization allowed to estimate at 29% the proportion

of these fibers being all synthetic (made with petrochemicals), or a mixture of natural and synthetic material. Extrapolation using weight and volume estimates of the collected fibers, allowed a rough estimation showing that between 3 and 10 tons of fibers are deposited by atmospheric fallout at the scale of the Parisian agglomeration every year (2500 km(2)). These results could serve the scientific community working on the different sources of microplastic in both continental and marine environments.

Dris, R., et al. (2015). "Beyond the ocean: contamination of freshwater ecosystems with (micro-)plastic particles. (Special Issue: Microplastics in the environment.)." Environmental Chemistry **12**(5): 539-550.

Massive accumulation of plastic particles has been reported for marine ecosystems around the world, posing a risk to the biota. Freshwater ecosystems have received less attention despite most plastic litter being produced onshore and introduced into marine environments by rivers. Some studies not only report the presence of microplastics in freshwater ecosystems, but show that contamination is as severe as in the oceans. In continental waters, microplastics have been observed in both sediments (predominantly lake shores but also riverbanks) and water samples (predominantly surface water of lakes and rivers). This review highlights recent findings and discusses open questions, focussing on the methodology of assessing this contaminant in freshwater ecosystems. In this context, method harmonisation is needed in order to obtain comparable data from different environmental compartments and sites. This includes sampling strategies (at spatial and temporal scales), sample treatment (taking into consideration high levels of organic matter and suspended solids) and reliable analytical methods to identify microplastics.

Dris, R., et al. (2015). "Beyond the ocean: contamination of freshwater ecosystems with (micro-)plastic particles." Environmental Chemistry **12**(5): 539-550.

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Drury, W. J., et al. (1993). "Interactions of 1 um latex particles with Pseudomonas aeruginosa biofilm." Water Research **27**(7): 1119-1126.

Some of the ways in which particles and biofilms might react in water and waste treatment are indicated, and results are reported from experiments to study such interactions in a well-characterized model system, with fluorescently-labelled latex microbeads and biofilms of Pseudomonas aeruginosa in a continuous flow annular reactor. The microbeads attached readily to the biofilm and could be easily identified and enumerated separately from the bacteria. The particles penetrated the full 34 um depth of the biofilm. Capture of the microbeads by the biofilm was proportional to the biofilm cell carbon concentration and to the standard deviation

in biofilm thickness measurements. The microbeads formed aggregates on the biofilm but not in the associated bulkwater. The retention period for the beads in the biofilm was much longer than that for suspended particles in the reactor. These experiments simulated the fate of quiescent (non-producing) micro-organisms in biological reactors.

Dryden, G. W., et al. (2011). "EGCG reduces pro-inflammatory cytokine production and induces apoptosis in activated CD14+ macrophages, CD4+Cd45+RO T cells, and mixed macrophage/T cell populations, but not CD4+Cd45+RA T cells from IBD patients and controls." Gastroenterology **1)**: S838.

Introduction: Due to its anti-oxidant, anti-inflammatory and pro-apoptotic effects, (-)epigallo-catechin 3-gallate (EGCG), the major green tea polyphenol, has sparked considerable interest as a potential therapeutic agent for chronic inflammatory diseases, including the inflammatory bowel diseases (IBD) Crohn's disease and ulcerative colitis. Aim(s): To analyze the ability of EGCG to inhibit production of pro-inflammatory cytokines and to induce apoptosis in subpopulations (CD14⁺ macrophages, CD4⁺CD45⁺RO T cells and CD4⁺CD45⁺RA T cells) of human peripheral blood mononuclear cells from IBD patients and controls. Method(s): CD14⁺ macrophages, CD4⁺CD45⁺RO and CD4⁺CD45⁺RA T cells were isolated by microbead technology from the peripheral blood of 5 IBD patients and 3 normal controls. Varying levels of EGCG were introduced into the supernatant for 24h with LPS-stimulated CD14⁺ macrophages, CD4⁺CD45⁺RO or CD4⁺CD45⁺RA T cells alone or mixed with CD14⁺ macrophages and the two T cell subpopulations. Supernatants were collected to assay IBD related cytokines, including IFNgamma, IL-6, and IL-17. Under similar conditions, apoptosis of the cells was assessed by Annexin V/propidium iodide staining immediately following the 24 hr culture. Result(s): In IBD patients, EGCG administration (5mug/ml) clearly diminished the production of pro-inflammatory cytokines in cultures of LPS-stimulated CD14⁺ macrophages alone or mixtures of macrophages co-cultured with CD4⁺CD45⁺RO T cells (see table for % reduction from LPS-stimulated baseline). However, EGCG had little or no effect on cultures of CD4⁺CD45⁺RA T cells. In cultures of cells from healthy control individuals, EGCG showed a similar inhibitory pattern. In IBD patients, EGCG (5mug/ml) induced significant apoptosis in 24 h cultures of LPS-stimulated CD14⁺ macrophages and CD4⁺CD45⁺RO T cells alone, while no apoptosis was detected (0.9%) in CD4⁺CD45⁺RA T cell cultures. In mixed cultures of LPS stimulated CD14+ macrophages and CD4⁺CD45⁺RO T cells, the same EGCG concentration induced significant apoptosis. No significant apoptosis (0.42%) was observed when CD4⁺CD45⁺RA T cells were substituted. Interestingly, cells from healthy control (normal) individuals showed similar patterns of response to EGCG, but reduced levels of apoptosis, whether examining LPS-stimulated CD14⁺ macrophages or CD4⁺CD45⁺RO T cells stimulated with anti-CD3. Discussion(s): These results reveal that EGCG administration imparts significant anti-inflammatory and proapoptotic effects, as evidenced by its capacity to reduce production of several pro-inflammatory cytokines and induce significant rates of apoptosis in LPS-stimulated CD14+ macrophages and CD4⁺CD45⁺RO T cells. The latter effect seemed to be more pronounced in cells from IBD patients compared to healthy controls. We are currently evaluating this therapy in patients with active colitis. (Table presented).

Dryden, G. W., et al. (2009). "EGCG, a green tea catechin, reduces pro-inflammatory cytokine production

by CD14⁺ macrophages, CD4⁺Cd45⁺RO⁺ T cells, and mixed macrophage/T Cell populations from IBD patients and controls." Gastroenterology **1)**: A687.

Introduction: Green tea polyphenols, particularly -(-) epigallocatechin 3-gallate (EGCG), have sparked considerable interest as potential therapeutic agents for chronic inflammatory diseases due to their anti-oxidant and anti-inflammatory effects. Aim(s): Analyze the ability of EGCG to inhibit production of pro-inflammatory cytokines in human peripheral blood mononuclear cells (PBMCs) In Vitro to gauge its anti-inflammatory effects in immune cells from IBD patients. Method(s): PBMCs were obtained from 4 colitis patients and 4 normal controls and enriched for monocytes or lymphocytes by plastic adherence. CD14+ macrophages, CD4⁺CD45⁺RO⁺ and CD4⁺CD45⁺RA⁺ T cells were isolated respectively by microbead technology. Three experiments were performed: 1) Lipopolysaccharide (LPS) stimulated CD14⁺ macrophages alone, 2) co-cultured with CD4⁺CD45⁺RO⁺ or CD4⁺CD45⁺RA⁺ T cells, or 3) anti-CD3 Ab stimulated CD4⁺CD45⁺RO⁺ T cells were incubated in the presence of EGCG (0-10 ng/mul) for 3 and 6 days. Supernatants were collected for cytokine analysis by ELISA. Result(s): LPS stimulated CD14⁺macrophages, orCD4⁺CD45⁺RO⁺T cells co-cultured with LPS stimulated macrophages experienced a dose-dependent reduction in pro-inflammatory cytokine production as shown in table 1. Co-culture of CD14⁺ macrophages with CD4⁺CD45⁺RO⁺ T cells resulted in a 92% reduction of IL-17 production. There was no change in IL-17 production when CD4⁺CD45⁺RA⁺T cells were substituted. When evaluated in LPS stimulated CD14⁺ macrophages alone, EGCG elicited a similar reduction in cytokine production. Reduced cytokine levels were not due to loss of cell viability. Discussion(s): These results reveal that EGCG produces a significant anti-inflammatory effect by reducing the production of the pro-inflammatory cytokines TNFalpha, IL-1beta, IL-6, and IFNgamma. The ability of EGCG to increase apoptosis in lymphocytes from colitis patients, but not from healthy controls, suggests that it may offer a clinical benefit by this mechanism, as well. We are currently conducting a clinical trial in patients with ulcerative colitis to evaluate the clinical correlation of these findings. {Table presented}.

Drzyzga, O. and A. Prieto (2019). "Plastic waste management, a matter for the ‘community’." Microbial Biotechnology **12**(1): 66-68.

[...]according to all current expert reports, if the advantages of plastics are to be enjoyed in full, we also need to promote the most sustainable waste management alternatives, encourage recycling, use energy recovery as a complementary option and restrict the dumping in landfills of all recoverable plastic waste. By screening natural microbial communities exposed to PET in the environment, Yoshida et al. ( ) isolated a novel bacterium (Ideonella sakaiensis strain 201-F6) that can use PET as its major energy and carbon source. Natural or designed microbial communities might also be used for the biodegradation of petroleum-based plastic waste, with a balanced set of enzymes attacking the carbon backbones under favourable abiotic conditions (e.g. at controlled industrial composting facilities; Bhardwaj et al.,). [...]it may be possible to design efficient microbial communities able to degrade plastic waste – even those types currently recalcitrant to biologically driven breakdown.

Du, P., et al. (2009). "Construction of DNA sandwich electrochemical biosensor with nanoPbS and

nanoAu tags on magnetic microbeads." Biosensors & Bioelectronics **24**(11): 3223-3228.

A novel and sensitive sandwich electrochemical biosensor based on the amplification of magnetic microbeads and Au nanoparticles (NPs) modified with bio bar code and PbS nanoparticles was constructed in the present work. In this method, the magnetic microspheres were coated with 4 layers polyelectrolytes in order to increase carboxyl groups on the surface of the magnetic microbeads, which enhanced the amount of the capture DNA. The amino-functionalized capture DNA on the surface of magnetic microbeads hybridized with one end of target DNA, the other end of which was hybridized with signal DNA probe labelled with Au NPs on the terminus. The Au NPs were modified with bio bar code and the PbS NPs were used as a marker for identifying the target oligoncleotide. The modification of magnetic microbeads could immobilize more amino-group terminal capture DNA, and the bio bar code could increase the amount of Au NPs that combined with the target DNA. The detection of lead ions performed by anodic stripping voltammetry (ASV) technology further improved the sensitivity of the biosensor. As a result, the present DNA biosensor showed good selectivity and sensitivity by the combined amplification. Under the optimum conditions, the linear relationship with the concentration of the target DNA was ranging from 2.0 x 10(-14) M to 1.0 x 10(-12)M and a detection limit as low as 5.0 x 10(-15)M was obtained.

Du, X., et al. (2009). "The epidemiological study on cryptosporidiosis in outpatients of Nanjing children's hospital." Journal of Tropical Medicine **9**(4): 382-385.

The prevalence of cryptosporidiosis among the paediatric outpatients of the Nanjing Children's Hospital, Jiangsu, China, was investigated. 2268 faecal samples collected from July to August and September to October were screened for Cryptosporidium using modified acid-fast staining and then sequentially diagnosed using auramine phenol fluorescence-modified acid-fast complex straining. In addition, 207 serum samples were randomly obtained from the outpatients to detect specific IgG to the Cryptosporidium recombinant SA35 protein using the microbead immunoassay (MIA). The prevalence of cryptosporidiosis based on faecal parasitological examination was 0.97%. The positive rate of anti-SA35 IgG was 29.95%. The prevalence was not significantly different between the male and female patients (P>0.05) by faecal examination, whereas there was a significant difference between children under and above one year old (P<0.05) by MIA. It is concluded that children in Nanjing and surrounding regions are still at risk of cryptosporidiosis in the summer and autumn.

Du, X., et al. (2009). "The application of microbead immunoassay in the research and diagnosis of parasitology." Zhongguo Bingyuan Shengwuxue Zazhi / Journal of Pathogen Biology **4**(9): 712-715.

The development and application of medical experimental methods are fundamental to medical research and disease diagnosis. Microbead immunoassay (MIA) can be used to detect specific proteins including cytokines and pathogenic antigen, as well as nucleic acids etc. MIA, which utilizes microbeads as solid support, can measure simultaneously up to 100 different analytes in a single reaction well and its predominance includes high sensitivity, specificity, reliability, and rapid multiplex detection capability. In recent years, MIA has been more and more applied in parasitological research and diagnostic test development. In this paper, we focus on the history, advantages and disadvantages of MIA, and its application and perspective in the fields of parasitology research are also reviewed.

Du, X. L., et al. (2009). "Simultaneous detection of serum immunoglobulin G antibodies to Cryptosporidium parvum by multiplex microbead immunoassay using 3 recognized specific recombinant C. parvum antigens." Diagnostic Microbiology & Infectious Disease **65**(3): 271-278.

Cryptosporidiosis is a significant diarrheal disease in both humans and other mammals worldwide. In the present study, we established and validated a multiplex microbead immunoassay (MIA) for surveillance of Cryptosporidium parvum infections. In the multiplex MIA, 3 specific recombinant proteins, CP23, SA35, and SA40, were used as the capture antigens simultaneously. The antibody directed against CP23 is an index of historic infection, and those against SA35 and SA40 are indices of recent infection. The multiplex MIA yielded essentially identical results with that of monoplex MIA using these 3 recombinant proteins, and the reproducibility of the multiplex MIA results was high when standardized with a calibration curve. With multiplex MIA, we detected that the pediatric population showed a higher percentage of recent infections (seropositive rates of antibodies directed against CP23, SA35, and SA40 were 6.28%, 23.19%, and 22.71%, respectively, n = 207), whereas the adult population showed a higher percentage of historic infections (seropositive rates of antibodies directed against CP23, SA35, and SA40 were 24.40%, 11.48%, and 16.75%, respectively, n = 209).

Duan, H., et al. (2019). "Post-consumer packaging waste from express delivery in China." Resources, Conservation and Recycling **144**: 137-143.

Express delivery plays a vital role in modern economy, but also brings great concern on post-consumer packaging waste. This study is therefore designed to characterize the material flows and environmental implications of post-consumer packaging waste from express delivery in China. While express delivery packaging uses mainly recycled materials, post-consumer packaging wastes are only partially recycled in China. In addition, plastic packaging materials are mainly produced from recycled agricultural films and contain chemical residues from pesticide applications which may have significant health impacts on employees and consumers in the express delivery industry. Policy suggestions are provided for government, express delivery service providers, and consumers to mitigate environmental impacts of post-consumer packaging waste from China's booming express delivery industry. Copyright © 2019 Elsevier B.V.

Duan, Z., et al. (2019). "Microplastics in Yellow River Delta wetland: Occurrence, characteristics, human influences, and marker." Environmental Pollution: 113232.

Microplastics (MPs) are widespread in the environment including coastal wetlands. The influence of different types and intensities of human activities on the occurrence of MPs in coastal wetlands is still unknown. The aim of this study was to investigate the distribution of MPs and the contribution of human activities in different areas of Yellow River Delta wetland. MPs were widely detected in different areas of the wetland even in the protection area with little human activities. Direct human activities resulted in more severe MPs contamination in the protection area than the tourism area. In the soil of different areas, the MPs abundances ranged from 136 to 2060 items/kg. The concentrations of polyethylene terephthalate (PET) ranged from 536 to 660mug/kg, and the concentrations of polycarbonate (PC) ranged from 83.9 to 196mug/kg. The MP abundances of the three areas had significant correlations with PET concentrations. These results indicate that the direct influence of human activities has much greater contribution than indirect influence. These results also suggest that PET concentration can be used as a potential marker of MPs contamination in wetland soils.

Duangchan, A. and C. Samart (2008). "Tertiary recycling of PVC-containing plastic waste by copyrolysis with cattle manure." Waste Management **28**(11): 2415-2421.

The corrosion from pyrolysis of PVC in plastic waste was reduced by copyrolysis of PVC with cattle manure. The optimization of pyrolysis conditions between PVC and cattle manure was studied via a statistical method, the Box-Behnken model. The pyrolysis reaction was operated in a tubular reactor. Heating rate, reaction temperature and the PVC:cattle manure ratio were optimized in the range of 1-5 degreeC/min, 250-450 degreeC and the ratio of 1:1-1:5, respectively. The suitable conditions which provided the highest HCl reduction efficiency were the lowest heating rate of 1 degreeC/min, the highest reaction temperature of 450 degreeC, and the PVC:cattle manure ratio of 1:5, with reliability of more than 90%. The copyrolysis of the mixture of PVC-containing plastic and cattle manure was operated at optimized conditions and the synergistic effect was studied on product yields. The presence of manure decreased the oil yield by about 17%. The distillation fractions of oil at various boiling points from both the presence and absence of manure were comparable. The BTX concentration decreased rapidly when manure was present and the chlorinated hydrocarbon was reduced by 45%. However, the octane number of the gasoline fraction was not affected by manure and was in the range of 99-100. © 2008 Elsevier Ltd. All rights reserved.

Dubaish, F. and G. Liebezeit (2013). "Suspended microplastics and black carbon particles in the Jade system, southern North Sea." Water, Air, and Soil Pollution **224 (2) (no pagination)**(1352).
Suspended microplastic and black carbon (BC) particles were determined in surface waters of the Jade system, southern North Sea, including freshwater sources. On average, 64 +/- 194 granular particles, 88 +/- 82 fibres and 30 +/- 41 BC particles/L were recorded. Maximum numbers reached 1,770/L for granules, 650/L for fibres and 330/L for black carbon particles. The distribution along a transect from the inner to the outer part of the Jade system indicates granular particles to be dominant in the inner part, while fibres occur more prominently in the outer part. The distribution of BC particles was more uniform. All freshwater sources including sewage treatment plant effluents discharged microplastics, while BC was encountered only at two of nine discharge points. © 2013 Springer Science+Business Media Dordrecht.

Dubbelboer, I. R., et al. (2018). "Porcine and Human In Vivo Simulations for Doxorubicin-Containing Formulations Used in Locoregional Hepatocellular Carcinoma Treatment." AAPS Journal **20**(6): 96.
It is important to be able to simulate and predict formulation effects on the pharmacokinetics of a drug in order to optimize effectivity in clinical practice and drug development. Two formulations containing doxorubicin are used in the treatment of hepatocellular carcinoma (HCC): a Lipiodol-based emulsion (LIPDOX) and a loadable microbead system (DEBDOX). Although equally effective, the formulations are vastly different, and little is known about the parameters affecting doxorubicin release in vivo. However, mathematical modeling can be used to predict doxorubicin release properties from these formulations and its in vivo pharmacokinetic (PK) profiles. A porcine semi-physiologically based pharmacokinetic (PBPK) model was scaled to a human physiologically based biopharmaceutical (PBBP) model that was altered to include HCC. DOX in vitro and in vivo release data from LIPDOX or DEBDOX were collected from the literature and combined with these in silico models. The simulated pharmacokinetic profiles were then compared with observed porcine and human HCC patient data. DOX pharmacokinetic profiles of LIPDOX-treated HCC patients were best predicted from release data sets acquired by in vitro methods that did not use a diffusion barrier. For the DEBDOX group, the best predictions were from the in vitro release method with a low ion concentration and a reduced loading dose. The in silico modeling combined with historical release data was effective in predicting in vivo plasma exposure. This can give useful insights into the release method properties necessary for correct in vivo predictions of pharmacokinetic profiles of HCC patients dosed with LIPDOX or DEBDOX.

Dubey, M. and J. R. Van Der Meer (2016). "Measuring microbial interactions in soil in high throughput."

Clinical Chemistry and Laboratory Medicine **54 (7)**: eA87.
Microbial ecosystem engineering approaches often rely on the introduction of one or more selected species into an existing microbial community. The success of introduced species to a large extent depends on the types of interactions that it is developing with other existing microbes, such as neutralism, commensalism, syntrophism or competition. Deciphering the rules governing microbial species' interactions is a strenuous task. Our project is focused on better understanding the principles of success of establishing pure cultures in complex microbial ecosystems such as contained within soil. Here we develop a high-throughput co-cultivation approach that might enable us to study the species' "interactome", the identification of favourable and non-favourable species combinations that decide on the survival of the inoculant in the community. We use agarose micro-beads as growth chambers to randomly combine soil community members with or without pure culture inoculants. Growth of co-cultured species members is followed by microscopy and enables a global overview of potentially positive effects of the inoculant on growth of the members in the soil on specific carbon substrates. In addition, the "interactome" study allows detecting possible species pairs, negative or positive, that can be recovered and identified in detail. The resulting knowledge not only provides ample data in designing functional synthetic communities but also construct new avenues for "synthetic ecology".

Dubey, S. K., et al. (2019). "Recent avenues in Novel Patient-Friendly Techniques for the Treatment of Diabetes." Current Drug Delivery **05**: 05.
BACKGROUND: Diabetes is one of the most common chronic metabolic disorder which affect the quality of human life worldwide. As per the WHO report, between 1980 to 2014, the number of diabetes patient increases from 108 million to 422 million, with a global prevalence rate of 8.5% per year. Diabetes is the prime reason behind various other diseases like kidney failure, stroke, heart disorders, glaucoma, etc. It is recognized as the seventh leading cause of death throughout the world. The available therapies are painful (insulin injections) and inconvenient due to higher dosing frequency. Thus, to find out a promising and convenient treatment, extensive investigations are carried out globally by combining novel carrier system (like microparticle, microneedle, nanocarrier, microbeads etc.) and delivery devices (insulin pump, stimuli-responsive device, inhalation system, bioadhesive patch, insulin pen etc.) for more precise diagnosis and painless or less invasive treatment of disease.
OBJECTIVE: The review article is made with an objective to compile information about various upcoming and existing modern technologies developed to provide greater patient compliance and reduce the undesirable side effect of the drug. These devices evade the necessity of daily insulin injection and offer a rapid onset of action, which sustained for a prolonged duration of time to achieve a better therapeutic effect.
CONCLUSION: Despite numerous advantages, various commercialized approaches like Afrezza (inhalation insulin) face failure in recent years. Such results call for more potential work to develop a promising system. The novel approaches range from the delivery of non-insulin blood glucose lowering agents to insulin-based therapy with minimal invasion are highly desirable.

Dubnyak, D., et al. (2017). "Short-term chimerism in T-helper cell subsets after allogeneic hematopoietic stem cell transplantation." Haematologica **102 (Supplement 2)**: 861.
Background: Despite the fact that almost all studies in transplant biology dedicate T-cells the chimerism in T-helper (Th) cells and its subsets such as T-regulatory (Treg) cells after allogeneic hematopoietic stem cell transplantation (allo-HSCT) has never been evaluated. Aim(s): To evaluate Th, Treg and bone marrow cell short-term chimerism in allo- HSCT patients. Method(s):

Between May 2015 and November 2016 there was 109 transplants in our center. The research included 24 patients with hematological malignancies (AML =14,ALL =7,MDS =2,CMML -1). The median age of patients was 33,5 (range 19 to 60) years old, female=16, male=8. Myeloablative conditioning regimen was used for 11 patients. The other 13 patients underwent reduced intensity conditioning regimen. Peripheral blood stem cells (PBSCs) as graft source was used in 9 patients, BM in 15 patients. 9 patients were transplanted from HLA-identical related donor ,15 - from unrelated matched. ?himerism was evaluated at +30, +60, and 90-day in blood and bone marrow. Peripheral blood mononuclear cells (PBMC) were isolated using standard protocol. Cells were sequentially incubated with CD4-biotin and anti-biotin microbeads (Milteney Biotec, Germany). Next pure fraction of Treg cells (CD4+CD25high) was obtained by positive selection with the use of anti-CD25 microbeads. DNA was isolated by AmpliSens DNA-sorbB nucleic acid extraction kit. Chimerism was assessed by the STR-PCR analysis (polymerase chain reaction with a panel of primers for loci of short tandem repeats). Result(s): For detailed result see Figure 1. 18 patients didn't have any signs of relapse, graft failure or acute graft-versus host disease at all observation time. In this group on day 30% of cells with donors genotype was - 97,17+/-0,75; on day 60 - 95,75+/-2,15; on day 90- 98,21+/-0,80. On day 30 T-helper - 87,51+/-3,12; on day Th 60-90,43+/-3,18; on day 90 Th - 93,71+/- 3,03. On day 30 T-regulatory - 77,36+/-4,50; on day 60Treg - 82,08+/- 5,94; on day 90Treg - 97,71+/- 1,18. Four patients were diagnosed with relapse at +4 and +6 months after allo-HSCT. Two patients were diagnosed with acute GVHD. (Figure presented) Summary/Conclusions: Impact of chimerism in different T-helper subsets still need further investigation. We will continue our research and further results will be reported later.

Duckett, P. E. and V. Repaci (2015). "Marine plastic pollution: using community science to address a global problem." Marine & Freshwater Research **66**(8): 665-673.

It was once thought oceans were so vast they could not be affected by humans, but unfortunately rapid globalisation now threatens marine biodiversity. The negative effects of marine debris were recognised in the 1970s, and more recently globally acknowledged in scientific literature. We revisited the Greater Sydney region in New South Wales Australia, to research whether plastic waste on coastal beaches has reduced in recent years. This was achieved by designing a community science project in collaboration with local schools and volunteers. We discovered that plastic debris differed between beaches and strata, but was similar to Australian beaches that were sampled over a decade ago. The high correlations we found between plastic debris and both the frequency of storm-water drains and local population sizes suggested that storm-water drains may be responsible for delivering plastic waste to coastal ecosystems, and the amount of plastic debris was proportional to the size of the surrounding population. Involving local communities has the potential to rapidly raise awareness about key conservation issues to large and broad demographic audiences. Ultimately, this may inspire public and political change. Additional keywords: conservation, consumerism, education, government.

Duddu, M. K. and G. Guntuku (2016). "Isolation, screening and characterization of antibiotic producing actinomycetes from kapuluppada plastic waste dumping yard, visakhapatnam." International Journal of Pharmacy and Pharmaceutical Sciences **8**(11): 221-229.

Objective: To isolate, screen and characterize antibiotic producing actinomycetes from Kapuluppada plastic waste dumping yard, Visakhapatnam. Method(s): A total of 12 soil samples were collected, serially diluted and spread on starch casein agar supplemented with Rifampicin and Cycloheximide for inhibition of bacteria and fungi, respectively. Cross-streak method was used to check the antagonistic activity of isolated actinomycetes against bacteria and fungi.

Crude extracts from submerged state fermentation were used for the production of antimicrobial compounds. Agar well diffusion method was used for antimicrobial activity of crude extracts against test organisms. The isolates were characterized by morphological, physiological and biochemical methods. Result(s): A total of 110 actinomycete isolates were isolated from plastic waste dumping yard. All isolates had shown antimicrobial activity against one or more tested bacteria/fungi. The crude extract of the isolates PD66 (12.2 mm), PD85 (11.5 mm) were most active against methicillin-resistant Staphylococcus aureus, PD4 (14.1 mm), PD66 (15.6 mm) were active against Pseudomonas aeruginosa, whereas the extracts of PD10 (19.2 mm), PD47 (19.8 mm), PD106 (19.1 mm) were active against Candida albicans, PD10 (14.6 mm), PD82 (15.7 mm) active against Saccharomyces cereviciae. The isolates had shown varying morphological, physiological and biochemical characteristics. Conclusion(s): The actinomycetes isolated from Kapuluppada plastic waste dumping yard were found to be most promising microorganisms for the production of antibacterial and antifungal antibiotics. Copyright © 2016 The Authors.

Duemichen, E., et al. (2019). "Automated thermal extraction-desorption gas chromatography mass spectrometry: A multifunctional tool for comprehensive characterization of polymers and their degradation products." Journal of Chromatography. A **1592**: 133-142.

The TED-GC-MS analysis is a two-step method. A sample is first decomposed in a thermogravimetric analyzer (TGA) and the gaseous decomposition products are then trapped on a solid-phase adsorber. Subsequently, the solid-phase adsorber is analyzed with thermal desorption gas chromatography mass spectrometry (TDU-GC-MS). This method is ideally suited for the analysis of polymers and their degradation processes. Here, a new entirely automated system is introduced which enables high sample throughput and reproducible automated fractioned collection of decomposition products. The fractionated collection together with low temperatures reduces the risk of contamination, improves instrumental stability and minimizes maintenance efforts. Through variation of the two main parameters (purge gas flow and heating rate) it is shown how the extraction process can be optimized. By measuring the decomposition products of polyethylene it is demonstrated that compounds with masses of up to 434 Da can be detected. This is achieved despite the low temperature (~40 degreeC) of the solid-phase adsorber and the low thermal desorption temperature of 200 degreeC in the TDU unit. It is now shown that automated TED-GC-MS represents a new flexible multi-functional method for comprehensive polymer analyses. Comparable polymer characterization was previously only achievable through a combination of multiple independent analytical methods. This is demonstrated by three examples focused on practical challenges in materials analysis and identification: The first one is the analysis of wood plastic composites for which the decomposition processes of the polymer and the bio polymer (wood) could be clearly distinguished by fractionated collection using sequential adsorbers. Secondly, a fast quantitative application is shown by determining the weight concentrations of an unknown polyolefin blend through comparison with a reference material. Additionally, the determination of microplastic concentrations in environmental samples is becoming an increasingly important analytical necessity. It is demonstrated that with TED-GC-MS calibration curves showing good linearity for the most important precursors for microplastic, even complex matrix materials (suspended particulate matter) can be successfully analyzed.

Dufresne, J. and J. G. Marshall (2014). "The capture and characterization of the Fc-receptor complex from cultured macrophages." FEBS Journal **1)**: 211.

Cell surface receptors are of critical importance to biomedicine and the treatment of disease but are notoriously difficult to isolate and identify by classical approaches. Thus there is an urgent need to activate and capture receptor associated supramolecular complexes from the surface of live cells using liquid chromatography and tandem mass spectrometry (LC-ESI-MS/MS). The Fc gamma receptor (FCGR) is responsible for the engulfment of foreign particles and pathogens coated with Immunoglobulin G (IgG). The FCGR complex was captured from live human U937 and murine RAW 264.7 macrophages by presenting the cognate ligand (IgG) on micro chromatography beads. Many co-receptors, including innate immune receptors such as Fc-like receptors, scavenger receptors, toll-like receptors, Fc-like killer cell receptor, lectins, epidermal growth factor, interleukin and colony stimulating factor, chemokine, cytokines, histamine and other receptors that are known to modulate immunological response were observed to copurify alongside the Fc receptors on micro beads. As a second method, direct biotinylation of IgG provides for specific capture of the Biotin-IgG-FCGR complex on strepavidin beads, but the biotinylated receptor complex cannot be specifically separated from the contamination and background binding to the strepavidin resin. However, new affinity chromatography reagents such as NHS-SS-biotin may be cleaved with DTT to specifically release the FCGR complex. The monovalent versus aggregated FCGR complex was bound and activated by its IgG-S-S-biotin probe to activate and capture the receptor before collection over streptavidin followed by specific elution with the reducing agent DTT. After binding and activation of the cell surface receptor by its ligand, the cells were disrupted with a French press and the homogenate applied to a streptavidin agarose affinity column. After washing, the activated and assembled FCGR cell surface complex was eluted from the column with a reducing agent DTT, and digested with trypsin. The peptides were analyzed by LC-ESIMS/ MS using a linear ion trap (Thermo) where the peptides identification using the SEQUEST, MASCOT, OMSSA and X!TANDEM algorithms and quantified using R statistical analysis. We propose to define the role of a subset of the IgG-Fc co-receptors by phagocytosis assays and the measurement of phagocytosis and free radical production in the presence of specific siRNA or controls, mutant constructs and pharmacological agents. We also propose to quantify the assembly of the Fc-IgG receptor complex over time and compared to other innate immune receptors. The analysis of a cell surface receptor complex developed and tested on the model FCGR complex may be applied to a wide variety of receptors crucial in human infection, disease and pain.

Duis, K. and A. Coors (2016). "Microplastics in the aquatic and terrestrial environment: sources (with a specific focus on personal care products), fate and effects." Environmental Sciences Europe **28**(1): 2.
Due to the widespread use and durability of synthetic polymers, plastic debris occurs in the environment worldwide. In the present work, information on sources and fate of microplastic particles in the aquatic and terrestrial environment, and on their uptake and effects, mainly in aquatic organisms, is reviewed. Microplastics in the environment originate from a variety of sources. Quantitative information on the relevance of these sources is generally lacking, but first estimates indicate that abrasion and fragmentation of larger plastic items and materials containing synthetic polymers are likely to be most relevant. Microplastics are ingested and, mostly, excreted rapidly by numerous aquatic organisms. So far, there is no clear evidence of bioaccumulation or biomagnification. In laboratory studies, the ingestion of large amounts of microplastics mainly led to a lower food uptake and, consequently, reduced energy reserves and effects on other physiological functions. Based on the evaluated data, the lowest microplastic concentrations affecting marine organisms exposed via water are much higher than levels measured in marine water. In lugworms exposed via sediment, effects were observed at microplastic levels that were higher than those in subtidal sediments but in the same range as maximum levels in beach sediments. Hydrophobic contaminants are enriched on microplastics,

but the available experimental results and modelling approaches indicate that the transfer of sorbed pollutants by microplastics is not likely to contribute significantly to bioaccumulation of these pollutants. Prior to being able to comprehensively assess possible environmental risks caused by microplastics a number of knowledge gaps need to be filled. However, in view of the persistence of microplastics in the environment, the high concentrations measured at some environmental sites and the prospective of strongly increasing concentrations, the release of plastics into the environment should be reduced in a broad and global effort regardless of a proof of an environmental risk.

Dumas, H., et al. (1992). "Prilling process applied to collagen solutions." Drug Development and Industrial Pharmacy **18**(13): 1395-1409.

The present work concerns the preparation of microbeads of collagen by a prilling process. Collagen is one of the main components of vertebrate proteins, especially in such tissues as skin, tendons, placenta. Furthermore, it has some properties which makes it interesting to use as a biomaterial: biocompatibility, biodegradability, high tensile strength, hemostatic power, participation to the wound healing. The patented process which is developped in this paper combines two techniques: breaking of a capillary flow by prilling and; reticulation of collagen after oxydation with periodic acid. It uses neither organic solvents, nor variation of temperature and allows the production of microbeads which can be utilized for many different medical applications.

Dumichen, E., et al. (2015). "Analysis of polyethylene microplastics in environmental samples, using a thermal decomposition method." Water Research **85**: 451-457.

Small polymer particles with a diameter of less than 5 mm called microplastics find their way into the environment from polymer debris and industrial production. Therefore a method is needed to identify and quantify microplastics in various environmental samples to generate reliable concentration values. Such concentration values, i.e. quantitative results, are necessary for an assessment of microplastic in environmental media. This was achieved by thermal extraction in thermogravimetric analysis (TGA), connected to a solid-phase adsorber. These adsorbers were subsequently analysed by thermal desorption gas chromatography mass spectrometry (TDS-GC-MS). In comparison to other chromatographic methods, like pyrolyse gas chromatography mass spectrometry (Py-GC-MS), the relatively high sample masses in TGA (about 200 times higher than used in Py-GC-MS) analysed here enable the measurement of complex matrices that are not homogenous on a small scale. Through the characteristic decomposition products known for every kind of polymer it is possible to identify and even to quantify polymer particles in various matrices. Polyethylene (PE), one of the most important representatives for microplastics, was chosen as an example for identification and quantification.

Dumichen, E., et al. (2017). "Fast identification of microplastics in complex environmental samples by a thermal degradation method." Chemosphere **174**: 572-584.

In order to determine the relevance of microplastic particles in various environmental media, comprehensive investigations are needed. However, no analytical method exists for fast identification and quantification. At present, optical spectroscopy methods like IR and RAMAN imaging are used. Due to their time consuming procedures and uncertain extrapolation, reliable monitoring is difficult. For analyzing polymers Py-GC-MS is a standard method. However, due to a limited sample amount of about 0.5 mg it is not suited for analysis of complex sample mixtures like environmental samples. Therefore, we developed a new thermoanalytical method as a first

step for identifying microplastics in environmental samples. A sample amount of about 20 mg, which assures the homogeneity of the sample, is subjected to complete thermal decomposition. The specific degradation products of the respective polymer are adsorbed on a solid-phase adsorber and subsequently analyzed by thermal desorption gas chromatography mass spectrometry. For certain identification, the specific degradation products for the respective polymer were selected first. Afterwards real environmental samples from the aquatic (three different rivers) and the terrestrial (bio gas plant) systems were screened for microplastics. Mainly polypropylene (PP), polyethylene (PE) and polystyrene (PS) were identified for the samples from the bio gas plant and PE and PS from the rivers. However, this was only the first step and quantification measurements will follow.

Duncan, E. M., et al. (2019). "Diet-related selectivity of macroplastic ingestion in green turtles (Chelonia mydas) in the eastern Mediterranean." Scientific Reports **9**(1): 11581.

Understanding the drivers of key interactions between marine vertebrates and plastic pollution is now considered a research priority. Sea turtles are primarily visual predators, with the ability to discriminate according to colour and shape; therefore these factors play a role in feeding choices. Classification methodologies of ingested plastic currently do not record these variables, however here, refined protocols allow us to test the hypothesis that plastic is selectively ingested when it resembles the food items of green turtles (Chelonia mydas). Turtles in the eastern Mediterranean displayed strong diet-related selectivity towards certain types (sheet and threadlike), colours (black, clear and green) and shapes (linear items strongly preferred) of plastic when compared to the environmental baseline of plastic beach debris. There was a significant negative relationship between size of turtle (curved carapace length) and number/mass of plastic pieces ingested, which may be explained through naivety and/or ontogenetic shifts in diet. Further investigation in other species and sites are needed to more fully ascertain the role of selectivity in plastic ingestion in this marine vertebrate group.

Duncan, E. M., et al. (2019). "Microplastic ingestion ubiquitous in marine turtles." Global Change Biology **25**(2): 744-752.

Despite concerns regarding the environmental impacts of microplastics, knowledge of the incidence and levels of synthetic particles in large marine vertebrates is lacking. Here, we utilize an optimized enzymatic digestion methodology, previously developed for zooplankton, to explore whether synthetic particles could be isolated from marine turtle ingesta. We report the presence of synthetic particles in every turtle subjected to investigation (n=102) which included individuals from all seven species of marine turtle, sampled from three ocean basins (Atlantic [ATL]: n=30, four species; Mediterranean (MED): n=56, two species; Pacific (PAC): n=16, five species). Most particles (n=811) were fibres (ATL: 77.1% MED: 85.3% PAC: 64.8%) with blue and black being the dominant colours. In lesser quantities were fragments (ATL: 22.9%: MED: 14.7% PAC: 20.2%) and microbeads (4.8%; PAC only; to our knowledge the first isolation of microbeads from marine megavertebrates). Fourier transform infrared spectroscopy (FT-IR) of a subsample of particles (n=169) showed a range of synthetic materials such as elastomers (MED: 61.2%; PAC: 3.4%), thermoplastics (ATL: 36.8%: MED: 20.7% PAC: 27.7%) and synthetic regenerated cellulosic fibres (SRCF; ATL: 63.2%: MED: 5.8% PAC: 68.9%). Synthetic particles being isolated from species occupying different trophic levels suggest the possibility of multiple ingestion pathways. These include exposure from polluted seawater and sediments and/or additional trophic transfer from contaminated prey/forage items. We assess the likelihood that microplastic ingestion presents a significant conservation problem at current levels compared to other anthropogenic threats.

Dunlap, D. G., et al. (2018). "Use of magnetic activated cell sorting to identify immunoglobulin-bound bacteria in bronchoalveolar lavage fluid in individuals with HIV and COPD." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **197**(MeetingAbstracts).

Rationale: Greater than 70% of HIV+ outpatients manifest at least one lung function abnormality, with many developing COPD. However, the mechanisms are poorly understood. Alterations in the lung microbiome that occur in HIV may increase risk of COPD, but there are limited taxonomic differences in lung bacterial communities between HIV+ and HIV- individuals detected by 16S rRNA gene sequencing. Although bacterial communities may be similar, there may be differences in bacterial recognition by the host that contribute to lung dysfunction in HIV. Using magnetic activated cell sorting (MACS), immunoglobulin-bound bacteria can be sorted from bronchoalveolar lavage (BAL) fluid and analyzed using flow cytometry and 16S rRNA gene sequencing to elucidate the amount and type of Ig-bound bacteria in the lungs. Method(s): BAL fluid was obtained from individuals with and without HIV and with varying degrees of lung dysfunction. Fluid was stained with SYTO BC and IgG, IgA, or IgM PE, centrifuged, and supernatant removed. The pellet was suspended with buffer mixed with anti-PE micro beads, creating a magnetic label on Ig-bound bacteria. The fluid was then run through MACS columns composed of ferromagnetic spheres, embedded in a super magnet (MACS sorter). Unbound bacteria freely flowed through the column while immunoglobulin-bound material, including bacteria, were held in suspension within the column until being manually expelled and collected in separate tubes. The immunoglobulin-bound and unbound material was then analyzed using flow cytometry. Result(s): Four individuals (2 HIV+, 2 HIV-) were included in preliminary results. Half of the individuals were male with an average age of approximately 50 years. Both HIV+ individuals were taking antiretroviral therapy. HIV+ individuals tended to have a greater number of IgG-bound bacteria detected in BAL (Figure 1). The greatest number of IgG-bound bacteria were recovered from the individual with both COPD and HIV. Conclusion(s): We used magnetic activated cell sorting to identify immunoglobulin-bound bacteria in BAL samples. This technique enables determination of which bacteria are recognized by the host and provoke an adaptive immune response. Future 16S rRNA gene sequencing of Ig-bound and unbound bacteria promises to elucidate functional differences between microbial communities, allowing us to better define the impact of the lung microbiome in HIV and COPD. (Figure presented) .

Dunlap, D. G., et al. (2019). "HIV COPD: Exploring the role of host recognition and response to the lung microbiome in pulmonary disease." American Journal of Respiratory and Critical Care Medicine. Conference **199**(9).

Rationale: The lung microbiome in healthy, HIV+ individuals on appropriate anti-retroviral therapy (ART) is similar to that of HIV-individuals. However, the host's recognition and response to the lung microbiome via immunoglobulin binding in HIV infection has not been explored. Using a novel application of magnetic-activated cell sorting (MACS), IgG-bound bacteria from the lungs can be sorted from bronchoalveolar lavage (BAL) fluid and analyzed using flow cytometry and 16S rRNA gene sequencing. We have found that the lung bacterial community recognized by IgG is distinct when comparing HIV+ to HIV-individuals and hypothesize that IgG-bound bacteria provoke an inflammatory response, promoting lung disease. Method(s): Bronchoscopy with BAL was performed on individuals with and without HIV infection, with pulmonary function testing performed on all participants. Bacteria were suspended in bacterial DNA stain (SYTO BC) and IgG-PE, then incubated with anti-PE micro beads, creating a magnetic label on IgGbound bacteria. Running these samples through MACS columns embedded within a super magnet (MACS sorter), IgG-bound bacteria were magnetically pulled out of solution. IgG-bound and -unbound bacteria were analyzed using flow cytometry and 16S rRNA gene sequencing on the Illumina MiSeq platform. Bacteria from unsorted BAL samples were analyzed in parallel. BAL and serum cytokines were measured using Luminex assays, and differential cell counts were manually performed on BAL. Result(s): Sixty-five individuals (43 HIV+, 22 HIV-) were included in this study. The mean age of participants was 51 years and approximately 70% were male in both groups. The median CD4 count in the HIV+ group was over 700 cells/uL with 70% on ART. Among HIV+ individuals, 72% were ever smokers compared to 55% among HIV-participants. Beta diversity in the IgG+ fractions were significantly different between HIV+ and HIV-individuals ($p<0.002$) while no differences were seen between these groups in unsorted samples (Figure 1). Additionally, beta diversity in HIV+ individuals stratified by diffusing capacity (DLCO) percent predicted. Preliminary cytokine analysis in 35 individuals demonstrates increased IL-1 in BAL from HIV+ individuals ($p=0.02$). Conclusion(s): We report the first successful use of magneticactivated cell sorting to identify IgG-bound bacteria from the lungs, and found that the bacterial community being recognized and bound by IgG differs between HIV+ and HIV-individuals. Preliminary cytokine results demonstrated increased BAL IL-1 in HIV+ individuals. Additional cytokine analyses are needed to detail the immune response to IgG-bound bacteria and its relationship to lung function. (Figure Preseted).

Duong, V., et al. (2018). A model template green environment initiative for recycling plastic bottles with progressive entrepreneurship partnership. 2018 Portland International Conference on Management of Engineering and Technology, PICMET 2018, August 19, 2018 - August 23, 2018, Honolulu, HI, United states, Institute of Electrical and Electronics Engineers Inc.

Plastic has been widely adopted by the global industry as the most common and adaptable material for marketing their products. Current levels of plastic usage and disposal is one of the biggest environmental challenge that we have to deal with. Collecting and Recycling plastic is one of the most important actions currently used to meet this challenge, but it represents one of the most demanding areas in the plastics industry today. A major percentage of recycled plastic produced each year is used to manufacture disposable packaging items or other short-lived items that are discarded within a year or so. This clearly means that our current use of plastics is not sustainable. In addition, because of the durability of the polymers involved, large amounts of discarded end-of-life plastics are accumulating as debris in landfills and in natural habitats worldwide [1]. Energy efficient plastic recycling process involves a complex system of machines and new manufacturing practices. This paper discusses a promising environmental friendly solution for reducing pollution by recycling plastic bottles. The process of recovering waste plastic and reprocessing into useful products would be implemented in three stages: A) Set up and organize a system for collecting plastics used for water and soda bottles. b) Design and manufacture production line for automatically processing plastic bottles to make plastic ribbon/wire of various sizes. c) Use the plastic ribbon/wire to manufacture prototypes of useful artifacts and products like table, chair, roofing material, decorations, etc. The project has both economic and social value. On the economical side, this will save money by minimizing all expenditure for waste processing related to destroying the plastic waste; the second important contribution of the project is the significant impact on employment creation especially in rural areas; lastly, the recycled plastic is used to make new plastic products with reasonable price for low-income families. On the Social side, this will improve environmental conditions for life; reduce landfill waste; prevent disease-spreading due to recycling plastic; eliminate contamination from burning and melting plastic material and increase public awareness of environmental protection for benefit of humanity. A prototype of the project designed and

manufactured in Duy Tan University, Vietnam for cutting bottles into ribbon/wire and connecting them continuously is complete. We will present a pilot test result of our approach to use the plastic ribbon/wire to make new and useful products. A Progressive sustainable economic model of Entrepreneurship Partnership is presented for the developing economies. 2018 Portland International Conference on Management of Engineering and Technology, Inc. (PICMET).

Dupai, L., et al. (2019). "Empowerment of coastal communities through systems approach in the field of environmental health in Kendari city, Southeast Sulawesi Province, Indonesia." Indian Journal of Public Health Research and Development **10**(9): 741-745.

One of the health problems faced by coastal communities is community behavior in the management and utilization of environmental resources. Coastal area has problems like the limitations of environmental health facilities that cause the health status low. The study aimed to know the Coastal Community Empowerment with a environmental health systems approach of Kendari. The type of study was qualitative. The informants was 12 people. Data collection uses in-depth interviews and Focus Group Discussion. Results of the implementation program appeared in three dimensions: a) Development of local communities through cross training sectors: agriculture and food, fisheries, private institutions, finance lending institutions and academics; and empowering youth groups through social activities. Empowerment through health village was carried out with: environmental cleanliness, family education, clean and healthy behavior, increasing family income, hydroponic planting methods, and utilizing plastic waste. b) Judging from the aspect of social policy, there was already the KOTAKU program (city without slums). c) Social action: Initiation of Movement 1 house 1 hand-washing, family medicinal plants, mobilizing to cleanliness the house yard, waste transportation services, coordinating with the Government to provide environmental health education, made a healthy smoke-free village. Conclusion(s): Community empowerment in order to improve environmental health behaviors can be more effective if using all potential stakeholders, education and training, local community development, social action and social policy. Recommendation: needin for socialization, education and training for the community, advocacy and collaboration across sectors of government agencies, and continuous supervision. Copyright © 2019, Indian Journal of Public Health Research and Development. All rights reserved.

Duranceau, C. (2009). "PICKING UP SPEED." Recycling Today **47**(12): 38-43.

The article describes increasing use of recycled and sustainable virgin plastics in the U.S. automobile industry. It notes that the automotive applications of such materials cut costs and promote the protection of the environment by keeping plastic scraps from wasting in landfills and producing lighter vehicles that use less fuel. The plastics industry's initiatives to increase the use of recycled materials in vehicles and its end-of-life recycling efforts are also discussed.

Durrieu, L., et al. (2012). "IFN-alpha increases the cytotoxic effect of CIK cells on B-all." Journal of Immunotherapy **35 (1)**: 100-101.

Haematopoietic stem cell transplantation (HSCT) is required in about 20% to 30% of children with B-lineage acute lymphoblastic leukemia (B-ALL). Relapses after HSCT are usually refractory to further therapy and in these cases, the development of an optimized immunotherapeutic strategy would be of great clinical interest. In this setting, the Cytokine-Induced Killer (CIK) cells could represent an interesting tool for immunotherapy. Indeed, they were showed to be highly cytotoxic against many cancer types. Nevertheless, their cytotoxicity against ALL cells is not consistent. Therefore, we have investigated the possibility of combining adoptive immunotherapy with CIK cells and interferon alpha (IFNalpha), to optimise the cytotoxicity of CIK cells against B-ALL cells. CIK cells were differentiated from cord blood mononuclear cells or peripheral blood mononuclear cells for 21 days. At the end of the culture, there were around 45% CIK cells (CD3+CD56+). The other cells were 1% natural killer (NK) cells and 54% T cells. The bulk CIK (CIK cells, NK cells and T cells) showed a mild cytotoxic activity against B-ALL cell lines. However, when the bulk CIK was purified with CD56 human microbeads there was significant cytotoxic activity against B-ALL cell lines. In addition, we have showed that sorted CIK cells removed from NK and T cells, always showed a cytotoxic activity against B-ALL cells lines. Also, after pre-incubation of sorted CIK cells with IFNalpha overnight, we have observed an increase of cytotoxicity by more than 20% to 40%. CIK cells displayed a phosphorylation of STAT-1 after stimulation by IFNalpha. In addition, we have tested in vivo CIK cells in NOD/SCID/gammac-(NSG) mice injected with human B-ALL cell lines and we could show that CIK cells (Target on effector ratio of 1:80) could significantly delay mice mortality. Also, we showed that CIK cells treated by IFNalpha did not the induce of xeno-Graft-versus-Host Disease (GvHD) in NSG mice. In conclusion, we showed that CIK cells are cytotoxic against B-ALL when they are purified and also their effect is increased by the IFNalpha via STAT-1. Finally, the CIK cells have a GvL effect (graft versus leukemia) in the NOD/SCID/gammac- mouse model.

Duval, D. and H. L. MacLean (2007). "The role of product information in automotive plastics recycling: a financial and life cycle assessment." Journal of Cleaner Production **15**(11/12): 1158-1168.

Abstract: Over the last 30 years the use of light weight, inexpensive, and durable plastics in automobiles has nearly tripled on a per vehicle basis. Although this has created benefits such as increased fuel efficiency and associated lower CO2 emissions, the growing disposition of plastics from end-of-life vehicles has put increasing pressure on North American landfill capacity. Financial and life cycle assessment models were developed and applied to the current and proposed recycling business operations of AADCO Automotive Incorporated (AADCO), a leading Canadian automotive dismantling company. By applying both kinds of models, two key questions are addressed. First, how much is it expected to cost AADCO to participate in a start-up automotive plastics recycling network? and second, by estimating greenhouse gas emissions and energy requirements, is recycling automotive plastics actually better for the environment compared to manufacturing virgin plastic resin within the boundaries set forth in this case study? The present study concluded that the proposed recycling network would reduce greenhouse gas emissions and energy requirements by nearly 50% when compared to the current operations at AADCO (equating to a reduction of 1063tonnes of CO2(eq) and 18TJ, respectively). However, in spite of the environmental benefits, the magnitude of the added costs for AADCO to participate in the post-consumer automotive plastics recycling network resulted in an unprofitable value proposition for the company. [Copyright &y& Elsevier]

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Duvernay, M. T. and H. Hamm (2013). "Platelet microparticle production is regulated by stim1 dependent entry of extracellular CA²⁺ through orai1." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Microparticles are submicron lipid vesicles packed with protein and nucleic acid. They are found

in abundance circulating in the vasculature and can be generated from a number of cell types including endothelial cells, leukocytes, and platelets. The microparticles generated from platelets far out number those generated from other cell types and their incidence is correlated with a myriad of cardiovascular diseases. We recently demonstrated that stimulation of gel filtered human platelets through Protease activated receptor (PAR) 4 leads to the generation of 4-5 times more platelet microparticles (PMP) than PAR1 stimulation. Platelet microparticle (PMP) production was demonstrated to be downstream of a Rho kinase-dependent signaling pathway. Consistently, more myosinIIa phosphorylation was observed downstream of PAR4 stimulation. PMP generation was quantified by flow cytometry using polystyrene microbeads of standardized size for appropriate size gating, and CD41a (aIIb) and CD62p (P-selectin) staining for positive identification of platelet derived membranes. Submicron particles positive for both CD41a and CD62p were classified as true PMP. Recently, we have expanded these observations to platelet stimulation with thrombin, convulxin (a GPVI collagen receptor agonist), and dual PAR/collagen receptor stimulation. Thrombin and PAR4-activating peptide (AP) stimulation leads to equivalent levels of PMP production, confirming that PAR4 is the major thrombin receptor responsible for PMP generation, with PAR1 playing only a minor role. Collagen receptor stimulation with convulxin lead to a comparable level of PMP generation as thrombin stimulation. However, co-stimulation with convulxin and thrombin or convulxin and PAR1-AP or PAR4-AP lead to PMP production exceeding the sum of PMP by convulxin and PAR agonist alone by as much as 350%, suggesting a synergistic response. It is well documented that PMP generation does not occur in the absence of extracellular Ca²⁺. Recently published data collected with Orai1 knockout mice indicate that the majority of extracellular Ca²⁺ entry into the platelet is mediated by the plasma membrane Ca²⁺ channel Orai1. STIM1 is an ER calcium sensor that migrates near the cell surface upon depletion of intracellular Ca²⁺ stores to oligomerize and activate Orai1. In an attempt to further elucidate the signaling pathways responsible for PMP generation we treated platelets with the STIM1 inhibitor SKF 96365. Preincubation with SKF 96365 nearly abolished PMP production induced by PAR4-AP, thrombin, convulxin, or the combination of PAR and collagen receptor agonist. Scanning Electron Microscopy of PAR4-AP stimulated platelets in suspension revealed extended filipodia and bag-like structures protruding from the platelet core which correlated with the size of PMPs as analyzed by flow cytometry. Pretreatment with the SKF 96365 or exclusion of extracellular Ca²⁺ prevented the formation of the microparticle-like extensions and blunted filipodia extension. Finally, confocal analysis of Orai1 staining on platelets spread on a collagen matrix and co-stimulated with PAR4-AP revealed Orai1 throughout the plasma membrane with intense staining of the microparticle-like structures. These data suggest that PMP generation is nucleated by STIM1 dependent Orai1 Ca²⁺ entry. Current efforts are focused on elucidating the mechanism by which PAR and collagen receptor agonists differentially regulate STIM1 or Orai1 activity to mediate PMP generation.

Dwivedi, H., et al. (2013). "Fabrication and evaluation of colon targeted uricase containing microbeads for treatment of gout." Drug Delivery Letters **3**(1): 47-53.

Gout is a painful disease of joints generated because of the deposition of urate crystals within the joints. Uri-case is an enzyme capable of degrading less water soluble urate crystals into a compound allantoin, which is more water soluble and hence is easily excreted. Uricase being proteinaceous is degraded by the protein digestive enzymes of gastro intestinal tract (GIT) when administered orally. Colonic part of GIT lacks protein digestive enzymes and thus provides suitable conditions for the absorption of uricase. Colon consists of several microbial flora which secrete enzymes capable of degradation of alginates and pectin which are not digested by upper GI tract. Eudragit S-100 (pH sensitive polymer) coated alginate - pectinate microbeads were found to be effective for delivery of uricase directly to the colonic site. Sodium taurocholate, a bile salt, was found to be suitable for the effective absorption of uricase from colonic site into the systemic circulation. © 2012 Bentham Science Publishers.

Dykes, J. H., et al. (2010). "Effective CD3 T-cell depletion using the CliniMacs System to produce peripheral blood progenitor cell products for haploidentical transplantation in 23 children and adults: The updated Lund experience." Bone Marrow Transplantation **2)**: S325.

Background: Rigorous depletion of T-lymphocytes in the progenitor cell graft is an absolute prerequisite in haploidentical transplantation. In the current study, we investigated the performance of two CliniMACS direct T-cell depletion programs, the Depletion D2.1 program and the large-capacity program D3.1, which are attractive alternatives to standard stem cell enrichment procedures. Study design and methods: Peripheral blood progenitor cells were harvested from 23 human-leukocyte-antigen (HLA)- haploidentical donors. T-cells labelled with anti-CD3 coated beads were depleted with the CliniMACS device using either the Depletion 2.1 (n = 23) or the D3.1 (n = 13) program. If indicated, additional positive CD34-selections (n = 16) were performed. Twenty-three patients received T-cell depleted grafts after reduced-intensity conditioning, with a target cell dose of >= 5 x 10⁶ CD34 + cells and <= 1 x 10⁵ CD3 + cells per kilogram of recipient body weight. Result(s): The median log10 T-cell depletion rate was significantly better with the D2.1 compared to the D3.1 (log 3.6 vs. log 2.3, P < 0.05) and could be further improved by blocking of non-specific binding using 0.15% Gammagard immune-globulin (IgG) (log 4.5 and log 3.4, respectively) and surprisingly only to a remarkably lesser extend with 0.15% Kiovig IgG (log 3.8 and log 2.9, respectively). A negative impact of platelet contamination on T-cell depletion rate was observed. The D3.1 was superior to the D2.1 (P < 0.05) in median recovery of CD34 + cells (90% vs. 80%) and in median recovery of CD3-negative cells (87% vs. 75%). The median processing time/1010 total cells was 0.90 hours (D2.1) and 0.35 hours (D3.1) The transplanted grafts (directly T-cell depleted products +/- CD34 + selected cells) contained a median of 12,9 x 10⁶/ kg CD34 + , 0.90 x 10⁵/kg CD3 + , and 18,6 x 10⁶/kg CD56 +. Rapid engraftment was achieved in 22 patients. The incidence of acute Graft-versus-host disease was 22% (grade I/II) and 0% (grade III/IV). Conclusion(s): Our results indicate that non-specific binding of cells to anti-CD3 micro beads considerably impair depletion results. This effect can be overcome by blocking with a carefully selected IgG preparation. We, conclude that both, the D2.1 and the novel D3.1 program enable effective, time-saving large-scale T-cell depletion. Combining direct depletion techniques with standard CD34-selection facilitates the composition of grafts optimized to the specific requirements of the patients.

Dziubanek, G., et al. (2016). "Inhalation Exposure to Dioxins and dl-PCBs Depending on the Season in Upper Silesia, Poland: A Pilot Study." Central European Journal of Public Health **24**(2): 115-119.

AIM: The aim of this study was to investigate the seasonal fluctuation of PCDD/Fs and dl-PCBs levels in the ambient air of Upper Silesia in the aspect of human inhalation exposure as well as the estimation of health risk attributed to this exposure pathway to dioxins and dl-PCBs.

METHODS: In the study air samples were taken in five urban districts of Upper Silesia, Poland, where the houses are heated with coal. The same sampling points in summer and winter were analyzed for dioxins/furans and dl-PCBs. In addition, information was collected on awareness of the residents about the co-incineration of plastic waste and effects of this activity on human health.

RESULTS: The results show that the average daily exposure of residents of Upper Silesia to TCDD and

DLCs in the heating season was about 6.5.-fold higher than in summer. The risk assessment showed that expected excess of cancer cases per 1,000,000 people ranged from 4.5 to 13.2 in winter and from 0.9 to 2.1 in summer. The practice of mixing waste with coal for houses heating has been confirmed by investigated families, who do not associate it with the possibility of negative health effects.

CONCLUSIONS: Air pollution can be a significant source of dioxin and dl-PCB for people during the winter season, as a result of co-burning coal and waste containing plastics. The dose of dioxins inhaled through the respiratory pathway in winter can be associated with the higher cancer risk in the population of Upper Silesia.

Dzoganova, Z., et al. (2012). IMPACT ASSESSMENT OF MECHANICAL PROPERTIES OF DEGRADED PET BOTTLES IN SELECTED ENVIRONMENTAL DEGRADATION. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **4:** 331-337.

Plastic bottles are one of the most custom packing materials in market. Plastic bottles are mainly made from polyethylenetereftalate, therefore they often are called like PET bottles. PET like basic plastic material is widely used for production fibers and foils because of its great abrasion resistance, chemical resistance, weather resistance, degradation and PET is dimensionally stable. Because of this properties PET is used like packing material of drinks in different shapes. PET bottles are consumer goods which are used only once and after that they are changed in waste. In environment, plastic waste is decomposed in many decades' years than is suitable to evaluate the degradation properties of PET bottles. For these experiments were selected two types of plastic bottles available in the Slovak market. Than from these bottles they were made some samples and they were taken into artificial environmental degradation of high and low temperature to simulate environmental conditions in summer and winter weather. After the exposition time the samples were taken out from environment degradation. To find out changed mechanical properties of PET bottles was made the tensile test where were defined the parameters like yield strength - aY, tensile strength - aM and relative elongation - eM. [PUBLICATION ABSTRACT]

Eagle, L., et al. (2016). "The role of social marketing, marine turtles and sustainable tourism in reducing plastic pollution." Marine Pollution Bulletin **107**(1): 324-332.

Environmental plastic pollution constitutes a significant hazard to marine turtles, human health and well-being. We describe a transdisciplinary approach to draw together findings from diverse disciplines in order to highlight key environmental pollution problems and their consequences, together with social marketing-based strategies to address the problems. The example of plastic pollution and impacts to marine turtles illustrates the severity of the problem. Wildlife tourism and sustainable tourism activity have not focussed on specific behaviours to change and have had minimal impact on subsequent human behaviour regarding environmental issues, indicating the need for new strategies. Social marketing principles offer promise, but there is a need to investigate the utility of various theoretical foundations to aid the design and implementation of interventions. We offer insight towards using sophisticated multi-method research to develop insights into behaviours and segmentation-based strategies, that can aid the identification of barriers to, and enablers of, sustained behaviour change.

Earley, M. C., et al. (2002). "Report from a workshop on multianalyte microsphere assays." Cytometry **50**(5): 239-242.

Multiplexed assays using fluorescent microspheres is an exciting technique that has been gaining popularity among researchers, particularly those in the public health field. Part of its

popularity is due to its flexibility, as both immunoassays and oligonucleotide hybridization assays can be developed on this platform. This report summarizes a workshop held by the Centers for Disease Control and Prevention that discussed issues surrounding these assays and the Luminex 100 xMAP instrument. Topics included instrumentation, assay design, sample matrix and volume, quality control, and development of commercial applications.

Echevarria, F. D., et al. (2016). "Interleukin-6: A Constitutive Modulator of Glycoprotein 130, Neuroinflammatory and Cell Survival Signaling in Retina." Journal of Clinical & Cellular Immunology **7**(4).

OBJECTIVE: The interleukin-6 (IL-6) family of cytokines and their signal transducer glycoprotein (gp130) are implicated in inflammatory and cell survival functions in glaucoma. There are several avenues for interdependent modulation of IL-6 family members and gp130 signaling. Here we investigated whether IL-6 modulates gp130 and related neuroinflammatory, cell survival and regulatory signaling in both healthy and glaucomatous retina.

METHODS: In naive and glaucomatous (Microbead Occlusion Model), wildtype (WT) and IL-6 knockout (IL-6-/-) mice, we examined gp130 protein expression and localization, using western blot and immunohistochemistry. Gene targets related to IL-6 and gp130 signaling and pertinent to neuroinflammation (TNFalpha, IL-1beta), cell health (Bax, Bcl-xl) and STAT3 regulation (Socs3) were quantified using qRTPCR.

RESULTS: In the naive retina, IL-6-/- retina contained significantly less gp130 compared to WT retina. This IL-6-related decrease in gp130 was accompanied by a reduction in mRNA expression of TNFalpha, Socs3 and Bax. After 4 weeks of microbead-induced ocular hypertension, both microbead- and saline-injected (control) eyes of IL-6-/- mice exhibited higher expression of TNFalpha, compared to WT mice. IL-1beta expression was also reduced specifically in IL-6-/- retina with microbead-induced glaucoma. While saline and microbead injection increased Bcl-xl and Socs3 mRNA in both WT and IL-6-/- mice, IL-6-/- deficiency led to smaller increases for both Bcl-xl and Socs3.

CONCLUSIONS: Our findings support a role for IL-6 in setting baseline parameters for neuroinflammatory, cell health and gp130 regulatory signaling that can impact the nature and magnitude of retinal responses to glaucoma-related stressors.

Eckert, E. M., et al. (2018). "Microplastics increase impact of treated wastewater on freshwater microbial community." Environmental Pollution **234**: 495-502.

Plastic pollution is a major global concern with several million microplastic particles entering every day freshwater ecosystems via wastewater discharge. Microplastic particles stimulate biofilm formation (plastisphere) throughout the water column and have the potential to affect microbial community structure if they accumulate in pelagic waters, especially enhancing the proliferation of biohazardous bacteria. To test this scenario, we simulated the inflow of treated wastewater into a temperate lake using a continuous culture system with a gradient of concentration of microplastic particles. We followed the effect of microplastics on the microbial community structure and on the occurrence of integrase 1 (int1), a marker associated with mobile genetic elements known as a proxy for anthropogenic effects on the spread of antimicrobial resistance genes. The abundance of int1 increased in the plastisphere with increasing microplastic particle concentration, but not in the water surrounding the microplastic particles. Likewise, the microbial community on microplastic was more similar to the original wastewater community with increasing microplastic concentrations. Our results show that microplastic particles indeed promote persistence of typical indicators of microbial anthropogenic pollution in natural waters, and substantiate that their removal from treated wastewater should be prioritised.

Eddy, T. D. (2019). "Climate change drowned out by plastic." Aquatic Conservation **29**(5): 848-848.

Edelstein, R. L., et al. (2000). "The BARC biosensor applied to the detection of biological warfare agents." Biosensors & Bioelectronics **14**(10-11): 805-813.

The Bead ARray Counter (BARC) is a multi-analyte biosensor that uses DNA hybridization, magnetic microbeads, and giant magnetoresistive (GMR) sensors to detect and identify biological warfare agents. The current prototype is a table-top instrument consisting of a microfabricated chip (solid substrate) with an array of GMR sensors, a chip carrier board with electronics for lock-in detection, a fluidics cell and cartridge, and an electromagnet. DNA probes are patterned onto the solid substrate chip directly above the GMR sensors, and sample analyte containing complementary DNA hybridizes with the probes on the surface. Labeled, micron-sized magnetic beads are then injected that specifically bind to the sample DNA. A magnetic field is applied, removing any beads that are not specifically bound to the surface. The beads remaining on the surface are detected by the GMR sensors, and the intensity and location of the signal indicate the concentration and identity of pathogens present in the sample. The current BARC chip contains a 64-element sensor array, however, with recent advances in magnetoresistive technology, chips with millions of these GMR sensors will soon be commercially available, allowing simultaneous detection of thousands of analytes. Because each GMR sensor is capable of detecting a single magnetic bead, in theory, the BARC biosensor should be able to detect the presence of a single analyte molecule.

Edo, C., et al. (2019). "Fate of microplastics in wastewater treatment plants and their environmental dispersion with effluent and sludge." Environmental Pollution **259**: 113837.

This work studied the occurrence of microplastics in primary and secondary effluents and mixed sludge of a WWTP as well as in processed heat-dried sludge marketed as soil amendment. Sampled microparticles were divided into fragments and fibres, the latter defined as those with cylindrical shape and length to diameter ratio >3. We showed the presence of 12 different anthropogenic polymers or groups of polymers with a predominance of polyethylene, polypropylene, polyester and acrylic fibres together with an important amount of manufactured natural fibres. The smaller sampled fraction, in the 25-104 mum range, was the largest in both primary and secondary effluents. Fibres displayed lower sizes than fragments and represented less than one third of the anthropogenic particles sampled in effluents but up to 84% of heat-dried sludge. The plant showed a high efficiency (>90%) in removing microplastics from wastewater. However, the amount of anthropogenic plastics debris in the 25 mum - 50 mm range still released with the effluent amounted to 12.8 +/- 6.3 particles/L, representing 300 million plastic debris per day and an approximate load of microplastics of 350 particles/m³ in the receiving Henares River. WWTP mixed sludge contained 183 +/- 84 particles/g while heat-dried sludge bore 165 +/- 37 particles/g. The sludge of the WWTP sampled in this work, would disseminate 8 x 10¹¹ plastic particles per year if improperly managed. The agricultural use of sludge as soil amendment in the area of Madrid could spread up to 10¹³ microplastic particles in agricultural soils per year.

Edson, E. C. and M. R. Patterson (2015). "MantaRay: A novel autonomous sampling instrument for in situ measurements of environmental microplastic particle concentrations." IEEE Conferences: 1-6.

Presented here is the initial hardware and software design of a prototype autonomous microplastic sampling instrument. Microplastics are defined as particles of plastic <5 mm greatest dimension. They are becoming pervasive in the world ocean due to anthropogenic pollution. The ocean has spatially variable concentrations of surface microplastics, so attempting to identify trends in global dispersal patterns is difficult and expensive using current research techniques. Understanding the global dispersion patterns and degradation rates of microplastics will help to uncover the associated human and ecosystem impacts. A novel low-cost oceanographic sensor has been developed that can determine the concentration of marine microplastics over large spatial areas. This sensor can remove plastic particulates from seawater and archive them for later analysis, determine microplastic concentrations for 28 discrete samples recording GPS position, and simultaneously measure salinity and water temperature. This sensor has been designed around the open-source Arduino platform, allowing for maximum implementation of additional sensors and systems in future prototypes. The MantaRay sensor can be implemented on a drifter, mooring, or Autonomous Underwater Vehicle to gather diverse data on the dispersion of microplastics. This sensor could drastically cut research costs associated with studying deep-sea microplastic concentrations and increase our understanding of plastic dispersion and degradation rates in marine ecosystems.

Edwards, R. (2000). "BAGS OF RUBBISH." Ecologist **30**(8): 52.

Reports on the growing problem of plastic waste in India. Estimated number of cows dying for eating discarded plastic bags; Reason behind the plastic waste problems facing the country in spite of its recycling efforts; Argument used by the Indian plastic industry to justify the status quo; Examples of legislation passed to address the problem.

Eerkes-Medrano, D., et al. (2015). "Microplastics in freshwater systems: a review of the emerging threats, identification of knowledge gaps and prioritisation of research needs." Water Research **75**: 63-82.

Plastic contamination is an increasing environmental problem in marine systems where it has spread globally to even the most remote habitats. Plastic pieces in smaller size scales, microplastics (particles <5 mm), have reached high densities (e.g., 100,000 items per m(3)) in waters and sediments, and are interacting with organisms and the environment in a variety of ways. Early investigations of freshwater systems suggest microplastic presence and interactions are equally as far reaching as are being observed in marine systems. Microplastics are being detected in freshwaters of Europe, North America, and Asia, and the first organismal studies are finding that freshwater fauna across a range of feeding guilds ingest microplastics. Drawing from the marine literature and these initial freshwater studies, we review the issue of microplastics in freshwater systems to summarise current understanding, identify knowledge gaps and suggest future research priorities. Evidence suggests that freshwater systems may share similarities to marine systems in the types of forces that transport microplastics (e.g. surface currents); the prevalence of microplastics (e.g. numerically abundant and ubiquitous); the approaches used for detection, identification and quantification (e.g. density separation, filtration, sieving and infrared spectroscopy); and the potential impacts (e.g. physical damage to organisms that ingest them, chemical transfer of toxicants). Differences between freshwater and marine systems include the closer proximity to point sources in freshwaters, the typically smaller sizes of freshwater systems, and spatial and temporal differences in the mixing/transport of particles by physical forces. These differences between marine and freshwater systems may lead to differences in the type of microplastics present. For example, rivers may show a predictable pattern in microplastic characteristics (size, shape, relative abundance) based on waste sources (e.g. household vs. industrial) adjacent to the river, and distance downstream from a point source. Given that the study of microplastics in freshwaters has only arisen in the last few years, we are still limited in our understanding of 1) their presence and distribution in the environment; 2) their transport pathways and factors that affect distributions; 3) methods for their accurate detection and quantification; 4) the extent and relevance of their impacts on aquatic life. We also do not know how microplastics might transfer from freshwater to terrestrial ecosystems, and we do not know if and how they may affect human health. This is concerning because human populations have a high dependency on freshwaters for drinking water and for food resources. Increasing the level of understanding in these areas is essential if we are to develop appropriate policy and management tools to address this emerging issue.

Ehlers, S. M. and J. A. Ellrich (2020). "First record of 'plasticrusts' and 'pyroplastic' from the Mediterranean Sea." Marine Pollution Bulletin **151 (no pagination)**(110845).

We report the presence of 'plasticrusts' and 'pyroplastic' from coastal habitats in Giglio island, Tyrrhenian Sea, Italy. These novel plastic debris types have only recently been described for the first time from Madeira island (NE Atlantic Ocean) and the United Kingdom, respectively. While 'plasticrusts' are generated by sea waves smashing plastic debris against intertidal rocks, 'pyroplastic' derives from (un)deliberately burnt plastic waste. Using Fourier-transform infrared (FTIR) spectroscopy, we identified the 'plasticrust' material as polyethylene (PE) and the 'pyroplastic' material as polyethylene terephthalate (PET). These polymers are widely used in everyday products and, therefore, contribute heavily to plastic pollution in aquatic and terrestrial environments worldwide. Furthermore, our field surveys suggest that 'plasticrust' abundance is related to wave-exposure and that the 'pyroplastic' derived from beverage bottles which we frequently found along the Giglio coast. Overall, our findings corroborate the notion that 'plasticrusts' and 'pyroplastic' are common debris types in marine coastal habitats. Copyright © 2019 Elsevier Ltd

Ehlers, S. M., et al. (2019). "Microplastics of different characteristics are incorporated into the larval cases of the freshwater caddisfly Lepidostoma basale." Aquatic Biology **28**: 67.

Plastic pollution is present in aquatic systems worldwide. While numerous studies have investigated microplastic interactions with marine organisms, microplastic effects on freshwater organisms, especially insects, have been rarely studied. Previous studies have mainly focused on dietary uptake of microplastics, but the presence of microplastics in animal constructions is largely unknown. To date, microplastics have only been observed in the tubes of a marine polychaete species. In freshwater systems, common caddisfly (Trichoptera) larvae build cases by using larval silk and mineral grains from benthic sediments, which are known microplastic sinks. Therefore, we examined caddisfly cases for microplastic presence. We collected caddisfly Lepidostoma basale cases in the field, disintegrated them using hydrogen peroxide, and determined microplastic polymer type through micro-Fourier-transform infrared spectroscopy. We found primary and secondary microplastics of different shapes, colors, sizes and chemical compositions (e.g. poly propylene, polyethylene, polyvinyl chloride). Thus, this is the first study to show that microplastics are present in the biological construction of a freshwater organism. Larval stages are usually more vulnerable than adult individuals, and microplastics can transport persistent organic pollutants and emit toxic leachates. In the caddisfly larval case, those substances are in close proximity to the sensitive larval body, which may be harmful for the larva and may eventually impede its development. We discuss the potential of caddisfly larval cases to act as microplastic bioindicators in freshwater habitats.

Einat, P. (2006). "Methodologies for high-throughput expression profiling of microRNAs." Methods in Molecular Biology **342**: 139-157.

MicroRNAs (miRNAs) have recently emerged as important regulators of gene expression controlling central biological processes. These small, approx 22-nucleotide (nt)-long RNA molecules induce translational suppression when they are imperfectly matched to their target messenger RNA (mRNA) or direct mRNA cleavage when perfectly, or nearly perfectly, matched to their target. Direct roles in developmental processes have been described in a variety of species, and involvement in human diseases, such as cancer and diabetes, has been implied. These studies highlight the need to obtain detailed expression profiles of miRNAs in tissues, during development, and in disease. Their small size and the existence of miRNA families of related sequences pose critical problems in approaching expression analysis of miRNAs, especially using high-throughput approaches. All methodologies presented here address the special requirements for the analysis of miRNA expression using a variety of platforms, including cloning, microarrays, and microbeads. The different variables, as well as the different approaches, used by various laboratories are detailed and general recommendations are provided. [References: 57]

Eitzen, L., et al. (2019). "The challenge in preparing particle suspensions for aquatic microplastic research." Environmental Research **168**: 490-495.

The occurrence of small particles consisting of organic polymers, so-called microplastic (MP), in aquatic environments attracts increasing interest in both public and science. Recent sampling campaigns in surface waters revealed substantial numbers of particles in the size range from a few micrometers to a few millimeters. In order to validate sample preparation, identification and quantification and to investigate the behavior of MP particles and potential toxic effects on organisms, defined MP model particles are needed. Many studies use spherical compounds that probably behave differently compared to irregularly shaped MP found in environmental samples. However, preparation and handling of MP particles are challenging tasks and have been systematically investigated in the present study. Polystyrene (PS) as a commonly found polymer with a density slightly above that of water was selected as polymer type for milling and fractionation studies. A cryogenic ball mill proved to be practical and effective to produce particles in the size range from 1 to 200micro m. The yield of small particles increased with increasing pre-cooling and milling durations. Depending on the concentration and the size, PS particles do not completely disperse in water and particles partly creep vertically up along glass walls. Stabilized MP suspensions without use of surfactants that might harm organisms are needed for toxicological studies. The stabilization of PS particle suspensions with ozone treatment reduced the wall effect and increased the number of dispersed PS particles but increased the dissolved organic carbon concentration and changed the size distribution of the particles.

Ekpunobi, U. E., et al. (2013). "Comparative study on the effect of density on water absorption of particle boards produced from Nipa palm fibres with HDPE wastes." Pertanika Journal of Science & Technology **21**(2): 499-506.

Nipa palm fibres were used in producing fibre boards with different mixtures of waste HDPE fibres. Density, swelling thickness and water absorption of the boards were determined and compared to know the combination that would yield the best quality. The relationship between the densities of boards produced and their ability to absorb water was also established. The significance of the results implies that the boards have special water resistant property, a feature that makes them suitable for use in areas of high humidity or occasional wetness. It is also noted that as more plastic waste is incorporated into Nipa fibres, the less density impacted on the particle boards and, hence, more water is absorbed.

Ekregbesi, P., et al. (2018). "Relationship between Anaemia, Haemolysis, Inflammation and Haem Oxygenase-1 at Admission with Sepsis: a pilot study." Scientific Reports **8**(1): 11198.

Upregulation of haem oxygenase-1 (HO-1), due to haemolysis and/or inflammation, can lead to impaired immune function. Anaemia is common among sepsis patients, but the consequences of sepsis-associated anaemia are poorly understood. Here, our objective was to determine the prevalence and extent of anaemia, haemolysis, inflammation, and HO-1 induction after early hospital admission. We hypothesised that inflammation- or infection-induced haemolysis contributes to sepsis-associated anaemia and that this will lead to expression of HO-1. In this study, plasma obtained from seventy adult patients within 12 hours of admission to intensive care due to sepsis were analysed for anaemia, haemolysis and inflammatory markers by ELISA and microbead array. The majority (82.6%) of patients were anaemic with evidence of haemolysis (raised haem, haptoglobin, haemopexin, and HO-1 concentrations). Interestingly, concentrations of both haemoglobin and IL-10 were moderately positively correlated with HO-1 concentration (Hb: $r = 0.32$, $p = 0.007$; IL-10 $r = 0.39$, $p = 0.0008$) whereas HO-1 concentration was weakly negatively correlated with haemopexin ($r = -0.23$, $p = 0.055$). Anaemia, while common, was not associated with HO-1 concentration. After adjusting for confounding, HO-1 induction appears to be associated primarily with IL-10 concentration rather than haemolysis. Disease severity at diagnosis was correlated with early plasma IL-10 ($r = 0.35$, $p = 0.003$) and HO-1 ($r = 0.24$, $p = 0.048$) concentrations. Notably, admission levels of haem, HO-1, and IL-10 were indicators of survival.

Ekstrom, S., et al. (2007). "Polymeric integrated selective enrichment target (ISET) for solid-phase-based sample preparation in MALDI-TOF MS." Journal of Mass Spectrometry **42**(11): 1445-1452.

A polymer microfabricated proteomic sample preparation and MALDI MS sample presentation device, the integrated selective enrichment target (ISET), comprising an array of perforated nanovials is reported. Each perforated nanovial can be filled with selective extraction media (microbeads) for purification and concentration of protein/peptides prior to matrix-assisted laser desorption/ionization mass spectrometry (MALDI MS). The main areas covered are the influence of the molding-process-induced surface roughness and how to address the lack of inherent conductivity in the polyetheretherketone (PEEK) material for optimal MALDI MS readout. Application of the disposable polymeric ISET devices for solid-phase extraction and phosphopeptide capture is also demonstrated.

El Essawy, N. A., et al. (2017). "Green synthesis of graphene from recycled PET bottle wastes for use in the adsorption of dyes in aqueous solution." Ecotoxicology & Environmental Safety **145**: 57-68.

Polyethyleneterephthalate (PET) is an important component of post-consumer plastic waste. This study focuses on the potential of utilizing "waste-treats-waste" by synthesis of graphene using PET bottle waste as a source material. The synthesized graphene is characterized by SEM, TEM, BET, Raman, TGA, and FT-IR. The adsorption of methylene blue (MB) and acid blue 25 (AB25) by graphene is studied and parameters such as contact time, adsorbent dosage were optimized. The Response Surface Methodology (RSM) is applied to investigate the effect of three variables (dye concentration, time and temperature) and their interaction on the removal efficiency. Adsorption kinetics and isotherm are followed a pseudo-second-order model and Langmuir and Freundlich isotherm models, respectively. Thermodynamic parameters demonstrated that adsorption of dye is spontaneous and endothermic in nature. The plastic waste can be used after transformation into valuable carbon-based nanomaterials for use in the adsorption of organic contaminants from aqueous solution.

El Haddad, L., et al. (2018). "Microencapsulation of a Staphylococcus phage for concentration and long-term storage." Food Microbiology **76**: 304-309.

In an effort to reduce food safety risks, virulent phages are investigated as antibacterial agents for the control of foodborne pathogens. The aim of this study was to evaluate microencapsulation (ME) as a tool to concentrate and store staphylococcal bacteriophages. As a proof of concept, phage Team1 belonging to the Myoviridae family was microencapsulated in alginate gel particles of 0.5mm (micro-beads) and 2mm (macro-beads) of diameter. Gel contraction occurred during the hardening period in the CaCl₂ solution, and the diameters of the initial alginate droplets shrunk by 16% (micro-beads) and 44% (micro-beads). As compared to the phage counts in the alginate solution, this contraction resulted in the increase of the phage titers, per g of alginate gel, by factors of 2 (micro-beads) and 6 (micro-beads). The encapsulation yield was highest in the macro-beads. Although phage Team1 was successfully frozen in beads, ME did not improve phage stability to freeze-drying. The addition of glycerol protected the microencapsulated phages during freezing but had no effect on free phage suspensions. Finally, ME improved storage stability at 4degreeC but had no impact on freezing or drying over three months of storage.

El Samaligy, M. and P. Rohdewald (1983). "Polyacrylamide microbeads, a sustained release drug delivery system." International Journal of Pharmaceutics **13**(1): 23-34.

Using tetracycline-HCl and theophylline as model drugs, polyacrylamide microbeads were prepared by w/o emulsion polymerization technique. Furthermore, drug-loaded polymer microbeads were prepared in the presence of different concentrations of gelatin, which were further cross-linked for different time intervals. The prepared microbeads were characterized through particle size analysis, electron microscopy, and in vitro dissolution. Relatively spherical free-flowing populations of microbeads were obtained. The presence of gelatin during the polymerization processes led to larger particles proportional to its concentration in the aqueous phase. The dried microbeads showed smooth pored or fissured surfaces. In aqueous media, they attained equilibrium hydration within 10 min, with 73.5% v/v water uptake forming spongy spheres. The products showed slower dissolution rates with higher gelatin concentrations and extended cross-linking.

El-Aassar, M. R., et al. (2014). "Microencapsulation of lectin anti-cancer agent and controlled release by alginate beads, biosafety approach." International Journal of Biological Macromolecules **69**: 88-94.

Hepatocellular carcinoma (HCC) is considered as one of the most aggressive cancer worldwide. In Egypt, the prevalence of HCC is increasing during last years. Recently, drug-loaded microparticles were used to improve the efficiency of various medical treatments. This study is designed to evaluate the anticancer potentialities of lectins against HCC while hinting to its safety usage. The aim is also extended to encapsulate lectins in alginate microbeads for oral drug delivery purposes. The extracted lectins showed anti-proliferative effect against HCC with a percentage of 60.76% by using its nontoxic dose with an up-regulation of P53 gene expression. Concerning the handling of lectin alginate microbeads for oral drug delivery, the prepared lectin alginate beads were ~100. mum in diameter. The efficiency of the microcapsules was checked by scanning electron microscopy, the SEM showed the change on the alginate beads surface revealing the successful lectin encapsulation. The release of lectins from the microbeads depended on a variety of factors as the microbeads forming carriers and the amount-encapsulated lectins. The Pisum sativum extracted lectins may be considered as a promising agent in controlling HCC and this solid dosage form could be suitable for oral administration complemented with/or without the standard HCC drugs. © 2014 Elsevier B.V.

Eldardiri, M., et al. (2009). "Comparative analysis of two types of Gelatin microcarrier beads for the culture of keratinocytes in vitro." Wound Repair and Regeneration **17 (4)**: A65.

The use of microcarriers for keratinocyte culture for skin replacement therapy has advantages including rapid cell expansion and the elimination of trypsinisation. In this study, we compared the behaviour of keratinocytes on two types of Gelatin-based microcarrier beads Cultispher-G and Cultispher-S in rotating and stirred culture. Isolated keratinocytes were cultured in Rheinwald and Green medium and either Cultispher-G or S in rotating tubes or in flasks on a magnetic stirrer. Keratinocyte attachment and proliferation was analysed at 4, 8, 12, 18, 24 and 30 days. MTT and Acridine orange staining were used for cell observation and Alamar Blue was used to quantitatively measure proliferation. Real-time PCR analysis was used to measure cytokeratin expression (K1, K10, K5, and K14) relative to GAPDH by keratinocytes grown in tissue culture flasks, on microcarrier beads in different conditions (+/- lethally irradiated 3T3 feeder cells). Cultispher-G and S supported keratinocyte culture in rotating tubes and cells were found to proliferate until d18 when a decrease was observed. Cultispher-G was used in stirred culture and staining demonstrated keratinocyte attachment and proliferation. Keratinocytes were found to proliferate with a slight decrease in proliferation after d12. There was no difference in the expression of cytokeratins K1/K10 which are markers for keratinocyte differentiation or K5/14, which are expressed by all keratinocytes, when grown on microcarrier beads (-3T3 cells) and compared with cells cultured on tissue culture plastic. Microcarrier beads allow easy retrieval and delivery of viable keratinocytes used as skin replacement therapy. Skin loss following full thickness burns, trauma, and chronic wounds remains a clinical challenge and the utilisation of keratinocytes in dynamic microbead culture may provide a substantial improvement to existing culture and delivery technologies.

Elert, A. M., et al. (2017). "Comparison of different methods for MP detection: What can we learn from them, and why asking the right question before measurements matters?" Environmental Pollution **231**(Pt 2): 1256-1264.

In recent years, an increasing trend towards investigating and monitoring the contamination of the environment by microplastics (MP) (plastic pieces < 5 mm) has been observed worldwide. Nonetheless, a reliable methodology that would facilitate and automate the monitoring of MP is still lacking. With the goal of selecting practical and standardized methods, and considering the challenges in microplastics detection, we present here a critical evaluation of two vibrational spectroscopies, Raman and Fourier transform infrared (FTIR) spectroscopy, and two extraction methods: thermal extraction desorption gas chromatography mass spectrometry (TED-GC-MS) and liquid extraction with subsequent size exclusion chromatography (SEC) using a soil with known contents of PE, PP, PS and PET as reference material. The obtained results were compared in terms of measurement time, technique handling, detection limits and requirements for sample preparation. The results showed that in designing and selecting the right methodology, the scientific question that determines what needs to be understood is significant, and should be considered carefully prior to analysis. Depending on whether the object of interest is quantification of the MP particles in the sample, or merely a quick estimate of sample contamination with plastics, the appropriate method must be selected. To obtain overall information about MP in environmental samples, the combination of several parallel approaches should be considered.

Elessawy, N. A., et al. (2020). "Ciprofloxacin removal using magnetic fullerene nanocomposite obtained from sustainable PET bottle wastes: Adsorption process optimization, kinetics, isotherm, regeneration

and recycling studies." Chemosphere **239 (no pagination)**(124728).

Numerous of pollutants threaten our planet, for instance plastic wastes causes a huge potential risk on the environment in addition to many of emergened pollutants as pharmaceutical residue in aquatic environments which affecting ecological balance and in-turn affecting human health. Accordingly, this research proposed an innovative facile, one-step synthesis of functionalized magnetic fullerene nanocomposite (FMFN) via catalytic thermal decomposition of sustainable poly (ethylene terephthalate) bottle wastes as feedstock and ferrocene as a catalyst and precursor of magnetite. Growth mechanism of FMFN was discussed and batch experiments were achieved to examine its adsorption efficiency in relation to Ciprofloxacin antibiotic. Different adsorption parameters including time, initial Ciprofloxacin concentration, and solution temperature were investigated and optimized using Response Surface Methodology (RSM) model. In addition, a study on the antibiotic adsorption process impact on the organisms of an ecosystem was conducted using E. coli DH5alpha, and results validated method's efficiency in overcoming problem of appearance of antibiotic-resistant microbes. Copyright © 2019 Elsevier Ltd

Elizalde-Velazquez, A., et al. (2020). "Translocation, trophic transfer, accumulation and depuration of polystyrene microplastics in Daphnia magna and Pimephales promelas." Environmental Pollution **259**: 113937.

In recent years, reports of plastic debris in the gastrointestinal (GI) tract of fish have been well documented in the scientific literature. This, in turn, increased concerns regarding human health exposure to microplastics through the consumption of contaminated fish. Most of the available research regarding microplastic toxicity has focused on marine organisms through direct feeding or waterborne exposures at the individual level. However, little is known about the trophic transfer of microplastics through the aquatic food chain. Freshwater zooplankton Daphnia magna (hereafter Daphnia), and the fathead minnow Pimephales promelas (FHM), are well-known model species used in standard toxicological studies and ecological risk assessments that provide a simple model for trophic transfer. The aim of this study was to assess the tissue translocation, trophic transfer, and depuration of two concentrations (20 and 2000-part ml⁻¹) of 6 mum polystyrene (PS) microplastics particles between Daphnia and FHM. Bioconcentration factors (BCF) and bioaccumulation factors (BAF) were determined. Fluorescent microscopy was used to determine the number of particles in the water media and within the organs of both species. Throughout the five days of exposure, PS particles were only found within the GI tract of both species. The BCF for Daphnia was 0.034 +/- 0.005 for the low concentration and 0.026 +/- 0.006 for the high concentration. The BAF for FHM was 0.094 +/- 0.037 for the low concentration and 0.205 +/- 0.051 for the high concentration. Between 72 and 96 h after exposure all microplastic particles were depurated from both species. The presence of food had a significant effect on the depuration of microplastic particles from Daphnia but not for FHM. Based on the low BCF and BAF values for both species, rapid depuration rates, and null translocation of microplastic particles to organs and tissues from the GI tract, there is a low probability that microplastics will bioconcentrate and bioaccumulate under environmental conditions.

Elkhalifa, M. Y., et al. (1992). "A flow cytometric method to detect anti-pyruvate dehydrogenase antibody in primary biliary cirrhosis." American Journal of Clinical Pathology **97**(2): 202-208.

Primary biliary cirrhosis (PBC) is an autoimmune disease characterized by the presence of anti-mitochondrial antibodies specifically directed against the M2 group of mitochondrial antigens. Recently, the E-1, the E-2, and protein X components of pyruvate dehydrogenase enzyme complex have been identified as the major antigens within the M2 group of autoantigens. An immunoassay using pyruvate dehydrogenase enzyme complex as a specific antigen for the diagnosis of PBC was developed. Pyruvate dehydrogenase enzyme complex was attached to polystyrene microbeads, incubated with sera from PBC patients (n = 18), normal controls (n = 50), or patients with other autoimmune diseases (n = 26), followed by incubation with a second fluorescein isothiocyanate conjugated goat anti-human immunoglobulin and then analyzed by flow cytometry. High numbers of fluorescence channels (mean, 1,693 +/- 846) were obtained for all PBC sera except for two patients. Compared to the conventional anti-mitochondrial antibody assay, the assay had a sensitivity rate of 94% and a specificity rate of 100%. The reactive antibodies are predominantly of the immunoglobulin G3 subclass. Their levels could be correlated with the histopathologic stages of PBC. These results were corroborated by immunoblotting. Sera from patients with later stages of PBC strongly reacted with pyruvate dehydrogenase enzyme complex components, E1 alpha, and protein X.

Elliott, J. E. and K. H. Elliott (2013). "Tracking Marine Pollution." Science **340**(6132): 556-558.

Visit a beach almost anywhere and you will see plastic waste floating in the water and heaped above the tide lines. That debris is both a source and an overt signal of the even more pervasive contamination of marine biota by persistent chemicals. Present at ultra-trace levels but often highly toxic, chemical pollutants can be challenging to measure and understand. As the most problematic compounds biomagnify in food chains, sampling of marine top predators yields a global picture of ocean pollution.

El-Mallawany, N. K., et al. (2010). "Global proteomic evaluation of the relationship between Epstein-Barr virus (EBV) and c-myc deregulation in endemic versus sporadic Burkitt lymphoma (BL)." Cancer Research. Conference: 101st Annual Meeting of the American Association for Cancer Research, AACR **70**(8 SUPPL. 1).

Endemic BL (eBL) is characteristically positive(100%) for EBV, contrasting with sporadic(sBL) BL(30% EBV+). eBL vs sBL have different breakpoint regions within c-myc. The different mechanisms of lymphomagenesis however, remain unknown. Global analysis of proteins expressed in the different subtypes may provide insights into biologic, pathogenetic, and molecular differences. Objective(s): To compare the proteomic expression profile and signal transduction pathways of EBV+ eBL with EBV+/- sBL and EBV+/- normal B-cells. Normal B-cells (EBV+/-) were isolated from leukopacks obtained from the NY Blood Center using Magnetic Cell Sorting CD20 MicroBeads (Miltenyi biotec, CA). Whole cell lysates obtained from EBV+ eBL Raji, EBV+ sBL NC37, EBV- sBL Ramos, and EBV+/- B-cells were digested and labeled with iTRAQ reagents. The peptides were resolved by 2D-LC technique. MS/MS spectra were acquired using an Orbitrap XL Tandem Mass Spectrometer (ThermoFisher). MS/MS data was searched using X! Tandem TPP software against human IPI database (v3.50) appended with decoy sequences. iTRAQ ratios of proteins (ProteinProphet probability of >0.9) were normalized and differentially expressed proteins were selected for further analysis. Over 400 proteins were identified; 827 binary differential protein expressions were established with a False Discovery Rate (FDR) of <0.4. Hierarchical clustering of the expression profiles grouped the 3 lymphoma cell lines and the 2 normal B-cell specimens. Specific cellular functions were implicated by differential protein expressions (with associated proteins in parentheses) including apoptotic signaling (AK2, C1QBP, DIABLO, PCNA, PPIF, SERPIN8&9, SET), viral pathogenesis (DDX3X, SYNCRIP, EIF5A), cell proliferation pathways and oncogenes (ANXA6, DDX5, DEK, GNB2L1, NME2, RAP1A&B, RIPK4, STMN1), c-myc expression regulation (ENO1, FUBP1), heat shock and ubiquitination (HSP90AB1, HSP90B1, HSPA5, UCHL1). There are several proteins with established links to malignancy

(RPL15, PSMA4, SLC3A2, TLX2, VIM) including TUBB2C, whose overexpression is found in pediatric BL and potential biomarkers for disease (IGHM, IGSF3, LDHA, LDHB, PPBP, LSP1, LYZ, DEFA1, DEFA3). We identified 41 proteins within the c-myc network, 21 of which are c-myc targets. Our results suggest that there are potentially different mechanisms driving cell proliferation and resistance to apoptosis in the different BL subtypes. Confirmatory studies will be required to establish the correlation between EBV, c-myc, and geographical subtype and how they may be involved in promoting lymphomagenesis. Ultimately, identification of proteins unique to the distinct disease subtypes will serve to establish tumor markers that may enable development of new diagnostic, prognostic, and therapeutic strategies.

Elmesmari, A., et al. (2014). "MIR-155 expression correlates with clinical disease activity and has effector function in rheumatoid arthritis." Arthritis and Rheumatology **10)**: S1069.

Background/Purpose: MicroRNAs are fine tuners of biological pathways that function via post-transcriptional regulation of target mRNA life span. MicroRNA 155 (miR155) is particularly implicated in Rheumatoid Arthritis (RA) pathology through regulation of synovial macrophage cytokine and chemokine production. Thus far miR155 expression across disease activity status has not been examined - to this end we have developed a novel assay of absolute copy number to facilitate such investigation. Method(s): Peripheral blood (PB) was obtained from healthy controls and RA patients who met the 2010 ACR/EULAR diagnostic criteria. CD14+ cells (monocytes) were isolated using micro-beads. The absolute copy numbers of miR-155 transcripts and housekeeping short RNA (U1) in peripheral blood (PB) and synovial fluid (SF) macrophages of RA and healthy controls were assessed using a novel qPCR methodology. Result(s): RA PB (n=24) and SF CD14+ monocytes (n=11) expressed higher copy numbers of miR-155 compared with healthy controls (n=22). As expected, RA SF macrophages exhibited the highest expression levels of miR-155 (75318.2/106 copies of RNU1A). In PB monocytes, miR-155 levels were higher when derived from patients with high or moderate disease activity (according to DAS28; $p < 0.05$) than those in remission or healthy controls. The copy number of miR-155 expression was significantly increased in anti-citrullinated protein antibody (ACPA) positive RA (n=17) compared with ACPA negative RA (n=7). The RA PB monocyte miR-155 copy number correlated positively and significantly with DAS28 as a continual variable. There was no correlation between observed increase in miR-155 copy number and patients' age, disease duration or medication. Conclusion(s): Our data demonstrate that miR-155 levels may reflect RA disease activity and could be a potential clinical disease activity biomarker for RA. Moreover our data suggest that circulating monocytes in RA patients exhibit an early activation signature, which is primed for subsequent cytokine release.

El-Mobaidh, A. M., et al. (2006). "Classification of in-flight catering wastes in Egypt air flights and its potential as energy source (chemical approach)." Waste Management **26**(6): 587-591.

Waste to energy conversion is based on the classification of waste. In-flight catering wastes resulting from Egypt Airlines economy class passengers were classified. The solid waste stream generated contains plastic, paper, left-over waste food and aluminum. The type of meal served varies according to the period of flight and so the quantity and content of the waste stream. It was found that the waste generation rate varied from 61.3 to 265 g according to the meal type. Breakfast snack meal generates the highest weight of waste which recorded an average of 265 g. Plastic waste generated varied from 39.6% to 64.6% by weight for the various types of meals served. A total amount of 725 tons were generated annually from organic waste (paper, plastic and food waste) among which a non combustible 39.4 tons of aluminum. The calorific value for each generated item is calculated and the total energy potential reached up to 14.3 TJ annually.

El-Sahrigy, S. A. F., et al. (2018). "The influence of interferon-beta supplemented human dendritic cells on BCG immunogenicity." Journal of Immunological Methods **457**: 15-21.

INTRODUCTION: Tuberculosis (TB) remains a huge worldwide burden, despite extensive vaccination coverage with the Bacillus Calmette-Guerin (BCG), the only vaccine available against this disease, indicating that BCG-driven immunity is inadequate to protect the human population against TB. This underscore the critical necessitate to develop an improved TB vaccine, based on a better understanding of host-pathogen interactions and immune responses during mycobacterial infection.

AIM OF THE WORK: To examine whether the exogenous addition of IFN-beta could improve dendritic cell (DC) response to Mycobacterium bovis (M. bovis) and to evaluate the effect induced by the infection of human DCs with M. bovis (with and without IFN-beta) and Mycobacterium tuberculosis (Mtb) on DC viability as well as to compare the ability of BCG and Mtb to provide DCs with a Th1-polarizing capacity through the assessment of the immunoregulatory cytokines interleukin (IL)-12, IL-10 and interferon-gamma (IFN-gamma).

METHODS: Immature DCs (iDCs) were generated in vitro using peripheral blood monocytes separated by anti-CD14-conjugated microbeads in the presence of granulocyte-macrophage-colony-stimulating factor (GM-CSF) and IL-4, cultured cells were analyzed using flow cytometry, then we tested DC viability after inoculation with M. bovis (with and without IFN-beta pretreatment) and Mtb using light microscopic examination and trypan blue exclusion method. Additionally, supernatants from infected-DCs cultures were analyzed for IFN-gamma, IL-12 and IL-10 by ELISA.

RESULTS: The viability of BCG-infected DCs was significantly higher than that of Mtb-infected DCs (61.55% vs 52.10%). BCG-infected DC produced significantly more IL-12 ($p=0.02$) and less IL-10 ($p=0.01$) compared with Mtb-infected cells. IFN-beta-pretreated BCG-infected DCs produced significantly larger amounts of IL-12 than did BCG-infected DCs ($p=0.03$) and Mtb-infected cells ($p<0.001$).

CONCLUSION: IFN-beta improves DC functions following BCG infection, thus assuming that IFN-beta could be used as a vaccine adjuvant.

Elsawy, M. A., et al. (2017). "Hydrolytic degradation of polylactic acid (PLA) and its composites." Renewable & Sustainable Energy Reviews **79**: 1346-1352.

Biodegradable polymers are seen as a potential solution to the environmental problems generated by plastic waste. In particular, the renewable aliphatic polyesters of poly(hydroxyacid)-type homopolymers and copolymers consisting of polylactic acid (PLA), poly(glycolic acid) (PGA), and poly(e -caprolactone) (PCL) constitute the most promising bioresorbable materials for applications in biomedical and consumer applications. Among those polymers, PLA has attracted particular attention as a substitute for conventional petroleum-based plastics. PLA is synthesized by the fermentation of renewable agricultural sources, including corn, cellulose, and other polysaccharides. Although some of its characteristics are disadvantageous (e.g., poor melt properties, mechanical brittleness, low heat resistance, and slow crystallization), there exist potential routes to resolve these shortcomings. These include copolymerization, blending, plasticization modification, or the addition of reinforcing phases (e.g., chitosan (Cs), cellulose, and starch). In this review, we discuss the degradation mechanisms of PLA and its modified form in the environment, current issues that hinder the achievement of good Cs/PLA combination, and ways to overcome some of these problems. Furthermore, our discussion is extended to cover the subjects of hydrolytic degradation and weathering effects with different Cs/PLA blends. [ABSTRACT FROM AUTHOR]

Eltemsah, Y. S. and T. Bohn (2019). "Acute and chronic effects of polystyrene microplastics on juvenile and adult Daphnia magna." Environmental Pollution **254**(Part A).

We investigate the distribution and effects of polystyrene microplastic (MP) particles in exposure experiments with the ecotoxicology model organism Daphnia magna. The aim was to investigate the short and long-term toxicity of MP at different concentrations. To achieve this goal, the effects of 6 micro m commercially available polystyrene beads on two different life-stages of D. magna: <24 h old juveniles and 9 days old adults was assessed. The following end points in test animals were measured: (1) survival, (2) growth, (3) individual and population fecundity, (4) age at maturation and (5) body size of newborn offspring. These response variables were followed in two acute and two chronic experiments. The acute experiments showed that MP is not acutely toxic to D. magna within 48 h, but cause added mortality within 120 h. The juveniles were about 50% more sensitive than the adults tested. In life-cycle experiments testing chronic exposure to MP, again, animals exposed as juveniles at relatively high concentrations, i.e. >30 micro g ml⁻¹ showed higher sensitivity. We observed slightly increased mortality, reduced growth and stimulation of early reproduction at the cost of later reproduction. Animals exposed after reaching adulthood did not show increased mortality and showed a stimulation response with higher reproductive rates than the control group. However, both the growth rate of mother animals and the body size of newborn declined with increasing dose of MP. We conclude that these effects indicate a role of MP in mechanical interaction/interference with the animal on the level of feeding (clogging filtering functions), digestion (gut filled with plastic particles), and/or other animal behavior. The study also illustrates how MP with slow break-down rates may accumulate in the environment and enter the food-chain as obstructing non-food particles in filter-feeding organisms.

Eltohamy, M., et al. (2011). "Electrosprayed tricalcium phosphate spherical microcups and antibiotic drug delivery." Materials Letters **65**(13): 2043-2046.

Here we prepared tricalcium phosphate (TCP) spherical cups of a few micrometers in size (average=2.74 mu m) by applying the electrospraying method. The sol-gel precursor containing calcium and phosphate (Ca/P=1.5) was mixed with Polyvinylpyrrolidone in ethanol at varying concentrations, and then sprayed under a controlled electrostatic field. The jets from the sol-gel solution changed from a complete fibrous mesh into a formation of microbeads connected with fibers and then further into a complete formation of microbeads as the solution viscosity became decreased. After the thermal treatment (800-1100A degree C), individual microbeads remained, to form the shape of a spherical cup and retained the phase of beta -TCP. The drug delivery potential of the TCP micro-cups, as assessed by using an antibiotic drug ampicillin, demonstrated a dose dependent loading capacity and almost a linear release profile over a day.

Ely, A., et al. (2009). "Copper and nitrophenol pollutants removal by Na-montmorillonite/alginate microcapsules." Journal of Hazardous Materials **171**(1-3): 405-409.

Abstract: The use of renewable bioresources allows the development of low cost adsorbents that are versatile. In the present paper, the affinity and the removal capacity of

montmorillonite/alginate microcapsules for a hydrophobic organic pollutant (4-nitrophenol) and an inorganic pollutant (copper) were evaluated. The physicochemical processes through sorption and kinetic experiments under different ratios of montmorillonite vs. alginate and initial contaminant concentrations were investigated. The total weight loss and diameter decrease during the drying process were 90–96% and 64%, respectively. A significant decrease in beads diameter, related to water elimination, has been observed during the first 24h. Structural modifications that occur during the drying process were evaluated using thermal analysis. From correlation coefficients, the second-order equation depicts properly the adsorption of copper by the microbeads adsorption capacity increases to saturation with time; 3 and 6h were needed to reach equilibrium on wet and dry mixed microcapsules. The pseudo-second order model properly depicts the adsorption process of 4-NP onto Na-mont and (Na-mont/SA) mixed microcapsules but failed to reproduce the data observed for the alginate beads. Isotherms data were fitted with good correlation using the Langmuir model; alginate and montmorillonite adsorption capacities (q m /wet beads) agree with those obtained by various studies. [Copyright &y& Elsevier]
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Enck, K., et al. (2017). "Development of a novel alginate based material for targeted intestinal delivery of therapeutic agents." Tissue Engineering - Part A **23 (Supplement 1)**: S18.

Alginate is a complex polysaccharide routinely used for various encapsulation purposes including oral drug delivery of therapeutic agents since it can immobilize and protect compounds from the harsh stomach acid. We have chemically modified alginate to enhance the bioavailability of orally-administered therapeutic substances through the generation of alginate microbeads resistant to low pH stomach conditions, but readily disintegrate in the more neutral pH of the small intestine. The alginate modification was achieved by oxidizing the vicinal diol in the alginate chain to an aldehyde, then coupling aminoethyl benzoic acid to the aldehyde. By uniquely combining both oxidizing and condensation chemistries, we have been able to more precisely control the degree of modification of alginate, which results in controlled levels of degradation of alginate hydrogel mi-crobeads under simulated gastrointestinal tract (GIT) regional pH conditions. Under these simulated GIT conditions, our in vitro experiments have shown that we can encapsulate specific compounds for oral drug delivery, protect them from low pH conditions and deliver them under neutral-basic pH conditions similar to those in the small intestine where nutrients are absorbed most effectively. Thus, the modification of alginate with aminoethyl benzoic acid would lead to enhanced bioavailability of therapeutic agents after release and absorption in the small intestine and as well as for targeted site delivery of certain substances such as probiotics.

Enders, K., et al. (2019). "Tracing microplastics in aquatic environments based on sediment analogies." Scientific Reports **9**(10).

Microplastics (MP) data collection from the aquatic environment is a challenging endeavour that sets apparent limitations to regional and global MP quantification. Expensive data collection causes small sample sizes and oftentimes existing data sets are compared without accounting for natural variability due to hydrodynamic processes governing the distribution of particles. In

Warnow estuarine sediments (Germany) we found significant correlations between high-density polymer size fractions (>=500 mm) and sediment grain size. Among potential predictor variables (source and environmental terms) sediment grain size was the critical proxy for MP abundance. The MP sediment relationship can be explained by the force necessary to start particle transport: at the same level of fluid motion, transported sediment grains and MP particles are offset in size by one to two orders of magnitude. Determining grain-size corrected MP abundances by fractionated granulometric normalisation is recommended as a basis for future MP projections and identification of sinks and sources.

Enders, K., et al. (2015). "Abundance, size and polymer composition of marine microplastics greater than or equal to 10 mu m in the Atlantic Ocean and their modelled vertical distribution." Marine Pollution Bulletin **100**(1): 70-81.

We studied abundance, size and polymer type of microplastic down to 10 mu m along a transect from the European Coast to the North Atlantic Subtropical Gyre (NASG) using an underway intake filtration technique and Raman micro-spectrometry. Concentrations ranged from 13 to 501itemsm-3. Highest concentrations were observed at the European coast, decreasing towards mid-Atlantic waters but elevated in the western NASG. We observed highest numbers among particles in the 10-20 mu m size fraction, whereas the total volume was highest in the 50-80 mu m range. Based on a numerical model size-dependent depth profiles of polyethylene microspheres in a range from 10-1000 mu m were calculated and show a strong dispersal throughout the surface mixed layer for sizes smaller than 200 mu m. From model and field study results we conclude that small microplastic is ubiquitously distributed over the ocean surface layer and has a lower residence time than larger plastic debris in this compartment.

Endo, S., et al. (2005). "Concentration of Polychlorinated Biphenyls (PCBs) in Beached Resin Pellets: Variability Among Individual Particles and Regional Differences." Marine Pollution Bulletin **50**(10): 1103.

Plastic resin pellets, which constitute one of the major components of plastic debris in the marine environment, contain PCBs, PAHs, and DDTs, among other contaminants, making their ingestion by marine organisms problematic. In this study, resin pellets were collected from a beach in Kasai Seaside Park, Tokyo, Japan, in July 2001 to assess the variation in PCB concentrations among pellets, and samples were also collected from 47 beaches in 2001 and 2002 to explore the regional variation in PCB concentrations. In 55 pellets from Kasai Seaside Park, PCB concentrations ranged from below the detection limit to 2300 ng/g, but only a small proportion of the pellets contained the bulk of the contaminant. Discolored and/or fouled polyethylene resin pellets had higher PCB concentrations than non-discolored pellets. Concentrations of PCBs in plastic resin pellets collected regionally also varied widely, with high PCB concentrations found most frequently in pellets from Tokyo Bay and its vicinity and Osaka Bay. The observed regional pattern of PCB concentrations in the pellets was consistent with that found in mussels.

Enfrin, M., et al. (2020). "Release of hazardous nanoplastic contaminants due to microplastics fragmentation under shear stress forces." Journal of Hazardous Materials **384**: 121393.

The presence of nanoplastics in water has become a major environmental concern in the last decade however the knowledge on the origin and formation of these emerging contaminants is lacking due to analytical challenges in detection and quantification techniques. The release of nanoplastics due to the fragmentation of microplastics extracted from a facial scrub and the resulting toxicity on aquatic species are reported here for the first time. The daily use of 4g of facial scrub could release up to 10¹¹ microplastics of 400nm in size per litre of wastewater from household drains. Turbulences created by mixing or pumping induced the fragmentation of microplastics into nanoplastics smaller than 10nm via a crack propagation and failure mechanism, increasing the number of particles in water by one order of magnitude. Compared to microplastics at a fixed concentration number of 6.8 x 10⁸ part./mL, the generated nanoplastics initiated the death of 54% more cells in zebrafish by passive ingestion via skin diffusion which therefore pose a real threat for aquatic living organisms. These results stress the need to reduce the release of nano/microplastics in the aquatic environment to prevent the contamination of all trophic levels.

Engelhard, H., et al. (2017). "Rotating magnetic beads for enhanced drug delivery: characterization of bead velocity, imaging, and adherence to cellular monolayers." Cancer Research. Conference: American Association for Cancer Research Annual Meeting **77**(13 Supplement 1).

Background: Superparamagnetic iron oxide nanoparticles (SPIONs) have been touted as promising vehicles for enhancing drug delivery for cancer, stroke, and other diseases. Unfortunately, successful clinical use has been hampered by the problem of scale, since the attractive force between iron particle and magnet is inversely proportional to at least the fourth power of the intervening distance. Utilization of magnetically-induced rotary traction (MIRT) offers a way to overcome this obstacle. Here, we present initial data from the use of a new two-part system consisting of: 1) a patented rotating magnet, and 2) magnetic microbeads (MBs), which have been optimized for MIRT. Method(s): MBs and the rotating magnet were provided by Pulse Therapeutics (St. Louis, MO). MBs consist of single-crystalline magnetite cores (~70 nm), which form aggregates in response to a magnetic field. Here, the field is generated by a neodymium-boron-iron permanent magnet, which is rapidly rotated causing MBs to counter-rotate (like meshed gears) at physiologic distances, and move by means of surface traction. Movement of MBs through PBS, DMEM with 5% serum, and 100% serum was measured 7.5 to 30 cm from the magnet. Suspensions of the particles were imaged at different concentrations by MRI and CT scan. 3 cancer cell lines (U87, E297, LKB1-KO), and normal vascular endothelial cells, were maintained using standard tissue culture technique. For adhesion studies, cells were grown in 6-well plates to confluence, treated with 10 uL MBs for 30 min., washed with PBS, imaged with standard light microscopy, digitized, then analyzed using Image J. Result(s): In our experiments, MBs moved readily through PBS, DMEM and serum at distances from 7.5 - 30 cm; with a maximum velocity at 22.5 cm (0.45 +/- 0.04 cm/sec, for serum). While MR imaging produced significant artifact as expected, MBs were clearly seen by CT scan. Adhesion of the MBs to the cancer cell lines was markedly higher than to the endothelial cells (10.9-12.0X) and to fixed cells, used as controls. Conclusion(s): MBs are easily rotated and moved at physiologic distances, even through 100% serum, by means of surface traction, and can be imaged by CT scan. Adhesion of MBs to cancer cells is significantly greater than to endothelial cells. These features show that the Pulse system is an extremely promising one, for use in magnetic drug targeting in the clinical setting.

Engler, R. E. (2012). "The Complex Interaction between Marine Debris and Toxic Chemicals in the Ocean." Environmental Science & Technology **46**(22): 12302-12315.

Marine debris, especially plastic debris, is widely recognized as a global environmental problem. There has been substantial research on the impacts of plastic marine debris, such as entanglement and ingestion. These impacts are largely due to the physical presence of plastic debris. In recent years there has been an increasing focus on the impacts of toxic chemicals as they relate to plastic debris. Some plastic debris acts as a source of toxic chemicals: substances that were added to the plastic during manufacturing leach from plastic debris. Plastic debris also

acts as a sink for toxic chemicals. Plastic sorbs persistent, bioaccumulative, and toxic substances (PBTs), such as polychlorinated biphenyls (PCBs) and dioxins, from the water or sediment. These PBTs may desorb when the plastic is ingested by any of a variety of marine species. This broad look at the current research suggests that while there is significant uncertainty and complexity in the kinetics and thermodynamics of the interaction, plastic debris appears to act as a vector transferring PBTs from the water to the food web, increasing risk throughout the marine food web, including humans. Because of the extremely long lifetime of plastic and PBTs in the ocean, prevention strategies are vital to minimizing these risks. [ABSTRACT FROM AUTHOR]

Entwistle, A., et al. (2018). "Fauna & Flora International expands strategy on marine plastics." Oryx **52**(4): 613-614.

Used in a wide range of consumer products, including rinse-off toiletries such as facial scrubs, shaving products and toothpastes, microbeads (microplastic particles) are known to pass through wastewater treatment and enter the sea, where their size makes them immediately available to filter feeders (Tanaka & Takada, 2016, Scientific Reports, 6, 34351). FFI recognizes the many threats plastic poses to marine life (including entanglement in abandoned fishing gear and the impact of ingestion of plastic pieces) and also has specific concerns about the potential for microplastic pollution to introduce hazardous substances into the marine food chain. [...]FFI also retains a strong focus on preventing direct sources of microplastic pollution (plastic particles reaching the ocean at sizes < 5 mm, such as microbeads, plastic pellets and microplastic fibres), given concerns about the potential for microplastics to introduce hazardous substances (either additives or sorbed chemicals) into the marine food chain.

Enyoh, C. E., et al. (2019). "Airborne microplastics: a review study on method for analysis, occurrence, movement and risks." Environmental Monitoring & Assessment **191**(11): 668.

Microplastics (of size < 5 mm) pollution in our environment is of current concern by researchers, public media and non-governmental organizations. Implications by their presence in aquatic and soil ecosystems have been well studied and documented, but less attention has been paid on airborne microplastics (MPs). Studies concerning airborne microplastics started from 2016 and only a few (n = 13) have been published to date. Although, studies may increase in the following years, since air is very important for human survival. Microplastics have been observed in atmospheric fallouts in indoor and outdoor environments using a sampling or vacuum pump, rain sampler, and/or particulate fallout collector. Identification and quantification have been carried out by visual, spectroscopic, and spectrometric techniques. Factors such as meteorological, climatic, and anthropogenic influence the distribution and movement of airborne MP. Human exposure may be through inhalation, dermal, and open meal during fallout, with their potential biopersistence and translocation. Ingestion may cause localized inflammation and cancer due to responses by the immune cells, especially in individuals with compromised metabolism and poor clearance mechanisms. Ecological risks involve possible contamination of the ecosystem through a dynamic relationship of MPs in soil, water, and air forming a MP contamination cycle. The present review aimed at providing a comprehensive overview of current knowledge or information regarding microplastics in air, identifying gap in knowledge, and giving suggestions for future research.

Eo, S., et al. (2018). "Abundance, composition, and distribution of microplastics larger than 20 µm in sand beaches of South Korea." Environmental Pollution **238**: 894-902.

To support microplastic management, the abundance, composition, and spatial distribution of microplastics on a national scale must be known. Hence, we studied the baseline level of microplastic pollution at 20 sandy beaches along the South Korean coast. All microplastic particles extracted from the sand samples were identified down to 20 µm in size using Fourier transform infrared spectroscopy. The abundances of large microplastics (L-MPs; 1–5 mm) and small microplastics (S-MPs; 0.02–1 mm) were in the range of 0–2088 n/m 2 and 1400–62800 n/m 2 , respectively. Maximum microplastic abundance was in the size range of 100–150 µm, and particles smaller than 300 µm accounted for 81% of the total abundance. Expanded polystyrene (EPS) accounted for 95% of L-MPs, whereas S-MPs were predominantly composed of polyethylene (49%) and polypropylene (38%). The spatial distribution of L-MPs, excluding EPS, was significantly related to population, precipitation, proximity to a river mouth and abundance of macroplastic debris on beach. However, there were no relationships between S-MPs and other environmental and source-related factors, except for macroplastic debris and L-MPs excluding EPS. These results imply that S-MPs are mainly produced on beaches by weathering, whereas L-MPs other than EPS are mainly introduced from land-based sources and are also partly produced on beaches. [ABSTRACT FROM AUTHOR]

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Eom, H. J., et al. (2018). "Potential detrimental effect of waterborne microplastics on differentiation and asexual reproduction of the jellyfish Sanderia malayensis." Toxicology and Environmental Health Sciences **10 (4)**: S43.

To examine potential detrimental effect of waterborne microplastics (MPs) on the development and asexual reproduction of the jellyfish Sanderia malayensis, different sizes of MPs (i.e. 1, 3, 6, and 10 mum) were exposed to the jellyfish under two different experimental conditions, direct and indirect exposures. Firstly, polyp and ephyra of S. malayensis were directly exposed to 200 mul/L of each size of MPs. As a result, the MPs were directly attached to the inside and outside of the polyp, which remained for up to 9 days, while MPs were observed to be attached only to the outside of ephyra. In addition, we observed that some MPs are transferred through body during strobilation. In the case of indirect exposure, the jellyfish were exposed through feeding with microplastic-fed brine shrimp. MPs movement in the inside of ephyra was observed compared to direct treatment. The MPs were remained until 6 days even without any food source. Finally, we observed that MPs treatment on polyps can affect next life cycle with differentiation.

Ercolini, D., et al. (2003). "Development of a fluorescence in situ hybridization method for cheese using a 16S rRNA probe." Journal of Microbiological Methods **52**(2): 267-271.

A 16S rRNA fluorescence in situ hybridization (FISH) method for cheese was developed to allow detection in situ of microorganisms within the dairy matrix. An embedding procedure using a plastic resin was applied to Stilton cheese, providing intact embedded cheese sections

withstanding the hybridization reaction. The use of a fluorescein-labelled 16S rRNA Domain Bacteria probe allowed observation of large colonies of microbial cells homogeneously distributed in the cheese matrix. FISH experiments performed on cheese suspensions provided images of the different microbial morphotypes occurring. The technique has great potential to study the spatial distribution of microbial populations in situ in foods, especially where the matrix is too fragile to allow manipulation of cryosections.

Erdem Yayayuruk, A., et al. (2019). "Polystyrene-divinyl benzene microspheres with amino methyl phosphonic acid functional hairy brushes for the sorption and speciation of chromium prior to inductively coupled plasma mass spectrometric determination." Mikrochimica Acta **186**(8): 571.

This article describes the synthesis and application of a novel sorbent for Cr(III) and Cr(VI) speciation prior to their quantitation by inductively coupled plasma mass spectrometry. The sorbent consists of polystyrene-divinyl benzene microbeads that were graft-coated with poly(oligo (ethylene glycol) methacrylate)-block-poly(glycidyl methacrylate). The particles were finally modified with phosphomethylated triethylene tetramine. The resulting microbeads are shown to be a viable sorbent for Cr(VI). The total concentration of chromium was determined after oxidation of Cr(III) to Cr(VI) with KMnO₄ using the novel sorbent. The Cr(III) amount was then calculated by subtracting the concentration of Cr(VI) from that of total chromium. The optimum conditions for batch type sorption were established. Under optimal conditions, the limit of detection and quantification are 0.015 mug L⁻¹ and 0.050 mug L⁻¹, respectively. The kinetics and isotherms of the sorption of Cr(VI) were investigated. Following desorption with 0.1 M hydroxylamine hydrochloride, the method was successfully applied to spiked real water samples and a certified reference material. Graphical abstract Schematic presentation of a method for the sorption and speciation of chromium using amino methyl phosphonic acid functional brushes on polystyrene-divinyl benzene microspheres.

Eriksen, M., et al. (2018). "Microplastic sampling with the AVANI trawl compared to two neuston trawls in the Bay of Bengal and South Pacific." Environmental Pollution **232**: 430-439.

Many typical neuston trawls can only be used during relatively calm sea states and slow tow speeds. During two expeditions to the Bay of Bengal and the eastern South Pacific we investigated whether the new, high-speed AVANI trawl (All-purpose Velocity Accelerated Net Instrument) collects similar amounts and types of microplastics as two established scientific trawl designs, the manta trawl and the DiSalvo neuston net. Using a 335 µm net, the AVANI trawl can collect microplastics from the sea surface at speeds up to 8 knots as it “skis” across the surface, whereas the manta and DiSalvo neuston trawls must be towed slowly in a less turbulent sea state and often represent shorter tow lengths. Generally, the AVANI trawl collected a greater numerical abundance and weight of plastic particles in most size classes and debris types than the manta trawl and DiSalvo neuston net, likely because these trawls only skim the surface layer while the AVANI trawl, moving vertically in a random fashion, collects a “deeper” sample, capturing the few plastics that float slightly lower in the water column. However, the samples did not differ enough that results were significantly affected, suggesting that studies done with these different trawls are comparable. The advantage of the AVANI trawl over traditional research trawls is that it allows for collection on vessels underway at high speeds and during long transits, allowing for a nearly continuous sampling effort over long distances. As local surface currents make sea surface abundance widely heterogeneous, widely spaced short-tow trawls, such as the manta and DiSalvo trawls, can catch or miss hotspots or meso-scale variability of microplastic accumulations, whereas the AVANI trawl, if utilized for back-to-back tows of intermediate distances (5–10 km), can bridge variable wind conditions and

debris concentrations potentially reducing variance and provide a greater resolution of spatial distribution. [ABSTRACT FROM AUTHOR]

Eriksen, M., et al. (2013). "Microplastic pollution in the surface waters of the Laurentian Great Lakes." Marine Pollution Bulletin **77**(1-2): 177-182.

Neuston samples were collected at 21 stations during an ~700 nautical mile (~1300 km) expedition in July 2012 in the Laurentian Great Lakes of the United States using a 333 mum mesh manta trawl and analyzed for plastic debris. Although the average abundance was approximately 43,000 microplastic particles/km2, station 20, downstream from two major cities, contained over 466,000 particles/km2, greater than all other stations combined. SEM analysis determined nearly 20% of particles less than 1 mm, which were initially identified as microplastic by visual observation, were aluminum silicate from coal ash. Many microplastic particles were multi-colored spheres, which were compared to, and are suspected to be, microbeads from consumer products containing microplastic particles of similar size, shape, texture and composition. The presence of microplastics and coal ash in these surface samples, which were most abundant where lake currents converge, are likely from nearby urban effluent and coal burning power plants.

Eriksson, C. and H. Burton (2003). "Origins and Biological Accumulation of Small Plastic Particles in Fur Seals from Macquarie Island." AMBIO - A Journal of the Human Environment **32**(6): 380.

One hundred and sixty four plastic particles (mean length 4.1 mm) recovered from the scats of fur seals (Arctocephalus spp.) on Macquarie Island were examined. Electron micrographs of 41 of the plastic particles showed that none could be identified as plastic pellet feedstock from their shapes. Commonly, such pellets are cylindrical and spherical. Instead, all the 164 plastic particles from the seal scats were angular particles of 7 colors (feedstock particles are normally opaque or white) and could be classified into 2 categories: i) fragmented along crystal lines and likely to be the result of UV breakdown; and ii) wom by abrasion (where striations were clearly visible) into irregular shapes with rounded corners. White, brown, green, yellow and blue were the most common colors. In composition, they came from 5 polymer groups; polyethylene 93%, polypropylene 4%, poly(1-Cl-1-butenylene) polychloroprene 2%, melamine-urea (phenol) (formaldehyde) resin 0.5%, and cellulose (rope fiber) 0.5%. The larger groups are buoyant with a specific gravity less than that of seawater. These small plastic particles are formed from the breakdown of larger particles (fragments). Their origin seems to be from the breakdown of user plastics washed ashore and ground down on cobbled beaches. Certainly most particles (70%) had attained their final form by active abrasion. It is hypothesized that the plastic particles were washed out to sea and then selected by size and consumed by individuals of a pelagic fish species, Electrona subaspera, who in turn were consumed by the fur seals. Thus, the particles were accumulated both by the fish and the seals in the usual process of their feeding. [ABSTRACT FROM AUTHOR]

Erkers, T., et al. (2018). "A proinflammatory invariant natural killer t cells phenotypic state associates with human graft-versus-host disease onset and response." Blood. Conference: 60th Annual Meeting of the American Society of Hematology, ASH **132**(Suppl. 1).

Human invariant natural killer T cells (iNKT) are a rare population of lymphocytes that bridges innate and adaptive immune functions. iNKt cells have different potent effector functions and subsets, but this heterogeneity is mostly understood by a superimposed framework of classic T cell markers. This may help explain contradictory studies of iNKt cells in diseases for which they are thought to play a pathogenic role. In this study, we present data suggesting new markers to understand human iNKt cell heterogeneity and function, as well as monitoring this in the clinical context of allogeneic stem cell transplantation (ASCT) and graft-versus-host disease (GVHD). In both preclinical murine models and in correlative clinical studies, iNKt cells are associated with less GVHD and better immune reconstitution following ASCT. We performed bulk whole transcriptome sequencing on iNKt cells from patients at day +30 after ASCT, some who developed and some who did not develop GVHD. Gene expression signatures of the iNKt cells from each individual are grouped based on a transcriptome library of reference cell types (CIBERSORT). Using this approach, we distinguished patients who will develop GVHD as predominately having an activated cytotoxic cell gene signature, whereas patients without GVHD had a CD4+ T cell gene signature within purified peripheral blood iNKt cells. Using two different high throughput single-cell RNA sequencing (sc-seq) platforms to determine differential gene expression on the single cell level, we first examined the gene expression signatures of primary human iNKt cells from healthy donors. Activation with CD3/28 microbeads of primary iNKt cells promoted two main differential transcriptional profiles in iNKt cells. One profile resembles conventional CD4+ T cells and associated Th2 cytokine profile (IL2, IL4), whereas the other profile has genes associated with cytotoxicity and inflammation (TNF, IFNG, GZMB). Confirmation by flow cytometry showed that while CD8 surface expression did not well differentiate the pro-inflammatory and cytotoxic subsets, but both CD94 and KLRG1 better associate with Th1 and cytotoxic responses. CD94+ iNKt are restricted to CD4-cells and KLRG1 expressed in both CD4+ and CD4-populations. By comparison, the analysis of sc-seq of normal healthy subjects and post-transplant patients with and without GVHD resulted in the identification of three major iNKt populations. The population most associated with GVHD showed expression of a pro-inflammatory profile enriched for CXCR4, CD94, HLADRB1/A1 and decreased KLRB1. Whereas, post-transplant patients with healthy GVHD-free and relapse free immune reconstitution showed a more T cell like profile but with increased expression of CXCR4, CD94, KLRB1 and decreased HLADRB1/A1. Using flow cytometry of ex vivo expanded iNKt cells, we found the expansion of CXCR4+HLA-DR+ that can be CD4+ or CD4-and that these cells produce high levels of the cytokine TNF-a, IFN-g and IL-4. Importantly, iNKt cells that are CXC4+HLA-DR+KLRB1^{low} make significantly less IL-4 and these are enriched in the GVHD setting. Using flow cytometry, we measured iNKt cell phenotypes in a pilot cohort of 48 individuals; 10 healthy controls, 10 patients with no complications or relapse after ASCt and 1 8 patients with GVHD of which 9 were steroid refractory. In addition, we evaluated 11 patients with new onset T frequency of the cytotoxic CD94+ iNKt cells were significantly increased in all patients following and in T1 D compared to healthy controls. patients with GVHD showed an increase in HLA-DR+CXCR4+KLRB1^{low} iNKt cells. Increases in the late activation marker HLA-DR distinguishe corticosteroid refractory (HLA-DR++) from steroid responsive

patients at the time of initial GVHD diagnosis. For patients who responded to steroids or further therapy, we found that a reduction in HLA-DR associated with treatment response. In a second 24 patient cohort, we found that the presence HLA-DR⁺CXCR4⁺CD161^{low} cells at day +30 was statistical y greater in patients who would go on to develop GVHD as compared as those who did not (student T test, p<0.01) To conclude, we have used different methods to discover and validate groups of iNKt cells with distinct functions, and the associated phenotype correlate with clinical inflammation both following ASCt and in T1D.

Erlandsen, S. L., et al. (1979). "Technical parameters of immunostaining of osmicated tissue in epoxy sections." Journal of Histochemistry and Cytochemistry **27**(9): 1286-1289.

The development of the labeled and unlabeled enzyme methods and their application at the light and electron microscopic level have led to the widespread use of postembedding staining techniques of a wide variety of antigens. An important step in the postembedding staining technique is the 'etching' or pretreatment of the plastic section with an agent to enhance the binding of specific primary antibody to antigen in the section. Sodium ethoxide (or alcoholic sodium hydroxide both of which physically dissolve polymerized epoxy resin, were initially used to facilitate tinctorial staining and later by Lange to enhance the imunofluorescence for glucagon in plastic sections of pancreatic islets. Hydrogen peroxide has been used to bleach osmium from plastic sections and to enhance staining for glycoproteins at the ultrastructural level, but was first used by Nakane in 1971 to enhance immunostaining at the ultrastructural level for growth hormone and prolactin in osmicated sections or rat pituitary. Using the unlabeled antibody enzyme method, Moriarty and Halmi and Erlandsen showed that intensity of immunostaining in the postembedding technique was enhanced if sections of aldehyde fixed tissue were briefly exposed to hydrogen peroxide before application of immunoreagents. The successful use of hydrogen peroxide and alcoholic sodium hydroxide in the enhancement of immunostaining has led to their widespread adoption as an essential step in post embedding staining despite the fact that there is relatively little information available as to what effect these agents may have on the plastic resin or on the stability and extraction of antigens from the tissue sections. In this report the effect of various types of etching or pretreatment agents on the surface topography of the plastic sections has been investigated and has been correlated with withg the immunostaining for lysozyme within rat Paneth cells and with the extraction of Na¹²⁵I by these agents from cured epoxy resin.

Erni-Cassola, G., et al. (2017). "Lost, but Found with Nile Red: A Novel Method for Detecting and Quantifying Small Microplastics (1 mm to 20 µm) in Environmental Samples." Environmental Science & Technology **51**(23): 13641.

Marine plastic debris is a global environmental problem. Surveys have shown that <5 mm plastic particles, known as microplastics, are significantly more abundant in surface seawater and on shorelines than larger plastic particles are. Nevertheless, quantification of microplastics in the environment is hampered by a lack of adequate high-throughput methods for distinguishing and quantifying smaller size fractions (<1 mm), and this has probably resulted in an underestimation of actual microplastic concentrations. Here we present a protocol that allows high-throughput detection and automated quantification of small microplastic particles (20-1000 µm) using the dye Nile red, fluorescence microscopy, and image analysis software. This protocol has proven to be highly effective in the quantification of small polyethylene, polypropylene, polystyrene, and nylon-6 particles, which frequently occur in the water column. Our preliminary results from sea surface tows show a power-law increase in small microplastics (i.e., <1 mm) with a decreasing particle size. Hence, our data help to resolve speculation about the "apparent" loss of this fraction from surface waters. We consider that this method presents a step change in the ability to detect small microplastics by substituting the subjectivity of human visual sorting with a sensitive and semiautomated procedure.

Erni-Cassola, G., et al. (2019). "Distribution of plastic polymer types in the marine environment; A meta-analysis." Journal of Hazardous Materials **369**: 691-698.

Despite growing plastic discharge into the environment, researchers have struggled to detect expected increases of marine plastic debris in sea surfaces, sparking discussions about "missing plastics" and final sinks, which are hypothesized to be coastal and deep-sea sediments. While it holds true that the highest concentrations of plastic particles are found in these locations (10³-10⁴ particles m⁻³ in sediments vs. 0.1-1 particles m⁻³ in the water column), our meta-analysis also highlights that in open oceans, microplastic polymer types segregated in the water column according to their density. Lower density polymers, such as polypropylene and polyethylene, dominated sea surface samples (25% and 42%, respectively) but decreased in abundance through the water column (3% and 2% in the deep-sea, respectively), whereas only denser polymers (i.e. polyesters and acrylics) were enriched with depth (5% in surface seawater vs. 77% in deep-sea locations). Our meta-analysis demonstrates that some of the most abundant and recalcitrant manufactured plastics are more persistent in the sea surface than previously anticipated and that further research is required to determine the ultimate fate of these polymers as current knowledge does not support the deep sea as the final sink for all polymer types. Copyright © 2019 The Author(s)

Erren, T., et al. (2009). "Increase of wildlife cancer: An echo of plastic pollution?" Nature Reviews Cancer **9**(11): 842.

Erren, T. C., et al. (2015). ""plastic ocean": What about cancer?" Environmental Pollution **207**: 436-437.

Marine plastic pollution may contribute to wildlife and human cancer. Copyright © 2015 Elsevier Ltd. All rights reserved.

Ersoz, A., et al. (2004). "Ni(II) ion-imprinted solid-phase extraction and preconcentration in aqueous solutions by packed-bed columns." Analytica Chimica Acta **502**(1): 91-97.

Solid-phase extraction (SPE) columns packed with materials based on molecularly imprinted polymers (MIPs) were used to develop selective separation and preconcentration for Ni(II) ion from aqueous solutions. SPE is more rapid, simple and economical method than the traditional liquid-liquid extraction. MIPs were used as column sorbent to increase the grade of selectivity in SPE columns. In this study, we have developed a polymer obtained by imprinting with Ni(II) ion as a ion-imprinted SPE sorbent. For this purpose, NI(II)-methacryloylhistidinedihydrate (MAH/Ni(II)) complex monomer was synthesized and polymerized with cross-linking ethyleneglycoldimethacrylate to obtain [poly(EGDMA-MAH/Ni(II))]. Then, Ni(II) ions were removed from the polymer getting Ni(II) ion-imprinted sorbent. The MIP-SPE preconcentration procedure showed a linear calibration curve within concentration range from 0.3 to 25ng/ml and the detection limit was 0.3ng/ml (3s) for flame atomic absorption spectrometry (FAAS). Ni(II) ion-imprinted microbeads can be used several times without considerable loss of adsorption capacity. When the adsorption capacity of nickel imprinted microbeads were compared with non-imprinted microbeads, nickel imprinted microbeads have higher adsorption capacity. The K<inf>d</inf> (distribution coefficient) values for the Ni(II)-imprinted microbeads show increase in K<inf>d</inf> for Ni(II) with respect to both K<inf>d</inf> values of Zn(II), Cu(II)

and Co(II) ions and non-imprinted polymer. During that time K<inf>d</inf> decreases for Zn(II), Cu(II) and Co(II) ions and the k' (relative selectivity coefficient) values which are greater than 1 for imprinted microbeads of Ni(II)/Cu(II), Ni(II)/Zn(II) and Ni(II)/Co(II) are 57.3, 53.9, and 17.3, respectively. Determination of Ni(II) ion in sea water showed that the interfering matrix had been almost removed during preconcentration. The column was good enough for Ni determination in matrixes containing similar ionic radii ions such as Cu(II), Zn(II) and Co(II). © 2003 Elsevier B.V. All rights reserved.

Esbert, M., et al. (2017). "Spermatozoa with numerical chromosomal abnormalities are more prone to be retained by Annexin V-MACS columns." Andrology **5**(4): 807-813.

Colloidal super-paramagnetic microbeads conjugated with annexin V are effective for separating apoptotic spermatozoa by MACS as a result of the high affinity of annexin V for externalized PS molecules. The effectiveness of the procedure in reducing the percentage of sperm with fragmented DNA and abnormal morphology has also been reported. However, it is still unknown if it could decrease the percentage of aneuploid spermatozoa. The objective of our prospective study, performed on 16 males with abnormal FISH on spermatozoa, was to assess if MACS columns were useful tools to retain spermatozoa carrying chromosomal abnormalities in semen samples processed after density gradient centrifugation (DGC). The pellet obtained after DGC was subjected to MACS, and sperm FISH analyses were performed both in the eluded fraction and in the fraction retained in the column. The observed frequencies of disomy and nullisomy 13, 18, and 21, X and Y, as well as the diploidy rates in the MACS eluded fraction and the fraction retained in the MACS column were recorded. We observed that the frequencies of aneuploidies in the eluded fraction were lower than in the fraction retained in the MACS column (0.59% vs. 0.75%; $p = 0.010$). DGC determined a significant reduction in sperm concentration (z-ratio = 2.83; $p = 0.005$) and a significant increase in sperm progressive motility (z-ratio = -3.5; $p < 0.001$). MACS also led to a significant reduction in sperm concentration (z-ratio = 3.14; $p = 0.002$) and a significant increase in progressive motility (z-ratio = -2.59; $p = 0.01$) when compared with the post-DGC sample. Sperm concentration was similar in the two fractions generated by MACS (z-ratio = 0.63; $p = 0.52$), while progressive motility was significantly higher in the MACS eluded fraction (z-ratio = 2.42; $p = 0.02$). According to our results, MACS columns are able to selectively retain spermatozoa carrying chromosomal abnormalities. Furthermore, the performance of DGC and MACS on semen samples leads to an enrichment of progressive motility.

Esiukova, E. (2017). "Plastic pollution on the Baltic beaches of Kaliningrad region, Russia." Marine Pollution Bulletin **114**(2): 1072-1080.

Contamination of sandy beaches of the Baltic Sea in Kaliningrad region is evaluated on the base of surveys carried out from June 2015 to January 2016. Quantity of macro/meso/microplastic objects in the upper 2cm of the sandy sediments of the wrack zone at 13 sampling sites all along the Russian coast is reported. Occurrence of paraffin and amber pieces at the same sites is pointed out. Special attention is paid to microplastics (range 0.5-5mm): its content ranges between 1.3 and 36.3 items per kg dry sediment. The prevailing found type is foamed plastic. No sound differences in contamination are discovered between beaches with high and low anthropogenic load. Mean level of contamination is of the same order of magnitude as has been reported by other authors for the Baltic Sea beaches.

Esiukova, E., et al. (2020). "Data on microplastic contamination of the Baltic Sea bottom sediment samples in 2015-2016." Data in Brief **28**: 104887.

The contamination by microplastics particles (MPs, 0.2-5 mm) in bottom sediments of the Baltic

Sea is quantified. In total, 53 sediment samples were obtained in 8 cruises of research vessels in July-October 2015 and March-December 2016. The depths from 3 to 215 m in the Gotland, Gdansk, and Bornholm Basins are covered. Primary data is provided, along with exhaustive information on sampling dates and coordinates, depths, sampling methods, extracting procedures, control measures, detection techniques, and verification by mu-Raman spectroscopy. Number of pieces per kg dry weight is determined separately for fibres, films, and fragments. Distributions by size, plastic colour, and plastic type are presented. Modified NOAA method and mu-Raman spectroscopy were applied to obtain the data, thus they can be used for comparative analyses.

Eskandari, H. G. (2011). "Flow cytometric applications in general and it's role on organ transplantation. [Turkish, English]." Turkish Journal of Biochemistry. Conference: 23rd National Biochemistry Congress. Adana Turkey. Conference Publication: **36**(SPEC. ISS. 2).

A flow cytometer is an instrument that illuminates cells or other particles as they flow individually in front of a light source and then detects and correlates the signals from those cells that result from the illumination. The value of the technique lies in the ability to make measurements on large numbers of single cells within a short period of time. The heterogeneity of populations can be revealed and different subsets of cells identified and quantified. Selected cell populations can also be physically sorted for further study. Flow cytometry is finding increasing use in routine clinical laboratories for the diagnosis, prognosis and monitoring of disease. The immunophenotyping of patients with a haematological neoplasm is the most frequently used area of the tool. Flow cytometry has also been used in the transplantation laboratory for several years. The presence of recipient antibodies against antigens expressed on donor cells are a major risk factor for early rejection or graft loss. To overcome this problem crossmatching between donor cells and recipient serum is performing. The initial tecnique for crossmatching, complement-dependent cytotoxicity, is relatively insensitive. The flow cytometric crossmatch which was developed in 1982, is an important method to investigate donor specific HLA antibodies before transplantation. The test has the advantage of being more sensitive than the initial tecnique. Since the early 2000s, panel reactive antibodies have been investigated by flow cytometry. In this system micro beads coated with HLA antigens have been used to detect both the frequency and the specificity of HLA antibodies.

Eskin, D., et al. (2005). "Microhydrodynamic analysis of nanogrinding in stirred media mills." American Institute of Chemical Engineers. AIChE Journal **51**(5): 1346-1358.

The dynamics of the milling media in a turbulent flow is considered. The mean velocity of the milling beads is calculated on the assumption that the power spent on stirring is transferred into the energy of turbulent eddies. The energy spent on stirring dissipates as a result of media-liquid viscous friction, lubrication, and by inelastic collisions of the beads with each other. The maximum force at which the milling beads can compress particles between them is calculated by the Hertzian theory of elastic impact. The frequency of compressions for a single particle is evaluated by probabilistic analysis. A criterion of milling efficiency, based on calculating the energy spent on the plastic particle deformation, is proposed. A numerical study of the milling bead dynamics and their interactions with the particles in the mixing tank is performed. The numerical results are in qualitative agreement with the experimental data. Both the numerical and experimental analyses show that, from the perspective of hydrodynamics, an optimization of stirred media mills can be achieved by choosing the optimum size and concentration of the milling media. [PUBLICATION ABSTRACT]

Esparza, M., et al. (2015). "PstS-1, the 38-kDa mycobacterium tuberculosis glycoprotein, is an adhesin, which binds the macrophage mannose receptor and promotes phagocytosis." Scandinavian Journal of Immunology **81**(1): 46-55.

Mycobacterium tuberculosis, the primary causative agent of tuberculosis, infects macrophages and transforms the hostile intracellular environment into a permissive niche. M. tuberculosis infects macrophages using a variety of microbial ligand/cell receptor systems. In this study, binding assays with biotin-labelled mycobacterial cell wall proteins revealed five Concanavalin A-reactive proteins that bind macrophages. Among these proteins, we identified PstS-1, a 38-kDa M. tuberculosis mannosylated glycolipoprotein, and characterized it as an adhesin. Inhibition assays with mannan and immunoprecipitation demonstrated that PstS-1 binds the mannose receptor. We purified PstS-1 to 95.9% purity using ion exchange chromatography. The presence of mannose in purified PstS-1 was demonstrated by Concanavalin A interaction, which was abolished in the presence of sodium m-periodate and α-D-mannosidase. Gas chromatography revealed that purified PstS-1 contained 1% of carbohydrates by weight, which was mainly mannose. Finally, we used fluorescent microbeads coated with purified PstS-1 in phagocytosis assays and discovered that microbead uptake was inhibited by the pre-incubation of cells with GlcNAc, mannan and α-methyl mannoside. The interaction of PstS-1 coated beads with the mannose receptor was confirmed by confocal colocalization studies that showed high Pearson and Manders's colocalization coefficients. Our findings contribute to a better understanding of the strategies M. tuberculosis uses to infect host cells, the critical first step in the pathogenesis of tuberculosis. © 2015 John Wiley & Sons Ltd.

Espinosa, C., et al. (2019). "Dietary administration of PVC and PE microplastics produces histological damage, oxidative stress and immunoregulation in European sea bass (Dicentrarchus labrax L.)." Fish & Shellfish Immunology **95**: 574-583.

Worldwide, plastic waste is increasingly being discharged into the oceans, where it breaks down into smaller particles. Of these particles, the ingestion of microplastics (MPs; particles smaller than 5mm) have been documented in some aquatic animals, including fish, whose health and welfare suffer as a consequence. However, their precise effects are not completely understood. To shed light on this issue, European sea bass (Dicentrarchus labrax L.) specimens were fed diets containing 0 (control), 100 or 500mg polyvinylchloride (PVC) or polyethylene (PE) MPs kg⁻¹ diet for three weeks, after which samples of liver, intestine, skin mucus and head kidney (HK) were obtained. A histological study of the liver and intestine revealed important alterations in the fish fed the MP diets, compared with control fish. At a functional level, PE-MPs, but not PVC-MPs, decreased the activity of antioxidant enzymes, suggesting a certain level of oxidative stress. As regards immunity, the intake of PVC-MPs increased the phagocytic and respiratory burst activities of HK leucocytes whilst the intake of PE-MPs increased skin mucus immunoglobulin M levels and the respiratory burst activity of leucocytes. The results suggest that the short-medium term intake of PVC- or PE-MPs by fish slightly depresses their immunity and produces oxidative stress. However, based on the histological alterations found, it seems that longer exposure times might lead to irreversible damage that could compromise fish health and welfare.

Espinosa, C., et al. (2018). "In vitro effects of virgin microplastics on fish head-kidney leucocyte activities." Environmental Pollution **235**: 30-38.

Microplastics are well-documented pollutants in the marine environment that result from production or fragmentation of larger plastic items. The knowledge about the direct effects of microplastics on immunity, including fish, is still very limited. We investigated the in vitro effects

of microplastics [polyvinylchloride (PVC) and polyethylene (PE)] on gilthead seabream (Sparus aurata) and European sea bass (Dicentrarchus labrax) head-kidney leucocytes (HKLs). After 1 and 24 h of exposure of HKLs with 0 (control), 1, 10 and 100 mg mL⁻¹ MPs in a rotatory system, cell viability, innate immune parameters (phagocytic, respiratory burst and peroxidase activities) and the expression of genes related to inflammation (il1b), oxidative stress (nrf2, prdx3), metabolism of xenobiotics (cyp1a1, mta) and cell apoptosis (casp3) were studied. Microplastics failed to affect the cell viability of HKLs. In addition, they provoke very few significant effects on the main cellular innate immune activities, as decrease on phagocytosis or increase in the respiratory burst of HKLs with the highest dose of microplastics tested. Furthermore, microplastics failed to affect the expression of the selected genes on sea bass or seabream, except the nrf2 which was up-regulated in seabream HKLs incubated with the highest doses. Present results seem to suggest that continue exposure of fish to PVC or PE microplastics could impair fish immune parameters probably due to the oxidative stress produced in the fish leucocytes.

Espulgar, W., et al. (2019). "Utility of Centrifugation-Controlled Convective (C3) Flow for Rapid On-chip ELISA." Scientific Reports **9**(1): 20150.

Miniaturizing the enzyme-linked immunosorbent assay (ELISA) protocols in microfluidics is sought after by researchers for a rapid, high throughput screening, on-site diagnosis, and ease in operation for detection and quantification of biomarkers. Herein, we report the use of the centrifugation-controlled convective (C3) flow as an alternative method in fluid flow control in a ring-structured channel for enhanced on-chip ELISA. A system that consists of a rotating heater stage and a microfluidic disk chip has been developed and demonstrated to detect IgA. The ring-structured channel was partially filled with microbeads (250 micro m in diameter) carrying the capture antibodies and the analyte solution was driven by thermal convection flow (50 micro L/min) to promote the reaction. The remaining part of the circular channel without microbeads served as the observation area to measure the absorbance value of the labeled protein. Currently, the system is capable of conducting four reactions in parallel and can be performed within 30 min at 300 G. A detection limit of 6.16 ng/mL using 24 micro L of target sample (IgA) was observed. By simply changing the capture antibodies, the system is expected to be versatile for other immunoassays.

Estahbanati, S. and N. L. Fahrenfeld (2016). "Influence of wastewater treatment plant discharges on microplastic concentrations in surface water." Chemosphere **162**: 277-284.

The abundance of microplastic particles in the marine environment is well documented, but less is known about microplastics in the freshwater environment. Wastewater treatment plants (WWTPs) may not effectively remove microplastics allowing for their release to the freshwater environment. To investigate concentration of microplastic in fresh water and the impact of WWTP effluent, samples were collected upstream and downstream of four major municipal WWTPs on the Raritan River, NJ. Microplastics were categorized into three quantitative categories (500-2000 mum, 250-500 mum, 125-250 mum), and one semi-quantitative category (63-125 mum). Then, microplastics were classified as primary (manufactured in small size) or secondary (derived from larger plastics) based on morphology. The concentration of microplastics in the 125-250 and 250-500 mum size categories significantly increased downstream of WWTP. The smaller size classes, often not quantified in microplastic studies, were in high relative abundance across sampling sites. While primary microplastics significantly increased downstream of WWTP, secondary microplastic was the dominant type in the quantitative size categories (66-88%). A moderate correlation between microplastic and

distance downstream was observed. These results have implications for understanding the fate and transport of microplastics in the freshwater environment.

Esther, C. R. (2015). "Of mucins, microbiome, and metabolome: Assessing the pathobiology of early Cf airways disease." Pediatric Pulmonology **41)**: 143.

Although airways from infants with cystic fibrosis (CF) appear anatomically normal at birth, lung disease can start very early in life. This disease develops in very heterogeneous fashion, progressing to bronchiectasis in less than a year in some regions of the lung but seemingly sparing other airways, and some individuals, entirely. Our group has hypothesized that abnormal hydration of mucins is the initiating defect in early CF airways disease, with heterogeneity arising from the fact that redundant (non-CFTR based) systems can normally maintain airway hydration but are vulnerable to localized exogenous insults that alter the airway milieu. Thus, we predict that early CF airway disease would be characterized by changes in airway mucins and aspects of the airway microenvironment (reflected in the metabolome and microbiome) that could alter redundant hydration pathways. We are testing these hypotheses through a collaborative effort between the Australian Respiratory Early Surveillance Team for CF (AREST CF) and the University of North Carolina at Chapel Hill (UNC). Preschool subjects in AREST CF undergo annual chest CT and bronchoscopy, and bronchoalveolar lavage fluid (BALF) samples are sent to UNC for analyses of mucins, metabolome, and microbiome. Heterogeneity is addressed through use of lobe specific lavages and chest CT scores. These collaborative studies have revealed that BALF obtained from lobes with CT evidence of structural lung disease have higher mucin concentrations than samples from lobes with minimal or no disease. In addition, immunohistochemistry studies suggest that mucins from children with CF exhibit a compact structure that differs from the more filamentous appearance of mucins from non-CF disease controls, and microbead rheology reveals the presence of highly concentrated mucin flakes in CF BALF. These structural changes to mucins likely exacerbate the airway dehydration phenotype. Early lung disease is also associated with changes in the airway microenvironment. Metabolomics studies have identified several altered pathways, including elevated extracellular adenosine metabolism and protease activity in early disease. Similar findings are observed with glutathione, indicating a role for oxidative stress. These pathways have been associated with airway neutrophils, consistent with inflammation occurring early in disease. The metabolites within these pathways can serve as biomarkers of structural lung disease and are predictive of future bronchiectasis. We have also observed changes in the microbiome associated with early disease. In preliminary studies, microbiota from CF airways appear to cluster into three general groups: environmental bacteria (that may reflect background signal), oral flora, and established pathogens. Not surprisingly, we find that pathogens are overrepresented in samples from lobes with bronchiectasis. More interestingly, oral flora are found at greater frequency in lobes with early disease (bronchial wall thickening), and we also detect higher concentrations of salivary amylase from these samples as well. In summary, our findings support the hypothesis that early CF lung disease is associated with changes in mucin concentration and structure as well as metabolomic biomarkers of inflammation and oxidative stress. The microbiome studies suggest the possibility that aspiration may serve as a trigger for early disease, though causation cannot necessarily be proven from these correlative studies. These findings provide new insights into early CF lung disease pathophysiology, and we are exploring methods such as biomarker detection in exhaled breath condensate (EBC) that could serve as less invasive methods to assess early disease.

Esther, C. R., et al. (2016). "Mucus dehydration as the initiating defect in early CF airways disease."

Pediatric Pulmonology **51 (Supplement 45)**: 223.

Background: While loss of CFTR-mediated airway hydration is hypothesized to be the initiating defect in CF airways disease, recent animal studies suggest that reduced bacterial killing and subsequent airway infection may precede changes in mucus hydration. To assess which factors are associated with the earliest stages of airways disease in humans, we measured mucin and metabolomic profiles of bronchoalveolar lavage fluid (BALF) relative to measures of infection, inflammation, and structural lung disease in preschool subjects enrolled in AREST CF. Method(s): Separate aliquots of BALF were obtained from the right middle lobe and lingula of 40 preschool subjects with CF (80 lobes) enrolled in AREST CF (age 3.5+/-2.0 years) and 14 non-CF disease controls (28 lobes) (age 3.2+/-1.8 years). Mucin concentrations were measured by refractometry, staining intensities of MUC5AC and MUC5B by immunohistochemistry, and rheological characteristics by microbead rheology. Findings were analyzed relative to BALF inflammatory markers, cultures, and metabolomic profiling in 24 subjects (48 lobes) as well as lobe-specific CT scores for bronchial wall thickening or bronchiectasis as markers of structural lung disease. Result(s): Airway mucus concentrations were higher in preschool subjects with CF relative to non-CF disease controls (Non-CF 99 [61-145] mug/mL vs. CF 182 [101-629] mug/mL, p<0.01), even in the subset without airway infection (58 [30-97] mug/mL vs. 155 [91-444] mug/mL, p<0.002). Mucus concentrations correlated with inflammatory markers including IL-8 (r=0.60, p<0.001) and % neutrophils (r=0.64, p<0.001) as well as metabolomic biomarkers of airway hypoxia (lactate r=0.69, p<0.001) and oxidative stress (oxidized glutathione r=0.57, p<0.001). Staining intensities of both MUC5AC (1.2 [0.6-1.7] vs. 4.6 [1.4-9.7], p<0.01) and MUC5B (4.2 [3.1- 7.7] vs. 13.0 [4.5-28], p<0.01) were elevated in CF, suggesting that mucins arose from both airway epithelia and glands. Mucus concentrations were most highly elevated in lobes with bronchial wall thickening as an early marker of disease (p<0.001 by ANOVA), and changes in structural lung disease scores were associated with altered mucus rheology. Conclusion(s): Airway mucus is elevated in preschool children with CF and associated with inflammatory markers, changes in the airway milieu, and early structural lung disease. These findings appeared independent of airways infection and are most consistent with airway mucus dehydration as the initiating defect in human CF airways disease. Thus, airway dehydration remains a high value target for therapeutic intervention in the youngest children with CF.

Esumi, K., et al. (1996). "Preparation of hollow carbon-microbeads from water-in-oil emulsion using amphiphilic carbonaceous material." Colloids and Surfaces A: Physicochemical and Engineering Aspects **108**(1): 113-116.

Carbon microbeads were prepared from water-in-oil emulsion using amphiphilic carbonaceous material and urea. With urea as a forming agent with a concentration 1-20 wt.%, hollow carbon-microbeads were obtained, and their particle size ranged between 2 and 15 mum. The true density of the hollow carbon-microbeads was changed, by varying the concentration of urea and the heat-treatment temperature. In particular, a pore size of about 50 A was predominantly produced under a certain condition. Carbon microbeads were prepared from water-in-oil emulsion using amphiphilic carbonaceous material and urea. With urea as a forming agent with a concentration 1-20 wt.%, hollow carbon-microbeads were obtained, and their particle size ranged between 2 and 15 mum. The true density of the hollow carbon-microbeads was changed, by varying the concentration of urea and the heat-treatment temperature. In particular, a pore size of about 50 angstrom was predominantly produced under a certain condition.

Esuvaranathan, K., et al. (2012). "Lactobacilli secreting a tumor antigen and IL15 activates neutrophils and dendritic cells and generates cytotoxic T lymphocytes against cancer cells." Cancer Research. Conference: 103rd Annual Meeting of the American Association for Cancer Research, AACR **72**(8 SUPPL. 1).

Introduction and Objective Lactobacillus rhamnosus GG (LGG) are lactic acid bacteria, which were found to be better than BCG at inducing cell death in human bladder cancer cell lines. This study compares both LGG and BCG in vivo in an orthopic model and further evaluates the potential of recombinant LGG to induce a directed anti-tumor response. Methods MB49-PSA (murine bladder cancer cells secreting human PSA) cells were implanted orthotopically in C57BL/6 mice and either LGG or BCG was instilled weekly for 6 weeks. Tumor cure rates were noted and an immnohistochemical examination was performed on the tumors. The human prostate specific antigen (PSA) PSA was cloned into pLP500-slpAp vector under the control of S-layer promoter of L. acidophilus. The murine IL-15 cDNA minus its termination codon was cloned upstream of the PSA protein sequence. Lactobacilli were transformed with the plasmids to generate LGG-IL15-PSA, LGG-PSA and LGG-S (pLP500-slpAp) respectively. PSA and IL15 secretion was 16-19 ng/2x109 CFU/ml. Bone marrow cells were isolated from the tibia and femur of 8-10 weeks old female C57BL/6 mice. Neutrophils were isolated by positive selection with anti-Ly6G microbead kit (Miltenyi Biotech, Germany). To generate DCs, bone marrow derived cells were cultured for 9 days in media with 40ng/ml of GM-CSF (BD Bioscience) which was replaced every other day. Neutrophils and DC were exposed to the recombinant LGG for 2h and used to stimulate T cells to generate CTL against the murine bladder cancer cell lines expressing PSA (MB49-PSA). Results LGG was as effective as BCG in the mice. Analysis of tumors after repeated weekly LGG instillations showed increased infiltration of neutrophils and macrophages into the tumor mass after therapy. In vitro, recombinant LGG activated neutrophils (elevated MHC class I expression) induced DC maturation (increased expression of CD86, CD80, CD40, MHC II and CD83), T cell proliferation and PSA specific cytotoxic T lymphocytes (CTL) activity. Activated DC were more efficient than activated neutrophils in inducing T cell IL2 and IFNalpha production. DC activated with LGG for 2 h or with LGG treated neutrophils were re-isolated and plated with naive T cells for 5 days to generate PSA specific T cells. Then PSA secreting or control MB49 cells were added to the wells. IL15 enhanced DC generation of CTL. Conclusions Intravesical instillation of LGG cured mice of tumors. LGG secreting tumor antigens and cytokines could be used to activate DC in vitro for DC therapy in patients or used as intravesical therapy.

Eswaramma, S. and K. S. Rao (2017). "Synthesis of dual responsive carbohydrate polymer based IPN microbeads for controlled release of anti-HIV drug." Carbohydrate Polymers **156**: 125-134.

The present study aims at preparation of dual responsive interpenetrating polymer network hydrogel microbeads from sodium alginate and functionally modified guar gum. Guar gum was modified by graft copolymerization using N-vinylcaprolactam, the maximum % grafting 123.2, obtained at different optimized conditions. The graft copolymer was blended with sodium alginate to form hydrogel microbeads by emulsion crosslinking method using glutaraldehyde as crosslinker. Zidovudine, an anti-HIV drug was encapsulated with 68% encapsulation efficiency. Fourier transform infrared spectroscopy, ¹H nuclear magnetic resonance spectroscopy, scanning electron microscopy, differential scanning calorimetry and X-ray diffraction studies justified the grafting reaction, structure, morphology and polymer-drug interactions, respectively. Swelling studies ascertained that microbeads were potentially sensitive to both pH and temperature. In vitro release studies were investigated in pH 1.2 and 7.4, the release time enhanced up to 34h in pH 7.4 at 37degreeC.

Evans, C. E., et al. (2015). "Pulmonary microvascular thrombosis enhances extravasation via myeloid hypoxia-inducible factors." Arteriosclerosis, Thrombosis, and Vascular Biology. Conference: American Heart Association's Arteriosclerosis, Thrombosis and Vascular Biology/Peripheral Vascular Disease **35**(SUPPL. 1).

Introduction: Mechanisms that regulate the positive association between thrombosis and metastasis are incompletely understood. It was hypothesised that thrombus formation stimulates a hypoxic response, which in turn promotes extravasation. The primary aim was to determine whether thrombosis of the pulmonary microvasculature (T<inf>pm</inf>) increases extravasation via myeloid (neutrophil and macrophage) hypoxia-inducible factor (HIF). Methods and Results: Tpm was induced in wild type mice via tail vein administration of polystyrene microbeads (15mum diameter, 1000/mouse). Tpm led to chronological increases in pulmonary HIF1alpha expression (P=0.01), HIF2alpha expression (P<0.01), neutrophil infiltration (P<0.05), and macrophage infiltration (P<0.05; 1-5days post-Tpm vs. non-thrombosed vehicle controls, n=8/group/time point); these increases were comparable with changes observed following vena cava thrombosis (assessed via image analysis of immunostained tissue throughout). In wild type mice with circulating Lewis lung cancer cells (LLCs, 1million/mouse i/v), Tpm led to increases in pulmonary fibrin deposition (P<0.0001), HIF1alpha expression (P<0.05), HIF2alpha expression (P<0.05), and LLC extravasation (P<0.0001; 14days post-LLCs vs. non-thrombosed controls, n=15/group). Using conditional HIFalpha knockout mice (vs. wild type littermates), it was shown that Tpm-induced increases in pulmonary fibrin deposition and LLC extravasation were dependent upon HIF1alpha or HIF2alpha in neutrophils and macrophages; myeloid HIFs were also responsible for Tpm-induced increases in pulmonary tumour proliferation and vascularisation (n=15/group). In human breast tumour microarrays (n=221), fibrin deposition was positively correlated with HIF2alpha expression (RS=0.22, P<0.001), while increases in HIF2alpha were associated with reductions in metastasis-free survival (HR=1.1, P<0.05). Conclusion(s): Thrombus formation in mouse pulmonary microvasculature enhances cancer cell extravasation via neutrophil- and macrophage-specific HIF1alpha or HIF2alpha. In human breast tumours, HIF2alpha is associated with increased fibrin deposition, and reduced survival. Pulmonary microvascular thrombosis can enhance cancer cell dissemination via myeloid cell-specific HIFs.

Evans, C. E., et al. (2017). "Modelling pulmonary microthrombosis coupled to metastasis: distinct effects of thrombogenesis on tumorigenesis." Biology Open **6**(5): 688-697.

Thrombosis can cause localized ischemia and tissue hypoxia, and both of these are linked to cancer metastasis. Vascular micro-occlusion can occur as a result of arrest of circulating tumour cells in small capillaries, giving rise to microthrombotic events that affect flow, creating localized hypoxic regions. To better understand the association between metastasis and thrombotic events, we generated an experimental strategy whereby we modelled the effect of microvascular occlusion in metastatic efficiency by using inert microbeads to obstruct lung microvasculature before, during and after intravenous tumour cell injection. We found that controlled induction of a specific number of these microthrombotic insults in the lungs caused an increase in expression of the hypoxia-inducible transcription factors (HIFs), a pro-angiogenic and pro-tumorigenic environment, as well as an increase in myeloid cell infiltration. Induction of pulmonary microthrombosis prior to introduction of tumour cells to the lungs had no effect on tumorigenic success, but thrombosis at the time of tumour cell seeding increased number and size of tumours in the lung, and this effect was strikingly more pronounced when the micro-occlusion occurred on the day following introduction of tumour cells. The tumorigenic effect of microbead treatment was seen even when thrombosis was induced five days after

tumour cell injection. We also found positive correlations between thrombotic factors and expression of HIF2alpha in human tumours. The model system described here demonstrates the importance of thrombotic insult in metastatic success and can be used to improve understanding of thrombosis-associated tumorigenesis and its treatment.

Evans, C. E., et al. (2015). "Microthrombosis enhances extravasation via myeloid hypoxia-inducible factors." Journal of Thoracic Oncology **2)**: S394-S395.

Background: Mechanisms that regulate the positive association between thrombosis and pulmonary metastasis are incompletely understood. It was hypothesised that thrombus formation stimulates a hypoxic response, which in turn promotes extravasation. The primary aim was to determine whether thrombosis of the pulmonary microvasculature (Tpm) increases extravasation via myeloid (neutrophil and macrophage) hypoxia-inducible factor (HIF). Method(s): Pulmonary microthrombosis was induced in wildtype and conditional HIFalpha knockout mice by administration of intravenous polystyrene microbeads (n=15/group). Murine lung cancer cell extravasation was quantified, and both murine pulmonary and human breast tumors (n=221) were characterised by immunostaining and image analysis. Result(s): Tpm was induced in wild type mice via tail vein administration of polystyrene microbeads (15mum diameter, 1000/mouse). Tpm led to chronological increases in pulmonary HIF1alpha expression (P=0.01), HIF2alpha expression (P<0.01), neutrophil infiltration (P<0.05), and macrophage infiltration (P<0.05; 1-5days post- Tpm vs. non-thrombosed vehicle controls, n=8/group/time point); these increases were comparable with changes observed following vena cava thrombosis (assessed via image analysis of immunostained tissue throughout). In wild type mice with circulating Lewis lung cancer cells (LLCs, 1million/mouse i/v), Tpm led to increases in pulmonary fibrin deposition (P<0.0001), HIF1alpha expression (P<0.05), HIF2alpha expression (P<0.05), and LLC extravasation (P<0.0001; 14days post-LLCs vs. non-thrombosed controls, n=15/group). Using conditional HIFalpha knockout mice (vs. wild type littermates), it was shown that Tpm- induced increases in pulmonary fibrin deposition and LLC extravasation were dependent upon HIF1alpha or HIF2alpha in neutrophils and macrophages; myeloid HIFs were also responsible for Tpm-induced increases in pulmonary tumour proliferation and vascularisation (n=15/ group). In human tumour samples (n=221), fibrin deposition was positively correlated with HIF2alpha expression (RS=0.22, P<0.001), while increases in HIF2alpha were associated with reductions in metastasis-free survival (P<0.05). Conclusion(s): Thrombus formation in mouse pulmonary microvasculature enhances cancer cell extravasation via neutrophiland macrophage-specific HIF1alpha or HIF2alpha. In human tumours, HIF2alpha is associated with increased fibrin deposition, and reduced survival. Pulmonary microvascular thrombosis can enhance cancer cell dissemination via myeloid cell-specific HIFs.

Evans, D. G., et al. (1979). "Purification and characterization of the CFA/I antigen of enterotoxigenic Escherichia coli." Infection & Immunity **25**(2): 738-748.

The fimbral colonization factor antigen CFA/I of enterotoxigenic Escherichia coli was purified and characterized. The initial purification step was release of these fimbriae from the bacterial cells by homogenization with a Waring blender. Common fimbriae and flagellar antigen were avoided by careful control of growth conditions and the use of a nonmotile (H-) mutant of the prototype strain H-10407 (O78:H11). The essential purification steps were membrane filtration (Millipore Corp.), ammonium sulfate fractionation, and negative diethylaminoethyl-Sephadex column chromatography. Yields were approximately 4.0 mg of CFA/I protein per g (wet weight) of bacteria. Purified CFA/I is a fimbrial molecule 7.0 nm in diameter and has an average molecular weight of 1.6 X 10(6), as determined by sedimentation equilibrium. CFA/I is a polymer of identical subunits of molecular weight 23,800 with an N-terminal valine, 37% hydrophobic amino acid residues, and 11 residues of proline per mol. The purified antigen retains its morphology, antigenicity, and biological activity. Purified antigen retains its morphology, antigenicity, and biological activity. Purified CFA/I exhibits mannose-resistant hemagglutination of human group A, bovine, and chicken erythrocytes, as do CFA/I-positive bacteria. This was demonstrated by sensitizing latex microbeads with the purified antigen since cell-free CFA/I fimbriae do not hemagglutinate erythrocytes. Thus, CFA/I detached from the bacteria are monovalent; however, purified CFA/I antigen retains an affinity for the epithelial cells of rabbit small intestine and blocks adhesion of CFA/I-positive bacteria. These results demonstrate that purified CFA/I is a good candidate for use in an oral vaccine for immunoprotection against diarrhea caused by CFA/I-positive enterotoxigenic E. coli.

Evariste, L., et al. (2019). "Gut microbiota of aquatic organisms: A key endpoint for ecotoxicological studies." Environmental Pollution **248**: 989-999.

Gut microbial communities constitute a compartment of crucial importance in regulation of homeostasis of multiple host physiological functions as well as in resistance towards environmental pollutants. Many chemical contaminants were shown to constitute a major threat for gut bacteria. Changes in gut microbiome could lead to alteration of host health. The access to high-throughput sequencing platforms permitted a great expansion of this discipline in human health while data from ecotoxicological studies are scarce and particularly those related to aquatic pollution. The main purpose of this review is to summarize recent body of literature providing data obtained from microbial community surveys using high-throughput 16S rRNA sequencing technology applied to aquatic ecotoxicity. Effects of pesticides, PCBs, PBDEs, heavy metals, nanoparticles, PPCPs, microplastics and endocrine disruptors on gut microbial communities are presented and discussed. We pointed out difficulties and limits provided by actual methodologies. We also proposed ways to improve understanding of links between changes in gut bacterial communities and host fitness loss, along with further applications for this emerging discipline.

Everaert, G., et al. (2018). "Risk assessment of microplastics in the ocean: Modelling approach and first conclusions." Environmental Pollution **242**(Pt B): 1930-1938.

We performed an environmental risk assessment for microplastics (<5mm) in the marine environment by estimating the order of magnitude of the past, present and future concentrations based on global plastic production data. In 2100, from 9.6 to 48.8 particles m⁻³ are predicted to float around in the ocean, which is a 50-fold increase compared to the present-day concentrations. From a meta-analysis with effect data available in literature, we derived a safe concentration of 6650 buoyant particles m⁻³ below which adverse effects are not likely to occur. Our risk assessment (excluding the potential role of microplastics as chemical vectors) suggests that on average, no direct effects of free-floating microplastics in the marine environment are to be expected up to the year 2100. Yet, even today, the safe concentration can be exceeded in sites that are heavily polluted with buoyant microplastics. In the marine benthic compartment between 32 and 144 particles kg⁻¹ dry sediment are predicted to be present in the beach deposition zone. Despite the scarcity of effect data, we expect adverse ecological effects along the coast as of the second half of the 21st century. From then ambient concentrations will start to outrange the safe concentration of sedimented microplastics (i.e. 540 particles kg⁻¹ sediment). Additional ecotoxicological research in which marine species are chronically exposed to realistic environmental microplastic concentration series are urgently needed to verify our findings.

Exley, M. A., et al. (2017). "Adoptive Transfer of Invariant NKT Cells as Immunotherapy for Advanced Melanoma: A Phase I Clinical Trial." Clinical Cancer Research **23**(14): 3510-3519.

Purpose: Invariant NKT cells (iNKT) are innate-like CD1d-restricted T cells with immunoregulatory activity in diseases including cancer. iNKT from advanced cancer patients can have reversible defects including IFNgamma production, and iNKT IFNgamma production may stratify for survival. Previous clinical trials using iNKT cell activating ligand alpha-galactosylceramide have shown clinical responses. Therefore, a phase I clinical trial was performed of autologous in vitro expanded iNKT cells in stage IIIB-IV melanoma.<b>Experimental

Fabbri, S., et al. (2016). "High-Velocity Microsprays Enhance Antimicrobial Activity in Streptococcus mutans Biofilms." Journal of Dental Research **95**(13): 1494-1500.

Streptococcus mutans in dental plaque biofilms play a role in caries development. The biofilm's complex structure enhances the resistance to antimicrobial agents by limiting the transport of active agents inside the biofilm. The authors assessed the ability of high-velocity water microsprays to enhance delivery of antimicrobials into 3-d-old S. mutans biofilms. Biofilms were exposed to a 90degree or 30degree impact, first using a 1-micro m tracer bead solution (10⁹ beads/mL) and, second, a 0.2% chlorhexidine (CHX) or 0.085% cetylpyridinium chloride (CPC) solution. For comparison, a 30-s diffusive transport and simulated mouthwash were also performed. Confocal microscopy was used to determine number and relative bead penetration depth into the biofilm. Assessment of antimicrobial penetration was determined by calculating the killing depth detected by live/dead viability staining. The authors first demonstrated that the microspray was able to deliver significantly more microbeads deeper in the biofilm compared with diffusion and mouthwashing exposures. Next, these experiments revealed that the microspray yielded better antimicrobial penetration evidenced by deeper killing inside the biofilm and a wider killing zone around the zone of clearance than diffusion alone. Interestingly the 30degree impact in the distal position delivered approximately 16 times more microbeads and yielded approximately 20% more bacteria killing (for both CHX and CPC) than the 90degree impact. These data suggest that high-velocity water microsprays can be used as an effective mechanism to deliver microparticles and antimicrobials inside S. mutans biofilms. High shear stresses generated at the biofilm-burst interface might have enhanced bead and antimicrobial delivery inside the remaining biofilm by combining forced advection into the biofilm matrix and physical restructuring of the biofilm itself. Further, the impact angle has potential to be optimized both for biofilm removal and active agents' delivery inside biofilm in those protected areas where some biofilm might remain.

Fackelmann, G. and S. Sommer (2019). "Microplastics and the gut microbiome: How chronically exposed species may suffer from gut dysbiosis." Marine Pollution Bulletin **143**: 193-203.

As small pieces of plastics known as microplastics pollute even the remotest parts of Earth, research currently focuses on unveiling how this pollution may affect biota. Despite increasing awareness, one potentially major consequence of chronic exposure to microplastics has been largely neglected: the impact of the disruption of the symbiosis between host and the natural community and abundance pattern of the gut microbiota. This so-called dysbiosis might be caused by the consumption of microplastics, associated mechanical disruption within the gastrointestinal tract, the ingestion of foreign and potentially pathogenic bacteria, as well as chemicals, which make-up or adhere to microplastics. Dysbiosis may interfere with the host immune system and trigger the onset of (chronic) diseases, promote pathogenic infections, and alter the gene capacity and expression of gut microbiota. We summarize how chronically exposed species may suffer from microplastics-induced gut dysbiosis, deteriorating host health, and highlight corresponding future directions of research.

Faggio, C., et al. (2018). "Mussel digestive gland as a model tissue for assessing xenobiotics: an overview." Science of the Total Environment **636**: 220-229.

Control strategies and routine biomonitoring programs are commonly performed worldwide using sentinel marine invertebrates, such as mussels of the genus Mytilus, for assessing the "health status" of the aquatic environment. Those species can accumulate and tolerate xenobiotics at levels higher than those being present into the aquatic environment, thus providing accurate and reliable biological endpoints (e.g. physiological, behavioral, cellular, biochemical and molecular indices) that can be measured in their tissues. Taking under consideration the significance of bivalves for assessing the environmental hazard of xenobiotics being present into the water medium, as well as the key role of digestive gland as a target-tissue for the compounds ingested in the organism, the present study aimed to summarize available data on the effects of different categories of xenobiotic compounds, previously characterized as a potential threat for the marine ecosystems. In this context, different types of pharmaceuticals and personal care products (PPCPs), biocides, microplastics (MPs) and nanoparticles (NPs), currently investigated in mussels' digestive gland, using a battery of experimental approaches and analytical methods, as well as stress indices evaluation, are briefly described and further discussed in order to elucidate not only the presence and the toxic mode of action of xenobiotics, but also the important role of the digestive gland as a reliable target-tissue for investigating the effects of xenobiotics at cellular, biochemical, and molecular levels.

Fahrenfeld, N. L., et al. (2019). "Source tracking microplastics in the freshwater environment." TrAC - Trends in Analytical Chemistry **112**: 248-254.

Plastics are a frequently observed component of marine debris and there is growing concern about microplastic (MP) ecotoxicity, and the impacts of additives, sorbed hazardous organic contaminants, heavy metals, and biofilm on MP surfaces. The relative importance of MP from different terrestrial and freshwater sources is poorly understood and limits our ability to develop best management practices. This review focuses on evidence and methods for source apportionment of MP in freshwater environments including the use of MP characteristics, mass balance techniques, and surface characteristics. Within-study data indicated some potential for differences in polymer identity and morphology for differentiating select sources, but clear cross-study patterns were lacking. Major challenges identified include technical challenges in accurately identifying polymers, multiple classification schemes for reported MP morphologies, lack of data for several terrestrial sources, poor understanding of differential fate/transport/weathering processes for MP and surface contaminants, and methodological difficulties simultaneously confirming polymers and surface contaminants. Copyright © 2018 Elsevier B.V.

Faigel, D., et al. (2014). "Endoscopic ultrasonography-guided portal injection chemotherapy for hepatic metastases." Endoscopic Ultrasound **3**(Suppl 1): S1.

INTRODUCTION: We hypothesized that endoscopic ultrasonography-guided portal injection chemotherapy (EPIC) using irinotecan-loaded microbeads may achieve increased intrahepatic concentrations, while decreasing systemic exposure. This may achieve enhanced efficacy for the treatment of diffuse liver metastases, while decreasing systemic toxicities.

MATERIALS AND METHODS: In eight anesthetized 35 kg pigs, EPIC was performed transgastrically using

the linear-array echoendoscope and a 22 g fine-needle aspiration. In four animals, irinotecan (100 mg) loaded onto 75-150 micron liquid chromatography (LC) beads was injected. In four animals, saline was injected into the portal vein and unloaded irinotecan (100 mg) was injected into the jugular vein. Plasma (every 15 min), and at 1 h bone marrow, liver and skeletal muscle samples were obtained. Irinotecan and SN-38 (active metabolite) concentrations were assayed by LC/mass spectrometry.

RESULTS: The procedure was performed safely in all eight animals. Compared with systemic administration, EPIC resulted in almost twice the hepatic concentration of irinotecan (6242 vs. 3692 ng/g) and half the systemic concentrations in plasma (1092 vs. 2762 ng/mL), bone marrow (815 vs. 1703 ng/mL) and skeletal muscle (521 vs. 1058 ng/g). SN-38 levels were lower with EPIC (liver: 166 vs. 681 ng/g; plasma: 1.8 vs. 2.4 ng/mL; bone marrow: 0.9 vs. 1.4 ng/mL; muscle 4.6 vs. 9.2 ng/g). Liver histology showed the beads within small portal venules.

CONCLUSIONS: EPIC using irinotecan-loaded microbeads can enhance hepatic exposure to irinotecan, while decreasing systemic concentrations. SN-38 levels were lower with EPIC indicating that a substantial portion of the irinotecan was still loaded onto beads. The microbeads may act as a reservoir resulting in prolonged hepatic drug exposure.

Faigel, D. O., et al. (2016). "477 Safety and Toxicity of EUS-Guided Portal Injection Chemotherapy (EPIC) Using Drug-Eluting Microbeads...2016 DDW (Digestive Disease Week) ASGE (American Society for Gastrointestinal Endoscopy) Program and Abstracts 21 May 2016-24 May 2016, San Diego, California." Gastrointestinal Endoscopy **83**: AB150-AB150.

Faigel, D. O., et al. (2014). "Feasibility of eus-guided portal injection of chemotherapy (EPIC) using irinotecan-loaded microbeads for the treatment of hepatic metastases." Gastroenterology **1)**: S692-S693.

The liver is a common site of distant metastases. While solitary metastases may be treated with a variety of local options, for diffuse hepatic metastases the only current option is systemic chemotherapy. Drug-eluting microbeads have been used for transarterial chemoembolization of localized disease. Their use in the portal system has not been described. We hypothesized that EPIC using irinotecan loaded microbeads may achieve increased intrahepatic concentrations while decreasing systemic exposure. This may achieve enhanced efficacy for the treatment of diffuse liver metastases while decreasing systemic toxicities. Aim(s): Perform EPIC using irinotecan-loaded microbeads in the acute non-survival porcine model and compare hepatic, plasma, bone marrow and skeletal muscle levels to systemic administration of non-loaded irinotecan. Method(s): In 8 anesthetized 35kg pigs, the Olympus linear array echoendoscope was inserted perorally to the stomach. The portal vein was identified by location, appearance and pulse-wave Doppler signature. A standard 22g FNA needle (Cook Medical) was advanced transgastrically into the portal vein. In 4 animals, irinotecan (100 mg) loaded onto 75-150 micron LC beads (Biocompatibles) was injected. In 4 animals, saline was injected into the portal vein and unloaded irinotecan (100 mg) was injected systemically into the jugular vein. Plasma was collected at baseline and every 15 minutes for 1 hour. At 1 hour laparotomy was performed and liver and skeletal muscle samples obtained and frozen. Bone marrow aspirate was obtained at 1 hour from the right anterior tibia. Irinotecan and SN-38 (active metabolite) concentrations were determined using LC/MS at a reference laboratory (MicroConstants) and reported as ng/ml or ng/gm tissue. Result(s): Irinotecan and SN38 concentrations are shown in table 1. Compared to systemic administration, EPIC resulted in almost twice the hepatic concentration of irinotecan and half the systemic concentrations in plasma, bone marrow and skeletal muscle. SN38 levels were lower in all sites with EPIC. Liver histology showed the beads scattered within small portal venules in the liver. Conclusion(s): EPIC using irinotecan-loaded microbeads may enhance hepatic exposure to irinotecan while decreasing systemic concentrations. The SN38 levels were lower with EPIC indicating that a substantial portion of the irinotecan was still loaded onto beads at 1 hour and not yet converted to active metabolite. Thus, the microbeads may act as a reservoir resulting in prolonged hepatic drug exposure. EPIC holds promise as a novel therapy for patients with hepatic metastases. (Table Presented).

Faigel, D. O., et al. (2016). "EUS-guided portal injection chemotherapy for treatment of hepatic metastases: feasibility in the acute porcine model." Gastrointestinal Endoscopy **83**(2): 444-446.

Background and Aims Direct injection of chemotherapy into the portal vein for treatment of liver metastases may increase hepatic tissue levels while decreasing systemic levels and toxicities. We aimed to evaluate EUS-guided portal injection chemotherapy (EPIC) by using drug-eluting microbeads or nanoparticles and compare it with systemic injection. Methods We conducted a comparative feasibility trial in the acute porcine model (24 anesthetized pigs). Pigs were treated with irinotecan, doxorubicin, or albumin-bound paclitaxel nanoparticles (n = 8/group). Within each group, pigs were treated with EPIC or a systemic intravenous injection of drug and saline solution into the portal vein (n = 4/treatment). Irinotecan or doxorubicin were loaded onto microbeads for EPIC treatment only. We examined drug levels in tissue (1 hour) and plasma (15 minutes). Results EUS-guided access and injection was successful in all animals. EPIC with irinotecan-loaded microbeads showed nearly double the hepatic concentration compared with systemic injection (6242 vs 3692 ng/g) and almost half the systemic levels. EPIC with doxorubicin-loaded microbeads showed a 5-fold increase in hepatic levels (35,450 vs 6930 ng/g) and a 30-fold decrease in cardiac levels (153 vs 4805 ng/g) compared with systemic administration ($P < .05$ for both). EPIC with albumin-bound paclitaxel nanoparticles increased hepatic concentrations by 60% and decreased systemic levels by 24% to 32%. Conclusions EPIC holds promise as a new treatment for hepatic metastases.

Fairbank, N. J., Jr. (2009). Cytoskeletal stress alters airway smooth muscle cell structure and contractile function.

In the asthmatic lung, airway smooth muscle (ASM) constantly experiences characteristically-elevated internal contractile stress as well as external mechanical stress (MS) due to breathing, which may be elevated by symptoms. The ASM cytoskeleton is highly adaptable, responding dynamically to external MS and inflammatory mediators, leading to altered structure and function that may enhance airway narrowing in asthma. In this thesis, we developed methodology and software to apply a technique known as optical magnetic twisting cytometry to investigate the roles of external MS; internal MS, or tone; and inflammation - alone and in combination - on the functional response of the cytoskeleton. We applied external MS to cultured human bronchial ASM cells acutely (90 min.) by sinusoidal rotation of integrin-bound microbeads (4.5 km diameter) on cells that had been incubated with proinflammatory cytokine, interleukin-1b (IL-1b, 20 ng/mL), for 20 hr. As previously established, IL-1b incubation increased contractility and decreased relaxation induced by b-agonists, promoting hyperresponsiveness. We found this occurred via cytoskeletal stiffening of 34.2% associated with Rho activation, actin polymerization, and focal adhesion growth, all mediated by cyclooxygenase (COX)-2-dependent pathways. MS similarly induced cytoskeletal stiffening of 29.8% and focal adhesion growth, but this was independent of COX-2 and without increased contractility. Airway inflammation thus increased contractile function via stress-independent cytoskeletal remodeling. In another study, chronic (5 days) external and predominantly-uniaxial MS was applied to the basal surface of ASM cell cultures (5%, 0.3 Hz), during which tone was

either decreased by repeated addition of forskolin or increased by repeated addition of either carbachol or histamine, relative to sham. Cells aligned and baseline stiffness increased with strain, but decreased tone inhibited both effects (p<0.05). Importantly, strain reversed previously-reported inhibition of myosin light-chain kinase (MLCK) content by tone in unstrained cells. Strain and tone together increased both MLCK and myosin light-chain phosphorylation, leading to an increase in contractility of 176%. Along with increased contractile protein content and activity, observed strain-dependent changes in cytoskeletal organization contributed to the increase in contractility. Taken together, the presented data suggest that treatment with corticosteroids and bronchodilators may lead to improved airway function by a novel mechanism involving the reduction of cytoskeletal remodeling-induced increases in ASM contractility.

Fajardo, P., et al. (2014). Mitigation Of Pathogens And Marine Biotoxins Contamination In Shellfish. Southampton, W I T Press. **134:** 691-698.

The EU FP7 funded project \“Bio-engineered micro Encapsulation of Active agents Delivered to Shellfish (BEADS)” is focused on mitigating the impact of marine biotoxins (ASP/DSP), microbial contamination (bacteria/norovirus) and the parasitic protozoan Bonamia ostreae on shellfish aquaculture. Purpose: to develop probiotic diets and a microencapsulated delivery system in the digestive tract of shellfish to improve depuration. Feeding experiments were performed to identify the optimum size of alginate microcapsules, testing three different sizes and colours containing nondegradable fluorescent dye microbeads. Oysters and mussels were placed in tanks containing filtered seawater. Three sizes of microcapsules were mixed and shellfish were fed for 3 hours. Shellfish were removed during the feeding period at 0.5, 1, 2 and 3 hours and dissected. Any capsules remaining in the water and in the digestive organs of shellfish were extracted and measured using a fluoroskan analyzer. A higher concentration of the smaller capsules was found in the digestive gland, indicating that the smaller capsules were preferentially ingested. The ingestion increased during the three-hour period. Fluorescent beads of different colours embedded in alginate capsules were observed bound to the mucus string. Mussels were more efficient than oysters in incorporating alginate beads that were observed by light microscopy as intact in the digestive gland of mussels and oysters during feeding period. Broken alginate beads were found in faeces. During passage through the intestine, active agents embedded by alginate capsules are released into the digestive gland providing a useful tool to transport active agents.

Fakile, Y. F., et al. (2018). "Correlation of Treponemal Immunoassay Signal Strength Values with Reactivity of Confirmatory Treponemal Testing." Journal of Clinical Microbiology **56**(1): 01.

Automated treponemal immunoassays are used for syphilis screening with the reverse-sequence algorithm; discordant results (e.g., enzyme immunoassay [EIA] reactive and reactive plasma reagin [RPR] nonreactive) are resolved with a second treponemal test. We conducted a study to determine automated immunoassay signal strength values consistently correlating with reactive confirmatory treponemal testing. We conducted a cross-sectional analysis of four automated immunoassays (BioPlex 2200 microbead immunoassay [MBIA], Liaison chemiluminescence immunoassay [CIA], Advia-Centaur CIA, and Trep-Sure EIA) and three manual assays (Treponema pallidum particle agglutination [TP-PA], fluorescent treponemal antibody absorption [FTA-ABS] test, and Inno-LIA line immunoassay). We compared signal strength values of automated immunoassays and positive and negative agreement. Among 1,995 specimens, 908 (45.5%) were true positives (>=4/7 tests reactive) and 1,087 (54.5%) were true negatives (>=4/7 tests nonreactive). Positive agreement ranged from 86.1% (83.7 to 88.2%)

for FTA-ABS to 99.7% (99.0 to 99.9%) for Advia-Centaur CIA; negative agreement ranged from 86.3% (84.1 to 88.2%) for Trep-Sure EIA to 100% for TP-PA (99.6 to 100%). Increasing signal strength values correlated with increasing reactivity of confirmatory testing (P < 0.0001 for all automated immunoassays by Cochran-Armitage test for trend). All automated immunoassays had signal strength cutoffs corresponding to >=4/7 reactive treponemal tests. BioPlex MBIA and Liaison CIA had signal strength cutoffs correlating with >=99% and 100% TP-PA reactivity, respectively. The Advia-Centaur CIA and Trep-Sure EIA had signal strength cutoffs correlating with at least 95% TP-PA reactivity. All automated immunoassays had signal strength cutoffs correlating with at least 95% FTA-ABS reactivity. Assuming that a 95% level of confirmation is adequate, these signal strength values can be used in lieu of confirmatory testing with TP-PA and FTA-ABS.

Falahudin, D., et al. (2019). "The first occurrence, spatial distribution and characteristics of microplastic particles in sediments from Banten Bay, Indonesia." Science of the Total Environment **705**: 135304.

Microplastics (MPs) are recognized as an emerging issue worldwide, including Indonesia. Due to the limited of data available regarding MPs pollution in Indonesian waters, we investigated the occurrence, spatial distribution, characteristics, and potential ecological impacts of MPs in sediments from 25 stations in the Banten Bay, a shallow and semi enclosed bay located on the northwestern coast of Java, Indonesia. The bay has experienced very high population pressure due to increasing coastal development in the last decade. MPs were extracted by flotation methods, observed under a stereomicroscope, and identified by FTIR imaging. This study showed that MPs pollution is prevalent in the Banten Bay, where all sediments contained MPs with an average concentration of 267 +/- 98 particles/kg dw sediment. The most common shape, size, and polymer type were foam (38% of the observed MPs), size between 500 and 1000 mum (>50%), and extended polystyrene, respectively. The particles were found to be more highly distributed in the stations with fine sediment grain sizes and in locations near the river mouth of the island than in areas offshore, which suggests that the impact of the MPs currently in the sediments might be harmful to the benthic community and potentially increase the magnitude into the pelagic community. Moreover, the river effluent is suggested as a pathway for plastic pollution to the Banten Bay.

Falk-Andersson, J., et al. (2019). "Citizen science for better management: Lessons learned from three Norwegian beach litter data sets." Marine Pollution Bulletin **138**: 364-375.

Increased plastic consumption and poor waste management have resulted in litter representing an ever-increasing threat to the marine environment. To identify sources and evaluate mitigation measures, beach litter has been monitored. Using data from two citizen science protocols (CSPs) and OSPAR monitoring of Norwegian beaches, this study 1) identifies the most abundant litter types, 2) compares OSPAR to citizen science data, and 3) examines how to improve the management relevance of beach litter data. The dominant litter types were; food and drink- and fishery related items, and unidentifiable plastic pieces. Data from CSPs are consistent with OSPAR data in abundance and diversity, although few OSPAR beaches limit verification of CSP data. In contrast to OSPAR, the CSPs estimate the weight of the litter. CSPs lack important variables which could explain why some litter types are abundant in some particular areas. The latter could be improved by recording GPS positions.

Fallon, A. M., et al. (2008). "Procoagulant properties of flow fields in stenotic and expansive orifices." Annals of Biomedical Engineering **36**(1): 1-13.

In the United States, over 125,000 mechanical heart valves (MHVs) are implanted each year.

Flow through the MHV hinge can cause thromboemboli formation. The purpose of this study was to examine various orifice geometries representing the MHV hinge region and how these geometries may contribute to platelet activation and thrombin generation. We also characterized these flow fields with digital particle image velocimetry (DPIV). Citrated human blood at room temperature was forced through the orifices (400 and 800 microm ID) with a centrifugal bypass pump, continuously infusing calcium chloride to partially reverse the citrate anticoagulant. Blood samples were tested for the presence of thrombin-antithrombin complex (TAT) and platelet factor 4 (PF4). Velocity and shear stress were measured with DPIV using a blood analog fluid seeded with fluorescent microbeads. The results indicate that small changes in geometry, although they do not affect the bulk flow, change the coagulation propensity as blood flows through the orifices. A more abrupt geometry allows more stagnation to occur resulting in more thrombin generation. PF4 measurements indicated similar levels of platelet activation for all orifices. DPIV showed differences in the jets with respect to entrainment of stagnant fluid. These results help to pinpoint the important parameters that lead to flow stasis and subsequent thrombus formation.

Fan, W., et al. (2020). "On-bead enzyme-catalyzed signal amplification for the high-sensitive detection of disease biomarkers." Methods in Enzymology **630**: 179-197.

The high-sensitive and rapid detection of critical biomarkers, e.g., disease-related nucleic acids and proteins, is always desired. Compared with the routine homogenous detection strategies, the on-bead flow cytometry (FCM)-based assays have drawn a lot of interests owing to their unique advantages. On one hand, microbeads (MBs) are employed for the enrichment of fluorescent signals, allowing the size encoding for multiplexed detection of biomarkers. On the other hand, FCM enables the fast read-out of the total fluorescent signals enriched on the MBs and the decoding of MBs' size information. For an improved sensitivity and versatile application scenarios, the signal amplification on MBs is required. However, the enzyme-catalyzed on-bead reactions remain challenging owing to the critical reaction conditions on the MBs/solution interface. Toward the high-sensitive detection of target biomolecules in real-samples, a series of on-bead enzyme-catalyzed signal amplification strategies have been developed. After careful optimization of the reaction conditions, the proposed sensors are proven to have ultra-high sensitivities to fulfill the requirement of real-sample detection.

Fan, X., et al. (2019). "Identification of deregulated microRNAs in hepatic stellate cells from mice infected with Schistosoma japonicum." China Tropical Medicine **19**(4): 301-306.

Objective: To screen and validate differentially expressed microRNAs (miRNAs) in hepatic stellate cells (HSCs) from mice infected Schistosoma japonicum.

Fan, Y., et al. (2019). "Distribution, sedimentary record, and persistence of microplastics in the Pearl River catchment, China." Environmental Pollution **251**: 862-870.

Microplastics (MPs) in the environment have become an issue worldwide. However, data about MPs in freshwater systems are still limited so far. This study investigated sources, fate, and seasonal and spatial distribution of MPs in the main stream Pearl River and its tributaries, as well as in the Pearl River Estuary (PRE), China. MPs were widely detected in the river water, river bed sediment, and estuarine sediment, with abundances of 0.57+/-0.71 items L⁻¹, 685+/-342 items kg⁻¹ dry weight (dw), and 258+/-133 items kg⁻¹ dw, respectively. Sheet, fragmental, and fibrous polyethylene, polypropylene, and ethylene-propylene copolymers were predominant, suggesting that MPs in the Pearl River catchment be mainly derived from fragmentation of discarded plastic wastes. In addition,

municipal wastewater was also an important MPs source, especially for polyethylene terephthalate (PET) fibers. Polymers of higher density, such as PET and polyvinyl alcohol were relatively more abundant in the sediment than in the river water, especially in the estuarine sediment. Upward increase of the MP abundance was observed in the sedimentary core, probably indicating increasing release of plastic wastes due to growing production and uses of plastic products. On the other hand, percentage of finer MPs increased with increasing depth. The results revealed persistence and potential downward dispersion of the fine MPs. The MPs abundance was positively related with population density and gross domestic product, demonstrating impacts of human activities and economic development on the MPs contamination. Higher MPs abundance was detected in dry season than in wet season in the river water, suggesting dilution effect of precipitation. It's estimated that 15963 tons of MPs could be released annually into the PRE from the main stream Pearl River and its tributaries.

Fang, C., et al. (2019). "Comparison of microplastic contamination in fish and bivalves from two major cities in Fujian province, China and the implications for human health." Aquaculture **512**(734322).

There is a growing global concern about the negative effects of microplastics (MPs) in aquaculture and their consequences for human health. This is the first study to investigate the contamination status and human health risks of MPs in commercial fish and bivalves collected from fishery markets of two major cities in Fujian province of China and compare them both nationally and internationally. The MP abundances in the bivalves from both cities were found to be lower when compared nationally (Qingdao and Shanghai) as well as internationally to several European countries (Italy, UK, France and Belgium). The MP abundances in the fish from both cities were also lower than reported nationally (Shanghai), but higher when compared internationally (Indonesia, USA and Portugal). In general, a higher percentage of fish than of bivalves tested positive for MPs. Moreover, fish contained higher abundances of total MPs and higher percentages of fibers, polystyrene (PS), polyvinyl chloride (PVC), blue and longer MPs than bivalves. In contrast, bivalves possessed higher percentages of fragments, films and particles together with polyethylene terephthalate (PET), transparent and shorter MPs than fish. Regarding regional differences, seafood collected at Xiamen had relatively higher abundances of total MPs and higher percentages of PET, polyacrylonitrile (PAN), fragments, films and particles along with black, white and transparent MPs. Whereas seafood from Fuzhou contained higher percentages of other polymers, fibers, and blue MPs. Finally, the polymer risk indexes caused by MPs in seafood were calculated based on the chemical hazards of polymers. The outcome of the risk assessment indicated human health risks posed by MPs via seafood consumption from both cities is likely to be higher than those from Shanghai, UK and South Korea due to greater percentages of PAN contamination.

Fang, C., et al. (2018). "Microplastic contamination in benthic organisms from the Arctic and sub-Arctic regions." Chemosphere **209**: 298-306.

The seafloor is recognized as one of the major sinks for microplastics (MPs). However, to date there have been no studies reported the MP contamination in benthic organisms from the Arctic and sub-Arctic regions. Therefore, this study provided the first data on the abundances and characteristics of MPs in a total of 413 dominant benthic organisms representing 11 different species inhabiting in the shelf of Bering and Chukchi Seas. The mean abundances of MP uptake by the benthos from all sites ranged from 0.02 to 0.46 items g⁻¹ wet weight (ww) or 0.04-1.67 items individual⁻¹, which were lower values than those found in other regions worldwide. The highest value appeared at the northernmost site, implying that the sea ice and the cold current represent possible transport mediums. Interestingly, the predator A.

rubens ingested the maximum quantities of MPs, suggesting that the trophic transfer of MPs through benthic food webs may play a critical role. Fibers constituted the major type (87%) in each species, followed by film (13%). The colors of fibers were classified as red (46%) and transparent (41%), and the film was all gray. The predominant composition was polyamide (PA) (46%), followed by polyethylene (PE) (23%), polyester (PET) (18%) and cellophane (CP) (13%). The most common sizes of MPs concentrated in the interval from 0.10 to 1.50 mm, and the mean size was 1.45+or-0.13 mm. Further studies about the temporal trends and detrimental effects of MPs remain to be carried out in benthic organisms from the Arctic and sub-Arctic regions.

Fang, H., et al. (2018). "Detection of Nucleic Acids in Complex Samples via Magnetic Microbead-Assisted Catalyzed Hairpin Assembly and "DD-A" FRET." Analytical Chemistry **90**(12): 7164-7170.

Nucleic acids, as one kind of significant biomarker, have attracted tremendous attention and exhibited immense values in fundamental studies and clinical applications. In this work, we developed a fluorescent assay for detecting nucleic acids in complex samples based on magnetic microbead (MMB)-assisted catalyzed hairpin assembly (CHA) and a donor donor-acceptor fluorescence resonance energy transfer ("DD-A" FRET) signaling mechanism. Three types of DNA hairpin probes were employed in this system, including Capture, H1 (double FAM-labeled probe as FRET donor), and H2 (TAMRA-labeled probe as FRET acceptor). First, the Captures immobilized on MMBs bound to targets in complex samples, and the sequences in Captures that could trigger catalyzed hairpin assembly (CHA) were exposed. Then, target-enriched MMB complexes were separated and resuspended in the reaction buffer containing H1 and H2. As a result, numerous H1-H2 duplexes were formed during the CHA process, inducing an obvious FRET signal. In contrast, CHA could not be triggered, and the FRET signal was weak, while target was absent. With the aid of magnetic separation and "DD-A" FRET, errors from background interference were effectively eliminated. Importantly, this strategy realized amplified detection in buffer, with detection limits of microRNA as low as 34 pM. Furthermore, this method was successfully applied to detect microRNA-21 in serum and cell culture media. The results showed that our method has the potential for biomedical research and clinical application.

Fang, S., et al. (2019). "Adsorption behavior of three triazole fungicides on polystyrene microplastics." Science of the Total Environment **691**: 1119-1126.

Environmental pollution caused by microplastics (MPs) and pesticides has become a global challenge, and increasing evidence shows that MPs can adsorb organic pollutants which may affect their distribution and bioavailability. As widely used pesticides, triazole fungicides with potential environmental and human safety risks often coexist with MPs in the environment. Understanding the adsorption behavior is the basis of risk assessment of co-exposure of MPs and triazole fungicides. In this study, the adsorption behavior of three commonly used triazole fungicides on polystyrene (PS) was studied using adsorption test. The influences of PS particle size and environmental factors on adsorption capacity were evaluated, and the adsorption mechanisms were discussed.

Faraca, G. and T. Astrup (2019). "Plastic waste from recycling centres: Characterisation and evaluation of plastic recyclability." Waste Management **95**: 388-398.

While recycling has been recognised as the preferred plastic waste management solution, little is known about the detailed characteristics of plastic waste and how these may affect its recycling. In this study hard plastic, plastic film and PVC waste collected at three Danish recycling centres were sampled and characterised according to product applications, legislative

requirements (quality), expected product life time, polymer types and presence of potential impurities such as coloured plastics, non-plastic materials and multi-polymer products. The obtained information was applied for estimation of overall recycling potentials for selected archetype recycling process chains based on material flow analysis. In addition to providing detailed data for the composition of the plastic waste products, the results showed that impurities represented 28% (wet weight) of the plastic waste, and that about 75% of the plastic waste was characterised as Low Quality applications, indicating some legislative recovery restrictions. By accounting for the level/type of impurities, the overall recycling potential was found to be 52% for hard plastics, 59% for plastic films and 79% for PVC waste. The results showed that while varying according to polymer type, the recyclability of "High Quality" plastic waste was 12-35% higher than "Low Quality" applications. While actual results are representative of Danish conditions, the study demonstrates that detailed characteristics of plastic waste are needed to identify potential challenges to recycling and thereby potentially improving the design (and recovery efficiency) of recycling facilities.

Faraca, G., et al. (2019). "Environmental life cycle cost assessment: Recycling of hard plastic waste collected at Danish recycling centres." Resources, Conservation and Recycling **143**: 299-309.

Recycling of plastic waste is promoted by the European Union as an important step toward a circular economy. Recovered plastic waste is a complex and heterogeneous material, and the impurities and/or untargeted polymers associated to plastic waste may affect the recycling process and potentially decrease the intended benefits. An environmental and financial assessment was conducted on one tonne of hard plastic waste collected at Danish recycling centres. Three management scenarios were considered: two mechanical recycling (a simpler and a more advanced configuration, namely sMR and aMR) and a feedstock recycling (FR) scenario based on conversion through pyrolysis. Scenario aMR provided the largest savings in the highest number of impact categories (including global warming potential) and total costs; scenarios sMR and FR provided smaller savings (or even burdens), depending on the environmental impact category considered. A scenario analysis evaluating the type of energy provision, location of recycling facilities and the application of the recycled material confirmed the ranking of results with respect to global warming potential and total costs. A global sensitivity assessment of model data inputs demonstrated that three to nine parameters were typically sufficient to achieve more than 90% of total variance of the results; critical parameters were mainly related to sorting efficiencies, technical yields and market substitution factors. The study demonstrates that if high quality of the recycled plastic is achieved, both environmental savings and financial revenues are possible. Copyright © 2019 Elsevier B.V.

Fard, N. A., et al. (2016). "The Safety Property of beta-D-Mannuronic Acid (M2000) as a Novel Immunosuppressive Agent on Differentiation, Maturation and Function of Human Dendritic Cells." Current Drug Discovery Technologies **13**(3): 164-169.

The study's background and aim: In this investigation, the safety property of M2000 (beta-D-mannuronic acid) on differentiation, maturation and function of dendritic cells, was determined. beta-D-mannuronic acid, as a novel immunosuppressive and anti-inflammatory agent, has been tested in various experimental models. In addition, DC-based immunosuppressive drugs can suppress the progression of autoimmune diseases, although, their notable side effects in increasing the risk of infectious diseases and cancers should be considered.

MATERIALS AND METHODS: The effect of M2000 on differentiation, maturation and function of dendritic cells was examined. To investigate how M2000 affects human dendritic cells (DC) in a

defined inflammatory environment, human peripheral blood mononuclear cells (PBMC) were isolated from healthy blood and monocytes were purified using anti-CD14 microbeads. Monocytes were incubated with M2000 in two different doses (6 and 12 J.g/well) along with adding the granulocyte-macrophage colony-stimulating factor (GM-CSF) and interleukin-4 for inducing monocytes to immature DC and lipopolysaccharide for running DC maturation. The differentiation, maturation and function of dendritic cells were examined with flow cytometry and ELISA method.
RESULT: The results demonstrate that M2000 has no significant side on differentiation, maturation and function of dendritic cells in immature DC and mature DC process in vitro.
CONCLUSION: Our findings show that beta-D-mannuronic acid (m2000) as a safe agent had no adverse effect on differentiation, maturation and function of dendritic cells which might be recommended as a novel immunosuppressive agent with no or fewer side effects in increasing the risk of infectious diseases and cancers.

Farlow, S. J., et al. (2007). "Enhanced transduction of colonic cell lines in vitro and the inflamed colon in mice by viral vectors, derived from adeno-associated virus serotype 2, using virus-microbead conjugates bearing lectin." BMC Biotechnology **7 (no pagination)**(83).
Background: Virus-mediated delivery of therapeutic transgenes to the inflamed colon holds a great potential to serve as an effective therapeutic strategy for inflammatory bowel disease, since local, long-term expression of the encoded therapeutic proteins in the colorectal system is potentially achievable. Viral vectors, derived from adeno-associated virus (AAV), should be very useful for such therapeutic strategies, particularly because they can establish long-term expression of transgenes. However, few studies have been carried out to investigate the ability of AAV-based vectors to transduce the inflamed colon. Result(s): AAV, derived from adeno-associated virus serotype 2 (AAV2), showed a limited ability to transduce colonic cell lines in vitro when used in free form. No appreciable enhancement of the transduction efficiency was seen when AAV2 particles were attached stably to the surfaces of microbeads and delivered to target cells in the form of AAV2-microbead conjugates. However, the transduction efficiency of these colonic cell lines was enhanced substantially when a lectin, concanavalin A (Con A), was co-attached to the microbead surfaces, to which AAV2 particles had been conjugated. This considerable infectivity enhancement of AAV2-microbead conjugates by the co-attachment of Con A may be derived from the fact that Con A binds to alpha-D-mannosyl moieties that are commonly and abundantly present in cell-surface carbohydrate chains, allowing the conjugates to associate stably with target cells. Intracolonical administration of free AAV2 or AAV2-microbead conjugates without Con A into a mouse colitis model by enema showed very poor transduction of the colonic tissue. In contrast, the delivery of AAV2 in the form of AAV2-microbead conjugates bearing Con A resulted in efficient transduction of the inflamed colon. Conclusion(s): AAV2-microbead conjugates bearing Con A can serve as efficient gene transfer agents both for poorly permissive colonic cell lines in vitro and for the inflamed colon in a mouse colitis model. This efficient transduction system for the inflamed colon should be useful for the development of gene therapy strategies for inflammatory bowel disease. © 2007 Farlow et al; licensee BioMed Central Ltd.

Farmer, R. W., et al. (2011). "Hepatic arterial therapy as a bridge to ablation or transplant in the treatment of hepatocellular carcinoma." American Surgeon **77**(7): 868-873.
Hepatocellular carcinoma (HCC) is a challenging malignancy as a result of the advanced course at presentation. Recent interventional advances have improved treatment of lesions unamenable to resection using drug-eluting microbeads delivered into the hepatic circulation. We

hypothesize that the use of hepatic arterial therapy (HAT) will safely identify appropriate patients who can proceed to ablation and/or transplantation. We evaluated our open-label, multicenter, multinational, single-arm study including 240 patients with intermediate-staged HCC who received drugeluting beads and were not initial candidates for transplantation or resection. We reviewed the resulting clinical data to determine factors leading to possible ablation or transplant. Of 240 patients undergoing HAT, 14 (5.8%) received ablation or transplant. We compared those receiving ablation or transplant with those receiving only HAT. Groups were similar regarding sex, age, median number of tumors (one; range, 1 to 25), Child's score, tobacco and alcohol abuse, and treatment type. Patients who were downstaged were more likely to have: hepatitis-related tumors (76 to 66%, P = 0.02), distinct lesions on imaging (92 to 76%, P = 0.004), and less than 25 per cent parenchymal involvement (84 to 59%, P = 0.0001). These patients typically had one tumor frequently in the left lobe (58.8 vs 30.9%, P = 0.0001), accessible through segmental arteries (47 vs 17%, P = 0.001), with increased segmental branch occlusion (57 vs 39%, P = 0.02). HATshould be considered a potential bridging therapy to eventual ablation or transplant in the multimodal treatment of HCC.

Farrell, P. and K. Nelson (2013). "Trophic level transfer of microplastic: Mytilus edulis (L.) to Carcinus maenas (L.)." Environmental Pollution **177**: 1-3.

This study investigated the trophic transfer of microplastic from mussels to crabs. Mussels (Mytilus edulis) were exposed to 0.5 micro m fluorescent polystyrene microspheres, then fed to crabs (Carcinus maenas). Tissue samples were then taken at intervals up to 21 days. The number of microspheres in the haemolymph of the crabs was highest at 24 h (15 033 ml⁻¹+or-SE 3146), and was almost gone after 21 days (267 ml⁻¹+or-SE 120). The maximum amount of microspheres in the haemolymph was 0.04% of the amount to which the mussels were exposed. Microspheres were also found in the stomach, hepatopancreas, ovary and gills of the crabs, in decreasing numbers over the trial period. This study is the first to show 'natural' trophic transfer of microplastic, and its translocation to haemolymph and tissues of a crab. This has implications for the health of marine organisms, the wider food web and humans.

Farzana, J., et al. (2018). "A novel pooled-sample multiplex luminex assay for high-throughput measurement of relative telomere length." American Journal of Human Biology **30**(4).

ObjectivesRelative telomere length (RTL) is a potential biomarker of aging and risk for chronic disease. Previously, we developed a probe-based RTL assay on Luminex platform, where probes for Telomere (T) and reference gene (R) for a given DNA sample were tested in a single well. Here, we describe a method of pooling multiple samples in one well to increase the throughput and cost-effectiveness.MethodsWe used four different microbeads for the same T-probe and four different microbeads for the same R-probe. Each pair of probe sets were hybridized to DNA in separate plates and then pooled in a single plate for all the subsequent steps. We used DNA samples from 60 independent individuals and repeated in multiple batches to test the precision.ResultsThe precision was good to excellent with Intraclass correlation coefficient (ICC) of 0.908 (95% CI 0.856–0.942). More than 67% of the variation in the RTL could be explained by sample-to-sample variation; less than 0.1% variation was due to batch-to-batch variation and 0.3% variation was explained by bead-to-bead variation. We increased the throughput of RTL Luminex assay from 60 to 240 samples per run. The new assay was validated against the original Luminex assay without pooling (r = 0.79, P = 1.44 × 10−15). In an independent set of samples (n = 550), the new assay showed a negative correlation of RTL with age (r = −0.41), a result providing external validation for the method.ConclusionWe describe a novel high throughput pooled-sample multiplex Luminex assay for RTL with good to excellent precision suitable for large-scale studies.

Fasano, R. M., et al. (2010). "HLA alloantibody persistence and de novo production of HLA alloantibodies of donor origin following reduced intensity allogeneic hematopoietic stem cell transplantation." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

Background: Platelet refractoriness as a consequence of HLA alloimmunization complicates allogeneic hematopoietic stem cell transplantation (HSCT). Little is known regarding the affects of reduced intensity HSCT on the incidence and duration of HLA alloimmune-mediated platelet refractoriness following reduced intensity HSCT. Method(s): We retrospectively studied HLA alloimmunization in 16 patients with malignant and non-malignant hematological disorders, who underwent an allogeneic HSCT from an HLA matched relative using reduced intensity, non-myeloablative conditioning. All patients received a G-CSF mobilized, lymphocyte replete, peripheral blood stem cell (PBSC) allograft following cyclophosphamide (120 mg/kg) and fludarabine (125 mg/m2) based conditioning (+/- equine ATG 40 mg/kg x 4 days) with cyclosporine (CSA; beginning on day -4) and IV methotrexate (5 mg/m2 x 3 days) given as GVHD prophylaxis. Eight patients known to be HLA alloimmunized pre-transplant were compared to 8 control patients who were HLA alloantibody negative pre-transplant. Stored patients' serum samples from pre-transplant (day -30) and post-transplant intervals (days +30, +60, +100, +180, and >= 365) were analyzed for the presence of IgG antibodies to HLA class I antigens using a membrane-independent solid phase assay involving color-coded microbeads coated with HLA antigens and analysis with a flow analyzer (LABScan 100; One Lambda, Canoga Park, CA). Panel reactive antibody (PRA) and mean fluorescent intensity (MFI) were analyzed for all samples to measure HLA antibody strength and specificity, respectively. HLA alloantibodies were analyzed and compared with the degree of donor myeloid and T-cell engraftment measured on post-transplant blood samples by PCR of short tandem repeats (STRs). Result(s): Among the 8 alloimmunized patients who required HLA matched platelets pre-transplant, the median time until HLA antibodies disappeared was 100 days post HSCT. Remarkably, among these patients, 3/8 (37%) had HLA class I antibodies detectable for more than 100 days post-transplant including one patient who continued to show high level alloreactivity greater than 1 year after HSCT. Among the 8 control patients who tested negative for HLA alloantibodies pre-transplant, 3 acquired HLA alloantibodies after HSCT which were first detected at day +30 in all 3 cases. In 2 of the 3 cases, the donors for these patients were found to have pre-existing HLA antibodies of equivalent specificity to those found in the patient post-transplant suggesting patient acquisition of HLA antibodies was mediated by passenger donor lymphocytes that were transplanted in the allograft. Overall, HLA antibodies were detectable for more than 100 days after transplantation in 6/16 (37%) patients analyzed with 3/16 (18%) having alloantibodies detectable for more than 1 year post-transplant despite chimerism being 100% donor in myeloid and T cell lineages. Conclusion(s): Prolonged production of HLA alloantibodies leading to platelet refractoriness can occur following reduced intensity allogeneic HSCT and may persist even after full donor myeloid and T-cell chimerism have been achieved. Remarkably, we observed that transplantation of passenger donor lymphocytes can result in de novo HLA alloimmunization, complicating post-transplant transfusion management. Screening patients and their donors for HLA antibodies before HSCT would identify the majority of subjects at risk for alloimmune-mediated platelet refractoriness after transplantation. This new screening strategy would not only assist in transfusion support after allogeneic HSCT but could also play a role in the decision analysis for selecting optimal stem cell donors.

Fassihi, R. A., et al. (1994). "Potential use of magnesium stearate and talc as dissolution retardants in the development of controlled drug delivery systems." Pharmazeutische Industrie **56**(6): 579-583.

The potential role of magnesium stearate (MS) and talc as dissolution retardants in development of controlled drug delivery was investigated. It was found that when mixtures of brittle and plastic excipients were used in the formulation, MS up to a concentration of 6% w/w did not reduce the hardness significantly. Addition of 2% w/w talc to the formulation containing 2% w/w MS, however, increased the hardness by about 50% and reduced drug release by 50% over a 9 h dissolution study. No correlation existed between increase in hardness and decrease in drug release. Scanning electron micrographs showed that hydrophobic film formation around drug particles and bonding mechanisms were responsible for delay in drug release. Polymeric excipients which deform plastically were not coated significantly with either MS or talc, while brittle components were completely coated. It appears that stearates soften and spread under compression to provide a more coherent coverage and hydrophobicity, whereas talc remains at the surfaces of the particles, stabilizing bonding mechanisms. Plastic particles being uncoated undergo plastic deformation during compression and further add to the compact strength. Synergistic effects of MS and talc as dissolution retardants and stabilizers of bonding mechanism in a mixture of brittle and plastic materials is discussed.

Fatma Sabariah, A., et al. (2014). "Solid waste generation and composition at water villages in Sabah, Malaysia." Polish Journal of Environmental Studies **23**(5): 1475-1481.

Life in an estuary and at the beach are unique settlement patterns in the history of Malaysia. Sabah is well known for its water village settlements that are built on wooden pillars and which can be found along Sabah coastal water. However, a lot of problems have occurred at the Sabah water villages. Thus, the aim of this study is to measure the solid waste generation and composition in 150 households at select water villages in Sabah, Malaysia. The study was conducted at three major towns in Sabah, namely Kampung Tanjung Batu Laut, Tawau water village, Kampung Tanjung Aru, Kota Kinabalu water village and Kampung Sim-sim, Sandakan water village. Based on the results, the total waste generation is 1519.30 kg and the average solid waste generation rate per household is 0.29 kg/person/day. The main component of solid waste is food waste, which comprises 37% of the total waste generated, followed by plastic waste at 31%, paper waste 14.7%, glass 7.2%, and metal 6.3%. The remainder (3.8%) includes bulky waste, furniture, wood, etc. Although the solid waste generation rate is comparatively low, it will create a negative impact on the environment and public health if proper management of solid waste is not practiced.

Faure, F., et al. (2015). "Plastic pollution in Swiss surface waters: nature and concentrations, interaction with pollutants. (Special Issue: Microplastics in the environment.)." Environmental Chemistry **12**(5): 582-591.

Marine microplastic (<5 mm) water pollution has met growing public and scientific interest in the last few years. The situation in freshwater environments remains largely unknown, although it appears that they play an important role as part of the origin of marine pollution. Apart from the physical impacts on biota, chemical effects are to be expected as well, especially with smaller particles. This study aims at assessing plastic abundance in Lakes Geneva, Constance, Neuchatel, Maggiore, Zurich and Brienz, and identifying the nature of the particles, potential ingestion by birds and fishes, and the associated pollutants. Lake surface transects and a few rivers were sampled using a floating manta net, and beach sediments were analysed. Plastics were sorted by type (fragments, pellets, cosmetic beads, lines, fibres, films, foams) and composition (polypropylene, polyethylene, polystyrene, etc.); fish and water birds were dissected to assess their potential exposure, and analyses were conducted on the hydrophobic micropollutants adsorbed to the microplastics as well as some potentially toxic additives they contained. Evidence of this pollution is shown for all lakes, microplastics of all types and diverse composition having been found in all samples. Birds and fish are prone to microplastic ingestion, and all the tested chemicals (both adsorbed micropollutants and contained additives) were found above the detection limit, and often the quantification limit. The sources and their respective contribution need to be confirmed and quantified, and the ecotoxicological effects need further investigation. Other questions remain open, including the transport and fate of plastic particles in the environment.

Faure, F., et al. (2015). "An evaluation of surface micro- and mesoplastic pollution in pelagic ecosystems of the Western Mediterranean Sea." Environmental science and pollution research international **22**(16): 12190-12197.

This study examines the distribution, abundance and characteristics of surface micro- and mesoplastic debris in the Western Mediterranean Sea. 41 samples were collected in 2011 (summer) and 2012 (summer). Results, firstly, revealed that micro- (<5 mm) and mesoplastic debris were widely and uniformly distributed in this area with average concentrations of 130,000 parts/km 2 and 5700 parts/km2, respectively. Importantly, a strong correlation between micro- and mesoplastic concentrations was identified. Secondly, a classification based on the shape and appearance of microplastics indicated the predominant presence of fragments (73 %) followed by thin films (14 %). Thirdly, the average mass ratio of microplastic to dry organic matter has been measured at 0.5, revealing a significant presence of microplastics in comparison to plankton. Finally, a correction method was applied in order to correct wind mixing effect on microplastics' vertical distribution. This data allows for a comprehensive view, for the first time, of the spatial distribution and nature of plastic debris in the Western Mediterranean Sea.

Faussone, G. C. (2018). "Transportation fuel from plastic: Two cases of study." Waste Management **73**: 416-423.

Synthesis of liquid fuels from waste is a promising pathway for reducing the carbon footprint of transportation industry and optimizing waste management towards zero landfilling. The study of commercial plants that conduct pyrolysis of plastics from post-consumer recycled materials and directly mine from old landfills without any pre-treatment has revealed two cases that show the feasibility of manufacturing transportation fuels via these methods. Pyrolysis oil, consisting of almost 26% hydrocarbons within the gasoline range and almost 70% within the diesel range, is upgraded to transportation fuel in the existing refinery. A batch operating plant is able to deliver relatively good quality pyrolysis oil from post-consumer plastic waste, owing to the catalyst employed. Simple distillation was also evaluated as an alternative and cheaper upgrading process into transportation fuels, meeting EN590 diesel and ISO8217 marine fuel standards. Even though the two installations are outside the European Union, they represent good examples of the "circular economy" concept envisaged by the European Union via its ambitious "Circular Economy Package [1]", providing real world data for comparison with other experimental and lab results.

Fauziah, S. H., et al. (2015). "Plastic debris in the coastal environment: The invincible threat? Abundance of buried plastic debris on Malaysian beaches." Waste Management and Research **33**(9): 812-821.

Studies on marine debris have gained worldwide attention since many types of debris have found their way into the food chain of higher organisms. Thus, it is crucial that more focus is given to this area in order to curb contaminations in sea food. This study was conducted to quantify plastic debris buried in sand at selected beaches in Malaysia. Marine debris was identified according to size range and distribution, and this information was related to preventive actions to improve marine waste issues. For the purpose of this study, comparison of plastic waste abundance between a recreational beach and fish-landing beaches was also carried out, since the different beach types represent different activities that produce debris. Six beaches along the Malaysian coastline were selected for this study. The plastic types in this study were related to the functions of the beach. While recreational beaches have abundant quantities of plastic film, foamed plastic including polystyrene, and plastic fragment, fish-landing beaches accumulated line and foamed plastic. A total of 2542 pieces (265.30 g m⁻²) of small plastic debris were collected from all six beaches, with the highest number from Kuala Terengganu, at 879 items m⁻² on Seberang Takir Beach, followed by Batu Burok Beach with 780 items m⁻². Findings from studies of Malaysian beaches have provided a clearer understanding of the distribution of plastic debris. This demonstrates that commitments and actions, such as practices of the reduce, reuse, recycle (3R) approach, supporting public awareness programmes and beach clean-up activities, are essential in order to reduce and prevent plastic debris pollution. Copyright © The Author(s) 2015.

Fava, F., et al. (2014). "Investigation of polyvinylchloride biodegradation by microbial consortia enriched from digested sludges." New Biotechnology **1)**: S141-S142.

During last decades, production of synthetic plastics has increased dramatically to reach approximately 280 million tonnes in 2011. The accumulation of plastic waste in the environment is raising concerns about its effects both on human and the environment. In EU, about 40% of plastic waste is currently disposed of in landfills, where partially undergoes photodegradation, producing microplastics which can absorb toxins and toxic chemicals and together with plasticizers enter the marine environment and thus the food chain, where they exert toxic effects. Furthermore, colonization of plastics by sessile organisms may permit transport of alien species in the ocean environment and may threaten marine biodiversity. Therefore it is necessary to find new eco-friendly techniques for safe handling and degradation of plastic wastes. In this work, ten microbial communities enriched from waste plastics from digested sludges were screened for their capability of degrading non-pretreated films of polyvynil chloride (PVC) and polypropylene (PP). After six months of anaerobic incubation in the presence of the plastic films as main carbon source, growth of microbial community was recorded in all enriched consortia. Thermogravimetric analysis (TGA) performed on PP and PVC films showed biodegradation of only PVC plastic film by 5 communities. Further analyses, including ATR-FTIR and SEM analyses to analyze surface film modifications and GPC for the evaluation of the reduction of the polymer molecular weight on biodegraded PVC films are ongoing.

Favoino, E., et al. (2014). "Expression of the transcription factor forkhead box E3 (FOXE3) in monocytes from patients with systemic sclerosis and correlation with their serological profile." Annals of the Rheumatic Diseases. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **73**(SUPPL. 2).

Background The process of epithelial-mesenchymal transition (EMT) has been regarded in systemic sclerosis (SSc) as one of the possible mechanisms favouring tissue accumulation of monocyte-derived fibrocytes or myofibroblasts, which contribute to tissue fibrosis [1]. Forkhead box E3 (FOXE3) is a transcription factor involved in EMT of lens epithelial cells (LEC). Its expression progressively decreases with the migration of LEC from the anterior to the equatorial region. FOXE3 expression cessation marks initiation of fiber differentiation, suggesting that the

loss of FOXE3 expression favors a pro-fibrotic phenotype [2]. No data are available on mRNA FOXE3 expression in sites other than LEC Objectives In this study, we investigated the FOXE3 mRNA expression in unstimulated and TGF-beta- or IL-4-stimulated monocytes from SSc patients and healthy blood donors (HBD), to established whether i) FOXE3 is constitutively expressed in human monocytes; ii) FOXE3 expression can be modulated in vitro by cytokines involved in SSc profibrotic process; iii) there is any association between FOXE3 expression and a particular SSc serological profile Methods PBMC were isolated from heparinized peripheral blood of 9 patients with SSc (5 Scl70⁺; 4 Scl70⁻), and 3 HBD by Ficoll-Hypaque density gradient centrifugation. Monocytes (CD14⁺) were isolated by positive selection using microbeads. Cells (1x10⁶ cells/ml) were stimulated TGF-beta (10 ng/ml) and IL-4 (40 ng/ml) for 14 days. mRNA was extracted and semi-quantitative PCR was performed to assess FOXE3 expression. GM-CSF stimulation (50ng/ml) was used as positive control. The levels of FOXE3 mRNA were quantified by normalizing its expression against that of GAPDH. Expression was measured as mean relative expression level (MREL). Variation of expression was measured as mean fold change (MFC) Results Similar baseline levels of FOXE3 mRNA was observed in unstimulated CD14⁺ cells from SSc patients and HBD (MREL SSc=0.32; HBD=0.26). As expected, GM-CSF stimulation of CD14⁺ cells from SSc patients and HBD markedly up-regulated FOXE3 expression (SSc: MFC=3.24; HBD: MFC=1.84). TGF-beta and IL-4 behaved similarly to GM-CSF in enhancing FOXE3 expression in CD14⁺ cells from all HBD (MFC<inf>TGF-beta</inf>=1.35; MFCIL-4=1.59) and from 3 out 4 Scl70- patients (MFC<inf>TGF-beta</inf>=2.36; MFCIL-4=2.9), being the expression unchanged in the remaining Scl70- patient. By contrast, in the 4 Scl70⁺ patients, CD14⁺FOXE3 expression markedly decreased following these cytokines stimulation (MFC<inf>TGF-beta</inf>=0.28; MFCIL-4=0.31) Conclusions This is the first study to demonstrate FOXE3 mRNA expression in monocytes from HBD and SSc patients, and its differential expression following TGF-beta and IL-4 stimulation, correlating with the serological profile of SSc patients. The data suggest that the down-regulation of FOXE3 induced by TGF-beta and IL-4 may direct monocytes toward a more profibrotic phenotype in Scl70⁺ as compared to Scl70- patients. The relationship of this finding with the anti-FOXE3 antibodies recently detected in SSc sera [3], remains to be determined.

Favoino, E., et al. (2014). "Expression of the transcription factor forkhead box E3 (FOXE3) in peripheral blood mononuclear cells of patients with systemic sclerosis." Clinical and Experimental Rheumatology **81)**: S63.

Introduction. The process of epithelial (or endothelial)-mesenchymal transition (EMT) is at the basis of generation of renal and pulmonary fibrosis, and, in systemic sclerosis (SSc), has been regarded as one of the possible mechanism for accumulation of lymphocyte/monocyte-derived fibrocytes or myofibroblasts, which contribute to tissue fibrosis. Forkhead box E3 (FOXE3) is a transcription factor involved in EMT of lens epithelial cells (LEC). Its expression progressively decreases with the migration of LEC from the anterior to the equatorial region. FOXE3 expression cessation marks initiation of fiber differentiation. No data are available on FOXE3 expression in sites other than LEC. Therefore, in this study, we investigate FOXE3-expression in peripheral blood mononuclear cells (PBMC) of SSc patients, to eventually explore its potential role in the generation of lymphocyte/monocyte-derived fibrocytes or myofibroblasts, hence of tissue fibrosis. Material and Methods. PBMC were isolated from heparinized peripheral blood of 10 patients with SSc and 7 healthy blood donors (HBD) by Ficoll-Hypaque density gradient centrifugation. Lymphocyte subsets (CD2+, CD19+) and monocytes (CD14+) were isolated by positive selection using microbeads. CD2+ cells (5x105 cells/ml) were stimulated with TGF-beta

(1mug/ml) and IL-6 (10 ng/ml) for 7 days. Total RNA was extracted and semi-quantitative PCR was performed to assess FOXE3 gene expression. The levels of FOXE-3 mRNA were quantified by normalizing its expression against that of GAPDH. Expression was measured as mean relative expression level (MREL). Variation of expression was measured as mean fold change (MFC). Results. FOXE3 was expressed in CD2+, CD19+ and CD14+ cells from SSc patients and HBD. Specifically, expression level of SSc was similar to that of HBD in both CD19+ (MREL, SSc= 0.02; HBD= 0.08) and CD14+ (MREL SSc= 0.52; HBD=0.61) cells, while in CD2+ cells, the expression in HBD was higher (MREL=0.58) than in SSc patients (MRE 0.22). FOXE3 expression markedly increased following TGF-beta stimulation in CD2+ cells from all HBD (MFC=1.43) and 5 SSc patients (MFC 1.94), whereas it decreased in CD2+ cells from the remaining 5 SSc patients (MFC = 0.71). IL-6 stimulation had no significant effect on FOXE-3 expression in CD2+ cells from both SSc patients and HBD. Conclusion. This study has shown, for the first time, the FOXE3 expression in PBMC of SSc patients, and an heterogeneity in the expression level changes in SSc CD2+ cells following stimulation with TGF-beta but not IL-6. Whether this heterogeneity parallels that of clinical manifestations remains to be determined.

Fay, S. P., et al. (1991). "Real-time analysis of the assembly of ligand, receptor, and G protein by quantitative fluorescence flow cytometry." Biochemistry **30**(20): 5066-5075.

We describe a general approach for the quantitative analysis of the interaction among fluorescent peptide ligands (L), receptors (R), and G proteins (G) using fluorescence flow cytometry. The scheme depends upon the use of commercially available fluorescent microbeads as standards to calibrate the concentration of fluorescent peptides in solution and the receptor number on cells in suspension. We have characterized a family of fluoresceinated formyl peptides and analyzed both steady-state and dynamic aspects of ligand formyl peptide-receptor interactions in digitonin-permeabilized human neutrophils. Detailed receptor-binding studies were performed with the pentapeptide N-formyl-Met-Leu-Phe-Phe-Lys-fluorescein. Equilibrium studies showed that GTP [S] caused a loss of binding affinity of approximately two orders of magnitude, from approximately 0.04 nM (LRG) to approximately 3 nM (LR), respectively. Kinetic studies revealed that this change in affinity was principally due to an increase in the dissociation rate constants from approximately 1 x 10(-3) s-1 (LRG) to approximately 1 x 10(-1) s-1 (LR). In contrast, the association rate constants in the presence and absence of guanine nucleotide (approximately 3 x 10(7) s-1 M-1) were statistically indistinguishable and close to the diffusion limit. In the presence of guanine nucleotide (LR), the kinetic data were adequately fit by a single-step reversible-binding model. In the absence of guanine nucleotides, not all receptors have rapid access to G to form the LRG ternary complex. Mathematically, those R that have rapid access to G are either precoupled to R or the association of G with R is fast compared to the association of L with R. The physiological consequences of coupling heterogeneity are discussed.

Fazey, F. M. and P. G. Ryan (2016). "Biofouling on buoyant marine plastics: An experimental study into the effect of size on surface longevity." Environmental Pollution **210**: 354-360.

Recent estimates suggest that roughly 100 times more plastic litter enters the sea than is found floating at the sea surface, despite the buoyancy and durability of many plastic polymers. Biofouling by marine biota is one possible mechanism responsible for this discrepancy. Microplastics (<5 mm in diameter) are more scarce than larger size classes, which makes sense because fouling is a function of surface area whereas buoyancy is a function of volume; the smaller an object, the greater its relative surface area. We tested whether plastic items with high surface area to volume ratios sank more rapidly by submerging 15 different sizes of

polyethylene samples in False Bay, South Africa, for 12 weeks to determine the time required for samples to sink. All samples became sufficiently fouled to sink within the study period, but small samples lost buoyancy much faster than larger ones. There was a direct relationship between sample volume (buoyancy) and the time to attain a 50% probability of sinking, which ranged from 17 to 66 days of exposure. Our results provide the first estimates of the longevity of different sizes of plastic debris at the ocean surface. Further research is required to determine how fouling rates differ on free floating debris in different regions and in different types of marine environments. Such estimates could be used to improve model predictions of the distribution and abundance of floating plastic debris globally.

Fedrigo, M., et al. (2013). "HLA-DRB1 typing by micro-bead array assay identifies the origin of early lymphoproliferative disorder in a heart transplant recipient." American Journal of Transplantation **13**(3): 802-807.

We report the case of a 68-year-old woman who underwent heart transplantation for hypertrophic cardiomyopathy. Two months after the transplant she developed mild fever and dyspnea with a marked drop in left ventricle ejection fraction of 31%. Coronary angiography was negative for cardiac allograft vasculopathy. Endomyocardial biopsy revealed ischemic damage with no evidence of acute cellular rejection, antibody-mediated rejection or viral myocarditis. A neoplastic process was suspected even though full-body computerized tomography was negative for malignancy. The patient died 4 months after transplantation. The autopsy showed acute antero-septal myocardial infarction due to a nodular epicardial EBV-related posttransplant lymphoproliferative disorder (PTLD) infiltrating the left anterior descending coronary artery with occlusive neoplastic thrombosis. We highlight two major aspects of this case: (1) the unusual occurrence of early PTLD involving the cardiac allograft and causing a fatal outcome, (2) the application of an immunological technique for HLA-DRB1 typing to posttransplant paraffin-embedded autopsy material to identify the recipient origin of this early malignancy, thus excluding a possible donor-transmitted neoplasm. The authors report the application of HLA typing technique to identify neoplastic donor/recipient cell origin from a tumor mass infiltrating the coronary artery of a heart allograft. © 2013 The American Society of Transplantation and the American Society of Transplant Surgeons.

Fehniger, T. A., et al. (2014). "Preliminary results of a phase 1/2 clinical trial of CNDO-109-activated allogeneic natural killer cells in high risk acute myelogenous leukemia patients in first complete remission." Blood. Conference: 56th Annual Meeting of the American Society of Hematology, ASH **124**(21).

BACKGROUND We previously reported that resting human peripheral blood NK cells can be primed to kill NK-resistant tumor cells by co-incubation with a lysate of the leukemia cell line CTV-1. CNDO-109 is a clinical-grade CTV-1 lysate that primes NK cells ex-vivo to kill NK-resistant acute myeloid leukemia (AML) cells. CNDO-109-activated NK cells can be cryopreserved and remain primed when thawed. Incubation or treatment with IL-2 is not required. We report preliminary safety, outcome and NK chimerism data from an ongoing Phase 1/2 transitional clinical trial of CNDO-109-NK cells. METHODS A 3x3 dose escalation phase 1 trial was opened in 2013 for patients with AML in 1st CR with high-risk disease and no conventional treatment options. Patients were given preparative chemotherapy of cyclophosphamide and fludarabine on Study Days -6 to -2, followed on day 0 by a single dose of CNDO-109-activated NK cells at the following doses; cohort 1 = 3x10⁵, cohort 2 = 1x10⁶, cohort 3 = up to 3x10⁶ cells/kg recipient body weight. The MTD will set the dose for the transitional phase 2 trial. CNDO-109-NK cells were generated from a single apheresis collection from

HLA-haploidentical related donors. NK cells were isolated with anti-CD56 microbeads (CliniMACS, Miltenyi Biotec) and co-incubated with CNDO-109 lysate (Coronado Biosciences) overnight under cGMP conditions. After lysate removal cells were cryopreserved in dosed aliquots and released for infusion. Exogenous IL-2 was not used. Quality control testing of the final product included NK purity (>50%), viability (> 70%), potency, sterility, mycoplasma and endotoxin. Residual T cell contamination (<104 cells/kg patient body weight) was a lot release safety criterion. Patients were assessed for safety and efficacy whilst expansion, proliferation and persistence of donor NK cells were assayed by molecular-based chimerism techniques, and by flow cytometry, where informative markers were available. Pre- and post-treatment samples from cohort 3 patients are being tested for flow cytometric and molecular MRD (University of Washington - Walter, R.B.2013 and NextGene Sequencing). RESULTS Seven eligible patients have been enrolled. All products met lot release and contained activated NK cells as determined by killing of NK resistant Raji cells as well as increased expression of CD69 & CD25: No infusional toxicity, adverse events attributed to NK therapy, GvHD nor deaths have been reported. As expected, all patients experienced transient myelosuppression (approx. 2 weeks). 3 patients suffered early relapse post-treatment (2 in cohort 1, 1 in cohort 2; average time to relapse from CR1 for these 3 patients was 104 days). In 5 of 7 evaluable patients, persistence of donor activated NK cells was observed from Day +7 post-infusion (chimerism = 1%-84%) to as late as day +56 in one patient. Flow cytometric comparison of donor NK cells and patient NK cells in the same sample by selective gating on the mismatched HLA allele showed that circulating donor NK cells typically differed from recipient NK cell in higher expression of NKG2A (e.g. 63.5% vs 2.7%), CD57 (e.g. 80.5% vs 13.2%) and CD69 (e.g. 11.6% vs 2.52%) suggesting a more normal, mature and activated phenotype than the endogenous host NK population. Even after loss of circulating donor primed NK cells, 2 of the 3 patients tested showed persistence of low levels of activated autologous NK cells (~10-20% of circulating NK) exceeding the numbers circulating pre-CNDO-109 NK treatment, out to Day +56, suggesting that the therapy may induce endogenous NK activation to enhance the patients' innate immunity to AML. CONCLUSIONS This establishes proof of concept that CNDO-109-NK can persist transiently in patients with lasting microchimerism for > 1 month and can induce activation of endogenous NK cells in patients treated without cytokine administration. To date 4 of the 7 patients enrolled remain relapse free (max. = 410 days post CR1 date). These results highlight the potential of CNDO-109-NK cells in the treatment of

Fei, Y., et al. (2019). "Response of soil enzyme activities and bacterial communities to the accumulation of microplastics in an acid cropped soil." Science of the Total Environment: 135634.

The ecological stress of microplastics (MPs) contamination in agroecosystems raise worldwide concerns. However very few studies concentrated on the effects of MPs exposure on soil microbial community. The alterations of enzymatic activities and bacterial communities were assayed by spiking 1% and 5% (w/w) of polyethylene (PE) and polyvinyl chloride (PVC) MPs in an acid soil. The results showed that both PE and PVC addition inhibited fluorescein diacetate hydrolase activity and stimulated urease and acid phosphatase activities, and declined the richness and diversity of the bacterial communities. More severe effects were observed in the PE treated soils compared to the PVC treated soils generally. The relative abundances of families Burkholderiaceae increased significantly ($p < .05$) after MPs addition, suggesting the bacteria associated with nitrogen fixation stimulated by the MPs input. Meanwhile, significant ($p < .05$) decline of Sphingomonadaceae and Xanthobacteraceae after addition of 5% PVC and 1% PE MPs, respectively implied that MPs might inhibit the biodegradation of xenobiotics in the soil. Mover, the PICRUSt analysis demonstrated that membrane transporter was a sensitive

prediction functional gene of microplastics exposure in the soil. Future studies could be focused on the role of MPs on the regulation of nitrogen cycling and organic compounds degradation in soils.

Feil, A., et al. (2017). "Separate collection of plastic waste, better than technical sorting from municipal solid waste?" Waste Management & Research **35**(2): 172-180.

The politically preferred solution to fulfil legal recycling demands is often implementing separate collection systems. However, experience shows their limitations, particularly in urban centres with a high population density. In response to the European Union landfill directive, mechanical biological waste treatment plants have been installed all over Europe. This technology makes it possible to retrieve plastic waste from municipal solid waste. Operators of mechanical biological waste treatment plants, both in Germany and the Netherlands, have started to change their mechanical separation processes to additionally produce plastic pre-concentrates.

Fela, J. (2014). "Dutch lead EU in microbead ban." Frontiers in Ecology & the Environment **12**(10): 541-541.

The article offers information related to decision of the government of The Netherlands to completely ban the use of microplastics from cosmetics, announced by Dutch State Secretary for the Ministry of Infrastructure and the environment, Wilma Mansveld as of December 2014.

Feld, G. K., et al. (2011). "Particle formation and risk of embolization during transseptal catheterization: comparison of standard transseptal needles and a new radiofrequency transseptal needle." Journal of Interventional Cardiac Electrophysiology **30**(1): 31-36.

OBJECTIVE: Anecdotally, the Brockenbrough transseptal needle generates plastic particles through a process of skiving (shaving off particles), when advanced through the dilator and sheath. This study was performed to assess particle creation by the Brockenbrough needle during transseptal catheterization. We explore strategies that may reduce this phenomenon, including use of the Brockenbrough stylet and a radiofrequency transseptal needle.

METHOD: In vitro simulations of transseptal catheterization were performed using Brockenbrough transseptal needles and a new radiofrequency transseptal needle. Particles that were created during advancement of transseptal needles through the sheath and dilator were collected and analyzed. Particles in the visible range of 50 mum to 4 mm were identified using a light microscope, whereas particles in the sub-visible, yet clinically relevant range of 10 to 50 mum, were counted using a light obscuration method.

RESULTS: All simulated procedures using the Brockenbrough transseptal needles, with or without a stylet, generated visible particles. Simulated procedures with the radiofrequency transseptal needle generated no visible particles. A greater number of sub-visible particles were generated with the standard Brockenbrough transseptal needle (BKR-1) without stylet compared with the standard Brockenbrough needle (BRK-1) with stylet, the Brockenbrough extra sharp (BRK-1XS) needle with or without stylet, and the radiofrequency needle (NRG C1).

CONCLUSION: Clinically relevant particles, both visible and sub-visible, with the potential for causing embolic complications, are generated by the BRK-1 needle without stylet. Use of a stylet in the BRK-1 needle, or the BRK-1XS needle with or without stylet, appears to reduce the size and amount of particles created. The NRG C1 needle appears to eliminate visible particles and is comparable to the BRK-1 with stylet and the BRK-1XS with or without stylet in generation of sub-visible particles. Important steps can be taken to minimize the creation of particles during the advancement of the BRK-1 through the transseptal sheath and dilator.

Feldman, T. B., et al. (2015). "Changes in spectral properties and composition of lipofuscin fluorophores from human-retinal-pigment epithelium with age and pathology." Analytical and bioanalytical chemistry **407**(4): 1075-1088.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Fundus autofluorescence mostly originates from bisretinoid fluorophores in lipofuscin granules, which accumulate in retinal-pigment-epithelium cells with age. The dynamics of accumulation, photo-oxidation, and photodegradation of bisretinoids during aging or in the presence of pathology have been insufficiently investigated. Changes in spectral properties and composition of human lipofuscin-granule fluorophores with age and pathology have now been investigated by a high-performance liquid chromatography method using spectrophotometric and fluorescent detectors connected in series. It was found that: (i) N-retinylidene-N-retinylethanolamine (A2E) fluorescence intensity is not predominant in the chloroform extract of human-cadaver-eye retinal pigment epithelium studied; bisretinoid photo-oxidation and photodegradation products have much higher fluorescent properties; (ii) the relative emission maximum in the fluorescence spectrum of suspended retinal-pigment-epithelium cells obtained from an individual human-cadaver eye without pathology is irrespective of donor age and falls within the range 575±15 nm; in two cadaver eyes with signs of age-related macular degeneration, emission maxima were shifted by 23-36 nm towards the shortwave region; and (iii) the ratio of bisretinoid photo-oxidation and photodegradation products to unoxidized bisretinoids in the chloroform extract of cadaver-eye retinal pigment epithelium increases with donor age, from 0.69±0.03 to 1.32±0.04. The differences in fluorescence properties between chloroform extracts obtained from cadaver eyes with and without signs of age-related macular degeneration could be used to increase the potential of fundus autofluorescence imaging as a noninvasive diagnostic method.

Feldmeyer, N., et al. (2009). "Arginine deficiency leads to impaired cofilin dephosphorylation and actin reorganization in activated human T lymphocytes." European Journal of Immunology **1)**: S159.

Objectives: The amino acid arginine is fundamentally involved in the regulation of the immune response during infection, inflammatory diseases and tumor growth. Arginine deficiency (e.g. due to the myeloid cell enzyme arginase) inhibits proliferation and effector functions of activated T lymphocytes. In this study we analysed intracellular mechanisms mediating T cell suppression in the absence of arginine. Method(s): In the absence or presence of arginine human T lymphocytes were stimulated with anti-CD3/anti-CD28-coupled microbeads or the Raji B cell line (as antigen presenting cells, APC) together with superantigen. T cell lysates were separated and comparatively analysed by 2D-gelelectrophoresis. Reproducibly overrepresented protein spots in the absence of arginine were sequenced by mass spectrometry and results were confirmed by Western Blot and various functional assays (proliferation assays, flow cytometry, ELISA, ImageStream Technology). Result(s): Our proteomic analysis revealed an impaired dephosphorylation of the actin-binding protein cofilin upon T cell activation in the absence of arginine. Normally, anti-CD3/anti-CD28-mediated T cell activation leads to dephosphorylation of cofilin and this plays an important role in the reorganization of the actin cytoskeleton, T cell proliferation and cytokine secretion of activated T cells. We show that the persistence of phospho-cofilin upon arginine withdrawal correlates with altered F-actin generation. While Calcium flux is unimpaired upon activation in arginine-deficient medium, cytokine synthesis is differentially regulated in human T lymphocytes. In contrast to impaired IFN-g secretion, T lymphocytes produce IL-2 irrespective of the extracellular arginine concentration. Finally, since the binding of cofilin to actin is important for immunological synapse formation we analysed the

accumulation of CD2 and CD3 in the evolving immunological synapse between T cell/APC conjugates. We demonstrate impairment of these crucial steps of immunological synapse formation in the context of arginine deficiency. Conclusion(s): Our data show for the first time an impairment of T lymphocyte actin reorganization and immunological synapse formation due to arginine deficiency. These findings clarify further the profound immune suppression in the context of chronic inflammation and cancer.

Felice, B. d., et al. (2019). "Polystyrene microplastics ingestion induced behavioral effects to the cladoceran Daphnia magna." Chemosphere **231**: 423-431.

Microplastic (micro Ps) contamination represents a dramatic environmental problem threatening both aquatic and terrestrial organisms. Although several studies have highlighted the presence of micro Ps in aquatic environments, the information regarding their toxicity towards organisms is still scant. Moreover, most of the ecotoxicological studies of micro Ps have focused on marine organisms, largely neglecting the effects on freshwater species. The present study aimed at exploring the effects caused by 21-days exposure to three concentrations (0.125, 1.25 and 12.5 micro g/mL) of two differently sized polystyrene microplastics (P micro Ps; 1 and 10 micro m) to the Cladoceran Daphnia magna. The ingestion/egestion capability of daphnids (<24 h) and adults, the changes in individual growth and behavior, in terms of changes in swimming activity, phototactic behavior and reproduction, were investigated. Both particles filled the digestive tract of daphnids and adults within 24 h of exposure at all the tested concentrations. Ingested P micro Ps remained in the digestive tract even after 96 h in a clean medium. For both particles, an overall increase in body size of adults was noted at the end of the exposure to the highest tested concentrations, accompanied by a significant increase in swimming activity, in terms of distance moved and swimming velocity, and by an alteration of the phototactic behavior. A significant increase in the mean number of offspring after the exposure to the highest P micro Ps concentrations of different size was recorded. Polystyrene micro Ps can affect behavioral traits of D. magna leading to potentially harmful consequences on population dynamics of this zooplanktonic species.

Fendall, L. S. and M. A. Sewell (2009). "Contributing to marine pollution by washing your face: microplastics in facial cleansers." Marine Pollution Bulletin **58**(8): 1225-1228.

Plastics pollution in the ocean is an area of growing concern, with research efforts focusing on both the macroplastic (>5mm) and microplastic (<5mm) fractions. In the 1990 s it was recognized that a minor source of microplastic pollution was derived from liquid hand-cleansers that would have been rarely used by the average consumer. In 2009, however, the average consumer is likely to be using microplastic-containing products on a daily basis, as the majority of facial cleansers now contain polyethylene microplastics which are not captured by wastewater plants and will enter the oceans. Four microplastic-containing facial cleansers available in New Zealand supermarkets were used to quantify the size of the polythelene fragments. Three-quarters of the brands had a modal size of <100 microns and could be immediately ingested by planktonic organisms at the base of the food chain. Over time the microplastics will be subject to UV-degradation and absorb hydrophobic materials such as PCBs, making them smaller and more toxic in the long-term. Marine scientists need to educate the public to the dangers of using products that pose an immediate and long-term threat to the health of the oceans and the food we eat.

Feng, C. and X. Q. Ma (2009). "The energy consumption and environmental impacts of a color TV set in China." Journal of Cleaner Production **17**(1): 13-25.

The present study analyses the different processes followed during color TV set production along with the energy consumption and the environment emissions in each stage. The purpose is to identify "hot-spots", i.e. parts of the life cycle important to the total environmental impact. The analysis is performed using life cycle assessment (LCA) methodology, which is a method used to identify and quantify in the environmental performance of a process or a product from "cradle to grave". LCA methodology provides a quantitative basis for assessing potential improvements in the environmental performance of a system throughout the life cycle. The system investigated includes the production of manufacturing materials, transport of manufacturing materials, color TV set manufacturing, transport of color TV sets, use of color TV sets, discarding color TV sets and partial plastic waste energy utilization. The environmental burdens that arise from color TV sets are mainly due to air emissions derived from fossil fuel utilization.

Feng, L. J., et al. (2018). "Role of extracellular polymeric substances in the acute inhibition of activated sludge by polystyrene nanoparticles." Environmental Pollution **238**: 859-865.

Microplastics and nanoplastics in aquatic systems have become a global concern because of their persistence and adverse consequences to ecosystems and potentially human health. Though wastewater treatment plants (WWTPs) are considered a potential source of microplastics in the environment, the role of extracellular polymeric substances (EPS) of activated sludge on the fate of nanoplastics is not clear. In this study, the role of EPS in the influence of polystyrene nanoparticles (PS-NPs) on the endogenous respiration of activated sludge was investigated for the first time. The results showed that the acute inhibition of activated sludge by PS-NPs was enhanced with increasing PS-NPs concentration. X-ray photoelectron spectroscopy (XPS) results indicate that the functional groups involved in the interactions between PS-NPs and EPS were carbonyl and amide groups and the side chains of lipids or amino acids. Furthermore, the Fourier transform infrared (FTIR) spectroscopy results show that the protein secondary structures in EPS were changed by PS-NPs and lead to the bioflocculation of activated sludge, which provides a better understanding on the fate of nanoplastics in WWTPs.

Feng, Y., et al. (2018). "Emerging investigator series: inhibition and recovery of anaerobic granular sludge performance in response to short-term polystyrene nanoparticle exposure." Environmental Science: Water Research & Technology **4**(12): 1902-1911.

Anaerobic treatment systems play an important role in treating nanoplastic-containing wastewater, such as textile dyeing wastewater. However, the influence of nanoplastics on anaerobic granular sludge (AGS), a key parameter determining the performance of anaerobic bioreactors, has not received sufficient attention. In this study, inhibition and recovery of AGS performances in response to short-term polystyrene (PS) nanoparticle exposure were investigated. Results showed that cationic PS nanoparticles (PS-NH₂) had higher inhibition capacity on methane production than anionic PS nanoparticles (PS-SO₃H). At the end of the first cycle, cumulative methane production was reduced by 22.98% and 17.47% by exposure to 20 micro g mL⁻¹ PS-NH₂ and 100 micro g mL⁻¹ PS-SO₃H, respectively. However, the system recovered in the second cycle of experiments. Volatile fatty acid (VFA) concentration had no obvious relationship to PS nanoparticle addition. Both functionalized PS nanoparticles could change the protein secondary structures of extracellular polymeric substances (EPS) and penetrate EPS matrix into AGS at specific concentration. The response of AGS was explored through bacterial and archaeal communities as well as the relative abundance of methanogenic functional genes. These results elucidated the complex interactions of AGS, EPS and PS-NPs, which will expand the knowledge on the stability of AGS under short-term exposure to nanoplastics.

Feng, Z., et al. (2019). "The accumulation of microplastics in fish from an important fish farm and mariculture area, Haizhou Bay, China." Science of the Total Environment **696**: 133948.

Marine fisheries and aquaculture can match growing demand for marine protein from an increasing population. However, the microplastics (MPs) in marine environments may pose a threat to human health through food chains by seafood consumption. The MPs have been found lodged in the digestive tracts and other tissues of various sea animals, nevertheless, little is known in regard to the accumulation of MPs in fish from major fish farms and mariculture areas, especially in non-digestive tissues of fishes. This study investigated the accumulation of MPs in six major wild fish species (including Thryssa kammalensis, Amblychaeturichthys hexanema, Odontamblyopus rubicundus, Cynoglossus semilaevis, Chaeturichthys stigmatias and Collichthys lucidus), both in digestive and non-digestive tissues, from an important fish farm and mariculture area, Haizhou Bay, China. All fishes had items that were identified as MPs. The highest abundance of MPs was 22.21+/-1.70items/individual or 11.19+/-1.28items/g in T. kammalensis, which is filter-feeding and usually inhabits in estuary. The lowest abundance of MPs was observed in C. semilaevis (13.54+/-2.09items/individual) and C. stigmatias (1.61+/-0.56items/g). The abundance of MPs exponentially increased with the decrease of MPs size. The MPs were dominated by fiber in shape, black or grey in colour and cellophane in composition. As to different tissues, the total number of MPs on skin (800) or in gills (746) was higher than that in gut (514). In terms of skin, the abundances of MPs in three species of scaleless fish with mucus (A. hexanema, C. stigmatias and O. rubicundus) were generally higher than other three fishes with scales (C. lucidus, C. semilaevis and T. kammalensis), implying the potential high risk of scaleless fish consumption for human health in Haizhou Bay. More in-depth studies need to focus on the scaleless fish through mucus adsorbing enormous MPs.

Ferguson, J. C. (1995). "The Structure and Mode of Function of the Water Vascular System of a Brittlestar, Ophioderma appressum." Biological Bulletin **188**(1): 98-110.

Unlike the asteroids, which have large madreporite structures, the ophiuroid Ophioderma appressum possesses only two small hidden madreporite pores. Experiments with labeled amino acids, fluorescent microbeads, and surgical obstruction show that small amounts of seawater do routinely enter these pores and become distributed throughout the water vascular system; but this uptake does not seem essential. The flagellated stone canal draws its fluid from the axial sinus, to which the pores connect through a tortuous ampulla. Thus, the stone canal mainly recirculates fluid from hyponeural (perihemal) passages. That perihemal fluid is augmented by seawater from the pores. As perihemal fluid moves towards the stone canal, it passes by or through the axial organ, where nutritive materials may be removed and passed into the hemal channels. Pressure generated by the stone canal forces flow out to the oral tube feet, polian vesicles, and, through valves, eventually to the arm tube feet. Inflation of the tube feet also might occur through osmotic mechanisms, but their activity was not impeded by raising the external osmotic level with dextran. Observations indicate that negative coelomic pressures must be generated during respiratory movements, and these could lead to sufficient body fluid production (by filtration) that the need for substantive madreporitic inflows would be alleviated.

Ferguson, K. (2010). "NOAA surveys plankton and plastic." Frontiers in Ecology & the Environment **8**(10): 511-511.

The article focuses on the plankton and plastic transect by the Fisheries Service researchers of U.S. National Oceanic and Atmospheric Administration (NOAA). It says that the funnel-shaped device called continuous plankton recorder was used in gathering plankton samples, while plastic wastes were taken in the North Pacific Ocean. It mentions that the survey will help in determining plankton communities' responses to environmental change and the effect of microplastic debris to planktons.

Fernandez, B. and M. Albentosa (2019). "Dynamic of small polyethylene microplastics (<=10 micro m) in mussel's tissues." Marine Pollution Bulletin **146**: 493-501.

MPs' uptake and tissue accumulation were investigated in mussel exposed to a single dose (2.85 mg ind⁻¹, 3 mg l⁻¹) of a heterogeneous mixture of irregularly shaped particles of HDPE (mainly <=10 micro m), followed by a 7 days depuration period. The results showed that mussels efficiently cleared MPs from water during exposure, and that MPs were accumulated in digestive gland and gills during depuration. In digestive gland, the amount and size of the MPs accumulated decreased with time, indicating a slower processing and elimination of small MPs than of larger ones. In gills, MPs' burdens increased with time, the MPs accumulated were the smallest ones, suggesting the translocation of small MPs from the digestive system to the gills. The hazardous potential of the smaller fraction of MPs (<=4 micro m) underlined that more focus should be directed towards the accumulation and effects of this fraction of MPs in the marine environment.

Fernández, B. and M. Albentosa (2019). "Dynamic of small polyethylene microplastics (≤10 μm) in mussel's tissues." Marine Pollution Bulletin **146**: 493.

MPs' uptake and tissue accumulation were investigated in mussel exposed to a single dose (2.85 mg ind−1, 3 mg l−1) of a heterogeneous mixture of irregularly shaped particles of HDPE (mainly ≤10 μm), followed by a 7 days depuration period. The results showed that mussels efficiently cleared MPs from water during exposure, and that MPs were accumulated in digestive gland and gills during depuration. In digestive gland, the amount and size of the MPs accumulated decreased with time, indicating a slower processing and elimination of small MPs than of larger ones. In gills, MPs' burdens increased with time, the MPs accumulated were the smallest ones, suggesting the translocation of small MPs from the digestive system to the gills. The hazardous potential of the smaller fraction of MPs (≤4 μm) underlined that more focus should be directed towards the accumulation and effects of this fraction of MPs in the marine environment.

Fernández, B. and M. Albentosa (2019). "Insights into the uptake, elimination and accumulation of microplastics in mussel." Environmental Pollution **249**: 321-329.

The majority of plastics present in the marine environment are microplastics (MPs, <5 mm). Suspension filter feeders are susceptible species to MPs ingestion. Once ingested MPs can be eliminated packed in fecal pellets, or they can be accumulated within tissues, and likely be transferred along the food web. The research on MPs is hampered by the difficulty on their quantification and the lack of standardized methodologies. Indeed, limited information exits about the capacity of marine organisms to ingest, accumulate and eliminate MPs. In this work we investigated the uptake, elimination and accumulation of MPs (irregularly shaped particles of high density polyethylene, ≤22 μm) in mussel. Mussels were exposed to two concentrations of MPs (2 and 4 mm3 l−1), and their uptake, elimination and accumulation in digestive gland was investigated. The results showed that the uptake of MPs increased at the high concentration tested, and that mussels cleared MPs at the same extent than a food item (microalgae) of similar size. Small MPs (2–4 μm) were less efficiently cleared than the larger ones. Large MPs

(>10 µm) were faster eliminated than the smaller ones. The global balance showed that after 6 days of depuration mussels eliminated ≈85% of the MPs cleared, and that ≈2–6% of the MPs cleared remained in the digestive gland, essentially those <6 µm. We recorded a long retention time for MPs, contrasting with the lower times assumed to be necessary to empty mussel's gut before quantifying MPs. Our study emphasized the gap of knowledge on the feeding behaviour of mussels in relation to MPs, and the necessity to investigate it in different marine species, and under different exposure scenarios. Image 1 • Mussels were exposed to microplastics (MPs, high density polyethylene, ≤ 22 µm). • Mussels cleared MPs with the same efficiency than a food item (microalgae) of similar size. • Around the 85% of the MPs cleared were eliminated after 6 days of depuration. • After 6 days of depuration the 2–6% of the MPs cleared remained in the digestive gland. • The MP particles tested showed a long retention time in mussel. This work contributes knowledge about the feeding behaviour of mussel towards microplastics by investigating their kinetics of uptake and elimination, and their retention in the digestive system. [ABSTRACT FROM AUTHOR]

Fernandez, L., et al. (2017). "NKG2D-car redirected CD45RA: Memory T cells target pediatric acute leukemia." Bone Marrow Transplantation **52 (Supplement 1)**: 470-471.

INTRODUCTION: Lymphoid and myeloid acute leukemia are the most frequent type of cancer and the most frequent cause of cancer related death in children. Relapse and refractory disease are the main clinical problems that current therapies are still unable to solve. One of the main NK cell activating receptors is NK cell group 2D (NKG2D). NKG2D receptor recognizes human MICA/ULBP1-6 ligands. These NKG2D ligands are expressed in leukemia cells and constitute suitable targets for immunotherapy. MATERIAL (OR PATIENTS) AND METHODS: The expression of NKG2D ligands was analyzed in Peripheral Blood Mononuclear Cells from 61 pediatric patients suffering from acute leukemia (21 Acute Myeloid Leukemia, 25 B cell Acute Lymphoid Leukemia and 15 T cell Acute Lymphoid Leukemia), as well as in 7 leukemia cell lines (K562, RS4-11, Jurkat, NALM-6, MOLT-3, REH and CEM), by flow cytometry using specific monoclonal antibodies directed against MICA, MICAB, ULBP-1, ULBP-2, ULBP-3 and ULBP-4, and by quantitative PCR using TaqMan probes. Peripheral blood mononuclear cells from healthy donors were labeled with CD45RA microbeads and depleted using AutoMACS device. The HL20i4r-MNDantiCD19bbz lentiviral vector was derived from the clinical vector CL20i4r-EF1a-hgcOPT27 but contained the extracellular domain of NKG2D, the hinge region of CD8a and the signaling domains of 4-1BB and CD3-z. The cassette was driven by MND promoter. Viral supernatant was produced by transient transfection of HEK293T cells with the vector genome plasmid and lentiviral packaging helper plasmids pCAGG-HIVgpco, pCAGG-VSVG and pCAG4-RTR2. Cytogenetic studies and array Comparative Genomic Hybridization were performed to analyze the genetic stability of lentiviral-transduced memory T cells. The in vitro cytotoxicity of CD45RA-T cells against leukemia cells, healthy PBMC and Mesenchymal Stem cells (MSC) was evaluated by performing conventional 4-hour europium-TDA release assays or by flow cytometry using CFSE and 7AAD labeling of target cells. RESULT(S): NKG2DL were heterogeneously expressed in leukemia primary cells and cell lines. For B cell ALL primary samples, we found expression of MICA/B, MICA and ULBP1 decreased in refractory disease compared to remission (p=0.01, p=0.03 and

p=0.02 respectively). Lentiviral transduction of NKG2D-4-1BB-CD3z markedly increased NKG2D surface expression in CD45RA-memory T cells, which became consistently more cytotoxic than untransduced cells against leukemia cells. Additionally, no chromosomal aberrations nor cytotoxic activity against healthy PBMC or Mesenchymal Stem cells was observed in NKG2D CAR expressing T cells. CONCLUSION(S): Our results demonstrate NKG2D-CAR redirected CD45RA-memory T cells target NKG2DL expressing leukemia cells in vitro and could be a promising and safe immunotherapeutic approach for acute leukemia patients.

Fernandez, L., et al. (2017). "CD45RA-memory T cells expressing an NKG2D-car target pediatric acute leukemia." Haematologica **102 (Supplement 2)**: 194.

Background: Lymphoid and myeloid acute leukemia are the most frequent type of cancer and the most frequent cause of cancer related death in children. Relapse and refractory disease are the main clinical problems that current therapies are still unable to solve. One of the main NK cell activating receptors is NK cell group 2D (NKG2D). NKG2D receptor recognizes human MICA, MICB and ULBP1-6 ligands. These NKG2D ligands (NKG2DL) are expressed in leukemia cells and constitute suitable targets for immunotherapy. Aim(s): The aim of thi study was to analyze the NKG2DL expression on pediatric acute leukemia cells and determine their susceptibility to an NKG2D CAR cell based immunotherapy. Method(s): The expression of NKG2DL was analyzed in Peripheral Blood Mononuclear Cells (PBMCs) from patients suffering from acute leukemia, as well as in leukemia cell lines, by flow cytometry (FCM) using specific monoclonal antibodies directed against MICA, MICAB, ULBP-1, ULBP-2, ULBP-3 and ULBP-4, and by quantitative PCR using TaqMan probes. PBMC from healthy donors were labeled with CD45RA microbeads and depleted using AutoMACS device. The HL20i4r-MNDantiCD19bbz lentiviral vector was derived from the clinical vector CL20i4r-EF1a-hgcOPT27 but contained the extracellular domain of NKG2D, the hinge region of CD8a and the signaling domains of 4-1BB and CD3-z. The cassette was driven by MND promoter. Viral supernatant was produced by transient transfection of HEK293T cells with the vector genome plasmid and lentiviral packaging helper plasmids pCAGG-HIVgpco, pCAGG-VSVG and pCAG4-RTR2. Cytogenetic studies and array Comparative Genomic Hybridization were performed to analyze the genetic stability of lentiviral-transduced memory T cells. The in vitro cytotoxicity of CD45RANKG2DCAR+ memory T cells against leukemia cells, healthy PBMC and Mesenchymal Stem cells (MSC) was evaluated by performing conventional 4-hour europium-TDA release assays or by FCM using CFSE and 7AAD labeling of target cells. Result(s): NKG2DL were heterogeneously expressed in leukemia primary cells and cell lines. For B cell ALL primary samples, we found expression of MICA/B, MICA and ULBP1 decreased in refractory disease compared to remission. Lentiviral transduction of NKG2D-4-1BB-CD3z increased NKG2D surface expression in CD45RA-memory T cells, which became consistently more cytotoxic than untransduced cells against leukemia cells. Additionally, no chromosomal aberrations nor cytotoxic activity against healthy PBMC or Mesenchymal Stem cells was observed in NKG2D CAR expressing T cells. Summary/Conclusions: Our results show NKG2D-CAR redirected CD45RAmemory T cells target NKG2DL expressing leukemia cells in vitro and could be a promising and safe immunotherapeutic approach for pediatric acute leukemia patients.

Fernandez Robledo, J. A., et al. (2019). "From the raw bar to the bench: Bivalves as models for human health." Developmental & Comparative Immunology **92**: 260-282.

Bivalves, from raw oysters to steamed clams, are popular choices among seafood lovers and once limited to the coastal areas. The rapid growth of the aquaculture industry and improvement in the preservation and transport of seafood have enabled them to be readily available anywhere in the world. Over the years, oysters, mussels, scallops, and clams have been the focus of research for improving the production, managing resources, and investigating basic biological and ecological questions. During this decade, an impressive amount of information using high-throughput genomic, transcriptomic and proteomic technologies has been produced in various classes of the Mollusca group, and it is anticipated that basic and applied research will significantly benefit from this resource. One aspect that is also taking momentum is the use of bivalves as a model system for human health. In this review, we highlight some of the aspects of the biology of bivalves that have direct implications in human health including the shell formation, stem cells and cell differentiation, the ability to fight opportunistic and specific pathogens in the absence of adaptive immunity, as source of alternative drugs, mucosal immunity and, microbiome turnover, toxicology, and cancer research. There is still a long way to go; however, the next time you order a dozen oysters at your favorite raw bar, think about a tasty model organism that will not only please your palate but also help unlock multiple aspects of molluscan biology and improve human health.

Fernandez-Repollet, E., et al. (1982). "In vivo effects of prostaglandin E<inf>2</inf> and arachidonic acid on phagocytosis of fluorescent methacrylate microbeads by rat peritoneal macrophages." Journal of Histochemistry and Cytochemistry **30**(5): 466-470.

Several studies have suggested that prostaglandin E<inf>2</inf> (PGE<inf>2</inf>) might influence the phagocytic activity of macrophage cells. The present study was designed to examine the in vivo effects of PGE<inf>2</inf>, the prostaglandin synthesis inhibitor meclofenamate, the prostaglandin precursor arachidonic acid, and the biologically inactive fatty acid 11,14,17-eicosatrienoic acid on phagocytosis by peritoneal macrophage cells in the rat. Following 3 days treatment with either agent, fluorescent methacrylate microbeads were injected intraperitoneally into all rats. Peritoneal exudates were harvested after administration of the microbeads and the percent phagocytosis determined in macrophage cells using a fluorescence-activated cell sorter (FACS II). The administration of PGE<inf>2</inf> was associated with a significant decrease in the percentage of peritoneal macrophages ingesting the fluorescent methacrylate microbeads. In contrast, treatment with arachidonic acid or 11,14,17-eicosatrienoic acid significantly enhanced the percentage of phagocytic macrophage cells. A significant increase in the number of macrophages undergoing phagocytosis of the methacrylate microbeads was also observed in rats treated with meclofenamate. This later observation, taken together with the inhibitory effect induced by PGE<inf>2</inf> on macrophage phagocytosis, points to a potential modulator role of PGE<inf>2</inf> on the phagocytic activity of macrophages. These data also suggest that arachidonic acid might influence macrophage phagocytosis by a mechanism independent of PGE<inf>2</inf>.

Ferrandiz, M., et al. (2017). "Development and characterization of bioactive alginate microcapsules with cedarwood essential oil." Flavour and Fragrance Journal **32**(3): 184-190.

In this work, sodium alginate microcapsules containing cedarwood essential oil (CWO) for uses in anti-acne tonic were prepared by ionic gelification of alginate with calcium chloride (CaCl₂) and subsequent addition of glutaraldehyde to improve the crosslinking degree. Alginate microcapsules with cedarwood essential oil were obtained in an encapsulator with a 600 micro m nozzle using different alginate concentrations (1, 3 and 4% w/v), and different compositions of the coagulation solution with CaCl₂ concentrations of 0.1, 0.25 and 0.5 M, and addition of glutaraldehyde at two concentrations: 12.5% and 50% (0.1 g L⁻¹ and 10 g L⁻¹, respectively). The effect of alginate concentration was followed by viscosimetry and the influence of the CaCl₂ concentration and

presence of glutaraldehyde on the microcapsules' shape as well as the total content on encapsulated cedarwood essential oil were evaluated by means of stereoscopic magnifying glass, scanning electron microscopy (SEM) and UV-vis spectrophotometry. Results show that proper shape formation is obtained for an alginate concentration of 3% w/v. With regard to the total encapsulated cedarwood oil, as the CaCl₂ concentration in the gelifying-coagulating solution increases the efficiency of the encapsulated oil. Best results in terms of micro-bead shape and total amount of encapsulated oil were obtained for a CaCl₂ concentration of 0.5 M without glutaraldehyde with a maximum encapsulation of 177.2 mg per gram of microcapsule.

Ferrante, M. C., et al. (2019). "PCB levels in adipose tissue of dogs from illegal dumping sites in Campania region (Italy)." Chemosphere **244**: 125478.

The aim of the study is to investigate the potential relationship between exposure to PCBs and cancer. In doing so we relied on a sample of dogs coming from a peculiar area of the Campania region (Italy), that has been suffering for illegal waste dumping and open air burning of plastic waste for many years. The latter determined the release of organic and inorganic pollutants, such as the PCBs. By comparing dogs with cancer and healthy dogs, we found much higher PCB concentrations in the former, with a significant difference (p < 0.05) for the non-indicator 10NDL-PCB and the DL-PCBs. A regression analysis, controlling for three potentially confounding factors, that are sex, age and weight, confirmed the higher 10NDL-PCB concentration in dogs with cancer. Hence, our evidence suggests a potential health hazard for animals and likewise people living in a risky area due to the presence of environmental organic pollutants.

Ferreira, G. V. B., et al. (2019). "Use of estuarine resources by top predator fishes. How do ecological patterns affect rates of contamination by microplastics?" Science of the Total Environment **655**: 292-304.

This study assessed the seasonal patterns of habitat utilization, feeding ecology and microplastic contamination in different ontogenetic phases of sympatric snooks (Centropomus undecimalis and C. mexicanus) inhabiting a tropical estuary. More than 50% of snooks, in all ontogenetic phases, ingested microplastics (1.5+or-0.1 and 1.4+or-0.1 particles ind⁻¹). Juveniles migrated to nursery grounds in the upper estuary, during the early dry (C. undecimalis 6.5+or-2.8 ind⁻¹) (p<0.01) and early rainy seasons (C. mexicanus 4.1+or-1.9 ind⁻¹). There, they fed mostly on invertebrates (Polychaeta) (p<0.01), and became contaminated by microplastics (C. undecimalis: 0.8+or-0.4 particles ind⁻¹; C. mexicanus: 1.7+or-0.5 particles ind⁻¹). Sub-adults of both species forage principally in the estuarine habitats after shifting their diet from invertebrates (shrimps) in the upper reaches (1806.4+or-1729.6 mg ind⁻¹) to pelagic fishes (R. bahiensis) in seaward habitats (2507.7+or-1758.4 mg ind⁻¹). During feeding continues the contamination by microplastics (3.1+or-0.8 part. ind⁻¹). Adults use the adjacent coastal as feeding and spawning grounds during the rainy season. In this phase, snooks are mostly piscivorous (R. bahiensis: up to 5303.8+or-3213.4 mg ind⁻¹), but also ingest penaeid shrimp as complementary item (up to 175.9+or-156.7). Microplastics contamination rates increased towards the adult phase, with maximum contamination coinciding with peaks of fish ingestion, suggesting trophic transfer of microplastics. The lower estuary and adjacent coastal zone were important contamination sites, especially during the rainy season (up to 3.1+or-0.8 part. ind⁻¹) (p<0.01), when fishery activities is intense and river basin runoff increases. Consequently, the availability of microplastics is higher during this time of year in the lower portion of the estuary. Snooks had similar prey preferences, but the use of different habitats

along the life cycle of each species avoids overlaps in estuarine use and minimizes competition.

Ferreira, G. V. B., et al. (2018). "High intake rates of microplastics in a Western Atlantic predatory fish, and insights of a direct fishery effect." Environmental Pollution **236**: 706-717.

Microplastic contamination was investigated in the gut contents of an economically important estuarine top predator, Cynoscion acoupa, according to spatiotemporal and ontogenetic use of a tropical estuary. Microplastic contamination was found in more than half of the analysed fish. Ingested microplastics were classified by type, colour and length with most of the particles consisting of filaments (<5 mm). Longer filaments were more frequently ingested in the upper estuary and smaller filaments in the lower estuary, as a result of differences in hydrodynamic forces and proximity to the probable input sources. The river is likely an important source of filaments to the estuary and filaments ingested in the upper estuary showed little sign of weathering, when compared with those from the lower estuary, which are subject to intense weathering and consequent break-up of particles to smaller sizes. Most filaments, of all colours, accumulated in adults of C. acoupa, which are more susceptible to contamination through both direct ingestion and trophic transference as they shift their feeding mode to piscivory. Moreover, the highest ingestion of filaments in adults occurred in the lower estuary, during the late rainy season, likely associated with the intense fishing activities in this habitat, which results in a greater input of filaments from fishing gear, which are mainly blue in colour. Overall, 44% of the ingested filaments were blue, 20% purple, 13% black, 10% red and 12% white. The next most common colour, the purple filaments, are most likely blue filaments whose colour has weathered to purple. Red filaments were proportionally more ingested in the lower estuary, indicating a coastal/oceanic source. White and black filaments were more commonly ingested in the inner estuary, suggesting that they have a riverine origin and/or were actively ingested by juveniles and sub-adults, which inhabit the inner estuary and have zooplankton as an important food resource. Environmental gradients and ecological interactions are responsible for the patterns of ingestion of the different colours and lengths of filaments by Cynoscion acoupa. Copyright © 2018 Elsevier Ltd

Ferreira, I., et al. (2019). "Nanoplastics and marine organisms: What has been studied?" Environmental Toxicology and Pharmacology **67**: 1-7.

Nowadays, there is an increased awareness on the threat that marine litter may pose to the marine environment. This review describes the major concerns related to plastic pollution, namely in terms of toxicity of different types and sizes of nanoplastics (particles smaller than 100 nm) to marine organisms, either producers or consumers. The available data show that nanoplastics may affect negatively organisms from different phyla with reported effects ranging from alterations in reproduction to lethality. Nevertheless, no information regarding marine vertebrates (e.g., fish) was found. Data show a high potential for bioaccumulation/biomagnification along marine food chains, since they can easily be retained inside organisms. The lack of standardized methodology for nanoplastics detection and the poor or inexistent legislation makes nanoplastics an environmental challenge. Copyright © 2019 Elsevier B.V.

Ferreira, P., et al. (2016). "Effects of multi-stressors on juveniles of the marine fish Pomatoschistus microps: gold nanoparticles, microplastics and temperature." Aquatic Toxicology **170**: 89-103.

Knowledge on multi-stressors effects required for environmental and human risk assessments is still limited. This study investigated the combined effects of gold nanoparticles (Au-NP), microplastics (MP) and temperature increase on Pomatoschistus microps, an important prey for

several higher level predators, including some species edible to humans. Four null hypotheses were tested: H0₁: P. microps juveniles do not take up Au-NP through the water; H0₂: Au-NP (ppb range) are not toxic to juveniles; H0₃: the presence of MP do not influence the effects of Au-NP on juveniles; H0₄: temperature increase (20-25 degrees C) does not change the effects of the tested chemicals on juveniles. Wild juveniles were acclimated to laboratory conditions. Then, they were exposed to Au-NP (~5 nm diameter) and MP (polyethylene spheres, 1-5 micro m diameter), alone and in mixture, at 20 degrees C and 25 degrees C, in semi-static conditions. After 96 h of exposure to Au-NP, fish had gold in their body (0.129-0.546 micro g/g w.w.) leading to H0₁ refusal. Exposure to Au-NP alone caused a predatory performance decrease (~-39%, p<0.05) leading to H0₂ refusal. MP did not change the Au-NP toxicity leading to H0₃ acceptance. Temperature rise significantly increased the concentration of gold in fish exposed to Au-NP (~2.3 fold), and interacted with chemical effects (e.g. glutathione S-transferases activity) leading to H0₄ refusal. Thus, the results of this study highlight the importance of further investigating the effects of multi-stressors on marine fish, particularly the effects of temperature on the uptake, biotransformation, elimination and effects of nanoparticles and microplastics, either alone or in mixture. This knowledge is most important to improve the basis for environmental and human risk assessments of these environmental contaminants of high concern.

Feuchtinger, T., et al. (2013). "Alternative donor stem cell transplantation in aplastic anemias and refractory cytopenias is save and feasible with T-and B-cell depleted haploidentical grafts." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Allogeneic stem cell transplantation is still the curative treatment option for the majority of patients with severe aplastic anemia and refractory cytopenias. However, a HLA-matched donor is not available for all patients. Alternative donor transplantation has been an experimental treatment option, limited by high rejection rates and transplant related mortality. We performed a prospective clinical trial to evaluate the safety and feasibility of haploidentical stem cell transplantation, since haploidentical family members are always available donors. We investigated a cohort of 10 pediatric patients with severe aplastic anemia or myelodysplatic syndrome transplanted (refractory cytopenia) with T-cell depleted grafts between 2004 and 2011. 7 patients had myelodyslastic syndrome with refractory cytopenia (MDS-RC), 3 had severe aplastic anemias (SAA) refractory to immunosuppresive treatment. 3 patients received a 2nd SCT after rejecting the graft from matched donors. Median age was 11.4 years. Standard conditioning regimen consisted of Fludarabin 3-4x40mg/m2, Thiotepa 1-3x5mg/kg, Melphalan 2x70mg/m2 (n=8) and serotherapy using OKT3 (n=5) and ATG (n=5). 8 patients received additional total lymphoid irradiation (TLI 7 Gy) to prevent graft rejection. In vitro graft manipulation was carried out by direct depletion using antiCD3/19 magnetic microbeads. A median number of 10.1x106 CD34+ progenitor cells and 27x103 T-cells/kg body weight (BW) were transfused. Pharmacological GvHD prophylaxis (graft vs. host disease) was carried out with Mycofenolate until day 60, if residual T-cells in the graft exceeded 25000/kg BW. Primary engraftment occurred in all patients Median time to reach 500/mul neutrophiles was 9 days (9-11). Independence from platelet substitution was reached after 13 days (8-16). Three patients rejected the graft later on. 6/10 patients had no signs of acute GvHD or GvHD grade I, 2 patients had GvHD grade II TRM at day +100 and after 1 year was 0% and 20%, respectively. Event free survival (EFS) at 3 years was 80%. Conclusions Haploidentical SCT with T-cell depleted grafts is a therapeutic option for refractory cytopenias and severe aplastic anemia after nonresponse to immunosuppressive treatment if no HLA-matched donor is available. Recovery of neutrophiles and platelets were fast and TRM was low, even if retransplantation was necessary. Since spontaneous outcome of these conditions are poor, alternative donor SCT is a realistic option for these patients.

Feuchtinger, T., et al. (2014). "HLA mismatched alternative donor SCT in aplastic anemias and refractory cytopenias is save and feasible using a reduced intensity conditioning and a T-and B-cell depleted graft but requires intensive immune ablation." Bone Marrow Transplantation **1)**: S384-S385.

Introduction: Allogeneic stem cell transplantation is still the curative treatment option of choice for the majority of patients with severe aplastic anemia and refractory cytopenias. However, a HLAmatched donor is not available for all patients. Alternative donor transplantation has been an experimental treatment option, limited by high rejection rates and transplant related mortality. Materials (or patients) and Methods: We performed a prospective clinical trial to evaluate the safety and feasibility of haploidentical stem cell transplantation, since haploidentical family members are always available donors. We investigated a cohort of 10 pediatric patients with severe aplastic anemia or myelodysplatic syndrome (refractory cytopenia) transplanted with T-cell depleted grafts between 2004 and 2011. Result(s): 7 patients had myelodyslastic syndrome with refractory cytopenia (MDS-RC), 3 had severe aplastic anemias (SAA) refractory to immunosuppressive treatment. 3 patients received a 2nd SCT after rejecting the graft from matched donors. Median age was 11.4 years. Standard conditioning regimen consisted of Fludarabin 3-4x40 mg/m², Thiotepa 1-3x5 mg/kg, Melphalan 2x70 mg/m² (n=8) and serotherapy using OKT3 (n=5) and ATG (n=5). 8 patients received additional total lymphoid irradiation (TLI 7 Gy) to prevent graft rejection. In vitro graft manipulation was carried out by direct depletion using antiCD3/19 magnetic microbeads. A median number of 10.1x106 CD34+ progenitor cells and 27x103 T-cells/kg body weight (BW) were transfused. Pharmacological GvHD prophylaxis (graft vs. host disease) was carried out with Mycophenolate until day 60, if residual T-cells in the graft exceeded 25000/kg BW. Primary engraftment occurred in all patients Median time to reach 500/mul neutrophiles was 9 days (9-11). Independence from platelet substitution was reached after 13 days (8-16). Three patients rejected the graft later on. 6/10 patients had no signs of acute GvHD or GvHD grade I, 2 patients had GvHD grade II. TRM at day +100 and after 1 year was 0% and 20%, respectively. After TLI no rejection was observed. Event free survival (EFS) at 3 years was 80%. Discussion(s): Haploidentical SCT with T-cell depleted grafts is a therapeutic option for refractory cytopenias and severe aplastic anemia after nonresponse to immunosuppressive treatment if no HLA-matched donor is available. Recovery of neutrophiles and platelets were fast and TRM was low, even if retransplantation was necessary. Since spontaneous outcome of these conditions are poor, alternative donor SCT is a realistic option for these patients.

Ficjan, A., et al. (2014). "Hypomethylation of interferon-regulated genes in invariant NKT cells from lupus patients." Journal fur Mineralstoffwechsel **21 (4)**: 140-141.

Purpose To characterize the DNA methylome of invariant natural killer T (iNKT) cells in patients suffering from systemic lupus erythematosus. Methods We performed a genome-wide DNA methylation study in 12 lupus patients and 12 age-matched healthy controls. Lupus patients fulfilling the ACR criteria were recruited consecutively; clinical data (including symptoms, laboratory findings, medication, and disease activity scores) and blood were collected at the same visit. Invariant NKT cells were separated from PBMCs at purities > 90 % (confirmed by flow cytometry using antibodies against CD3 and 6B11) using anti-iNKT Micro Beads (Miltenyi Biotec). DNA of iNKT cells was isolated using QIAamp DNA micro Kit (Qiagen). DNA methylation was quantified for > 485,000 methylation sites across the genome using the Illumina Infinium

HumanMethylation450 Bead chip array. Differentially methylated sites were defined as CG sites with an average level of at least 1.2-fold after adjusting for multiple testing (FDR < 5 %). Results Analysing the average level of DNA methylation of the whole genome revealed that iNKT cells of lupus patients exhibit globally hypermethylated DNA, with an average methylation level of 0.522 (CI: 0.5185-0.5245) in lupus patients and 0.515 (CI: 0.5119-0.5186) in controls (p = 0.014, Mann-Whitney-U Test). Te average methylation level of the whole genome does not correlate with disease activity measured by SLEDAI and ECLAM and is not influenced by immunosuppressive medication. We identified 19 differentially methylated CG sites between patients and controls in 12 genes, with the majority (14) being hypomethylated. Te entirety of hypomethylated genes is interferon-regulated. Significantly hypomethylated genes include IFI44L, MX1, and PLSCR1. We show consistent hypomethylation across multiple CG sites in the promoter region of IFI44L in iNKT cells. Regression analysis revealed correlation of the methylation level of cg00855901 (IFI44L) and ECLAM/SLEDAI (r2 = 0.334, B coefcient =-8.577), suggesting that hypomethylation of this position is associated with disease activity. To ensure differential methylation of the CG sites afliated to IFI44L between lupus patients and controls not being influenced by Chloroquin, Mycophenolate-mofetil (MMF), and prednisolon treatment, we performed a subset analysis in Chloroquin-, MMF-, and prednisolon-treated and non-treated patients. One out of the 4 differentially methylated CG loci of IFI44L (cg06872964) between lupus patients and controls was differentially methylated when comparing prednisolon-treated versus non-prednisolon-treated patients (Mann-Whitney-U Test; p = 0.026). Chloroquin and MMF treatment did not interfere with the methylation level of the differentially methylated CG loci of IFI44L (Kruskal-Wallis Test; Figure 9). Conclusion We identified DNA methylation changes in iNKT cells from lupus patients for the first time. In contrast to CD4 T cell DNA being hypomethylated in lupus patients, iNKT cells of lupus patients exhibit globally hypermethylated DNA. Consistent with resultsPurpose To characterize the DNA methylome of invariant natural killer T (iNKT) cells in patients suffering from systemic lupus erythematosus. Methods We performed a genome-wide DNA methylation study in 12 lupus patients and 12 age-matched healthy controls. Lupus patients fulfilling the ACR criteria were recruited consecutively; clinical data (including symptoms, laboratory findings, medication, and disease activity scores) and blood were collected at the same visit. Invariant NKT cells were separated from PBMCs at purities > 90 % (confirmed by flow cytometry using antibodies against CD3 and 6B11) using anti-iNKT Micro Beads (Miltenyi Biotec). DNA of iNKT cells was isolated using QIAamp DNA micro Kit (Qiagen). DNA methylation was quantified for > 485,000 methylation sites across the genome using the Illumina Infinium HumanMethylation450 Bead chip array. Differentially methylated sites were defined as CG sites with an average level of at least 1.2-fold after adjusting for multiple testing (FDR < 5 %) Results Analysing the average level of DNA methylation of the whole genome revealed that iNKT cells of lupus patients exhibit globally hypermethylated DNA, with an average methylation level of 0.522 (CI: 0.5185-0.5245) in lupus patients and 0.515 (CI: 0.5119-0.5186) in controls (p = 0.014, Mann-Whitney-U Test). Te average methylation level of the whole genome does not correlate with disease activity measured by SLEDAI and ECLAM and is not influenced by immunosuppressive medication. We identified 19 differentially methylated CG sites between patients and controls in 12 genes, with the majority (14) being hypomethylated. Te entirety of hypomethylated genes is interferon-regulated. Significantly hypomethylated genes include IFI44L, MX1, and PLSCR1. We show consistent hypomethylation across multiple CG sites in the promoter region of IFI44L in iNKT cells. Regression analysis revealed correlation of the methylation level of cg00855901 (IFI44L) and ECLAM/SLEDAI (r2 = 0.334, B coefcient =-8.577), suggesting that hypomethylation of this position is associated with disease activity. To ensure differential methylation of the CG sites

afliated to IFI44L between lupus patients and controls not being influenced by Chloroquin, Mycophenolate-mofetil (MMF), and prednisolon treatment, we performed a subset analysis in Chloroquin-, MMF-, and prednisolon-treated and non-treated patients. One out of the 4 differentially methylated CG loci of IFI44L (cg06872964) between lupus patients and controls was differentially methylated when comparing prednisolon-treated versus non-prednisolon-treated patients (Mann-Whitney-U Test; p = 0.026). Chloroquin and MMF treatment did not interfere with the methylation level of the differentially methylated CG loci of IFI44L (Kruskal-Wallis Test; Figure 9). Conclusion We identified DNA methylation changes in iNKT cells from lupus patients for the first time. In contrast to CD4 T cell DNA being hypomethylated in lupus patients, iNKT cells of lupus patients exhibit globally hypermethylated DNA. Consistent with results of previous genome-wide methylation studies on total CD4 T cells and naive CD4 T cells, we detected hypomethylation of interferonregulated genes in iNKT cells of lupus patients. To determine the functional consequences of the methylation changes, further experiments including gene expression analysis have to be performed.

Fickes, M. and E. Spinka (2004). "Diamonds in the Rough." Waste Age **35**(7): 20-20.

Presents information on a set of electronic recycling guidelines developed by the Stakeholder Dialogue which help recyclers extract plastic resin from electronic waste, published by the Institute of Scrap Recycling Industries Inc. in the U.S. in 2004. Aim of the guidelines; Categories identified in the guidelines; Recommendation goals. INSET: SUPPORTING THE PROCESS.

Fields, C., et al. (2012). "Isolation of Bowman-Birk-Inhibitor from soybean extracts using novel peptide probes and high gradient magnetic separation." Food Chemistry **134**(4): 1831-1838.

Soybean proteins offer exceptional promise in the area of cancer prevention and treatment. Specifically, Bowman-Birk Inhibitor (BBI) has the ability to suppress carcinogenesis in vivo, which has been attributed to BBI's inhibition of serine protease (trypsin and chymotrypsin) activity. The lack of molecular probes for the isolation of this protein has made it difficult to work with, limiting its progress as a significant candidate in the treatment of cancer. This study has successfully identified a set of novel synthetic peptides targeting the BBI, and has demonstrated the ability to bind BBI in vitro. One of those probes has been covalently immobilised on superparamagnetic microbeads to allow the isolation of BBI from soy whey mixtures in a single step. Our ultimate goal is the use of the described synthetic probe to facilitate the isolation of this potentially therapeutic protein for low cost, scalable analysis and production of BBI.

Figgener, C. (2018). "What I learnt pulling a straw out of a turtle's nose." Nature **563**(7730): 157.

(Roughly, they make up less than 0.03% of the more than 8 million tonnes of plastic waste, largely consumer trash and fishing nets, that makes its way to the ocean every year, mainly from middle-income countries.) I take care to explain that the straw is emblematic of unnecessary plastic items and how human activity harms oceans. When you're trying to preserve species effectively and have limited funds, you need to know which life stages have the highest chance of survival and whether there is enough suitable habitat left for a species to even sustain larger numbers. Thanks to my video, I have acquired a thicker skin and an eclectic set of skills ranging from copyright law, social-media marketing and unconventional ways of fundraising (I started a GoFundMe page for research).

Figueiredo, G. M. and T. M. P. Vianna (2018). "Suspended microplastics in a highly polluted bay: Abundance, size, and availability for mesozooplankton." Marine Pollution Bulletin **135**: 256-265.

Microplastic ingestion by mesozooplankton may be an important pathway for the microplastics

to enter the food web. To determine microplastic abundance in Guanabara Bay, samples were collected by neustonic haul with a 64-mum-net and oblique hauls using 64- and 200-mum nets. Microplastic size and abundance as well as copepod, fish-larvae, and chaetognath sizes, densities, and preferential prey sizes were determined. Microplastic abundance was higher in samples collected with fine nets (average 4.8 microplastics m⁻³, maximum 11 microplastics m⁻³) than in those collected with coarse net. Microplastic abundance in Guanabara Bay was higher than that in other marine ecosystems. Microplastics >100 mum were too large to be ingested by copepods. However, for fish larvae and chaetognaths, the abundance of microplastics, at the corresponding prey size range, were, respectively, ~9000- and 14,400-folds lower than the preferential copepod prey, in the same size range. Thus, in Guanabara Bay, microplastics were available, but too diluted to be frequently ingested by fish larvae and chaetognaths. Copyright © 2018 Elsevier Ltd

Fikarova, K., et al. (2019). "A flow-based platform hyphenated to on-line liquid chromatography for automatic leaching tests of chemical additives from microplastics into seawater." Journal of Chromatography. A **1602**: 160-167.

An automatic flow-based system as a front end to liquid chromatography (LC) for on-line dynamic leaching of microplastic materials (polyethylene of medium density and poly(vinyl chloride)) with incurred phthalates and bisphenol A is herein presented. The microplastic particles were packed in a metal column holder, through which seawater was pumped continuously by resorting to advanced flow methodology. Each milliliter of the leachable (bioaccessible) fraction of chemical additives was preconcentrated on-line using a 10mm-long octadecyl monolithic silica column placed in the sampling loop of the injection valve of a HPLC system that served concomitantly for analyte uptake and removal of the seawater matrix. After loading of the leachate fraction, the LC valve was switched to the inject position and the analytes were eluted and separated by a monolithic column (Onyx C18HD 100x4.6mm) using an optimized acetonitrile/water gradient with UV detection at 240nm. The automatic flow method including dynamic flow-through extraction, on-line sorptive preconcentration, and matrix clean-up was synchronized with the HPLC separation, which lasted ca. 9min. The only two currently available multi-component certified reference materials (CRM) of microplastics (CRM-PE002 and CRM-PVC001) were used for method development and validation. Out of the eight regulated phthalates contained in the two CRMs, only the 2 most polar species, namely, dimethyl phthalate and diethyl phthalate as well as bisphenol A, were leached significantly by the seawater in less than 2h, with bioaccessibility percentages of 51-100%. The leaching profiles were monitored and modeled with a first-order kinetic equation so as to determine the rate constants for desorption in a risk assessment scenario. Intermediate precision values of bioaccessibility data for three batches of CRMs were for the suite of targeted compounds <=22%. This work for the first time reports a fully automatic flow method with infinite sink capacity (i.e., using a surplus of extracting solution) for the target species able to mimic the leaching of additives from plastic debris across the water body in marine settings under worst-case extraction conditions.

Filgueiras, A. V., et al. (2019). "Microplastic distribution in surface sediments along the Spanish Mediterranean continental shelf." Environmental Science & Pollution Research **26**(21): 21264-21273.

Microplastics (MPs) are widely recognised as a contaminant of emerging concern in the marine environment. This work provides original data of the presence of MPs in coastal sediments along the Spanish Mediterranean continental shelf. Ten surface sediment samples were collected in order to document baseline microplastic distribution from Algeciras to Barcelona. Microplastics were extracted from bulk sediments by density separation. The number of microplastics per kilogramme of dry weight ranged from 45.9 +/- 23.9 MPs/kg d.w. observed at Palma de Mallorca to 280.3 +/- 164.9 MPs/kg d.w. noted at Malaga, with an average value of 113.2 +/- 88.9 MPs/kg d.w. The lower limit is defined by the pore filter size used (1.2 mum). For all analysed locations, the dominant microplastic type was fibres (82.9%), followed by fragments, and the main colours were transparent and blue. Microplastic size distribution was presented; in the case of fragments, 85% was lower than 0.5 mm, and in the case of fibres, the three studied intervals (0.5-1, 1-2, 2-5 mm) had similar distribution (35, 34 and 31%, respectively). Attending to all available data, no statistically significant relationship (Spearman's correlation) was found between microplastic average size and distance to the coast, the depth, density population and sediment grain size. Neither relationship was observed between these variables and microplastic concentration using the non-parametric Kruskal-Wallis H test. This study has confirmed the widespread distribution of MPs in surface sediments from the Spanish Mediterranean continental shelf, and these data are useful to define baselines for MPs in the Western Mediterranean region.

Finkelstein, S. D., et al. (1999). "Cold-temperature plastic resin embedding of liver for DNA- and RNA-based genotyping." Journal of Molecular Diagnostics **1**(1): 17-22.

The standard practice of tissue fixation in 10% formalin followed by embedding in paraffin wax preserves cellular morphology at the expense of availability and quality of DNA and RNA. The negative effect on cellular constituents results from a combination of extensive cross-linking and strand scission of DNA, RNA, and proteins induced by formaldehyde as well as RNA loss secondary to ubiquitous RNase activity and negative effects of high temperature exposure during paraffin melting, microscopic section collection, and tissue adherence to glass slides. An effective strategy to correlate cellular phenotype with molecular genotype involves microdissection of tissue sections based on specific histopathological features followed by genotyping of minute representative samples for specific underlying molecular alterations. Currently, this approach is limited to short-length polymerase chain reaction amplification (<250 bp) of DNA, due to the negative effects of standard tissue fixation and processing. To overcome this obstacle and permit both cellular morphology and nucleic acid content to be preserved to the fullest extent, we instituted a system of cold-temperature plastic resin embedding based on the use of the water-miscible methyl methacrylate polymer known as Immunobed (Polysciences, Warminster, PA). The system is simple, easy to adapt to clinical practice, and cost-effective. Immunobed tissue sections demonstrate a cellular appearance equivalent or even superior to that of standard tissue sections. Moreover, thin sectioning (0.5-1.0 microm thickness) renders ultrastructural evaluation feasible on plastic-embedded blocks. Tissue microdissection is readily performed, yielding high levels of long DNA and RNA for genomic and transcription-based correlative molecular analysis. We recommend the use of Immunobed or similar products for use in molecular anatomical pathology.

Finska, L. and J. G. Howden (2018). "Troubled waters – Where is the bridge? Confronting marine plastic pollution from international watercourses." Review of European Comparative & International Environmental Law **27**(3): 245-253.

A considerable volume of marine plastic pollution derives from watercourses, and many of the world's largest and most heavily polluted watercourses are international. In spite of the clear factual link between the utilization and protection of international watercourses and marine plastic pollution there is hardly any interaction between the legal sub-fields of international water law and marine environmental law. This lack of interaction also reflects the absence of a

global treaty, or even a shared global understanding, of the environmental threat from plastic pollution and the universal responsibility this generates also for landlocked States. This article investigates the possibilities for more integrated measures to prevent pollution of international watercourses and oceans, and argues that regimes within international water law and marine environmental law must cooperate to create awareness of the plastic pollution risk from watercourses and take steps to harmonize their legal rules and policies to contribute to the control and mitigation of marine plastic pollution. Regional coordination, such as improved cooperation between the regional seas organizations and river basin organizations, could provide a tool to better address transboundary sources of plastic. Potentially, such developments could be adopted to control marine plastic pollution from the most heavily polluted international watercourses. [ABSTRACT FROM AUTHOR]
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Fiorio, R., et al. (2020). "Influence of Different Stabilization Systems and Multiple Ultraviolet A (UVA) Aging/Recycling Steps on Physicochemical, Mechanical, Colorimetric, and Thermal-Oxidative Properties of ABS." Materials **13**(1): 04.

Commercially mass-polymerized acrylonitrile-butadiene-styrene (ABS) polymers, pristine or modified by stabilization systems, have been injection molded and repeatedly exposed to ultravilolet A (UVA) radiation, mechanical recycling, and extra injection molding steps to study the impact of such treatments on the physicochemical, mechanical, colorimetric, and thermal-oxidative characteristics. The work focus on mimicking the effect of solar radiation behind a window glass as relevant during the lifetime of ABS polymers incorporated in electrical and electronic equipment, and interior automotive parts by using UVA technique. The accelerated aging promotes degradation and embrittlement of the surface exposed to radiation and causes physical aging, deteriorating mechanical properties, with an expressive reduction of impact strength (unnotched: up to 900%; notched: up to 250%) and strain at break (>1000%), as well as an increase in the yellowing index (e.g., 600%). UV-exposition promotes a slight increase in the tensile modulus (e.g., 10%). The addition of antioxidants (AOs) leads to a limited stabilization during the first UVA aging, although the proper AO formulation increases the thermal-oxidative resistance during all the cycles. Mechanical recycling promotes an increase in strain at break and unnotched impact strength alongside a slight decrease in tensile modulus, due to disruption of the brittle surface and elimination of the physical aging.

Firestone, G., et al. (2019). "Photothermally-driven thermo-oxidative degradation of low density polyethylene: heterogeneous heating plus a complex reaction leads to homogeneous chemistry." Nanotechnology **30**(47): 475706.

Photothermal heating from embedded nanoparticles, a process whereby visible light is converted into heat resulting in a high temperature in each particle's immediate vicinity, was utilized to degrade low density polyethylene (LDPE) via thermo-oxidation. The spatially-varying steady-state photothermal temperature field is a potential mechanism by which ambient light (e.g. sunlight) could be used to drive chemical reactions within solid materials and may result in a non-uniform pattern of products, an advantage or disadvantage depending on application. Novel approaches to control polymer degradation are of interest because of the goal of remediating plastic waste, including autonomous means to minimize its effect when unconfined in the environment. For thermoplastic auto-oxidation, heterogeneous degradation would likely enhance deleterious micro-fragmentation however, the multi-step, multi-site nature of the reaction mitigated the temperature non-uniformity. A photothermally-heated LDPE nanocomposite with silver nanoparticle and cobalt-stearate additives showed degradation, characterized by ultraviolet-visible and Fourier-transform infrared absorption spectroscopy, electron microscopy, and mechanical testing, nearly identical to that resulting from uniform conventional treatment at the same average temperature.

First, M. R. and L. A. Drake (2012). "Performance of the human "counting machine": evaluation of manual microscopy for enumerating plankton." Journal of Plankton Research **34**(12): 1028-1041.

In this study, live plankton (greater than or equal to 50 mu m in minimum dimension) in samples were counted by three analysts to determine counting rates, accuracy and precision of manual microscopy. Counting rates were compared with sample characteristics (e.g. concentration of dead organisms). In separate experiments, plankton proxies, spherical microbeads (49 and 150 mu m in diameters), were added to samples with varying degrees of debris loading, including samples from full-scale, replica ballast tanks. These analyses were used to test the hypothesis that as debris loading increases, counting rate increases and accuracy decreases. Highly concentrated samples and samples with high concentrations of dead plankton resulted in significantly slower counting rates. The recovery of 50- mu m microbeads was lowest (75%) in laboratory samples that contained the highest debris load. The recovery of 150- mu m microbeads was very high (>98%) in laboratory samples with and without debris. Field samples from the replica ballast tank were highly turbid, and microbead recoveries were low for both microbead sizes. Sample quality, therefore, will affect counting rates and accuracy and will limit the volume of the sample that can be analyzed within short-time windows available for counting live plankton samples.

First, M. R., et al. (2012). "Validation of a closed-housing filter skid for in-line sampling of aquatic organisms." Journal of Plankton Research **34**(4): 321-331.

A prototype shipboard filter skid (p1SFS) was designed and built to facilitate shipboard collection and concentration of greater than or equal to 50 mu m planktonic organisms from large volumes of water. The p1SFS consisted of two stainless steel filter housings, each containing a filter bag, arranged in parallel. Validation of the device examined the particle retention efficiency of filter bags (using inert polystyrene microbeads), the potential toxicity of filter skid materials and the capture efficiency of plankton collected with a filter skid versus a plankton net at two sample volumes (5 and 10 m super(3)). Microbead recovery in filter bags was >89 and 100% for microbeads of 50 and 150 mu m diameters, respectively. Exposure to the sealant used to close the filter bags' seams or stainless steel did not lead to mortality of two model zooplankton species. Overall, the concentration of greater than or equal to 50 mu m plankton in the p1SFS relative to concentrations in the plankton net (i.e. the capture efficiency, CE) was 108 +/- 66% (mean +/- 1 SD, n = 6). The p1SFS CE was higher in experiments with 5 m super(3) sample volume (147 +/- 74%; n = 3) relative to experiments with a 10 m super(3) sample volume (69 +/- 28%, n = 3), although the difference in CE between the sample volumes was not significant. Consequently, these experiments suggest this or similarly validated filter skids are appropriate for in-line sampling of plankton from relatively large volumes of water.

Fischer, D., et al. (2016). "Novel method to leukoreduce murine blood for transfusion: how to reduce animal usage." Transfusion **56**(1): 146-152.

BACKGROUND Basic research on the pathomechanisms of transfusion-related adverse events depends on murine transfusion models, in which leukoreduction (LR) is a prevalent standard. The commonly used neonatal LR filter (LRF) is associated with considerable animal numbers. A more efficient method would help support the guiding principles of "replacement, reduction, refinement" (3Rs). STUDY DESIGN AND METHODS Blood from C57BL/6 and C57BL/6-Tg(UBC-GFP)30Scha/J mice was leukoreduced using 1) a neonatal LRF, 2) a syringe LRF, or 3) CD45 microbeads. Product quality was assessed according to US Food and Drug Administration (FDA) standards. White blood cell numbers were analyzed by flow cytometry; hemoglobin concentrations and hematocrit were measured and in vivo posttransfusion recoveries were determined after 2 weeks of storage. RESULTS Using the neonatal filter, a LR of 99.56% was achieved with wastage of 12.4 mL in comparison to 99.68% and 1-mL hold-up volume with the syringe filter and 99.11±0.24% LR and 0.1-mL wastage using microbeads. All techniques achieved FDA quality standards, apart from posttransfusion recovery rate, which was only reached by the microbeads-based technique. CONCLUSION

Fischer, E. K., et al. (2016). "Microplastic pollution in lakes and lake shoreline sediments - A case study on Lake Bolsena and Lake Chiusi (central Italy)." Environmental Pollution **213**: 648-657.

Rivers and effluents have been identified as major pathways for microplastics of terrestrial sources. Moreover, lakes of different dimensions and even in remote locations contain microplastics in striking abundances. This study investigates concentrations of microplastic particles at two lakes in central Italy (Lake Bolsena, Lake Chiusi). A total number of six Manta Trawls have been carried out, two of them one day after heavy winds occurred on Lake Bolsena showing effects on particle distribution of fragments and fibers of varying size categories. Additionally, 36 sediment samples from lakeshores were analyzed for microplastic content. In the surface waters 2.68 to 3.36 particles/m³ (Lake Chiusi) and 0.82 to 4.42 particles/m³ (Lake Bolsena) were detected, respectively. Main differences between the lakes are attributed to lake characteristics such as surface and catchment area, depth and the presence of local wind patterns and tide range at Lake Bolsena. An event of heavy winds and moderate rainfall prior to one sampling led to an increase of concentrations at Lake Bolsena which is most probable related to lateral land-based and sewage effluent inputs. The abundances of microplastic particles in sediments vary from mean values of 112 (Lake Bolsena) to 234 particles/kg dry weight (Lake Chiusi). Lake Chiusi results reveal elevated fiber concentrations compared to those of Lake Bolsena what might be a result of higher organic content and a shift in grain size distribution towards the silt and clay fraction at the shallow and highly eutrophic Lake Chiusi. The distribution of particles along different beach levels revealed no significant differences. Copyright © 2016 Elsevier Ltd. All rights reserved.

Fischer, M. and B. M. Scholz-Böttcher (2019). "Microplastics analysis in environmental samples – recent pyrolysis-gas chromatography-mass spectrometry method improvements to increase the reliability of mass-related data (Electronic supplementary information (ESI) available. See DOI: 10.1039/c9ay00600a)." Analytical Methods **11**(18): 2489-2497.

Thermal methods are of increased relevance in the field of microplastics (MP) analysis. The presented method improvements emphasize the potential of pyrolysis gas-chromatography mass-spectrometry (Py-GCMS) methods for mass-related MP quantification in environmental samples. A previously established Curie-Point (CP)-pyrolyzer is compared to a micro furnace (MF) pyrolyzer of higher sample capacity. The two Py-GCMS systems are examined in terms of calibration aspects like dynamic range, linearity, process standard deviation and overall sensitivity. Here, MF-PyGCMS provided advantages. Depending on the samples and their residual organic matrix content, the related pyrolysis products may interact with relevant indicator ions of interesting polymers. This can hamper or even impede any calibration and quantification of MP in the given sample. An internal standard mixture added just before the pyrolysis process (ISTDpy) mimics these interactions to a certain extent. Based on selected peak ratios, ISTDpy offers a possible quantification option in those cases. The application in selected environmental samples (sea salt, surface water and muddy sediment) after adequate preconcentration illustrates the capability and sensitivity of MF-Py-GCMS for MP-quantification regarding the encountered concentrations (ppt–ppm).

Fischer, R. A., et al. (2019). "Impairment of Membrane Repolarization Accompanies Axon Transport Deficits in Glaucoma." Frontiers in Neuroscience **13**: 1139.

Glaucoma is a leading cause of blindness worldwide, resulting from degeneration of retinal ganglion cells (RGCs), which form the optic nerve. In glaucoma, axon transport deficits appear to precede structural degeneration of RGC axons. The period of time between the onset of axon transport deficits and the structural degeneration of RGC axons may represent a therapeutic window for the prevention of irreversible vision loss. However, it is unclear how deficits in axon transport relate to the electrophysiological capacity of RGCs to produce and maintain firing frequencies that encode visual stimuli. Here, we examined the electrophysiological signature of individual RGCs in glaucomatous retina with respect to axon transport facility. Utilizing the Microbead Occlusion Model of murine ocular hypertension, we performed electrophysiological recordings of RGCs with and without deficits in anterograde axon transport. We found that RGCs with deficits in axon transport have a reduced ability to maintain spiking frequency that arises from elongation of the repolarization phase of the action potential. This repolarization phenotype arises from reduced cation flux and K+ dyshomeostasis that accompanies pressure-induced decreases in Na/K-ATPase expression and activity. In vitro studies with purified RGCs indicate that elevated pressure induces early internalization of Na/K-ATPase that, when reversed, stabilizes cation flux and prevents K+ dyshomeostasis. Furthermore, pharmacological inhibition of the Na/K-ATPase is sufficient to replicate pressure-induced cation influx and repolarization phase phenotypes in healthy RGCs. These studies suggest that deficits in axon transport also likely reflect impaired electrophysiological function of RGCs. Our findings further identify a failure to maintain electrochemical gradients and cation dyshomeostasis as an early phenotype of glaucomatous pathology in RGCs that may have significant bearing on efforts to restore RGC health in diseased retina.

Fischer, R. A., et al. (2019). "Pressure-dependent modulation of inward-rectifying K⁺ channels: implications for cation homeostasis and K⁺ dynamics in glaucoma." American Journal of Physiology - Cell Physiology **317**(2): C375-C389.

Glaucoma is the leading cause of blindness worldwide, resulting from degeneration of retinal ganglion cells (RGCs), which form the optic nerve. Prior to structural degeneration, RGCs exhibit physiological deficits. Muller glia provide homeostatic regulation of ions that supports RGC physiology through a process called K⁺ siphoning. Recent studies suggest that several retinal conditions, including glaucoma, involve changes in the expression of K⁺ channels in Muller glia. To clarify whether glaucoma-related stressors directly alter expression and function of K⁺ channels in Muller glia, we examined changes in the expression of inwardly rectifying K⁺ (Kir) channels and two-pore domain (K2P) channels in response to elevated intraocular pressure (IOP) in vivo and in vitro in primary cultures of Muller glia exposed to elevated hydrostatic pressure. We then measured outcomes of cell health, cation homeostasis, and cation flux in Muller glia cultures. Transcriptome analysis

in a murine model of microbead-induced glaucoma revealed pressure-dependent downregulation of Kir and K2P channels in vivo. Changes in the expression and localization of Kir and K2P channels in response to elevated pressure were also found in Muller glia in vitro. Finally, we found that elevated pressure compromises the plasma membrane of Muller glia and induces cation dyshomeostasis that involves changes in ion flux through cation channels. Pressure-induced changes in cation flux precede both cation dyshomeostasis and membrane compromise. Our findings have implications for Muller glia responses to pressure-related conditions, i.e., glaucoma, and identify cation dyshomeostasis as a potential contributor to electrophysiological impairment observed in RGCs of glaucomatous retina.

Fisner, M., et al. (2017). "Colour spectrum and resin-type determine the concentration and composition of Polycyclic Aromatic Hydrocarbons (PAHs) in plastic pellets." Marine Pollution Bulletin **122**(1-2): 323-330.

This study assessed the concentration and composition of Polycyclic Aromatic Hydrocarbons (PAHs) in plastic pellets, collected from sandy beaches and considered different resin and colour tones.

Fisner, M., et al. (2013). "Polycyclic aromatic hydrocarbons (PAHs) in plastic pellets: Variability in the concentration and composition at different sediment depths in a sandy beach." Marine Pollution Bulletin **70**(1-2): 219-226.

Plastic pellets have the ability to adsorb organic pollutants such as PAHs. This study analyzed the variability in the concentration and composition of PAHs on plastic pellets sampled up to 1. m deep in the sediment of a sandy beach. The toxic potential of PAHs was analyzed, and the possible sources of contamination are discussed. The total PAHs varied, with the highest concentrations in the surface layer; the priority PAHs showed a different pattern. PAHs at greater depths did not reach toxicity levels above the PEL. The composition of PAHs differed between pellets from the shallower and from deeper sediment layers, and was suggested a mixture of sources. These results provided the first information on the depth distribution of PAHs in sandy beaches, associated with plastic pellets; and evidenced the potential environmental risk. Similarly to the abundance of pellets, the toxic potential is underestimated in surface samples. © 2013 Elsevier Ltd.

Flaxa, J., et al. (2015). "Methodological and clinical aspects of alloimmunization after granulocyte transfusion in patients undergoing allogeneic stem cell transplantation." Tissue Antigens **85**(2): 93-103.

In allogeneic hematopoietic stem cell transplantation (HSCT), granulocyte transfusions (GT) may be required in immunocompromised, neutropenic patients. In this context, alloimmunization against alloantigens may occur and affect HSCT outcome. Anti-human leukocyte antigen (HLA) and -MHC class I chain related antigens A (MICA) antibody response after the administration of GT in 29 patients undergoing allogeneic HSCT (n=27) encompassing 109 sera was investigated by multianalyte microbead assay before and up to 6month after HSCT. Anti-HLA class I and II antibodies emerged de novo in 11 (38%) and 4 (14%) patients, respectively. Similarly, preformed antibodies were observed in four cases (14%) for anti-HLA class I and also four patients for anti-HLA class II antibodies. Anti-MICA antibodies were observed in eight granulocyte recipients of which three patients developed anti-MICA antibodies after GT, whereas preformed antibodies were seen in five patients. The conversion to positivity for any of the investigated antibodies did not significantly affect overall survival or the incidence of GVHD. GT-associated alloantibody conversion observed did not significantly correlate with outcome. Thus, surveillance of anti-HLA antibodies in the course of GT in the context of HSCT may not be required routinely. The role of MICA antibodies in HSCT and GT, however, requires further study. Copyright © 2014 John Wiley & Sons A/S.

Floren, H. P. and G. W. Shugart (2017). "Plastic in Cassin's Auklets (Ptychoramphus aleuticus) from the 2014 stranding on the Northeast Pacific Coast." Marine Pollution Bulletin **117**(1-2): 496-498.
Oceanic plastic debris found in the digestive tracts of seabirds includes industrial plastic pellets and post-consumer user plastics. We examined whether the amount and type of plastic ingested by Cassin's Auklets (Ptychoramphus aleuticus) is changing by surveying the stomach contents of 171 Cassin's Auklets stranded along the Washington and Oregon coasts in 2014. We found that 41.5% of the birds contained plastic in their ventriculi, similar to values from the North Subarctic Pacific reported in the 1980s. Industrial pellets were found in 22.8% of our samples, and accounted for 28.1% of all the plastic pieces found. Industrial pellets tended to be larger than pieces of user plastic and accounted for 40.2% of total plastic weight. These industrial pellets were significantly smaller than those found in other species, suggesting either that Cassin's Auklets selected smaller plastic particles or that plastic was retained in ventriculi and worn down. Copyright © 2017 Elsevier Ltd

Florentinus-mefailoski, A., et al. (2015). "An enzyme-linked immuno-mass spectrometric assay with the substrate adenosine monophosphate." Analytical and bioanalytical chemistry **407**(4): 1119-1130.
Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis An enzyme-linked immuno-mass spectrometric assay (ELIMSA) with the specific detection probe streptavidin conjugated to alkaline phosphatase catalyzed the production of adenosine from the substrate adenosine monophosphate (AMP) for sensitive quantification of prostate-specific antigen (PSA) by mass spectrometry. Adenosine ionized efficiently and was measured to the femtomole range by dilution and direct analysis with micro-liquid chromatography, electrospray ionization, and mass spectrometry (LC-ESI-MS). The LC-ESI-MS assay for adenosine production was shown to be linear and accurate using internal ^sup 13^C^sup 15^N adenosine isotope dilution, internal ^sup 13^C^sup 15^N adenosine one-point calibration, and external adenosine standard curves with close agreement. The detection limits of LC-ESI-MS for alkaline phosphatase-streptavidin (AP-SA, 190,000 Da) was tested by injecting 0.1 [mu]l of a 1 pg/ml solution, i.e., 100 attograms or 526 yoctomole (5.26E-22) of the alkaline-phosphatase labeled probe on column (about 315 AP-SA molecules). The ELIMSA for PSA was linear and showed strong signals across the picogram per milliliter range and could robustly detect PSA from all of the prostatectomy patients and all of the female plasma samples that ranged as low as 70 pg/ml with strong signals well separated from the background and well within the limit of quantification of the AP-SA probe. The results of the ELIMSA assay for PSA are normal and homogenous when independently replicated with a fresh standard over multiple days, and intra and inter diem assay variation was less than 10 % of the mean. In a blind comparison, ELIMSA showed excellent agreement with, but was more sensitive than, the present gold standard commercial fluorescent ELISA, or ECL-based detection, of PSA from normal and prostatectomy samples, respectively.

Florentinus-Mefailoski, A. K. and J. G. Marshall (2013). "The CD36 scavenger receptor in the phagocytic engulfment of oxLDL particles in human U937 macrophages." FEBS Journal **1)**: 499.
Atherosclerosis is a leading cause of morbidity and mortality in developed countries. Atherosclerosis is an inflammatory disease in response to the buildup of fatty deposits within the intima of the walls of the artery. Macrophages become activated upon binding to oxidized

low density lipoprotein (oxLDL) deposited on the walls of the arteries resulting in the production of free radicals inducing oxidative stress, the formation of foam cells and atherosclerosis. CD36, a member of the class B scavenger receptor family, is known to play a key role in the uptake of ox- LDL by macrophages. In this study, U937 cells were treated with PMA to induce monocytic differentiation. Monocyte derived macrophages were stimulated with microbeads coated with ox- LDL or immunoglobulin (IgG) ligands to examine the oxLDL internalization pathway by mass spectrometry and confocal microscopy. Multiple peptides were correlated to CD36 like molecules in the oxLDL and IgG receptor complexes as determined by nano LC-ESI-MS/MS and confirmed by confocal microscopy and Western blots using anti CD36 IgA, IgM and IgG probes. Immunostaining with, versus without, detergent revealed that most of the CD36 signal was ectopic and thus associated with the exterior leaflet of the plasma membrane. Silencing RNA against CD36 inhibited the uptake of oxLDL beads by about 40% but did not inhibit IgG bead engulfment. Hence it may be possible to inhibit the phagocytic engulfment of oxLDL by macrophages without preventing bacterial clearance.

Flores, J. L., et al. (2007). "Flow-through optosensor combined with photochemically induced fluorescence for simultaneous determination of binary mixtures of sulfonamides in pharmaceuticals, milk and urine." Analytica Chimica Acta **600**(1-2): 164-171.

A sensitive and selective flow-through optosensor implemented with photochemically induced fluorescence (PIF) is proposed for the simultaneous determination of mixtures sulfamethoxazole/sulfanilamide and sulfathiazole/sulfanilamide. The resolution was accomplished by placing in the flow system a minicolumn filled with an appropriate solid support. Whereas one of the sulfonamides is not retained in the minicolumn and is determined by measuring its native fluorescence on the solid surface of the sensing microbeads in the detection area, the other one is retained and, after its elution, it is photochemically converted into a strongly fluorescent photoproduct which is transitorily retained on the sensing support in the flow cell and monitored. Linear calibration graphs were obtained over a concentration range of 2-3 orders of magnitude. The detection limits for the determination of sulfamethoxazole, sulfanilamide and sulfathiazole are 8.1, 2.9 and 5.7 ng mL(-1), respectively. The method was applied to pharmaceuticals, milk and human urine. The recovery of sulfamethoxazole from pharmaceuticals was 102.5% indicating no interference from trimethoprim which is not photochemically active. The recoveries for urine and milk samples fortified with sulfonamides at levels between 0.1 and 0.7 microgmL(-1) agreed within 95.0-107.5% of spiked levels.

Foekema, E. M., et al. (2013). "Plastic in North Sea Fish." Environmental Science & Technology **47**(15): 8818-8824.

To quantify the occurrence of ingested plastic in fish species caught at different geographical positions in the North Sea, and to test whether the fish condition is affected by ingestion of plastics, 1203 individual fish of seven common North Sea species were investigated: herring, gray gurnard, whiting, horse mackerel, haddock, atlantic mackerel, and cod. Plastic particles were found in 2.6% of the examined fish and in five of the seven species. No plastics were found in gray gurnard and mackerel. In most cases, only one particle was found per fish, ranging in size from 0.04 to 4.8 mm. Only particles larger than 0.2 mm, being the diameter of the sieve used, were considered for the data analyses, resulting in a median particle size of 0.8 mm. The frequency of fish with plastic was significantly higher (5.4%) in the southern North Sea, than in the northern North Sea above 55°N (1.2%). The highest frequency (>33%) was found in cod from the English Channel. In addition, small fibers were initially detected in most of the samples, but their abundance sharply decreased when working under special clean air conditions. Therefore, these fibers were considered to be artifacts related to air born contamination and were excluded from the analyses. No relationship was found between the condition factor (size–weight relationship) of the fish and the presence of ingested plastic particles. [ABSTRACT FROM AUTHOR]

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Foerster, A., et al. (2008). "Detection and isolation of viable mouse IL-17-secreting T cells." Journal of visualized experiments : JoVE(22).

The MACS Cytokine Secretion Assay technology allows detection of secreted cytokines on the single cell level and sensitive isolation of viable cytokine-secreting cells. In order to label IL-17-secreting cells, a single cell suspension of mouse splenocytes is prepared and stimulated at 37 degrees C with PMA/ionomycin to induce cytokine secretion. To stop secretion cells are then placed on ice and are exposed to the IL-17 Catch Reagent a bi-specific antibody that binds to CD45 on the cell surface of leukocytes and to IL-17 as it is secreted and caught near the cell surface. Secretion is then re-started by increasing the temperature to 37 degrees C and IL-17 is trapped by the Catch Reagent. Secretion is then stopped again, by placing cells on ice. To detect the trapped IL-17, cells are incubated with a second IL-17-specific antibody conjugated to biotin and an Anti-Biotin-PE antibody. Cells can now be directly analyzed by flow cytometry or prepared for isolation and enrichment by subsequent labeling with Anti-PE conjugated MicroBeads.

Fogel, O., et al. (2018). "MicroRNAs dysregulation in monocytes and T CD4 lymphocytes from patients with axial spondyloarthritis." Annals of the Rheumatic Diseases **77 (Supplement 2)**: 625.

Background: MicroRNAs have been shown to play a crucial role during innate or adaptive immune response. Dysregulation of miRNAs has been described in several autoimmune or rheumatic diseases including rheumatoid arthritis, inflammatory bowel disease or psoriasis. In spondyloarthritis (SpA), only few studies on miR expression have been reported with highly diverse methodologies and involving small samples of patients. Objective(s): Because T CD4 lymphocytes and monocytes are important cells in SpA pathophysiology, we wanted to assess the miR expression profile in these two cell types sorted from axial SpA (AxSpA) patients. Method(s): Eighty one AxSpA patients were included in this study. Among these patients, 74 fulfilled the ASAS classification criteria (imaging arm) with sacro-iliitis on X-rays (n=56) or objective signs of inflammation on MRI (n=18). Two independent cohorts of 22 and 59 SpA patients were compared to 17 and 38 age and sexmatched controls. Both SpA patients and controls were recruited from October 2014 to July 2017 in the department of rheumatology at Cochin Hospital in Paris, France. All SpA patients had an active disease despite NSAIDs intake (mean BASDAI score of 49+/-19 and mean ASDAS score of 3+/-0.9), were free of any biologic treatment and were eligible for a TNF-blocker treatment. Seventy-seven percent were HLA-B27 positive. T lymphocytes and monocytes were isolated from PBMC by direct isolation with magnetic microbeads (CD4 +and CD14+). Threehundred seventy two miRs were screened by q-RT-PCR on the exploratory cohort and only MiRs showing a significant differential expression in the first cohort were analysed in the validation cohort. An unpaired T-test was used for comparison of miR expression level. Result(s): In the exploratory cohort, 51 (CD14+) and 70 miRs

(CD4+) were found to be differentially expressed between patients and controls. Among these, 15 miRs (in CD14+), and 12 miRs (in CD4+) were also found dysregulated in the validation cohort. These validated miRNAs were found to play a key role in physiological pathways such as NFkB or TGFbeta, Wnt signalling and monocyte differentiation that have been involved in the pathophysiology of the disease. Neither clinical subphenotypes nor biological parameters were associated with different profiles of miR expression after adjusting for multiple tests. We found a negative correlation between miR-146a-5p level and BASDAI (r=-0.28, p=0.011) and ASDAS (r=-0.38, p=5.9 10-4) in monocytes. Conclusion(s): We found a dysregulation of miR expression in monocytes and T CD4 lymphocytes from patients with axial spondyloarthritis, whose consequences could contribute to the pathophysiology of the disease and be of interest for therapeutic perspective. Moreover, identifying biomarkers with the potential of diagnostic signature should help the clinician in daily practice.

Fogel, O., et al. (2018). "Micrornas deregulation in monocytes and T CD4 lymphocytes from patients with axial spondyloarthritis." Arthritis and Rheumatology **70 (Supplement 9)**: 2304-2305.

Background/Purpose: MicroRNAs have been shown to play a crucial role during innate or adaptive immune response. Deregulation of miRNAs has been described in several autoimmune or rheumatic diseases including rheumatoid arthritis, inflammatory bowel disease or psoriasis. In spondyloarthritis (SpA), only few studies on miR expression have been reported with highly diverse methodologies and involving small samples of patients. Because T CD4 lymphocytes and monocytes are important cells in SpA pathophysiology, we wanted to assess the miR expression profile in these two cell types sorted from axial SpA (AxSpA) patients. Method(s): Eighty one AxSpA patients were included in this study. Among these patients, 74 fulfilled the ASAS classification criteria (imaging arm) with sacro-iliitis on X-rays (n=56) or objective signs of inflammation on MRI (n=18). Two independent cohorts of 22 and 59 SpA patients were compared to 17 and 38 age and sex-matched controls. Both SpA patients and controls were recruited from October 2014 to July 2017 in the department of rheumatology at Cochin Hospital in Paris, France. All SpA patients had an active disease despite NSAIDs intake (mean BASDAI score of 49 +/-19 and mean ASDAS score of 3 +/- 0.9), were free of any biologic treatment and were eligible for a TNF-blocker treatment. Seventy-seven percent were HLA-B27 positive. T lymphocytes and monocytes were isolated from PBMC by direct isolation with magnetic microbeads (CD4+ and CD14+). Three-hundred seventy two miRs were screened by q-RT-PCR on the exploratory cohort and only MiRs showing a significant differential expression in the first cohort were analyzed in the validation cohort. An unpaired T-test was used for comparison of miR expression level. Result(s): In the exploratory cohort, 51 (CD14+) and 70 miRs (CD4+) were found to be differentially expressed between patients and controls. Among these, 15 miRs (in CD14+), and 12 miRs (in CD4+) were also found deregulated in the validation cohort. These validated miRNAs were found to play a key role in physiological pathways such as NFkB or TGFbeta, Wnt signalling and monocyte differentiation that have been involved in the pathophysiology of the disease. Neither clinical subphenotypes nor biological parameters were associated with different profiles of miR expression after adjusting for multiple tests. We found a negative correlation between miR-146a-5p level and BASDAI (r=-0.28, p=0.011) and ASDAS (r=-0.38, p= 5.9 10-4) in monocytes. Conclusion(s): We found a deregulation of miR expression in monocytes and T CD4 lymphocytes from patients with axial spondyloarthritis, whose consequences could contribute to the pathophysiology of the disease and be of interest for therapeutic perspective. Moreover, identifying biomarkers with the potential of diagnostic signature should help the clinician in daily practice.

Foley, C. J., et al. (2018). "A meta-analysis of the effects of exposure to microplastics on fish and aquatic invertebrates." Science of the Total Environment **631**(632): 550-559.

Microplastics are present in aquatic ecosystems the world over and may influence the feeding, growth, reproduction, and survival of freshwater and marine biota; however, the extent and magnitude of potential effects of microplastics on aquatic organisms is poorly understood. In the current study, we conducted a meta-analysis of published literature to examine impacts of exposure to microplastics on consumption (and feeding), growth, reproduction, and survival of fish and aquatic invertebrates. While we did observe within-taxa negative effects for all four categories of responses, many of the effects summarized in our study were neutral, indicating that the effects of exposure to microplastics are highly variable across taxa. The most consistent effect was a reduction in consumption of natural prey when microplastics were present. For some taxa, negative effects on growth, reproduction and even survival were also evident. Organisms that serve as prey to larger predators, e.g., zooplankton, may be particularly susceptible to negative impacts of exposure to microplastic pollution, with potential for ramifications throughout the food web. Future work should focus on whether microplastics may be affecting aquatic organisms more subtly, e.g., by influencing exposure to contaminants and pathogens, or by acting at a molecular level.

Fomin, P., et al. (2017). "Optimized Time-Gated Fluorescence Spectroscopy for the Classification and Recycling of Fluorescently Labeled Plastics." Applied Spectroscopy **71**(5): 919-928.

For the production of high-quality parts from recycled plastics, a very high purity of the plastic waste to be recycled is mandatory. The incorporation of fluorescent tracers ("markers") into plastics during the manufacturing process helps overcome typical problems of non-tracer based optical classification methods. Despite the unique emission spectra of fluorescent markers, the classification becomes difficult when the host plastics exhibit (strong) autofluorescence that spectrally overlaps the marker fluorescence. Increasing the marker concentration is not an option from an economic perspective and might also adversely affect the properties of the plastics. A measurement approach that suppresses the autofluorescence in the acquired signal is time-gated fluorescence spectroscopy (TGFS). Unfortunately, TGFS is associated with a lower signal-to-noise (S/N) ratio, which results in larger classification errors. In order to optimize the S/N ratio we investigate and validate the best TGFS parameters-derived from a model for the fluorescence signal-for plastics labeled with four specifically designed fluorescent markers. In this study we also demonstrate the implementation of TGFS on a measurement and classification prototype system and determine its performance. Mean values for a sensitivity of [Formula: see text] = 99.93% and precision [Formula: see text] = 99.80% were achieved, proving that a highly reliable classification of plastics can be achieved in practice.

Fonseca M, M. A., et al. (2017). "The impact of microplastics on food safety: the case of fishery and aquaculture products." FAN FAO Aquaculture Newsletter **57**: 43-45.

The objective of the article was to determine the impact on human health of the presence of microplastics in fisheries and aquaculture conducted by the Fisheries and Aquaculture Department of FAO through an exposure assessment of plastic polymers, additives, and sorbed contaminants in mussels.

Fontana, S., et al. (2015). "Donor anti-HLA antibodies may not significantly increase the risk of transfusion reactions in recipients of apheresis platelet concentrates." Vox Sanguinis **1)**: 351.

Background: Donor antibodies against HLA antigens may induce TRALI, FNHTR or other transfusion reactions in recipients of blood components containing plasma. The prevalence of

HLA-antibodies in apheresis platelet (PLT) donors is high and varies depending on the detection test used. The clinical impact on patients of HLAantibodies detected in PLT apheresis donors, of the HLA-antibodies detection technique, and of the immunization history of donors, has not yet been assessed on a large transfusion data base. Aim(s): To explore the clinical risk of transfusion reactions in recipients of apheresis PLT concentrates collected from donors with HLA-antibodies detected by different laboratory tests in a broad donor and patient collective. Method(s): Retrospective cohort study on patients receiving PLT concentrates collected from donors previously tested for HLA-antibodies. HLA-antibodies were investigated by microbead single antigen essay (Luminex), ELISA (Lambda Antigen Tray), or a combination of GAT and GIFT. All consecutive patients of 2 large public hospitals transfused with PLT concentrates donated after HLA-antibody testing of the donor were included in the study. Transfusions and transfusion reactions were evaluated if sufficiently documented in the patient records. Transfusion reactions were classified on the basis of IHN standard definitions. The proportions of transfusion reactions were compared by chi-squared test in transfusions of PLT derived from donors with positive or negative HLA-antibody test, from male or female donors, and from females with or without history of pregnancy. Result(s): Out of 3'837 identified PLT concentrates, 2'976 transfusions were documented and 2'284 had charts evaluable for the occurrence of a transfusion reactions or not. The PLT concentrates were donated by 217 donors and transfused to 609 patients. The current results are summarized in Table 1. Donor, donation, and patient characteristics were roughly balanced between positive and negative HLA antibody results; further analyses aimed to identify confounding factors are ongoing. [TABLE PRESENTED] Conclusion(s): This first analyses exploring correlations between HLA antibodies and transfusion reactions in apheresis PLT concentrates doesn't indicate an increased risk due to donors with HLA antibodies, independently from the detection method, or to donors with immunization history (pregnancy). This conclusion may be limited to PLT in additive solution (<80% of the study products), is not applicable to HNAantibodies (no positive donors found in our study), and should be confirmed by the ongoing analysis of additional risk factors, which could bias the results. After the introduction of the mandatory pathogen reduction with amotosalen and UVA, Switzerland is increasing the proportion of buffy coat PLT, in which the antibodies are further diluted. Thus, further preventive measures reducing the risk of transfusion reactions after PLT transfusion in this setting may be not necessary.

Fontana, S., et al. (2010). "An evaluation of preventive measures to reduce the risk of TRALI after transfusion of single donor apheresis platelets in Switzerland." <u>Transfusion and Apheresis Science</u> **1)**: S13.

Background: TRALI is one of the most severe complications of blood transfusion. Exclusion of females from donation of fresh frozen plasma (FFP) has been implemented in several countries to reduce the risk of immunological TRALI. We compared different preventive measures in platelet (PLT) donors for their consequences on the supply of PLT concentrates in terms of loss of donors. Method(s): Assessment of gender, transfusion, pregnancy history, and leukocyte antibodies by different methods in apheresis PLT donors: granulocyte agglutination (GAT) and immunofluorescence test (GIFT), HLA antibodies by ELISA, and HLA antibodies by microbead flow analyzer (Luminex). Result(s): Out of our pool which includes 40% of female (F) donors, we analyzed 261 consecutive F and 118 control males (M). Ten percent of donors tested so far by GIFT and GAT were positive (17/170). Positive results by different methods of HLA class I and II antibody analysis (n, %; w/wo P = with/without pregnancies) (See Table). Conclusion(s): Assessment of pregnancy history may reduce the number of F donor excluded, but does not necessarily target all donors with leukocyte antibodies. Furthermore, the impact of a screening for antibodies depends largely on the technique used. Only taking into account this observation and further data showing which antibodies are clinical significant will allow the introduction of more efficient measures to prevent TRALI, without unnecessary loss of PLT donors. Table Presented.

Fonte, E., et al. (2016). "Temperature rise and microplastics interact with the toxicity of the antibiotic cefalexin to juveniles of the common goby (Pomatoschistus microps): post-exposure predatory behaviour, acetylcholinesterase activity and lipid peroxidation." Aquatic Toxicology **180**: 173-185.

The goal of this study was to investigate the toxicity of cefalexin to Pomatoschistus microps juveniles in relation to the presence of microplastics in the water and temperature rise. After acclimatization, groups of wild juveniles were exposed for 96 h to artificial salt water (control), microplastics alone (0.184 mg/l), cefalexin alone (1.3-10 mg/l) and in mixture with microplastics (cefalexin: 1.3-10 mg/l; microplastics: 0.184 mg/l) at 20 and 25 degrees C. Effect criteria were mortality, post-exposure predatory performance (PEPP), acetylcholinesterase activity (AChE) and lipid peroxidation levels (LPO). At 20 degrees C, concentrations of cefalexin alone >=5 mg/l significantly reduced PEPP (up to 56%; 96h-EC₅₀=8.4 mg/l), indicating toxicity of the antibiotic to juveniles after short-term exposure to water concentrations in the low ppm range. At 20 degrees C, fish exposed to microplastics alone did not have significant differences in any of the parameters tested relative to the control group but tended to have an inhibition of the PEPP (23%) and AChE (21%); at 25 degrees C, microplastics alone caused mortality (33%) and PEPP inhibition (28%). Thus, microplastics are toxic to P. microps juveniles. At 20 degrees C, under simultaneous exposure to cefalexin and microplastics, the PEPP was significantly reduced (at cefalexin concentrations >=1.25 mg/l). Moreover, at 25 degrees C, the toxicity curves of cefalexin (PEPP based), alone and in mixture with microplastics, were significantly different (p<0.05; 96h-EC₅₀ of 3.8 and 5.2 mg/l, respectively), and the integrated data analysis indicated significant interactions between the two substances for all biomarkers. Thus, the presence of microplastics in the water influenced the toxicity of cefalexin. The rise of water temperature (from 20 degrees C to 25 degrees C), increased the microplastics-induced mortality (from 8 to 33%), and the inhibitory effects of cefalexin on the PEPP (up to 70%). Significant differences (p<0.05) between the toxicity curves of cefalexin alone at distinct temperatures were found, with a lower 96h-EC₅₀ at 25 degrees C (3.8 mg/l) than at 20 degrees C (8.4 mg/l). Moreover, at 25 degrees C, increases of AChE activity (14%) and LPO (72%) in fish exposed to the mixture treatment containing the highest cefalexin concentration were found, and the integrated analysis of data indicated significant interactions between cefalexin and temperature for PEPP, and among all stressors for LPO. Thus, the temperature rise increased the toxicity of microplastics and of cefalexin, alone and in mixture with microplastics, to P. microps juveniles. These findings raise concern on the long-term exposure of wild populations to complex mixtures of pollutants, likely decreasing their fitness, and highlight the need of more research on the combined effects of widely used pharmaceuticals, microplastics and temperature increase on wild species to improve environmental and human risk assessments of chemicals and their safe use under a global warming scenario.

Fontes, G. C., et al. (2013). "Characterization of antibiotic-loaded alginate-OSA starch microbeads produced by ionotropic pregelation." BioMed Research International **2013**: 472626.

The aim of this study was to characterize the penicillin-loaded microbeads composed of alginate and octenyl succinic anhydride (OSA) starch prepared by ionotropic pregelation with calcium chloride and to evaluate their in vitro drug delivery profile. The beads were characterized by size, scanning electron microscopy (SEM), zeta potential, swelling behavior, and degree of erosion. Also, the possible interaction between penicillin and biopolymers was investigated by differential scanning calorimetry (DSC), powder X-ray diffraction (XRD), and Fourier transform infrared (FTIR) analysis. The SEM micrograph results indicated a homogeneous drug distribution in the matrix. Also, based on thermal analyses (TGA/DSC), interactions were detected between microbead components. Although FTIR spectra of penicillin-loaded microbeads did not reveal the formation of new chemical entities, they confirmed the chemical drug stability. XRD patterns showed that the incorporated crystalline structure of penicillin did not significantly alter the primarily amorphous polymeric network. In addition, the results confirmed a prolonged penicillin delivery system profile. These results imply that alginate and OSA starch beads can be used as a suitable controlled-release carrier for penicillin.

Ford, H. Z., et al. (2019). "Efferocytosis perpetuates substance accumulation inside macrophage populations." Proceedings of the Royal Society of London - Series B: Biological Sciences **286**(1904): 20190730.

In both cells and animals, cannibalism can transfer harmful substances from the consumed to the consumer. Macrophages are immune cells that consume their own dead via a process called cannibalistic efferocytosis. Macrophages that contain harmful substances are found at sites of chronic inflammation, yet the role of cannibalism in this context remains unexplored. Here we take mathematical and experimental approaches to study the relationship between cannibalistic efferocytosis and substance accumulation in macrophages. Through mathematical modelling, we deduce that substances which transfer between individuals through cannibalism will concentrate inside the population via a coalescence process. This prediction was confirmed for macrophage populations inside a closed system. We used image analysis of whole slide photomicrographs to measure both latex microbead and neutral lipid accumulation inside murine bone marrow-derived macrophages (10⁴-[Formula: see text]) following their stimulation into an inflammatory state ex vivo. While the total number of phagocytosed beads remained constant, cell death reduced cell numbers and efferocytosis concentrated the beads among the surviving macrophages. As lipids are also conserved during efferocytosis, these cells accumulated lipid derived from the membranes of dead and consumed macrophages (becoming macrophage foam cells). Consequently, enhanced macrophage cell death increased the rate and extent of foam cell formation. Our results demonstrate that cannibalistic efferocytosis perpetuates exogenous (e.g. beads) and endogenous (e.g. lipids) substance accumulation inside macrophage populations. As such, cannibalism has similar detrimental consequences in both cells and animals.

Ford, K. I. (2013). Applied Magnetic Forces Enhance Nanoparticle Based Gene Delivery and Characterize Intracellular Rheology and Transport.

Magnetically applied forces present the ability to manipulate paramagnetic nanoparticles for a wide variety of biomedical applications. In vivo gene delivery offers the promise of new ways to treat disease at a genetic level, but it unfortunately suffers from low efficiencies. Nanoparticles present a platform for non-viral gene therapy but delivery must be optimized to make them a viable option for treatment. This work describes how magnetic forces can be applied to paramagnetic nanoparticles to enhance the delivery of antisense oligonucleotides for correction of mRNA splicing errors. Applied oscillating forces can be used to stimulate certain endocytic pathways, which acts to more than double transfection efficiency. Once a nanoparticle enters the cell, it is surrounded by the complex intracellular environment. To understand the environment that the nanoparticle enters, intracellular rheology is probed with paramagnetic microbeads. A protocol for introducing 1 micron microbeads into cells is presented. By manipulation with 3-dimensional force microscopy, the mechanical features of the cell can be characterized. Additionally, the in vivo transport due to molecular motors is also characterized. Stall force on an intracellular 1 micron bead, caused by dynein motors, is determined. This represents the force exerted on a vesicle by the motors, as it is being transported towards the nucleus, the target of the oligonucleotide delivery.

Forde, E., et al. (2017). "AML blasts induce a senescent phenotype in the BM-MSC through the upregulation of P21." Haematologica **102 (Supplement 2)**: 359-360.

Background: Acute myeloid leukaemia (AML) is a heterogeneous clonal disorder that arises from the haematopoietic myeloid progenitor cells within the bone marrow microenvironment (BMM). Survival of patients with AML is presently poor; two-thirds of younger adults and 90% of older adults die of their disease. Even in patients who achieve remission with chemotherapy, relapse is common and occurs from minimal residual disease sequestered in protective niches in the BMM. Reciprocal interactions between that of the AML and bone marrow mesenchymal stromal cells (BM-MSC) are central to the survival and progression of the leukaemic blasts through micro-environmental promotion of quiescence in malignant cells as well as the activation of anti-apoptotic and pro-survival pathways. Aim(s): To investigate how BM-MSC are programmed by AML to generate a pro-tumoural environment. Method(s): Primary AML and BM-MSC were isolated from the pelvis of AML patients following informed consent and under approval from the UK National Research Ethics Service (LRCEref07/H0310/146). Low input RNASeq of 10 AML BM-MSC and 10 healthy BM-MSC (taken from the pelvis of patients undergoing elective hip replacement surgery) was performed following CD271 MicroBead selection. Primary AML blasts 1x10⁶ were co-cultured on confluent primary BM-MSC for 48 hours (h), 72h and 168h. Real-time PCR was used to verify the RNA sequencing data and Western Blot analysis to confirm protein expression. Lentivirus mediated knockdown was used to target gene expression in the BM-MSC. Senescence was assayed by beta-Galactosidase staining. Result(s): Results from the RNA sequencing carried out to compare 10 healthy and 10 AML BM-MSC show that 1125 genes were differentially expressed, with 924 down-regulated in AML derived BM-MSC and 201 up-regulated. From this analysis, we found that CDKN1A (p21) is up-regulated in BM-MSC from AML patients (7.406 logFC) compared to BM-MSC from patients with normal bone marrow. Further analysis of p21 mRNA expression confirmed an increase in AML BM-MSC compared to normal BM-MSC. In-vitro experimentation showed that p21 mRNA and protein expression is increased in BM-MSC when co-cultured with primary AML. Furthermore, we show that AML increased senescence beta-Galactosidase staining in BM-MSC and that p21 knockdown in BM-MSC reversed the senescent phenotype. Finally, primary AML cultured on p21 knockdown BM-MSC had reduced survival compared to control BM-MSC. Summary/Conclusions: We have identified that AML induces a senescent BM-MSC niche via the p21 mediated pathway which in turn promotes survival and proliferation of AML. Silencing of p21 within the BM-MSC reduces AML survival. In identifying this novel microenvironment feedback loop in AML we highlight a potential new target for future AML therapies.

Forrest, S. A., et al. (2019). "Citizen science sampling programs as a technique for monitoring microplastic pollution: results, lessons learned and recommendations for working with volunteers for monitoring plastic pollution in freshwater ecosystems." Environmental Monitoring & Assessment **191**(3): 172.

A citizen science microplastic monitoring method was developed to engage the public and quantify microplastic contamination at various sites along an approximately 550 km length of

the Ottawa River from Lake Temiskaming to Hawkesbury, Ontario, Canada. The volunteers filtered 100 L of river water through a 100-mum mesh at their desired location along the Ottawa River. All but one of the river samples (n = 43) contained microplastics, with the vast majority of microplastics identified as microfibers. Microplastic concentrations ranged from 0.02 to 0.41 microplastic pieces per litre. We noted numerous advantages in working with citizen scientists including actively engaging citizens in the research, ease of recruiting volunteers within the established Ottawa Riverkeeper network, and expanded spatial coverage at minimal additional costs. Despite these important advantages, there are some important considerations with citizen scientist sampling including the rare events where volunteers mislabelled sample sheets (e.g. labelling as control instead of river sample) and the relatively low volume of water (100 L) that the volunteers could easily sample using our methodology. Recommendations for future citizen science projects for freshwater microplastic research include utilising an established and engaged network, running both field and lab control samples (blanks) to obtain estimates of contamination with microplastic fibres, and increasing the amount of water filtered to obtain more reliable estimates of microplastic pollution in our freshwater ecosystems.

Forsmo, S. P. E., et al. (2008). "Studies on the influence of a flotation collector reagent on iron ore green pellet properties." Powder Technology **182**(3): 444-452.

The properties of iron ore green pellets with varying additions of a surface-active flotation collector reagent (Atrac) were studied by small-scale balling. The compression strength and plasticity were measured with a semi-automatic measuring device and the pressure curves were saved and subjected to further mathematical treatment. The green pellet breakage was also filmed with a high-speed camera. Adding Atrac to the pellet feed seriously damaged the quality of green pellets, even in small dosages. This is because an increasing amount of air bubbles became so strongly attached on the particle surfaces that they could not be removed during compaction by balling. The adsorption of air in green pellets was seen as an increase in porosity and a decrease in the filling degree (proportion of pores filled with water). Both the wet and dry compression strength decreased. The air bubbles behaved in wet green pellets like large, plastic particles and the plasticity increased beyond an acceptable level. Breakage started inside the green pellets, along the air bubbles, and generated multi-breakage patterns in wet as well as dry green pellets. Green pellet breakage to crumbs instead of a few distinct segments, promotes the generation of dust and fines and leads to lower bed permeability in the pelletizing machine. The results show that the decrease in iron ore green pellet wet strength in the presence of surface-active agents is not fully described by the so called Rumpf equation, where surface tension and contact angle are used as variables to describe the capillary forces. The green pellet breakage in the presence of air bubbles took place by crack propagation along pore structures rather than through the loss of the capillary forces. © 2007 Elsevier B.V. All rights reserved.

Fortin, S., et al. (2019). "Quantifying and identifying microplastics in the effluent of advanced wastewater treatment systems using Raman microspectroscopy." Marine Pollution Bulletin **149 (no pagination)**(110579).

Microplastics in wastewater treatment plant (WWTP) effluent have been identified and quantified, but few studies have examined the microplastics in advanced treatment systems. A new method for isolating, quantifying, and determining the polymer type of microplastics was developed that included chemical digestion coupled with Raman microspectroscopy to investigate microplastics in the effluent of reverse osmosis nanofiltration and activated carbon filtration systems. This method allows for the removal of organics and the quantification and identification of all microplastics present in the sample. A large number of microplastics, the

majority of which were smaller than 10 mum, were identified in the effluent of the advanced filtration systems with polyethylene the most common polymer identified. This study not only reports a new method for microplastic identification and quantification but also shows the importance of measuring the smallest fraction of microplastics, those smaller than 20 mum, which have previously been understudied. Copyright © 2019

Fossi, M. C., et al. (2017). "Are whale sharks exposed to persistent organic pollutants and plastic pollution in the Gulf of California (Mexico)? First ecotoxicological investigation using skin biopsies. (Special Issue: Unraveling complexity: from molecules to ecosystems.)." Comparative Biochemistry and Physiology. C, Toxicology & Pharmacology **199**: 48-58.

The whale shark (Rhincodon typus) is an endangered species that may be exposed to micro- and macro-plastic ingestion as a result of their filter-feeding activity, particularly on the sea surface. In this pilot project we perform the first ecotoxicological investigation on whale sharks sampled in the Gulf of California exploring the potential interaction of this species with plastic debris (macro-, micro-plastics and related sorbed contaminants). Due to the difficulty in obtaining stranded specimens of this endangered species, an indirect approach, by skin biopsies was used for the evaluation of the whale shark ecotoxicological status. The levels of organochlorine compounds (PCBs, DDTs), polybrominated diphenyl ethers (PBDEs) plastic additives, and related biomarkers responses (CYP1A) were investigated for the first time in the whale shark. Twelve whale shark skin biopsy samples were collected in January 2014 in La Paz Bay (BCS, Mexico) and a preliminary investigation on microplastic concentration and polymer composition was also carried out in seawater samples from the same area. The average abundance pattern for the target contaminants was PCBs > DDTs > PBDEs > HCB. Mean concentration values of 8.42 ng/g w.w. were found for PCBs, 1.31 ng/g w.w. for DDTs, 0.29 ng/g w.w. for PBDEs and 0.19 ng/g w.w. for HCB. CYP1A-like protein was detected, for the first time, in whale shark skin samples. First data on the average density of microplastics in the superficial zooplankton/microplastic samples showed values ranging from 0.00 items/m³ to 0.14 items/m³. A focused PCA analysis was performed to evaluate a possible correlation among the size of the whale sharks, contaminants and CYP1A responses. Further ecotoxicological investigation on whale shark skin biopsies will be carried out for a worldwide ecotoxicological risk assessment of this endangered species.

Fossi, M. C., et al. (2017). "Are whale sharks exposed to persistent organic pollutants and plastic pollution in the Gulf of California (Mexico)? First ecotoxicological investigation using skin biopsies." Comparative biochemistry and physiology. Toxicology & pharmacology : CBP **199**: 48-58.

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Fossi, M. C., et al. (2014). "Large filter feeding marine organisms as indicators of microplastic in the pelagic environment: The case studies of the Mediterranean basking shark (Cetorhinus maximus) and fin whale (Balaenoptera physalus)." Marine Environmental Research **100**: 17-24.

The impact of microplastics (plastic fragments smaller than 5 mm) on large filter feeding marine organisms such as baleen whales and sharks are largely unknown. These species potentially are ingesting micro-litter by filter feeding activity. Here we present the case studies of the Mediterranean fin whale (Balaenoptera physalus) and basking shark (Cetorhinus maximus) exploring the toxicological effects of microplastics in these species measuring the levels of phthalates in both species. The results show higher concentration of MEHP in the muscle of basking shark in comparison to fin whale blubber. These species can be proposed as indicators of microplastics in the pelagic environment in the implementation of Descriptor 8 and 10 of the EU Marine Strategy Framework Directive (MSFD).

Fossi, M. C., et al. (2016). "Fin whales and microplastics: the Mediterranean Sea and the Sea of Cortez scenarios." Environmental Pollution **209**: 68-78.

The impact that microplastics have on baleen whales is a question that remains largely unexplored. This study examined the interaction between free-ranging fin whales (Balaenoptera physalus) and microplastics by comparing populations living in two semi-enclosed basins, the Mediterranean Sea and the Sea of Cortez (Gulf of California, Mexico). The results indicate that a considerable abundance of microplastics and plastic additives exists in the neustonic samples from Pelagos Sanctuary of the Mediterranean Sea, and that pelagic areas containing high densities of microplastics overlap with whale feeding grounds, suggesting that whales are exposed to microplastics during foraging; this was confirmed by the observation of a temporal increase in toxicological stress in whales. Given the abundance of microplastics in the Mediterranean environment, along with the high concentrations of Persistent Bioaccumulative and Toxic (PBT) chemicals, plastic additives and biomarker responses detected in the biopsies of Mediterranean whales as compared to those in whales inhabiting the Sea of Cortez, we believe that exposure to microplastics because of direct ingestion and consumption of contaminated prey poses a major threat to the health of fin whales in the Mediterranean Sea.

Fossi, M. C., et al. (2012). "Are baleen whales exposed to the threat of microplastics? A case study of the Mediterranean fin whale (Balaenoptera physalus)." Marine Pollution Bulletin **64**(11): 2374-2379.

Baleen whales are potentially exposed to micro-litter ingestion as a result of their filter-feeding activity. However, the impacts of microplastics on baleen whales are largely unknown. In this case study of the Mediterranean fin whale (Balaenoptera physalus), we explore the toxicological effects of microplastics on mysticetes. The study included the following three steps: (1) the collection/count of microplastics in the Pelagos Sanctuary (Mediterranean Sea), (2) the detection of phthalates in surface neustonic/planktonic samples, and (3) the detection of phthalates in stranded fin whales. A total of 56% of the surface neustonic/planktonic samples contained microplastic particles. The highest abundance of microplastics (9.63

items/m³) was found in the Portofino MPA (Ligurian Sea). High concentrations of phthalates (DEHP and MEHP) were detected in the neustonic/planktonic samples. The concentrations of MEHP found in the blubber of stranded fin whales suggested that phthalates could serve as a tracer of the intake of microplastics. The results of this study represent the first warning of this emerging threat to baleen whales.

Fossi, M. C., et al. (2018). "Bioindicators for monitoring marine litter ingestion and its impacts on Mediterranean biodiversity." Environmental Pollution **237**: 1023-1040.

The Mediterranean Sea has been described as one of the most affected areas by marine litter in the world. Although effects on organisms from marine plastic litter ingestion have been investigated in several oceanic areas, there is still a lack of information from the Mediterranean Sea. The main objectives of this paper are to review current knowledge on the impact of marine litter on Mediterranean biodiversity, to define selection criteria for choosing marine organisms suitable for use as bioindicator species, and to propose a methodological approach to assessing the harm related to marine litter ingestion in several Mediterranean habitats and sub-regions. A new integrated monitoring tool that would provide the information necessary to design and implement future mitigation actions in the Mediterranean basin is proposed. According to bibliographic research and statistical analysis on current knowledge of marine litter ingestion, the area of the Mediterranean most studied, in terms of number of species and papers in the Mediterranean Sea is the western sub-area as well as demersal (32.9%) and pelagic (27.7%) amongst habitats. Applying ecological and biological criteria to the most threatened species obtained by statistical analysis, bioindicator species for different habitats and monitoring scale were selected. A threefold approach, simultaneously measuring the presence and effects of plastic, can provide the actual harm and sub-lethal effects to organisms caused by marine litter ingestion. The research revealed gaps in knowledge, and this paper suggests measures to close the gap. This and the selection of appropriate bioindicator species would represent a step forward for marine litter risk assessment, and the implementation of future actions and mitigation measures for specific Mediterranean areas, habitats and species affected by marine litter ingestion. Selection of suitable bioindicators of marine litter ingestion and the simultaneous quantification of its presence and ecotoxicological effects is recommended in order to monitor the impact on Mediterranean fauna and habitats. Copyright © 2017 Elsevier Ltd

Foster, S. (2008). "A materials world: PLASTICS." Materials Recycling Week **192**(9): 17-17.

The article discusses the opportunities and challenges faced by the waste plastic recycling industry in Great Britain. It highlights the significance of the government's backing to improve recycling facilities on streets, shopping center, transport hubs, theme parks and recreational centers. It states that recycling mixed plastics will set to be a key issue for the industry. It outlines the emergence of new facilities aiming to allow plastic bottles to be recycled back into plastic bottles. It emphasizes that a full supply chain approach will play an important role for the industry's progress.

Foster, S. (2012). "PLASTICS." Materials Recycling World **199**(22): 31-32.

The article discusses issues related to the collection of plastic waste in Great Britain and the market for recycled plastic products. It highlights the increase in domestic plastic packaging which led to high levels of recycling. It mentions the decrease in demand for plastic bottles from China and in the prices of HDPE and mixed bottles. The article explains the key requirements for any plastic collection scheme.

Fostier, K., et al. (2013). "Immunomodulatory drugs restore effector cell immune functions in myeloma patients with low disease burden after autologous stem cell transplantation." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

The micro-environment in multiple myeloma (MM) is highly immunosuppressive with increased numbers of regulatory T cells (Tregs) and myeloid derived suppressor cells (MDSCs) favoring tumorcell survival and hampering immunotherapeutic strategies such as dendritic cell vaccination. Immunomodulatory drugs (IMiDs) are known to enhance T- and NK-cell function. In this study we evaluated the effects of low dose (0.5 microM) lenalidomide (Len) and pomalidomide (Pom) on the functionality of CD8+ and CD4+ T cells, MDSCs, Tregs and ex-vivo generated mononuclear derived dendritic cells (moDCs) obtained from MM patients after first autologous stem cell transplantation (ASCT). Peripheral blood mononuclear cell fractions were obtained by leukapheresis from 9 MM patients (age 29-62 years), in very good partial response (4/9) or complete response (5/9) after ASCT. The magnitude of cytokine release (mean +/- standard error of the mean, in ng/ml) by purified CD8+ T cells after 144 hours stimulation with anti-CD3/anti-CD28 coated microbeads was significantly increased after addition of Len and Pom to the culture medium, respectively : IFN-gamma (217.5 +/- 62.1 and 437.1 +/- 137.1** vs 66.4 +/- 21.0) , TNF-alpha (21.4 +/- 5.4 and 44.9 +/- 9.4*** vs 4.9 +/- 1.7) and IL-2 (5.3 +/- 2.7 and 12.7 +/- 6.6 vs 1.9 +/- 1.7 ng/ml) (** p< 0.01, *** p< 0.001). We also evaluated the number of different types of cytokines/chemokines on a per cell basis by intracellular flow cytometry staining for IFN-gamma, TNF-alpha, IL-2 and MIP-1beta and observed increased polyfunctionality of CD8+ and CD4+ T cells. After 72 h of stimulation with anti-CD3/CD28 microbeads the number of single, double, triple or quadruple functional CD8+ T cells increased from 5.96 %, 2.82 %, 0.1 %, 0 % (culture medium alone) to 9.68 %, 7.57 %, 0.41%, 0.03 % (Len) and 12.57 %, 8.96 %, 0.81 %, 0.03 % (Pom), respectively. A similar observation was made for CD4+ T cells. A significant percentage, median 5.7 % (4.0-7.2 %) of CD4+ CD25high CD127low (Tregs) was found in the CD4+ T cell population in 8 out of 9 patients, demonstrating the highly suppressive immune environment in myeloma patients even with low disease burden. Effector T cells (Teffs) were stimulated with anti-CD3/CD28 microbeads and cocultured at varying ratios with purified Tregs. After 144 h of coculture, Len and Pom reduced the suppressive effects of Tregs on Teffs proliferation and IFN-gamma and TNF-alpha production (see figure). A similar effect was observed for MDSC but did not reach statistical significance (data not shown). TriMix DCs (moDCs matured by electroporation with mRNA encoding TLR4, CD40L and CD70) and cytokine matured moDCs were cocultured with autologous CD4+ and CD8+ T cells and anti-CD3 microbeads. Adding IMiDs resulted in more polyfunctional CD4+ and CD8+ T cells with both types of DCs but effects were most pronounced with the TriMix variant. Our study shows that Len and Pom restore effector cell functions in myeloma patients with low tumor burden after ASCT. These findings provide a immunomechanistic explanation for IMiD-based maintenance therapy. They also offer a rationale to combine IMiD-based maintenance with immunotherapeutic approaches such as dendritic cell vaccination in this particular setting.

Foulon, V., et al. (2016). "Colonization of Polystyrene Microparticles by Vibrio crassostreae: Light and Electron Microscopic Investigation." Environmental Science & Technology **50**(20): 10988-10996.

Microplastics collected at sea harbor a high diversity of microorganisms, including some Vibrio genus members, raising questions about the role of microplastics as a novel ecological niche for potentially pathogenic microorganisms. In the present study, we investigated the adhesion dynamics of Vibrio crassostreae on polystyrene microparticles (micro-PS) using electronic and fluorescence microscopy techniques. Micro-PS were incubated with bacteria in different media

(Zobell culture medium and artificial seawater) with or without natural marine aggregates. The highest percentage of colonized particles (38-100%) was observed in Zobell culture medium, which may be related to nutrient availability for production of pili and exopolysaccharide adhesion structures. A longer bacterial attachment (6 days) was observed on irregular micro-PS compared to smooth particles (<10 h), but complete decolonization of all particles eventually occurred. The presence of natural marine agreggates around micro-PS led to substantial and perennial colonization featuring monospecific biofilms at the surface of the aggregates. These exploratory results suggest that V. crassostreae may be a secondary colonizer of micro-PS, requiring a multispecies community to form a durable adhesion phenotype. Temporal assessment of microbial colonization on microplastics at sea using imaging and omics approaches are further indicated to better understand the microplastics colonization dynamics and species assemblages. [ABSTRACT FROM AUTHOR]

Fragoulis, G. E., et al. (2009). "Immunological tolerance and autoimmunity: A1 Altered phagocytic activity in primary sjogren's syndrome: Similarity to lupus and association with extraglandular disease." Annals of the Rheumatic Diseases **1)**: A1.

Background and Objectives: The pathogenesis of systemic lupus erythematosus (SLE) has been thought to involve impaired clearance of apoptotic remnants, as suggested by altered uptake capacity of peripheral blood monocytes and granulocytes. In this study, we sought to assess the phagocytic capacity of peripheral blood monocytes and granulocytes of patients with primary Sjogren's syndrome (SS). For this purpose, we examined comparatively the uptake of fluorescent microbeads and of necrotic cellderived material in SS patients, SLE patients and healthy controls. Method(s): Patients studied included 29 with primary SS (American-European criteria 2002) and 13 with SLE (American College of Rheumatology criteria 1997). Healthy blood donors (HBD) matched for age and sex to the SS and SLE groups (HBD-1, n = 13and HBD-2, n = 13, respectively) were also studied in all assays. The phagocytosis capacity was assessed according to previously established methods (Gaipl et al, J Autoimmun 2007) using heparinised whole blood from individuals studied mixed with a commercially available preparation of fluorescent microbeads (MB-phagocytosis; Polysciences, size 1 mum, 25 SS and 13 SLE patients studied) or a preparation of propidium iodide-stained necrotic cell-derived material obtained from heat-treated normal peripheral blood mononuclear cells (SNEC-phagocytosis, 11 SS and 8 SLE patients studied). The ingestion of particles was assessed by flow cytometry and the phagocytosis index (PInd) was calculated as the product of the percentage of fluorescent cells by the mean fluorescence intensity. Result(s): In agreement with previous studies, SLE patients manifested significantly decreased capacity for MB-phagocytosis by granulocytes (median PInd 18, range 5-47), as well as by monocytes (median PInd 30, range 1-98), compared with HBD-2 (granulocytes: median PInd 53, range 42-110, p=0.002; monocytes: median PInd 108, range 90-182, p=0.0001). In SS patients, defective MB-phagocytosis involved only monocytes (median PInd 26, range 1-126), compared with HBD-1 (median PInd 113, range 70-191, p<0.0001). On the other hand, significantly increased SNEC-phagocytosis was observed in granulocytes (but not monocytes) in SLE (median PInd 419, range 270-1018), as well as in SS (median PInd 415, range 153-1487), compared with HBD-2 (median PInd 133, range 76-244, p<0.0001) and HBD-1 (median PInd 154, range 86-287, p=0.001), respectively. MB-phagocytosis by monocytes was significantly decreased in SS patients with extraglandular manifestations (median PInd 23, range 1-58) compared with SS patients without (median PInd 39, range 10-126, p=0.02). Conclusion(s): The peripheral blood phagocytes of SS patients appear to manifest altered capacity for the uptake of microbeads and SNEC, in a manner similar to SLE. Such disordered phagocytosis may play a role in the pathogenesis of SS.

Fragoulis, G. E., et al. (2009). "Evidence for defective phagocytic activity in primary sjogren's syndrome (ss) that is largely similar to lupus and is more pronounced in ss patients with extraglandular disease." European Journal of Immunology **1)**: S232.

Objectives: Altered phagocytic capacity has been shown to characterize systemic lupus erythematosus (SLE) that is thought to lead to impaired clearance of apoptotic remnants. Herein, we assessed comparatively the phagocytic capacity in the peripheral blood of SS and SLE patients and investigated the phagocytosis of apoptotic/necrotic cells in the salivary glands of SS patients. Method(s): Patients studied included 29 with primary SS (American-European criteria 2002) and 14 with SLE (ACR criteria 1997). Age- and sex-matched healthy blood donors to the SS and SLE groups (13 donors each) were also studied in all assays. The phagocytosis capacity (phagocytosis index) was assessed by flow cytometry, as previously (Gaipl et al, J Autoimmunity, 2007) using heparinized whole blood from individuals studied mixed with a commercially available preparation of fluorescent microbeads (MB-phagocytosis) or a preparation of propidium iodide-stained necrotic cell-derived material obtained from heat-treated normal PBMC (SNEC-phagocytosis). Salivary gland biopsies of patients with SS with and without MALT lymphoma (5 patients each) were also assessed by confocal microscopy for the presence of apoptotic/necrotic material (TUNEL assay) and the presence of macrophages (CD68-staining). Result(s): In agreement to previous studies, MB-phagocytosis was found significantly decreased in granulocytes and monocytes of SLE patients (both for P=0.0001). In SS patients, defective MB-phagocytosis involved only monocytes (P< 0.0001) and significantly correlated with the presence of extraglandular manifestations (P=0.02). Compared to controls, SNEC-phagocytosis was significantly increased in the granulocytes of SLE (P< 0.0001) and of SS (P=0.001). In the salivary gland biopsies of SS patients, the lymphoepithelial lesions and germinal center-like structures manifested significantly increased infiltrations by macrophages. These lesions were also characterized by notable accumulation of apoptotic/necrotic material that resided both inside and outside the phagocytes. These phenomena were significantly more intense in the salivary gland lesions that manifested malignant in-situ B-cell lymphoma. Conclusion(s): In a manner similar to SLE, SS patients appear to manifest altered phagocytic capacity. This may be associated with the observed accumulation of apoptotic/necrotic cells in the salivary glands that in turn, may participate in the chronic autoimmune reactions and/or the lymphoma-generating processes that characterize the disorder.

Francis, V., et al. (2012). "Characterization of linear low-density polyethylene/poly(vinyl alcohol) blends and their biodegradability by Vibrio sp. isolated from marine benthic environment." Journal of Applied Polymer Science **124**(1): 257-265.

Increasing amounts of plastic waste in the environment have become a problem of gigantic proportions. The case of linear low-density polyethylene (LLDPE) is especially significant as it is widely used for packaging and other applications. This synthetic polymer is normally not biodegradable until it is degraded into low molecular mass fragments that can be assimilated by microorganisms. Blends of nonbiodegradable polymers and biodegradable commercial polymers such as poly (vinyl alcohol) (PVA) can facilitate a reduction in the volume of plastic waste when

they undergo partial degradation. Further, the remaining fragments stand a greater chance of undergoing biodegradation in a much shorter span of time. In this investigation, LLDPE was blended with different proportions of PVA (5-30%) in a torque rheometer. Mechanical, thermal, and biodegradation studies were carried out on the blends. The biodegradability of LLDPE/PVA blends has been studied in two environments: (1) in a culture medium containing Vibrio sp. and (2) soil environment, both over a period of 15 weeks. Blends exposed to culture medium degraded more than that exposed to soil environment. Changes in various properties of LLDPE/PVA blends before and after degradation were monitored using Fourier transform infrared spectroscopy, a differential scanning calorimeter (DSC) for crystallinity, and scanning electron microscope (SEM) for surface morphology among other things. Percentage crystallinity decreased as the PVA content increased and biodegradation resulted in an increase of crystallinity in LLDPE/PVA blends. The results prove that partial biodegradation of the blends has occurred holding promise for an eventual biodegradable product. copyright 2011 Wiley Periodicals, Inc. J Appl Polym Sci, 2012

Franco, J., et al. (2019). "Incidence of plastic ingestion in seabirds from the Bay of Biscay (southwestern Europe)." Marine Pollution Bulletin **146**: 387-392.

Seabirds have been widely used to monitor marine debris by the analysis of plastic ingestion. With the aim of obtaining the first data on ingestion of plastics by different seabird species in the Bay of Biscay and evaluating their suitability as biomonitors of plastic pollution in this area, a total of 159 seabirds of fifteen species were analyzed. Plastics were found in 26 birds (16% of the individuals) of nine species (60% of the species). Frequency of occurrence of plastics varied between 0% (Razorbill) and 100% (species of the family Procellariidae). Considering several criteria to assess their suitability as biomonitors of plastic pollution (frequency of occurrence of plastic ingestion, species abundances and stranding occurrence in the Bay of Biscay), the Common Guillemot and the Atlantic Puffin seem the most promising candidates. This study provides the first data on plastic ingestion in seabirds of the Bay of Biscay.

Francois, A. and M. Himmelhaus (2009). "Optical sensors based on whispering gallery modes in fluorescent microbeads: size dependence and influence of substrate." Sensors **9**(9): 6836-6852.

Whispering gallery modes in surface-fixated fluorescent polystyrene microbeads are studied in view of their capability of sensing changes in the refractive index of the beads' environment by exposing them to water/glycerol mixtures of varying composition. The mode positions are analyzed by simultaneous fitting for mode number, bead radius, and environmental index. Down to a diameter of 8 mum, the sensor response follows the index of the bulk solution very well. For smaller bead sizes, some deviations occur, in particular for fluid indices not too different from that of water, which might be attributed to the presence of the substrate.

Francois, J. J., et al. (2015). "Mechanics of neutrophil migration in three-dimensional extra-cellular matrices." Molecular Biology of the Cell. Conference: Annual Meeting of the American Society for Cell Biology, ASCB **26**(25).

While much research has been dedicated to the identification of the cascade of specific biochemical processes involved in the recruitment of neutrophils, much less is known about the mechanical events driving their migration; in particular, how they generate the necessary traction forces to migrate across three-dimensional (3-D) extravascular spaces is unclear. In this study, we investigate the mechanics of 3- D neutrophil motility in collagen gels using a novel Elastographic 3D Force Microscopy (E3DFM) technique, which simultaneously determines the 3-D cellular forces and non-linear material properties of the extracellular environment. We used neutrophil-like differentiated human promyelocytic leukemia cells (dHL-60) as a model system. dHL-60 cells were embedded in collagen matrices of different porosities containing fluorescent micro-beads. The concentration of collagen was varied in order to fabricate collagen gels with different matrix porosities. Neutrophil motility was induced via the introduction of the neutrophil chemokine formyl-Methionyl-Leucyl-Phenylalanine (fMLP) in a custom build device. Both Confocal and Fluorescent microscopy techniques were used to image the movement of the embedded micro-beads as well as fluorescently labeled dHL-60 cells. Particle Image Velocimetry (PIV) and Finite Deformation Theory were used to compute displacement fields in the collagen matrices. Stress fields in the matrices were computed using a constitutive relationship with several material parameters. The over determined nature of the problem was used to estimate the aforementioned material parameters. We will present data showing that cell speed, morphological changes, and migratory patterns varied with differing matrix porosities. We will also provide data showing a clear relationship between the aforementioned migratory characteristics and computed displacement and stress fields around migrating neutrophils in these different collagen matrices. The results from our study show that neutrophils migrating in 3-D environments employ distinct mechanical mechanisms that depend on their environment's mechanical structure.

Franeker, J. and P. J. Bell (1988). "Plastic ingestion by petrels breeding in Antarctica." Marine Pollution Bulletin **19**(12): 672-674.

Plastic particles were found to be common pollutants in stomachs of Wilson's Storm Petrels and Cape Petrels breeding on the Antarctic continent. Highest incidence of plastics was found in chicks of Wilson's Storm Petrels that had died before fledging. Few or no plastics were found in Snow Petrels and Antarctic Petrels. Evidence suggests that most plastics originate from wintering areas outside the Antarctic, and that relatively few plastics are available in Antarctic waters. Possible hazards of plastic levels observed in Wilson's Storm Petrels are discussed.

Frank, R., et al. (2013). "Correlation of circulating donor-specific anti-HLA antibodies and presence of C4d in endomyocardial biopsy with heart allograft outcomes: A single-center, retrospective study." Journal of Heart and Lung Transplantation **32**(4): 410-417.

Background: Donor-specific antibodies (DSA) are associated with increased cardiac graft loss and cardiac vasculopathy (CAV). Detection of antibody-mediated rejection (AMR) relies on graft dysfunction, C4d immunofluorescence (IF) and DSA. Method(s): We retrospectively studied the relationship of DSA, endomyocardial biopsy (EMB) and C4d IF to cardiac transplant outcomes. DSA were evaluated against HLA Class I and II specificities, both pre- and post-transplant, using microbead-based assays. Result(s): Of 626 cardiac transplant patients, 109 with concurrent EMBs and C4d IF and DSA measurement were included in this study. In patients with and without DSA, CAV occurred in 31% and 13% and acute cellular rejection (ACR) in 100% and 84%, respectively. One hundred ten of 170 EMBs procured during episodes of graft dysfunction had concurrent DSA. In these patients, C4d IF correlated better with DSA to Class I or both Class I and II and less so in patients with DSA to Class II. Graft failure (GF) rates of 40%, 29% and 58% with average times to GF of 33, 77 and 48 months were seen in patients with DSA to Class I, II or both, respectively. Conclusion(s): Patients with DSA to Class I or to both Class I and II showed a correlation with C4d IF and had higher GF rates compared to patients with DSA to only Class II or no DSA; patients with DSA to Class II remained at risk for CAV. Episodes of ACR and CAV, but not AMR, appeared to be more frequently associated with graft dysfunction in patients with circulating DSA. © 2013 International Society for Heart and Lung Transplantation.

Franke, S., et al. (2015). "One-step assay for the quantification of T4 DNA ligase." Analytical and bioanalytical chemistry **407**(4): 1267-1271.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis As one of the most commonly used enzyme in molecular biology, the T4 DNA ligase presents an important tool for the manipulation of DNA. T4 DNA ligase activity measurements are based on the use of radioactivity or rather labor-intense procedures including gel-based analysis. We therefore established a homogeneous T4 DNA ligase assay utilizing a specifically designed fluorescein- and dark quencher-labeled DNA molecule. Upon ligation of both DNA molecules, a quenching occurs and the fluorescence intensity decreases with increasing ligase concentrations. The assay allows a sensitive and precise quantification (CV, 4.6-5.5 %) of T4 DNA ligase activities and showed a high specificity when tested against other ligases of related and different species. Most importantly, this T4 DNA ligase assay requires only one working and incubation step before measurement can take place at room temperature and may therefore offer an interesting alternative to existing, more laborious ligase assays.

Frankel, H. (1990). Automated sorting of post-consumer plastic waste. Proceedings of the ACS Division of Polymeric Materials: Science and Engineering, August 26, 1990 - August 31, 1990, Washington, DC, USA, Publ by ACS.

Almost all post-consumer plastic waste can be recycled (85% of plastic is thermoplastic) but it must be separated by type of polymer. Unfortunately, recycling is viewed and practiced as people hand-sorting municipal solid waste. This is totally unsatisfactory for handling the large volumes of material which must be recycled. This paper describes the development of an automatic recycling system which is capable of sorting post-consumer containers at a rate of over 200 bottles a minute. The purpose of the system is to reduce errors of sorting, reduce processing costs, and avoid the environmental and health concerns of handling post-consumer waste. In addition, future trends to increase the capacity and provide closer to source processing are also discussed.

Franzellitti, S., et al. (2019). "Microplastic exposure and effects in aquatic organisms: A physiological perspective." Environmental Toxicology & Pharmacology **68**: 37-51.

The impact of microplastics (MPs) on aquatic life, given their ubiquitous presence in the water compartment, represents a growing concern. Consistently, scientific knowledge is advancing rapidly, although evidence on actual adverse effects is still highly fragmented. This paper summarizes the recent literature on MP impacts on aquatic organisms in an attempt to link routes of uptake, possible alterations of physiological processes, and outcomes at different levels of biological organization. Animal feeding strategies and MP biodistribution is discussed, alongside with relevant effects at molecular, cellular, and systemic level. Pathways from animal exposure to apical physiological responses are examined to define the relevance of MPs for animal health, and to point out open questions and research gaps. Emphasis is given to emerging threats posed by leaching of plastic additives, many of which have endocrine disruption potential. The potential role of MPs as substrates for microorganism growth and vehicle for pathogen spreading is also addressed.

Franzellitti, S., et al. (2019). "The Multixenobiotic resistance system as a possible protective response triggered by microplastic ingestion in Mediterranean mussels (Mytilus galloprovincialis): Larvae and adult stages." Comparative biochemistry and physiology. Toxicology & pharmacology : CBP **219**: 50-58.

The emerging paradigm on plastic pollution in marine environments is that microsize particles (MPs) have far more subtle effects than bigger fragments, given their size range overlapping with that of particles ingested by filter-feeders. The impacts include gut blockage, altered feeding and energy allocation, with knock-on effects on widespread physiological processes. This study investigated whether ingestion of polystyrene MPs (PS-MPs) triggers protective processes in marine mussels. The Multixenobiotic resistance (MXR) system is a cytoprotective mechanism acting as an active barrier against harmful xenobiotics and a route of metabolite detoxification. Both larvae and adults were employed in laboratory experiments with different concentrations of 3-µm PS-MPs (larvae), and 3-µm and 45-µm PS-MPs (adults) matching size range of planktonic food through the mussel lifecycle. Embryos grown in the presence of 3-µm PS-MPs showed significant reduction of MXR activity and down-regulation of ABCB and ABCC transcripts encoding the two main MXR-related transporters P-glycoprotein and the Multidrug resistance-related protein, respectively. In adults, effects of PS-MPs were assessed in haemocytes and gills, which showed different modulation of MXR activity and ABCB/ABCC expression according to MP size (haemocyte and gills) or particle concentration (haemocyte). These data showed that modulation of MXR activity is part of a generalized response triggered by particle ingestion.

Frapin, L., et al. (2018). "Development of controlled release systems of biological factors for the regeneration of intervertebral disc." Osteoarthritis and Cartilage **26 (Supplement 1)**: S425.

Purpose: The degeneration of intervertebral disc (IVD), and notably of its central part the nucleus pulposus (NP), is responsible for 40% of chronic low back pain (LBP). Recent studies have reported the existence of endogenous regenerative cells in the IVD vicinity and within the IVD. These endogenous cells have been characterized as mesenchymal stem cell-like progenitors residing in specificniches. Inresponsetochemokines (stromal derived factor-1 (SDF-1)) these cells can be recruited and migrate to the site of injury and thus contribute to the endogenous repair process. In this context, the development of microbeads-based local delivery systems of factors involved in progenitors recruitment has recently been contemplated for IVD regenerative medicine. Because of their physicochemical and biological properties, microbeads of pullulans (PMBs) have long been investigated as drug carriers. In addition, we recently demonstrated that transforming growth factor-beta1 (TGF-beta1) and growth differentiation factor5 (GDF5) are potent stimulators of the differentiation ofmesenchymal stemcells(MSC) intoNP-like cells. In this context, the aim of this work was to develop an intradiscal pullulan microbeads-based delivery systemfor the controlled release of SDF-1, TGF-beta1 and GDF5. This drug delivery system would be able to sequentially contribute to 1) the recruitment and mobilization of resident progenitors, 2) the differentiation of themobilized progenitors and 3) the subsequent regeneration of NP. Method(s): Chemotaxis assays were performed to determine the in vitro cell migration. Human MSCs (1250 cells/ml) were incubated with or without SDF-1 (250 ng/ml) in Transwells for 4h, migratory cells were stained by crystal violet then quantified by spectrophotometry. In parallel, PMBs were prepared by a simultaneous crosslinking protocol coupled to a water-in-oil emulsification process. Freeze-dried PMBs were incubated with GDF-5 and TGF-beta1 separately (25 mg of PMBs at final concentration of 1, 2 and 4 mg/mL and in a final volume of 500 mL of PBS) for 24 h at 4degreeC under rotary stirring at 24 rpm. GDF-5 and TGF-beta1 release assays were performed in PBS at 37degreeC for 21 days and concentrations were measured by ELISA. Result(s): SDF-1 has improved the in vitro migration of hMSCs, increasing by more than twice the number of migratory cells. GDF-5 and TGF-beta1 were successfully adsorbed on PMBs with a 100% efficiency. Release experiments showed a burst release within the 1st h, at 604 ng/h and 50 ng/h for GDF-5 and TGF-beta1 respectively, then the

release rate decreased during 21 days with 0.6 ng/h and 0.15 ng/h during the last 7 days for GDF-5 and TGF-beta1, respectively. At day 21, GDF-5 was entirely released, whereas only 40% of TGF-beta1 was released. This different release profiles could be explained by the difference of molecular weight (13 kDa for GDF-5 and 25 kDa for TGF-beta1). Conclusion(s): We have confirmed that SDF-1 improved hMSCs in vitro migration, and that PMBs are suitable microcarriers for the loading and release of GDF-5 and TGFbeta-1. The loading and release capability of SDF- 1 by PMBs, as well as SDF-1 bioactivity after release will be analyzed, to obtain a fast and massive recruitment of resident progenitors in vivo. Then, we will study the action of GDF-5 and TGFbeta1 released from PMBs on in vitro NP differentiation, by using a 3D matrix model to mimic the NP microenvironment. Nucleopulpogenic differentiation will be evaluated by analysis of specific extracellular matrix production and gene expression markers. (Table Presented).

Fred, R. G., et al. (2011). "The human insulin mRNA is partly translated via a cap- and eIF4A-independent mechanism." Biochemical & Biophysical Research Communications **412**(4): 693-698.

The aim of this study was to investigate whether cap-independent insulin mRNA translation occurs in human pancreatic islets at basal conditions, during stimulation at a high glucose concentration and at conditions of nitrosative stress. We also aimed at correlating cap-independent insulin mRNA translation with binding of the IRES trans-acting factor polypyrimidine tract binding protein (PTB) to the 5'-UTR of insulin mRNA. For this purpose, human islets were incubated for 2h in the presence of low (1.67 mM) or high glucose (16.7 mM). Nitrosative stress was induced by addition of 1 mM DETA/NO and cap-dependent mRNA translation was inhibited with hippuristanol. Insulin biosynthesis rates were determined by radioactive labeling and immunoprecipitation. PTB affinity to insulin mRNA 5'-UTR was assessed by a magnetic micro bead pull-down procedure. We observed that in the presence of 1.67 mM glucose, approximately 70% of the insulin mRNA translation was inhibited by hippuristanol. Corresponding value from islets incubated at 16.7 mM glucose was 93%. DETA/NO treatment significantly decreased the translation of insulin by 85% in high glucose incubated islets, and by 50% at a low glucose concentration. The lowered insulin biosynthesis rates of DETA/NO-exposed islets were further suppressed by hippuristanol with 55% at 16.7 mM glucose but not at 1.67 mM glucose. Thus, hippuristanol-induced inhibition of insulin biosynthesis was less pronounced in DETA/NO-treated islets as compared to control islets. We observed also that PTB bound specifically to the insulin mRNA 5'-UTR in vitro, and that this binding corresponded well with rates of cap-independent insulin biosynthesis at the different conditions. In conclusion, our studies show that insulin biosynthesis is mainly cap-dependent at a high glucose concentration, but that the cap-independent biosynthesis of insulin can constitute as much as 40-100% of all insulin biosynthesis during conditions of nitrosative stress. These data suggest that the pancreatic beta-cell is able to uphold basal insulin synthesis at conditions of starvation and stress via a cap- and eIF4A-independent mechanism, possibly mediated by the binding of PTB to the 5'-UTR of the human insulin mRNA.

Fred-Ahmadu, O. H., et al. (2020). "Interaction of chemical contaminants with microplastics: Principles and perspectives." Science of the Total Environment **706**: 135978.

Scientific evidences abound of the occurrence of plastic pollution, from mega- to nano-sized plastics, in virtually all matrixes of the environment. Apart from the direct effects of plastics and microplastics pollution such as entanglement, inflammation of cells and gut blockage due to ingestion, plastics are also able to act as vectors of various chemical contaminants in the aquatic environment. This paper provides a review of the association of plastic additives with environmental microplastics, how the structure and composition of polymers influence sorption capacities and highlights some of the models that have been employed to interpret experimental data from recent sorption studies. The factors that influence the sorption of chemical contaminants such as the degree of crystallinity, surface weathering, and chemical properties of contaminants. and the implications of chemical sorption by plastics for the marine food web and human health are also discussed. It was however observed that most studies relied on pristine or artificially aged plastics rather than field plastic samples for studies on chemical sorption by plastics.

Free, C. M., et al. (2014). "High-levels of microplastic pollution in a large, remote, mountain lake." Marine Pollution Bulletin **85**(1): 156-163.

Despite the large and growing literature on microplastics in the ocean, little information exists on microplastics in freshwater systems. This study is the first to evaluate the abundance, distribution, and composition of pelagic microplastic pollution in a large, remote, mountain lake. We quantified pelagic microplastics and shoreline anthropogenic debris in Lake Hovsgol, Mongolia. With an average microplastic density of 20,264 particles km(-2), Lake Hovsgol is more heavily polluted with microplastics than the more developed Lakes Huron and Superior in the Laurentian Great Lakes. Fragments and films were the most abundant microplastic types; no plastic microbeads and few pellets were observed. Household plastics dominated the shoreline debris and were comprised largely of plastic bottles, fishing gear, and bags. Microplastic density decreased with distance from the southwestern shore, the most populated and accessible section of the park, and was distributed by the prevailing winds. These results demonstrate that without proper waste management, low-density populations can heavily pollute freshwater systems with consumer plastics.

Freeman, D. E., et al. (1992). "Comparison of the effects of intragastric infusion of equal volumes of water, dioctyl sodium sulfosuccinate, and magnesium sulfate on fecal composition and output in clinically normal horses." American Journal of Veterinary Research **53**(8): 1347-1353.

A Latin square design was used to compare the effects of laxatives and a corresponding volume of water on gastrointestinal tract function in 4 healthy Thoroughbred geldings. Horses were intragastrically infused with each of the following: dioctyl sodium sulfosuccinate (DSS; 50 mg/kg of body weight); magnesium sulfate (0.5 g/kg - low dosage); magnesium sulfate (1.0 g/kg - high dosage); and a equal volume of water (6 litre) given as a control infusion. From 5 to 33 hours after the high dosage of magnesium sulfate, faeces were slightly softer than usual in all horses. In 1 horse, DSS caused mild colic, hyperpnoea, and diarrhoea from 0.3 to 3 hours after administration. After all laxative treatments and the control infusion, faecal output, faecal water, number of defecations, and faecal water percentage were greater during the first 6 and 12 hours, compared with each subsequent 6-hour period. The high dosage of magnesium sulfate had greater effect on faecal output and faecal water than did the low dosage and control infusion. However, this effect preceded arrival of the liquid transit marker, polyethylene glycol, and magnesium at their highest concentrations in faeces by 12 to 18 hours. Compared with the control infusion, none of the laxative treatments affected excretion of polyethylene glycol and plastic particulate markers, nor did they increase water consumption. It was concluded that the response to intragastric infusions may involve reflex mechanisms in the gastrointestinal tract and that these responses could be used for treatment of colon impactions. Under conditions of this study, DSS was not a sufficiently effective laxative to outweigh the risk of toxic effects at recommended doses. Although DSS and the low dosage of magnesium sulfate may not provide a greater laxative effect than did an equal volume of water, the high dosage of magnesium sulfate should be more effective.

Frei, S., et al. (2019). "Occurence of microplastics in the hyporheic zone of rivers." Scientific Reports **9**(1): 15256.

Although recent studies indicate that fluvial systems can be accumulation areas for microplastics (MPs), the common perception still treats rivers and streams primarily as pure transport vectors for MPs. In this study we investigate the occurrence of MPs in a yet unnoticed but essential compartment of fluvial ecosystems - the hyporheic zone (HZ). Larger MP particles (500-5,000 micro m) were detected using attenuated total reflectance (ATR) - Fourier-transform infrared (FTIR) spectroscopy. Our analysis of MPs (500-5,000 micro m) in five freeze cores extracted for the Roter Main River sediments (Germany) showed that MPs were detectable down to a depth of 0.6 m below the streambed in low abundances (<<1 particle per kg dry weight). Additionally, one core was analyzed as an example for smaller MPs (20-500 micro m) with focal plane array (FPA)- based micro FTIR spectroscopy. Highest MP abundances (~30,000 particles per kg dry weight) were measured for pore scale particles (20-50 micro m). The detected high abundances indicate that the HZ can be a significant accumulation area for pore scale MPs (20-50 micro m), a size fraction that yet is not considered in literature. As the HZ is known as an important habitat for invertebrates representing the base of riverine food webs, aquatic food webs can potentially be threatened by the presence of MPs in the HZ. Hyporheic exchange is discussed as a potential mechanism leading to a transfer of pore scale MPs from surface flow into streambed sediments and as a potential vector for small MPs to enter the local aquifer. MPs in the HZ therefore may be a potential risk for drinking water supplies, particularly during drinking water production via river bank filtration.

Frentzel, S. (2017). "An assay to characterize the impact of cigarette smoke exposure on mucociliary clearance in-vitro." Toxicology Letters **280 (Supplement 1)**: S263.

Mucociliary clearance (MCC) constitutes a first-line defense mecha-nism to remove inhaled particles or pathogens from the respiratory tract. Impairment of MCC contributes or plays a causative role in the etiology of various respiratory diseases and is associated with an increased risk for pulmonary infections. Cigarette smoke (CS) has been reported to impact all functional elements required for an effective MCC. This includes the observation that respiratory epithelia of smokers show fewer cilia and with abnormal morphology. Smoking can lead to mucus hypersecretion or changes in the biophysical properties of mucus. CS may also influence the hydration of the periciliary surface liquid (PCL). While there are established tests to measure MCC (mucociliary transport) rates in humans (e.g. Saccharine transit test), standard in-vitro assays are lacking that can be used to characterize CS (whole smoke) effects. We have setup an assay to measure mucociliary transport rates in an in-vitro setting on nasal MucilAir^{TM} 3D-organotypic air-liquid interface cultures by determining velocities of polystyrene microbeads. We observed a dose-dependent decrease of bead transport rates upon exposure of MucilAir^{TM} to 3R4F Reference CS. Concomitant with a decreased transport, cilia beating, as determined at various post-exposure time points, was similarly impaired in the cultures. This assay is a useful addition to match clinical reports on CS effects on MCC in humans and may be used for comparative studies using potential modified risk tobacco products.

Frere, L., et al. (2018). "Microplastic bacterial communities in the Bay of Brest: Influence of polymer type and size." Environmental Pollution **242**(Pt A): 614-625.

Microplastics (<5mm) exhibit intrinsic features such as density, hydrophobic surface, or high

surface/volume ratio, that are known to promote microbial colonization and biofilm formation in marine ecosystems. Yet, a relatively low number of studies have investigated the nature of microplastic associated bacterial communities in coastal ecosystems and the potential factors influencing their composition and structure. Here, we characterized microplastics collected in the Bay of Brest by manual sorting followed by Raman spectroscopy and studied their associated bacterial assemblages using 16S amplicon high-throughput sequencing. Our methodology allowed discriminating polymer type (polyethylene, polypropylene and polystyrene) within small size ranges (0.3-1 vs. 1-2 vs. 2-5mm) of microplastics collected. Data showed high species richness and diversity on microplastics compared to surrounding seawater samples encompassing both free living and particle attached bacteria. Even though a high proportion of operational taxonomic units (OTU; 94+/-4%) was shared among all plastic polymers, polystyrene fragments exhibited distinct bacterial assemblages as compared to polyethylene and polypropylene samples. No effect of microplastic size was revealed regardless of polymer type, site and date of collection. The Vibrio genus was commonly detected in the microplastic fraction and specific PCR were performed to determine the presence of potentially pathogenic Vibrio strains (namely V. aestuarianus and the V. splendidus polyphyletic group). V. splendidus related species harboring putative oyster pathogens were detected on most microplastic pools (77%) emphasizing the need of further research to understand the role of microplastics on pathogen population transport and ultimate disease emergence.

Frere, L., et al. (2017). "Influence of environmental and anthropogenic factors on the composition, concentration and spatial distribution of microplastics: A case study of the Bay of Brest (Brittany, France)." Environmental Pollution **225**: 211-222.

The concentration and spatial distribution of microplastics in the Bay of Brest (Brittany, France) was investigated in two surveys. Surface water and sediment were sampled at nine locations in areas characterized by contrasting anthropic pressures, riverine influences or water mixing. Microplastics were categorized by their polymer type and size class. Microplastic contamination in surface water and sediment was dominated by polyethylene fragments (PE, 53-67%) followed by polypropylene (PP, 16-30%) and polystyrene (PS, 16-17%) microparticles. The presence of buoyant microplastics (PE, PP and PS) in sediment suggests the existence of physical and/or biological processes leading to vertical transfer of lightweight microplastics in the bay. In sediment (upper 5 cm), the percentage of particles identified by Raman micro-spectroscopy was lower (41%) than in surface water (79%) and may explain the apparent low concentration observed in this matrix (0.97 +/- 2.08 MP kg⁻¹ dry sediment). Mean microplastic concentration was 0.24 +/- 0.35 MP m⁻³ in surface water. We suggest that the observed spatial MP distribution is related to proximity to urbanized areas and to hydrodynamics in the bay. A particle dispersal model was used to study the influence of hydrodynamics on surface microplastic distribution. The outputs of the model showed the presence of a transitional convergence zone in the centre of the bay during flood tide, where floating debris coming from the northern and southern parts of the bay tends to accumulate before being expelled from the bay. Further modelling work and observations integrating (i) the complex vertical motion of microplastics, and (ii) their point sources is required to better understand the fate of microplastics in such a complex coastal ecosystem.

Frias, J. P., et al. (2016). "Microplastics in coastal sediments from Southern Portuguese shelf waters." Marine Environmental Research **114**: 24-30.

Microplastics are well-documented pollutants in the marine environment that result from fragmentation of larger plastic items. Due to their long chemical chains, they can remain in the environment for long periods of time. It is estimated that the vast majority (80%) of marine litter derives from land sources and that 70% will sink and remain at the bottom of the ocean. Microplastics that result from fragmentation of larger pieces of plastic are common to be found in beaches and in the water surface. The most common microplastics are pellets, fragments and fibres. This work provides original data of the presence of microplastics in coastal sediments from Southern Portuguese shelf waters, reporting on microplastic concentration and polymer types. Microplastic particles were found in nearly 56% of sediment samples, accounting a total of 31 particles in 27 samples. The vast majority were microfibers (25), identified as rayon fibres, and fragments (6) identified as polypropylene, through infrared spectroscopy (mu-FTIR). The concentration and polymer type data is consistent with other relevant studies and reports worldwide.

Frias, J. P. G. L., et al. (2014). "Evidence of microplastics in samples of zooplankton from Portuguese coastal waters." Marine Environmental Research **95**: 89-95.

Records of high concentrations of plastic and microplastic marine debris floating in the ocean have led to investigate the presence of microplastics in samples of zooplankton from Portuguese coastal waters. Zooplankton samples collected at four offshore sites, in surveys conducted between 2002 and 2008, with three different sampling methods, were used in this preliminary study. A total of 152 samples were processed and microplastics were identified in 93 of them, corresponding to 61% of the total. Costa Vicentina, followed by Lisboa, were the regions with higher microplastic concentrations (0.036 and 0.033 no. m⁻³) and abundances (0.07 and 0.06cm³m⁻³), respectively. Microplastic: zooplankton ratios were also higher in these two regions, which is probably related to the proximity of densely populated areas and inputs from the Tejo and Sado river estuaries. Microplastics polymers were identified using Micro Fourier Transformed Infrared Spectroscopy (mu-FTIR), as polyethylene (PE), polypropylene (PP) and polyacrylates (PA). The present work is the first report on the composition of microplastic particles collected with plankton nets in Portuguese coastal waters. Plankton surveys from regular monitoring campaigns conducted worldwide may be used to monitor plastic particles in the oceans and constitute an important and low cost tool to address marine litter within the scope of the Marine Strategy Framework Directive (2008/56/EC). © 2014 Elsevier Ltd.

Frias, J. P. G. L., et al. (2010). "Organic pollutants in microplastics from two beaches of the Portuguese coast." Marine Pollution Bulletin **60**(11): 1988-1992.

Microplastics pose a threat to coastal environments due to their capacity to adsorb persistent organic pollutants (POPs). These particles (less than 5. mm in size) are potentially dangerous to marine species due to magnification risk over the food chain. Samples were collected from two Portuguese beaches and sorted in four classes to relate the adsorption capacity of pollutants with color and age. Polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and DDTs were analysed on pellets through gas chromatography mass spectrometry (GC-MS), and types of plastic were identified using Fourier transformed infra-red spectroscopy (micro-FTIR). Microplastics were mostly polyethylene and polypropylene. Regarding sizes, some fibres ranged from 1 to 5mum in diameter and were 500mum in length. The majority of samples collected had sizes above 200mum. Black pellets, unlike aged pellets, had the highest concentrations of POPs except for PAHs in Fonte da Telha beach. PAHs with higher concentrations were pyrene, phenantrene, chrysene and fluoranthene. Higher concentrations of PCBs were found for congeners 18, 31, 138 and 187. Further investigation is necessary to understand the relationship between plastic degradation and adsorption for different pollutants. © 2010 Elsevier Ltd.

Fridlender, Z. G., et al. (2011). "Molecular characterization of tumor associated neutrophils from Non Small Cell Lung Cancer (NSCLC) and mesothelioma tumors." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **183**(1 MeetingAbstracts).

Rationale: We previously identified and preliminarily characterized two phenotypes of tumor-associated neutrophils (TAN) in murine models of non-small cell lung cancer (NSCLC) and mesothelioma, dependent on the presence or absence of active TGF-beta (Cancer Cell, 2009). In the current study, we further define the characteristics of these TAN using a microarray approach comparing naive bone-marrow neutrophils (BMN) to N1 ("anti-tumor") and N2 ("pro-tumor") TAN from mice bearing mesothelioma and NSCLC tumors. Method(s): Balb/C mice bearing large mesothelioma flank tumors were treated with SM16, a TGF-beta-R1 kinase inhibitor (N1-TAN) or left untreated (N2-TAN). Neutrophils were isolated from tumors using microbeads (CD11b) and flow cytometry (Ly6G). BMN were isolated from naive mice. mRNA from each subgroup was arrayed on Illumina chips. Enrichment pathways were identified using Genomica software. Selected results were validated by RT-PCR in these tumors and in tumors originating from an NSCLC cell line. Result(s):. Hierarchical clustering and PCA analysis showed that the three types of cells were clearly separated. Differences between N1- and N2-TAN were less prominent than between them and BMN. Many more genes were up-regulated than down-regulated in TAN compared to BMN, including pathways related to immune responses (e.g. Toll-like receptors), cytokine pathways (e.g. IL1beta and TNF), and a striking up-regulation of chemokines, including chemoattractants for T-cells (e.g. CXCL10), neutrophils (e.g. CXCL1), B-cells (CXCL13) and macrophages (e.g. CCL2). For several of these we found increased secretion to supernatant from TAN compared to BMN. Several pathways related to responses to stimuli were up-regulated in N1 versus N2 TAN, including the IL3 signaling pathway, CCR5, IRF-1, and some important anti-oxidants (e.g. GpX1). Up-regulated immune genes included TNF, Jak3, MapK14 and NF-kB-1alpha, and several antigen-processing and presentation genes, mostly by MHC-1. Macrophage chemoattractans (CCL2, CCL6 and CXCL10), as well as CXCL13, CCL8 and CCL3 were upregulated in N1-TAN, whereas the T-regulatory cell chemoattractant CCL17, was the only up-regulated in N2-TAN. In order to validate these results in humans, we are currently isolating and characterizing neutrophils from human NSCLC tumors. Conclusion(s): Our data demonstrate major differences between naive neutrophils and N1/N2-TAN in mesothelioma and NSCLC tumors, primarily in immune responses and chemotaxis. N1-TAN appear to make more macrophage chemoattractants and antigen processing and presentation genes. N2-TAN may attract Treg's with CCL17. The observation that differences between N1/N2-TAN are less prominent than between them and BMN, suggests that the change between N2 and N1 phenotypes is intra-tumoral and not d/t differential recruitment.

Friec, G. L., et al. (2011). "CD3/CD46-mediated generation of IL-10-secreting T cells is defective in rheumatoid arthritis." Annals of the Rheumatic Diseases **2)**: A48.

Background and objectives Control of effector T cell responses to foreign and self-antigens through interleukin (IL)-10-producing Th1 cells and adaptive IL-10+Tregs is vital for limiting immune pathology during infection and for preventing autoimmunity. However, the mechanisms that regulate their production remain incompletely understood. CD46 is the receptor for the C3b/C4b components of complement. The authors have previously demonstrated that activation of human CD4 T cells through the T-cell receptor and the complement regulator CD46 induces Tr1 like IL-10-producing Tregs. The authors set out to study factors that regulate the generation of IL-10 producing Tregs during normal immune homeostasis and to determine whether this pathway is defective in chronic inflammatory disease, such as rheumatoid arthritis. Materials and methods CD4 T lymphocytes were purified from PBMC of normal donors or PBMC and synovial fluid of rheumatoid arthritis (RA) and JIA patients using CD4 MicroBeads prior to activation with anti-CD3 and anti-CD46 mAb in the presence or absence of increasing concentrations of IL-2. After 36 h cytokine production was determined using the Th1/Th2 cytokine bead array. Cells were stained using the IFNgamma and IL-10 cytokine secretion assay kits in combination and IFNgamma⁺, IFNgamma ⁺/IL-10⁺ and IL-10⁺ cells isolated via cell sorting. Supernatants from cultures of these cells were then tested for their capacity to suppress proliferation of freshly purified T cells. Approval for this study was obtained from the Local Ethics Review Committee. Results IL-10-secreting T cells are derived from populations of differentiating Th1 effector T cells as they also secrete IFNgamma. The authors observed that the cytokine expression profile of CD3/CD46-activated T cells is heavily influenced by the amount of IL-2 present during activation. Thus, in the presence of low IL-2, CD3/CD46-activation induces strong IFNgamma-secretion and a proinflammatory effector phenotype. High IL-2 induces a 'switch' from IFNgamma⁺ T cells, via an IFNgamma⁺/ IL-10⁺ state, to an IL-10⁺ phenotype. CD46-induced IFNgamma⁺/ IL-10⁺ and IL-10⁺ cells are suppressive. By contrast, analysis of T cell populations from patients with inflammatory arthritis such as RA and JIA reveals that progression to the IL-10⁺ state is blocked even in the presence of high exogenous IL-2. In addition, CD3/CD46-activated T cells produce 20-30 times more IFN-gamma than IL-10. Conclusions CD46 activation during T cell response initiation supports IFNgamma secretion to combat infection while expansion of the effector response provides high IL-2 and the signal to switch to IL-10 production and resolution of the immune response. This regulatory switch appears to be defective in chronic inflammatory disease.

Friedlander, D. R., et al. (1994). "The neuronal chondroitin sulfate proteoglycan neurocan binds to the neural cell adhesion molecules Ng-CAM/L1/NILE and N-CAM, and inhibits neuronal adhesion and neurite outgrowth." Journal of Cell Biology **125**(3): 669-680.

We have previously shown that aggregation of microbeads coated with N-CAM and Ng-CAM is inhibited by incubation with soluble neurocan, a chondroitin sulfate proteoglycan of brain, suggesting that neurocan binds to these cell adhesion molecules (Grumet, M., A. Flaccus, and R. U. Margolis. 1993. J. Cell Biol. 120:815). To investigate these interactions more directly, we have tested binding of soluble ¹²⁵I-neurocan to microwells coated with different glycoproteins. Neurocan bound at high levels to Ng-CAM and N-CAM, but little or no binding was detected to myelin-associated glycoprotein, EGF receptor, fibronectin, laminin, and collagen IV. The binding to Ng-CAM and N- CAM was saturable and in each case Scatchard plots indicated a high affinity binding site with a dissociation constant of ~1 nM. Binding was significantly reduced after treatment of neurocan with chondroitinase, and free chondroitin sulfate inhibited binding of neurocan to Ng-CAM and N-CAM. These results indicate a role for chondroitin sulfate in this process, although the core glycoprotein also has binding activity. The COOH-terminal half of neurocan was shown to have binding properties essentially identical to those of the full-length proteoglycan. To study the potential biological functions of neurocan, its effects on neuronal adhesion and neurite growth were analyzed. When neurons were incubated on dishes coated with different combinations of neurocan and Ng-CAM, neuronal adhesion and neurite extension were inhibited. Experiments using anti-Ng-CAM antibodies as a substrate also indicate that neurocan has a direct inhibitory effect on neuronal adhesion and neurite growth.

Immunoperoxidase staining of tissue sections showed that neurocan, Ng-CAM, and N-CAM are all present at highest concentration in the molecular layer and fiber tracts of developing cerebellum. The overlapping localization in vivo, the molecular binding studies, and the striking effects on neuronal adhesion and neurite growth support the view that neurocan may modulate neuronal adhesion and neurite growth during development by binding to neural cell adhesion molecules.

Fries, E., et al. (2013). "Identification of polymer types and additives in marine microplastic particles using pyrolysis-GC/MS and scanning electron microscopy." Environmental Science. Processes & Impacts **15**(10): 1949-1956.

Any assessment of plastic contamination in the marine environment requires knowledge of the polymer type and the additive content of microplastics. Sequential pyrolysis-gas chromatography coupled to mass spectrometry (Pyr-GC/MS) was applied to simultaneously identify polymer types of microplastic particles and associated organic plastic additives (OPAs). In addition, a scanning electron microscope equipped with an energy-dispersive X-ray microanalyser was used to identify the inorganic plastic additives (IPAs) contained in these particles. A total of ten particles, which were optically identified as potentially being plastics, were extracted from two sediment samples collected from Norderney, a North Sea island, by density separation in sodium chloride. The weights of these blue, white and transparent fragments varied between 10 and 350 mug. Polymer types were identified by comparing the resulting pyrograms with those obtained from the pyrolysis of selected standard polymers. The particles consisted of polyethylene (PE), polypropylene, polystyrene, polyamide, chlorinated PE and chlorosulfonated PE. The polymers contained diethylhexyl phthalate, dibutyl phthalate, diethyl phthalate, diisobutyl phthalate, dimethyl phthalate, benzaldehyde and 2,4-di-tert-butylphenol. Sequential Py-GC/MS was found to be an appropriate tool for identifying marine microplastics for polymer types and OPAs. The IPAs identified were titanium dioxide nanoparticles (TiO2-NPs), barium, sulphur and zinc. When polymer-TiO2 composites are degraded in the marine environment, TiO2-NPs are probably released. Thus, marine microplastics may act as a TiO2-NP source, which has not yet been considered.

Fritzler, M. J. and M. L. Fritzler (2009). "Microbead-based technologies in diagnostic autoantibody detection." Expert Opinion on Medical Diagnostics **3**(1): 81-89.

BACKGROUND: There is a rapid proliferation of new technologies to identify a spectrum of autoantibodies in medical conditions that range from organ-specific autoimmune diseases to systemic rheumatic diseases. Although many laboratories have adopted high-throughput diagnostic platforms such as enzyme linked immunoassays (ELISA), other technologies such as microbead-based assays are emerging as an alternative diagnostic platform.

OBJECTIVE: To understand the performance and importance of bead based immunoassays in clinical diagnostics and therapeutics.

METHOD: Current literature was reviewed using the PubMed search engine combining keywords of immunoassay and Luminex, as well as a personal literature database. Included in the evaluation and commentary are bead-based assays such as addressable laser bead immunoassays and related magnetic bead assays.

CONCLUSIONS: Comparison with other conventional technologies has indicated that laser microbead immunoassays are reliable, accurate, cost-effective, highly sensitive and have rapid turn around time for results. While there are advantages to this diagnostic platform, there are challenges that must be addressed before wider acceptance or long-term use of this technology platform in the routine clinical diagnostic laboratory.

Fromant, A., et al. (2016). "Wide range of metallic and organic contaminants in various tissues of the Antarctic prion, a planktonophagous seabird from the Southern Ocean." Science of the Total Environment **544**: 754-764.
Trace elements (n = 14) and persistent organic pollutants (POPs, n = 30) were measured in blood, liver, kidney, muscle and feathers of 10 Antarctic prions (Pachyptila desolata) from Kerguelen Islands, southern Indian Ocean, in order to assess their concentrations, tissue distribution, and inter-tissue and inter-contaminant relationships. Liver, kidney and feathers presented the highest burdens of arsenic, cadmium and mercury, respectively. Concentrations of cadmium, copper, iron, and zinc correlated in liver and muscle, suggesting that uptake and pathways of metabolism and storage were similar for these elements. The major POPs were 4,4′-DDE, mirex, PCB-153 and PCB-138. The concentrations and tissue distribution patterns of environmental contaminants were overall in accordance with previous results in other seabirds. Conversely, some Antarctic prions showed surprisingly high concentrations of BDE-209. This compound has been rarely observed in seabirds before, and its presence in Antarctic prions could be due to the species feeding habits or to the ingestion of plastic debris. Overall, the study shows that relatively lower trophic level seabirds (zooplankton-eaters) breeding in the remote southern Indian Ocean are exposed to a wide range of environmental contaminants, in particular cadmium, selenium and some emerging-POPs, which merits further toxicological investigations. [ABSTRACT FROM AUTHOR]

Frommel, U., et al. (2013). "Adhesion of human and animal Escherichia coli strains in association with their virulence-associated genes and phylogenetic origins." Applied and environmental microbiology **79**(19): 5814-5829.
Intestinal colonization is influenced by the ability of the bacterium to inhabit a niche, which is based on the expression of colonization factors. Escherichia coli carries a broad range of virulence-associated genes (VAGs) which contribute to intestinal (inVAGs) and extraintestinal (exVAGs) infection. Moreover, initial evidence indicates that inVAGs and exVAGs support intestinal colonization. We developed new screening tools to genotypically and phenotypically characterize E. coli isolates originating in humans, domestic pigs, and 17 wild mammal and avian species. We analyzed 317 isolates for the occurrence of 44 VAGs using a novel multiplex PCR microbead assay (MPMA) and for adhesion to four epithelial cell lines using a new adhesion assay. We correlated data for the definition of new adhesion genes. inVAGs were identified only sporadically, particularly in roe deer (Capreolus capreolus) and the European hedgehog (Erinaceus europaeus). The prevalence of exVAGs depended on isolation from a specific host. Human uropathogenic E. coli isolates carried exVAGs with the highest prevalence, followed by badger (Meles meles) and roe deer isolates. Adhesion was found to be very diverse. Adhesion was specific to cells, host, and tissue, though it was also unspecific. Occurrence of the following VAGs was associated with a higher rate of adhesion to one or more cell lines: afa-dra, daaD, tsh, vat, ibeA, fyuA, mat, sfa-foc, malX, pic, irp2, and papC. In summary, we established new screening methods which enabled us to characterize large numbers of E. coli isolates. We defined reservoirs for potential pathogenic E. coli. We also identified a very broad range of

colonization strategies and defined potential new adhesion genes.

Frond, H. L., et al. (2019). "Estimating the Mass of Chemicals Associated with Ocean Plastic Pollution to Inform Mitigation Efforts." Integrated Environmental Assessment & Management **15**(4): 596-606.
Plastic pollution in the marine environment is well documented. What remains less recognized and understood are the chemicals associated with it. Plastics enter the ocean with unreacted monomers, oligomers, and additives, which can leach over time. Moreover, plastics sorb organic and inorganic chemicals from surrounding seawater, for example, polychlorinated biphenyls (PCBs) and metals. Thus, interception and cleanup of plastics reduces the amount of chemical contaminants entering or reentering the oceans and removes those already present. Here, we estimate 1) the mass of selected chemical additives entering the global oceans with common plastic debris items, and 2) the mass of sorbed chemicals (using PCBs as a case study) associated with microplastics in selected locations. We estimate the mass of additives that entered the oceans in 2015 as constituents of 7 common plastic debris items (bottles, bottle caps, expanded polystyrene (EPS) containers, cutlery, grocery bags, food wrappers, and straws or stirrers). We calculate that approximately 190 tonnes (t) of 20 chemical additives entered the oceans with these items in 2015. We also estimate the mass of PCBs associated with microplastics in 2 coastal (Hong Kong and Hawaii) and 2 open ocean (North Pacific and South Atlantic gyres) locations, as comparative case studies. We find that the mass of chemicals is related to the mass of plastics in a location, with greater mass of PCBs closer to the source (i.e., land), where there is more plastic per unit area compared to the open ocean. We estimate approximately 85 000 times more PCBs associated with plastics in an average 4.5-km stretch of beach in Hong Kong than from the same size transect in the North Pacific gyre. In conclusion, continuing efforts for plastic interception and cleanup on shorelines effectively reduces the amount of plastic-related chemicals entering and/or reentering the marine environment. Integr Environ Assess Manag 2019;15:596–606. © 2019 SETAC Key Points: Plastic debris is more than a physical presence; it is also associated with a mixture of chemicals that can be removed from the ocean with prevention and cleanup.We estimate that 87 000 t of plastic bottles, bottle caps, expanded polystyrene (EPS) food and drink containers, cutlery, grocery bags, straws or stirrers, and food wrappers entered the ocean in 2015; approximately 190 t of 20 chemical additives entered the oceans with these plastic items.The amount of sorbed chemicals per unit area is greater on shorelines where there is more concentrated plastic litter, with approximately 85 000 times more PCBs in Hong Kong than in the North Pacific gyre.Continuing efforts for plastic interception and cleanup on shorelines, where there are more plastics, effectively reduces the amount of plastic-related chemicals entering and/or reentering the marine environment. [ABSTRACT FROM AUTHOR]

Fry, D. M., et al. (1987). Ingestion of plastic debris by Laysan albatrosses and wedge-tailed shearwaters in the Hawaiian Islands.
Surveys of Laysan albatross (Diomedea immutabilis) and wedge-tailed shear-waters on (Puffinus pacificus) on Midway and Oahu Island, Hawaii, identified a high proportion of birds with plastic in the upper gastrointestinal tract. Fifty Laysan Albatross chicks were examined for

plastic items lodged within the upper digestive tract. Forty-five (90%) contained plastic, including 3 chicks having proventricular impactions or ulcerative lesions. Plastic items in 21 live albatross chicks weighed a mean of 35.7 g/ chick super(-1) (range 1-175 g). Two of four adult albatross examined contained plastic in the gut. Twelve of 20 adult Wedge-tailed Shearwaters (60%) contained plastic particles 2-4 mm in diameter. Chemical toxicity of plastic polymers, plasticizers and antioxidant additives is low, although many pigments are toxic and plastics may serve as vehicles for the adsorption of organochlorine pollutants from sea water, and the toxicity of plastics is unlikely to pose a significant hazard.

Frydkjær, C. K., et al. (2017). "Ingestion and Egestion of Microplastics by the Cladoceran <i>Daphnia magna</i>: Effects of Regular and Irregular Shaped Plastic and Sorbed Phenanthrene." Bulletin of environmental contamination and toxicology **99**(6): 655-661.

The presence of microplastics in aquatic ecosystems is of increasing global concern. This study investigated ingestion, egestion and acute effects of polyethylene microplastics in Daphnia magna. Fate of regular shaped microplastic beads (10–106 µm) were compared with irregular shaped microplastic fragments (10–75 µm). Daphnia magna ingested regular and irregular microplastic with uptake between 0.7 and 50 plastic particles/animal/day when exposed to microplastic concentrations of 0.0001–10 g/L. Egestion of irregular fragments was slower than that of microplastic beads. The EC50 for irregular microplastic was 0.065 g/L whereas microplastic beads were less inhibitory. The potential of microplastic to act as vector for hydrophobic pollutants was examined using [14C]phenanthrene as tracer. Polyethylene microplastic sorbed less [14C]phenanthrene compared to natural plankton organisms (bacteria, algae, yeast). As microplastics are much less abundant in most aquatic ecosystems compared to plankton organisms this suggests a limited role as vector for hydrophobic pollutants under current environmental conditions.

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Fu, D., et al. (2019). "Aged microplastics polyvinyl chloride interact with copper and cause oxidative stress towards microalgae Chlorella vulgaris." Aquatic Toxicology **216**: 105319.

Microplastics (MPs) could pose potential risks to microalgae, the primary producer of marine ecosystems. Currently, few studies focus on the interaction of aged MPs with other pollutants and their toxic effects to microalgae. Therefore, the present study aimed to investigate i) the

aging of microplastics polyvinyl chloride (mPVC) in simulated seawater and the changes in physical and chemical properties; ii) the effects of single mPVC (virgin and aged) and copper on microalgae Chlorella vulgaris; and iii) the interaction of aged mPVC and copper and the oxidative stress towards C. vulgaris. In this study, some wrinkles, rough and fractured surface textures can be observed on the aged mPVC, accompanying with increased hydroxyl groups and aromatic carbon-carbon double bond but decreased carbon hydrogen bond. It was found that single virgin or aged mPVC at low concentration (10mg/L) had significant inhibition on the growth of C. vulgaris but no inhibition at higher concentration (100, 1,000mg/L), which can be reasonably explained by the aggregation and precipitation of mPVC at high concentration. The aging of mPVC inhibited the growth of C. vulgaris with the maximum growth inhibition ratio (IR) of 35.26% as compared with that of virgin mPVC (IR=28.5%). However, the single copper could significantly inhibit the growth of C. vulgaris and the inhibitory effects increased with concentration (0.2, 0.5, 1.0mg/L). Furthermore, both the single aged mPVC (10mg/L) and copper (0.5mg/L) caused serious cell damage, although the concentration of superoxide dismutase (SOD) and the intracellular malonaldehyde (MDA) increased. In contrast to single treatment, the growth of C. vulgaris can be enhanced by the combined group with copper (0.5mg/L) and aged mPVC (10mg/L).

Fu, S. F., et al. (2018). "Exposure to polystyrene nanoplastic leads to inhibition of anaerobic digestion system." Science of the Total Environment **625**: 64-70.

In this study, impacts of nanoplastic on the pure and mixed anaerobic digestion systems were investigated.

Fu, Z., et al. (2006). "Flow-injection chemiluminescent immunoassay for alpha-fetoprotein based on epoxysilane modified glass microbeads." Journal of Immunological Methods **312**(1-2): 61-67.

A flow-injection chemiluminescent immunoassay system based on a novel transparent immunoaffinity reactor is proposed for the quantitation of alpha-fetoprotein. The reactor prepared with alpha-fetoprotein immobilized epoxysilane modified glass microbeads was used as an immunosensor for chemiluminescent detection. With a non-competitive immunoassay format, the proposed immunosensor system is a low cost, flexible and rapid assay for alpha-fetoprotein. After an off-line incubation of the analyte alpha-fetoprotein with horseradish peroxidase-labeled alpha-fetoprotein antibody as enzyme tracer, the mixture was injected into the reactor, which led to trapping of the free enzyme tracer by the reactor. The trapped enzyme tracer was detected by the p-iodophenol-luminol-H2O2 chemiluminescence system. Under optimal conditions, the decrease in chemiluminescence intensity was proportional to the alpha-fetoprotein concentration in the range of 5.0-100 ng/ml with a detection limit of 2.7 ng/ml at a signal/noise ratio of 3. The immunosensor system showed an acceptable reproducibility and stability. Clinical serum samples were assayed with this method and the results were in acceptable agreement with those obtained from immunoradiometric assay.

Fu, Z. and J. Wang (2019). "Current practices and future perspectives of microplastic pollution in freshwater ecosystems in China." Science of the Total Environment **691**: 697-712.

The pollution of marine and freshwater environments by plastic waste has attracted increasing public attention worldwide in recent years. China is the world's second largest economy and contributes the largest mass of mismanaged plastic waste. In this review, we collected accessible data on the abundance of microplastics in China's freshwater ecosystems, analyzing this pollutant in the samples of waters, sediments and biota. The results showed that microplastics are pervasive in surveyed freshwater environments, and a high abundance of microplastics was found in estuaries and inland waters located in populated urban areas. Moreover, many freshwater bivalve and fish have been found to uptake microplastics. Although similar sampling and laboratory processing methods were applied for microplastic research in different aquatic ecosystems, methods of investigation and units reported by different authors should be standardized. The characteristics of the detected microplastics showed that small size (<1 mm), fibers and transparency were the most common features in China's freshwater ecosystems and that PP and PE were the most common types of microplastics. The current situation of microplastic pollution in China is largely caused by inefficient administration and lack of applicable legislation and regulations. Therefore, we suggest that the Chinese government need to be more active in dealing with the plastic pollution issues, and increase education and publicity to promote people's awareness of environmental pollution caused by microplastics. Copyright © 2019 Elsevier B.V.

Fuente-Cuesta, A., et al. (2012). "Biomass gasification chars for mercury capture from a simulated flue gas of coal combustion." Journal of Environmental Management **98**: 23-28.

The combustion of coal can result in trace elements, such as mercury, being released from power stations with potentially harmful effects for both human health and the environment. Research is ongoing to develop cost-effective and efficient control technologies for mercury removal from coal-fired power plants, the largest source of anthropogenic mercury emissions. A number of activated carbon sorbents have been demonstrated to be effective for mercury retention in coal combustion power plants. However, more economic alternatives need to be developed. Raw biomass gasification chars could serve as low-cost sorbents for capturing mercury since they are sub-products generated during a thermal conversion process. The aim of this study was to evaluate different biomass gasification chars as mercury sorbents in a simulated coal combustion flue gas. The results were compared with those obtained using a commercial activated carbon. Chars from a mixture of paper and plastic waste showed the highest retention capacity. It was found that not only a high carbon content and a well developed microporosity but also a high chlorine content and a high aluminium content improved the mercury retention capacity of biomass gasification chars. No relationship could be inferred between the surface oxygen functional groups and mercury retention in the char samples evaluated.

Fuentes Talavera, F. J., et al. (2007). "Effect of production variables on bending properties, water absorption and thickness swelling of bagasse/plastic composite boards." Industrial Crops and Products **26**(1): 1-7.

Composite boards of sugar cane bagasse particles and recycled high-density polyethylene were manufactured by means of a flat press process under laboratory conditions using a partial factorial experimental design (2^{K-1}) to determine the effects of the process variables press temperature, pressing time, bagasse/plastic content and pressure on bending properties, water absorption and thickness swelling. The sugar cane bagasse particles varied in size from 2 to 15 mm, the plastic particles from 1 to 3 mm. Nominal board dimensions and density were 300 mm x 300 mm x 5 mm and 0.75 g/cm³, respectively. The following process conditions were implemented: press temperature 140 and 160 degrees C, pressing time 6 and 12 min, bagasse/plastic content 40/60% and 60/40%, and pressure 3 and 6 MPa. Bending strength (MOR) and bending modulus of elasticity (MOE) increased proportionally with press temperature and pressing time. An increase of the bagasse content had a positive effect only on bending MOE. An increase in pressure had a negative effect on both bending strength and MOE. Water absorption and thickness swelling were reduced significantly by an increase in temperature and pressing time, whereas variation of pressure did not have any influence on these board properties.

Fueser, H., et al. (2019). "Ingestion of microplastics by nematodes depends on feeding strategy and buccal cavity size." Environmental Pollution **255**(Part 2).

Microplastics are hardly biodegradable and thus accumulate rather than decompose in the environment. Due to sedimentation processes, meiobenthic fauna is exposed to microplastics. Within the meiofauna, nematodes are a very abundant taxon and occupy an important position in benthic food webs by connecting lower and higher trophic levels. However, the key determinants of the uptake of microplastics by freshwater nematodes are still unknown. To investigate the bioaccessibility of microplastics for nematodes, we performed single- and multi-species ingestion experiments in which the ability of seven nematode species (six bacterial and one fungal feeder), diverse in their buccal cavity morphology (1.3-10.5 micro m), to ingest fluorescence-labelled polystyrene (PS) beads along with their natural diet was examined. Applied beads sizes (0.5, 1.0, 3.0 and 6.0 micro m), exposure time (4, 24 and 72 h) and concentration (3x10⁶ PS beads ml⁻¹ and 10⁷ PS beads ml⁻¹) were varied. Ingested beads were localized and quantified via fluorescence microscopy in the nematodes. In contrast to fungal-feeding nematode species with a stylet, bacterial-feeding species ingested 0.5- and 1.0- micro m PS beads with up to 249 and 255 beads after 24 h, respectively. Microplastics >=0.5 micro m could only be ingested and transported into the gastrointestinal tract, if the buccal cavities were considerably (>1.3 times) larger than the beads. At concentrations of 10⁷ PS beads ml⁻¹ ingestion rates were influenced by exposure time and PS bead concentration. In case of a known microplastic size distribution in the environment, predictions on the potential ingestion for nematode communities can be made based on the feeding type composition and the size of their buccal cavities.

Fugetsu, B., et al. (2004). "Encapsulation of multi-walled carbon nanotubes (MWCNTs) in Ba(2+)-alginate to form coated micro-beads and their application to the pre-concentration/elimination of dibenzo-p-dioxin, dibenzofuran, and biphenyl from contaminated water." Analyst **129**(7): 565-566.

We report preliminary data on the first use of multi-walled carbon nanotubes as adsorbents for the pre-concentration/elimination of dibenzo-p-dioxin, dibenzofuran and biphenyl from contaminated water.

Fujii, M., et al. (2012). "Smart recycling of organic solid wastes in an environmentally sustainable society." Resources, Conservation & Recycling **63**: 1-8.

Abstract: The organic fraction of municipal solid waste (MSW), such as plastics and paper, is commonly recycled in Japan, but a considerable room for improvement still remains. Energy intensive industries, such as steel, cement, paper, and power plants, have great capacities to accept waste plastics and paper to substitute their fossil resource consumption and to reduce carbon emissions. We propose a “smart recycling system” that utilizes existing industrial facilities that have high energy efficiency, for establishing a cost-effective and robust recycling system. The core of the smart recycling system is the smart recycling center (SRC) that establishes a new recycling pathway connecting spatially diffuse municipal sources to facilities in energy intensive industries. This paper discusses the design and function of an SRC and estimates the CO2 emissions and costs related to the operation and construction of the SRC. We also evaluated the cost effectiveness of the smart recycling system, taking into account sorted collection, incineration, processes in the SRC, and processes in industrial facilities. We estimated

that the system could result in a reduction of approximately 100kg of CO2 emissions per capita per year without a significant increase in cost. [Copyright &y& Elsevier]

Fujino, N., et al. (2011). "A new flow-cytometric method for isolating component cells individually from adult human distal lungs." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **183**(1 MeetingAbstracts).

RATIONALE: Constituent cells of the alveolar walls are approximately divided into three cell types: epithelial, mesenchymal and endothelial cells. These three cell-populations work together to maintain homeostasis and repair process of the lungs. Therefore, comprehensive analysis of the role of these cell populations in lung diseases is essential for better understanding of the pathophysiology and for discovering novel therapies. The aim of this study it to establish a new method for isolating each component cell from adult human distal lungs. METHODS We enzymatically digested human lung tissues obtained from thoracic surgery and prepared single cell suspensions. Hematopoietic cells were depleted with anti-CD45 antibody-coated microbeads. We sorted cell-populations by FACS based on staining pattern of the following antigens; EpCAM/E-cadherin (markers for epithelial cells), T1alpha (a marker for lymphatic endothelial and alveolar type I cells) and VE-cadherin (a marker for endothelial cells). Sorted cells were characterized by immunostaining, RT-PCR and subsequent culture. This study was approved by the Ethics Committee at Tohoku University School of Medicine and all subjects gave informed consent. RESULTS CD45-negative lung cells were divided into sub-populations based on the expression pattern of EpCAM, E-cadherin and T1alpha. The EpCAM/E-cadherin-highly positive subset without expression of T1alpha expressed surfactant protein-C (SP-C) but not Clara cell-specific protein (CCSP) or aquaporin 5 (AQP5), suggesting that alveolar type II cells were enriched in this subset. The other EpCAM/E-cadherin positive subset with no or low expression of T1alpha expressed CCSP and AQP5, but not SP-C, indicating that this EpCAM/E-cadherin-positive subset contained alveolar type I cells and bronchiolar epithelial cells including Clara cells. The T1alpha(hi) cells were thought to be lymphatic endothelial cells based on the positive expression of another lymphatic endothelial marker (VEGFR3). The EpCAM(-)/E-cadherin(-)/T1alpha subset was distinctively divided into a vascular endothelial population and a mesenchymal population based on the VE-cadherin expression. The VE-cadherin(+) cells expressed other vascular endothelial merkers (PECAM-1 and KDR), while the VE-cadherin(-) cells expressed markers for fibroblasts or pericytes, such as alpha-SMA. CONCLUSION This systematic approach facilitates comprehensive analysis of the lung component cells.

Fujino, Y., et al. (2013). "Art outcome of non-apoptotic spermatozoa selected by magnetic-activated cell sorting with annexin v-conjugated microbeads." Fertility and Sterility **1)**: S433.

OBJECTIVE: ART is a popular treatment but success rate remains still low. One of the reason may be the inclusion of sperm apoptosis. Magnetic activated cell sorting(MACS) with annexin-V microbeads recognizes externalized phosphatidylserine residues on the surface of apoptotic sperm. The aim of this study is to compare the outcome of ART using non-apoptotic sperm using with Annexin V-MACS and that of usual method. DESIGN: Clinical study. MATERIALS AND

METHODS: Twenty-three patients were received ovarian stimulation with clomiphene and hMG. Oocytes were retrieved at 32 hrs later after GnRHa spray. Motile sperm were selected by density- gradient centrifugation. One aliquot of sperm suspension was used for fertilization by usual method, the other aliquot by Annexin VMACS. Oocytes(N=64) in each case were divided into two, 34 oocytes were fertilized with the sperm by usual method (C) and 30 oocytes by Annexin V-MACS(VM). After fertilization and culture, one embryo was transferred in 14 cases(9:C, 5:VM). Another embryos were frozen with vitrification method. Fertilization, cleavage, growth rate and pregnancy rate were compared in two groups. Data were statically analyzed by c2test. RESULT(S): The mean concentration of sperm was 50.1x10[sup6]/ml and motility was 57% before the separation. After the separation, the mean concentration of sperm was 24.8x10[sup6]/ml and motility was 91% in "C", and that of 41.9x10[sup6]/ml and 92% in "VM", respectively. Fertilization rate was 88.2% and cleavage rate was 100% and blastocyst development rate was 36.7% in "C", and that was 90%, 85.2% and 33.3% in "VM", respectively. Pregnancy rate in transferred cases was 44.4%(C) and 40%(VM), respectively. There were no significant differences between two groups. CONCLUSION(S): The annexin V-MACS has the potential to benefit ART for the selection of apoptotic sperm. However, we cannot find any significant advantage in V-MACS procedure from this study. A larger scale prospective randomized study is required to evaluate the value of this technique.

Fujishiro, A., et al. (2015). "Vitamin K2 supports hematopoiesis through acting on bone marrow mesenchymal stromal/stem cells." Blood **126 (23)**: 1192.

[Background] Myelodysplastic syndrome is an intractable disorder characterized by ineffective hematopoiesis. Although allogeneic hematopoietic stem cell transplantation is the only curative therapy for eligible patients, hematopoiesis-supportive pharmacotherapy is practically important for transplant-ineligible patients to overcome transfusion dependency and infections. Vitamin K2 (VK2, menatetrenone) is a drug used to aim at improvement of hematopoiesis in MDS patients (Leukemia 14: 1156, 2000). However, the exact mechanism how VK2 improves hematopoiesis remains largely unknown. It was reported that VK2 induces MDS cells to undergo apoptosis (Leukemia 13: 1399, 1999). Here, we investigated our hypothesis that VK2 exerts its hematopoiesis-supportive effects through acting on mesenchymal stem/stromal cells (BM-MSCs) in the bone marrow microenvironment. [Methods] Normal bone marrow (BM) samples from healthy adult volunteers were purchased from AllCells (Emeryville, CA). BM-CD34⁺ cells were isolated from BM-mononuclear cells using anti-CD34 immunomagnetic microbeads (Miltenyi Biotec, Bergisch Gladbach, Germany). Human BM-MSCs were isolated according to our previously published methods (Stem Cells 32:2245, 2014). In co-culture experiments, BM-MSCs with or without VK2 treatment were seeded on a 24-well culture plate. BM-CD34⁺ cells were applied on the MSC-grown plate and co-cultured in SFEM (StemCell Technologies, Vancouver, Canada) supplemented with 100 ng/mL SCF, 100 ng/mL Flt-3 ligand, 50 ng/mL TPO and 20 ng/mL IL-3. After 10 days of co-culture, the number and surface marker expression of the expanded hematopoietic cells were examined by flow cytometric analysis. [Results] We first tested the direct effect of VK2 on BM-CD34⁺ cells. BM-CD34⁺ cells were treated with VK2 at various concentrations ranged from 0 muM to 10 muM for 24 hours and then cultured in SFEM in combinations with cytokines. Surprisingly, viable hematopoietic cells were hardly detected in the expansion culture of BM-CD34⁺ cells treated with 10 muM VK2. Even with 1 muM treatment, the number of CD45+ cells was decreased, as compared to that of expansion culture of untreated BM-CD34⁺ cells. The apoptosis analysis showed that the percentage of AnnexinV+ PI+ cells in the expanded hematopoietic cells is increased by VK2 treatment. We next examined the effect of VK2 on the hematopoiesis-supportive capability of BM-MSCs. BM-MSCs were pretreated with VK2 at various concentrations and then co-cultured with BM-CD34⁺ cells. The numbers of CD34⁺ cells and CD45+ cells were increased in a VK2 dose-dependent manner. These results demonstrated that VK2 shows different effects on distinct stem/progenitor cells: the induction of apoptosis in BM-CD34⁺ cells and the enhancement of hematopoiesis-supportive capability of BM-MSCs. We then investigated whether apoptosis-related cell death of BM-CD34⁺ cells by VK2 treatment is ameliorated in the presence of BM-MSCs. Both BM-CD34⁺ cells and BM-MSCs were treated with VK2 for 24 hours, and then co-cultured. The number of CD34⁺ cells was not decreased significantly in contrast to its severe decrease in single culture of VK2-treated BM-CD34⁺ cells. We further analyzed the effect of VK2 on BM-MSCs. Subpopulation analysis in co-culture of CD34⁺ cells with VK2-treated BM-MSCs showed that the expansion efficacy of CD34⁺CD38⁺ cells is higher in comparison to that of CD34⁺CD38- cells. In addition, the percentages of CD34-CD33+ cells and CD34-CD13+ cells were higher than those in co-cultures with untreated BM-MSCs. Therefore, VK2-treated BM-MSCs supported the expanded CD34⁺ cells to skew their phenotype toward myeloid lineage. The presence of a transwell in the co-culture system was unrelated to the expansion pattern of CD34⁺ cells, which suggested the involvement of soluble factors with respect to the underlining mechanism. We there ore compared the levels of hematopoiesis-supporting cytokine mRNA expression in VK2-treated and untreated BM-MSCs: VK2-treated BM-MSCs showed lower expression of CXCL12/SDF-1 mRNA and a trend toward higher expression of GM-CSF mRNA. [Summary] VK2 acted on BM-MSCs to support their ability to enhance expansion and myeloid differentiation of BM-CD34⁺ cells probably via altered GM-CSF and CXCL12/SDF-1 expression in MSCs. These findings may help to identify the mechanisms of therapeutic effects of VK2 in patients with MDS (Figure).

Fujiyama, T., et al. (2013). "Increased frequency of skin-infiltrating Th17 cells is associated with interstitial lung disease and hyperkeratotic eruptions in dermatomyositis patients." Journal of Investigative Dermatology **1)**: S35.

Dermatomyositis (DM) is an autoimmune disorder clinically characterized by skin eruptions, muscle weakness, autoantibodies, and occasional interstitial lung disease (ILD) and internal malignancy. Recently, DM has been reclassified into several subtypes according to the autoantibodies. ILD frequently occurs in the anti-aminoacyl-tRNA synthetase (ARS) antibody+ type and anti-CADM-140 antibody+ type. Meanwhile, the pathogenesis of skin eruptions in DM remains unfully elucidated. We sought to investigate the association of the eruptions with ILD, focusing on the skin-infiltrating T cells. Fourteen newly diagnosed DM patients were enrolled in this study, and skin biopsies were taken from markedly erythematous lesions. Eight patients had active ILD with elevated serum KL-6 levels (>=500 U/ml), while 6 had no detectable ILD with normal KL-6 levels (<500 U/ml). By immunofluorescence staining of the affected lesional skin, IL-17+ cells were observed in the majority of cases at various frequencies. We expanded skin-infiltrating T cells with IL-2 and anti-CD3/CD28 antibody-coated microbeads. T cells from DM patients with ILD produced significantly higher amounts of IL-17 in the culture supernatants than did those from DM patients without ILD (P=0.036). Flow cytometric analysis of the expanded T cells showed that they were positive for CD4 and CCR6, indicating Th17 cells. We found that this Th17 population was increased in skin-infiltrating cells from DM patients with ILD (mean, 1.9%) compared to those without ILD (mean, 0.2%). When the skin lesions were clinically divided into 4 grades in hyperkeratosis intensity, the patients with ILD exhibited significantly marked hyperkeratosis (top 2 grades, 7/8) and mimicked psoriasis as compared to those without ILD (2/7). Our study suggests that the frequency of skin-infiltrating Th17 cells and their cytokine production are increased in DM patients with ILD, and they preferentially manifest hyperkeratotic psoriasiform skin eruptions.

Fujiyama, T., et al. (2018). "Skin-infiltrating MDR1-expressing T cells are associated with therapeutic responsiveness to corticosteroids in severe cutaneous adverse reactions of drugs." Clinical and Translational Allergy. Conference: 8th Drug Hypersensitivity Meeting, DHM **8**(Supplement 3).

Background Systemic corticosteroid administration is the mainstay of therapeutic strategy for severe cutaneous adverse reactions (SCARs) of drugs. However, some cases are resistant to the treatment and occasionally need additional or alternative treatments to abrogate the inflammatory responses. It is believed that the type of eruptions, the severity of the inflammation and the clearance of the causative drugs are the main factors to influence on the responsiveness of corticosteroids. In addition to these factors, we hypothesized that there are some variations in the corticosteroid sensitivity of skin-infiltrating T cells, containing major effector cells concerned with drug eruptions. Multidrug resistance protein 1 (MDR1, CD243; also known as P-glycoprotein 1), capable of pumping many foreign substances out of the cells, is associated with corticosteroid resistance of T cells in certain diseases. Methods In this study, we investigated skin-infiltrating T cells from nine cases of drug eruption, including four cases of Stevens-Johnson syndrome or toxic epidermal necrolysis (SJS/TEN), four cases of drug-induced hypersensitivity syndrome or drug reaction with eosinophilia and systemic symptoms (DIHS/DRESS), and one case of fixed drug eruption (FDE). Skin-infiltrating T cells were expanded from skin biopsy specimen using IL-2 and anti-CD3/CD28 mAb-coated microbeads, and MDR1 gene and protein expressions were assessed by RT-PCR and flow cytometry, respectively. The function of MDR-1 was assessed by Rhodamine 123 efflux assay. Results In our preliminary study, we confirmed that the gene expression of MDR-1 was correlated with its function. The function of MDR-1 in T cells was not affected by the cultivation and stimulation process, while it was suppressed by cyclosporine A, an inhibitor of MDR-1. As assessed by cell survival assay, MDR-1+ cells were resistant to the in vitro treatment of corticosteroid. In all cases, both CD4+ and CD8+ T cells contained functional MDR-1+ T cells, and there was no significant difference in the frequency of MDR-1+ cells between SJS/TEN and DIHS/DRESS. However, the frequency of MDR-1+ tended to be higher in the patients who had previously received corticosteroid treatment. A case of FDE also showed a high frequency of MDR1+ T cells. MDR-1+ T cells produced IFNgamma in a SJS case, and both IFN-gamma and IL-4 in a DIHS case. Conclusion These results suggest that MDR-1+ cells contain T cells pathogenic for drug eruptions, and a medication history of previously used corticosteroids leads to a high frequency of MDR-1+ cells, resulting in the decreased sensitivity to corticosteroid treatment.

Fujiyama, T., et al. (2014). "Preferential infiltration of interleukin-4-producing CXCR4+ T cells in the lesional muscle but not skin of patients with dermatomyositis." Clinical & Experimental Immunology **177**(1): 110-120.

Dermatomyositis (DM) and polymyositis (PM) are collectively termed autoimmune myopathy. To investigate the difference between muscle- and skin-infiltrating T cells and to address their role for myopathy, we characterized T cells that were directly expanded from the tissues. Enrolled into this study were 25 patients with DM and three patients with PM. Muscle and skin biopsied specimens were immersed in cRPMI medium supplemented with interleukin (IL)-2 and anti-CD3/CD28 antibody-conjugated microbeads. The expanded cells were subjected to flow

cytometry to examine their phenotypes. We analysed the cytokine concentration in the culture supernatants from the expanded T cells and the frequencies of cytokine-bearing cells by intracellular staining. There was non-biased in-vitro expansion of tissue-infiltrating CD4(+) and CD8(+) T cells from the muscle and skin specimens. The majority of expanded T cells were chemokine receptor (CCR) type 7(-) CD45RO(+) effecter memory cells with various T cell receptor (TCR) Vbetas. The skin-derived but not muscle-derived T cells expressed cutaneous lymphocyte antigen (CLA) and CCR10 and secreted large amounts of IL-17A, suggesting that T helper type 17 (Th17) cells may have a crucial role in the development of skin lesions. Notably, the frequency of IL-4-producing chemokine (C-X-C motif) receptor (CXCR)4(+) Th2 cells was significantly higher in the muscle-derived cells and correlated inversely with the serum creatine phosphokinase (CPK) and lactate dehydrogenase (LDH) levels. stromal-derived factor (SDF)-1/CXCL12, a ligand for CXCR4, was expressed at a high level in the vascular endothelial cells between muscular fasciculi. Our study suggests that T cell populations in the muscle and skin are different, and the Th2 cell infiltrate in the muscle is associated with the low severity of myositis in DM.

Fujiyama, T., et al. (2013). "Tug-of-war between IFN-gamma-producing CD8 + T cells and IL-4-producing CD4 + T cells destines the severity of muscle injury in dermatomyositis." Journal of Dermatological Science **69 (2)**: e11.

Objective. Dermatomyositis (DM) is an autoimmune disorder characterized by inflammation of muscles and skin. Although it seems mediated by autoreactive lymphocytes, the mechanisms remain poorly understood. The aim of this study was to directly characterize pathogenic T-lymphocytes in their phenotype and function after expansion from skin and muscle lesions using the method that we have recently established. Methods. We expand T lymphocytes of skin and muscle biopsy specimens from 15 DM patients by the method that we have established using IL-2 and anti-CD3/CD28 Ab-coated microbeads, and investigated their phenotypes, T cell receptor (TCR) Vb usage, chemokine receptors and cytokine profiles. Results. Our observations demonstrated 1) the presence of type-1 and type-2 T cells in muscle lesions, 2) accumulation of antigen-reactive T cells comprising IL-4-producing CD4 + T cells and CD8 + T cells in muscle lesions and 3) negative correlation of the ratios of IL-4/IFN-gamma in the muscle-resident T cell cultures to muscle damage parameters, serum CPK and LDH. Conclusions. Our observations suggest that a tug of war between IFN-gamma-producing CD8 + T-lymphocytes that augment inflammation and IL-4-producing CD4 + T-lymphocytes that abrogate inflammation destines grade of muscle injury of DM.

Fujiyama, T., et al. (2019). "154 MDR1-expressing T cells accumulate in the resolved skin of psoriatic plaque after treatment with topical corticosteroid but not with anti-IL-17A mAb." Journal of Investigative Dermatology **139 (9 Supplement)**: S240.

Topical corticosteroid is a widely used for treatment of psoriasis. However, its long-term use may bring about resistance to the treatment. We have previously shown that multiple drug resistance 1 (MDR1)-expressing T cells infiltrate in the skin lesions of psoriasis, especially at the skin treated with a corticosteroid. Corticosteroids are a substrate of MDR1, and possible association of MDR1+ T cells and corticosteroid resistance has been documented in some diseases. Since MDR1+ T cells in psoriatic skin include a large number of IL-17A and IL-22-producing cells, they can be associated with corticosteroid resistance. In this study, we sought to clarify whether the blockade of IL-17A by Secukinumab affects MDR1 expression. We analyzed stocked T cells expanded by IL-2 and anti-CD3/CD28 mAb-coated microbeads from biopsy specimens taken from the skin of 7 patients treated with topical corticosteroid and from

the skin of 6 patients treated with Secukinumab. The function of MDR1 was investigated by Rh123 efflux assay. Rh123^{low} cells expressed ABCB1 gene, while Rh123^{hi} cells did not. In addition, verapamil, a specific inhibitor of MDR1 depressed the efflux of Rh123 at 94.0+/-2.3 percent, and thus, we considered Rh123^{low} cells as MDR1+ cells. In vitro treatment of a corticosteroid significantly increased the frequency of MDR1+ cells (P=0.02). The frequency of MDR1+ T cells was significantly higher in the corticosteroid-treated skin than in Secukinumab-treated patients' skin (P=0.01). Notably, this difference was more apparent in CD4+ T cells than in CD8+ T cells. Our results suggest that, unlike corticosteroid-treated skin, MDR1+ T cells do not accumulate in the skin of Secukinumab-treated patients. While anti-IL-17A mAb more strongly improves psoriasis than do topical corticosteroids, it renders remaining skin T cells susceptible to corticosteroid treatment. Copyright © 2019

Fujiyama, T., et al. (2018). "Skin-infiltrating Th17/Tc17 and Th1/Tc1cells are significantly decreased and IL-17+ CD103+ resident memory T cells partly remain after secukinumab treatment." Journal of Investigative Dermatology **138 (5 Supplement 1)**: S96.

IL-17-producing T cells are involved in the pathogenesis of psoriasis, and the blockade of IL- 17 by monoclonal antibodies dramatically improves the clinical symptoms of psoriasis. However, their effects on T cells in the patients skin is not fully investigated. To evaluate the alteration of skin-infiltrating T cells in response to the secukinumab, an IL-17A mAb therapy, we used our established method for ex vivo expansion of skin-infiltrating T cells from biopsied skin using IL-2 and anti-CD3/CD28 mAb-coated microbeads. Ten patients with psoriasis vulgaris were enrolled in this study. Four-mm punch skin biopsies were performed from lesional and non-lesional skin before treatment, 4 and 24 weeks after the treatment. The posttreatment biopsies were conducted from the skin where the first biopsy had been performed. In each time, a half of the biopsy specimens were used for T cell expansion and the other half was subjected to histology and immunostaining. After 2 weeks of expansion, the number of the cells and their cytokine profile were assessed using flow cytometry. We found that the numbers of total expanded T cells, and IFN-gamma and IL-17-producing CD4+ and CD8+ T cells from the lesional skin were significantly higher than those from non-lesional skin. These Th1/ Tc1 and Th17/Tc17 populations were decreased in the improved skin at 24 weeks after the therapy. The frequency of each cytokine-producing cells was not affected by the therapy. CD103+ resident memory T cells (TRM) were also expanded, and at 24 week-post-treatment, they contained a significantly higher frequency of IL-17-producing T cells than CD103- T cells. These results suggest that the blockade of IL-17 inhibits the local inflammatory loop of psoriasis by suppressing infiltration of IL-17-producing T cells, while a certain IL-17-producing TRM population remains in the skin even after the 24-week post-treatment.

Fuller, M., et al. (2011). "Screening patients referred to a metabolic clinic for lysosomal storage disorders." Journal of Medical Genetics **48**(6): 422-425.

Background: Lysosomal protein profiling is being developed as a high throughput method to screen populations for lysosomal storage disorders (LSD). Design(s): 1415 blood spots from patients referred to a metabolic clinic for LSD were screened using a single multiplex assay for 14 proteins in a dried blood spot. Results All patients with Pompe disease, metachromatic leukodystrophy, and mucopolysaccharidosis (MPS) type I, IIIA, IIIB and VI were identified by reduced lysosomal protein. Five samples were identified as possible pseudoarylsulfatase A deficiency; four were confirmed. One multiple sulfatase deficiency patient was identified with multiple reduced sulfatase proteins. There were 10 MPS II patients identified with reduced

iduronate 2-sulfatase, and one MPS II patient with iduronate 2-sulfatase in the unaffected range. For Fabry disease, 10 male patients were identified with reduced a-galactosidase and 2/6 female Fabry heterozygotes returned a-galactosidase concentrations in the male Fabry range. All 10 mucolipidosis II/III patients were identified with multiple raised proteins. For 79 blood spots with chitotriosidase >3.4 mg/l, a follow-up one-plex chitotriosidase assay enabled identification of all nine Gaucher patients. Conclusion(s): This study demonstrates the sensitivity and specificity of this technology to accurately identify 99% of LSD patients, with the exception of one MPS II false negative.

Fuller, S. and A. Gautam (2016). "A Procedure for Measuring Microplastics using Pressurized Fluid Extraction." Environmental Science & Technology **50**(11): 5774-5780.

A method based on pressurized fluid extraction (PFE) was developed for measuring microplastics in environmental samples. This method can address some limitations of the current microplastic methods and provide laboratories with a simple analytical method for quantifying common microplastics in a range of environmental samples. The method was initially developed by recovering 101% to 111% of spiked plastics on glass beads and was then applied to a composted municipal waste sample with spike recoveries ranging from 85% to 94%. The results from municipal waste samples and soil samples collected from an industrial area demonstrated that the method is a promising alternative for determining the concentration and identity of microplastics in environmental samples.

Fultz, K. (2019). UP AHEAD. Water Quality Products. Arlington Heights, Scranton Gillette Communications Inc. **24:** 10.

A proposed legislative or regulatory idea often takes more than one government session to gain the necessary traction and support to pass. During this time, provisions are amended and stakeholders lend expertise. In drinking water, the hot topics have been lead and per- and polyfl uoroalkyl substances (PFAS). Reviewing proposed legislation and regulations can provide some indication of drinking water concerns ahead. Beyond lead and PFAS concerns, proposed legislation considers other emerging contaminants including manganese, perchlorate, and microplastics.

Funane, T., et al. (2018). "Selective plane illumination microscopy (SPIM) with time-domain fluorescence lifetime imaging microscopy (FLIM) for volumetric measurement of cleared mouse brain samples." Review of Scientific Instruments **89**(5): 053705.

We have developed an imaging technique which combines selective plane illumination microscopy with time-domain fluorescence lifetime imaging microscopy (SPIM-FLIM) for three-dimensional volumetric imaging of cleared mouse brains with micro- to mesoscopic resolution. The main features of the microscope include a wavelength-adjustable pulsed laser source (Ti:sapphire) (near-infrared) laser, a BiBO frequency-doubling photonic crystal, a liquid chamber, an electrically focus-tunable lens, a cuvette based sample holder, and an air (dry) objective lens. The performance of the system was evaluated with a lifetime reference dye and micro-bead phantom measurements. Intensity and lifetime maps of three-dimensional human embryonic kidney (HEK) cell culture samples and cleared mouse brain samples expressing green fluorescent protein (GFP) (donor only) and green and red fluorescent protein [positive Forster (fluorescence) resonance energy transfer] were acquired. The results show that the SPIM-FLIM system can be used for sample sizes ranging from single cells to whole mouse organs and can serve as a powerful tool for medical and biological research.

Fung, Y. L. (2010). "Developments in the de tection of HNA and HLA antibodies." Vox Sanguinis **2)**: 9.

In the last decade there has been a resurgence of interest in neutrophil (PMN) reactive antibodies because antibodies to HNA- 1a, -1b, -2a and 3a have been associated with and implicated in TRALI events, which have been the top cause of transfusion related fatalities in the US (Holness, ABC Newletter 2007#12). Assays for detecting PMN antibodies include the granulocyte agglutination test (GAT), granulocyte immunofluorescence test (GIFT), and monoclonal antibody immobilisation of granulocyte antigen (MAIGA). However, because these assays are labour intensive and dependent on isolated viable PMNs, they are unsuitable for high throughput screening of blood donors to minimise the risk of TRALI. The use of solid phase assays for PMN antibodies may potentially address this problem, but published reports are scarce. Alternatively, transfected cells expressing HNA (Yasui et al. Transfusion 2007 & 2008) could potentially be a unlimited source of HNA for mass screening. In contrast, HLA antibodies which been associated in multiple TRALI events can easily be tested by high throughput and sensitive solid phase platforms. Briefly, soluble or recombinant HLA molecules are attached to solid phase media e.g. ELISA or microbeads, and bound antibodies are detected by changes in optical density (ELISA) or fluorescence detection (microbead). Studies indicate the following sensitivity; microbead assay > ELISA > antiglobulin-enhanced cytotoxicity based assay (Gebel et al. Transplantation 2000). Such sophisticated technology however appears to be over sensitive for screening donors for TRALI antibodies, as two studies show a disproportionately small number of detected HLA antibodies actually induce TRALI (Cooling et al. JAMA 2002, Toy et al. Transfusion 2004). This would suggest that the blanket application of antibody detection systems for different clinical applications (e.g. transplant in contrast to TRALI) is not always be suitable, and could unnecessarily reduce blood donor numbers. While we may be able to detect HNA and HLA antibodies, questions remain as to; Why do some antibodies (anti-HNA-3a, anti-HLA-A2) cause more severe reactions than others? Why does an antibody cause a reaction in one recipient and not another with the cognate antigen? Detailed studies of implicated antibodies may provide answers to these questions, as a study comparing anti-HNA-2a sera from ANN and TRALI cases demonstrated that although all 5 sera had the same specificity they had different titers, and variable serological and epitope preferences (Hassell et al. AABB 2009 abstract). In conclusion, even though HNA and HLA antibodies are implicated in both alloimmune neonatal neutropenia (ANN) and TRALI their underlying pathogenetic mechanisms are quite distinct. An effective antibody testing system for TRALI can only be developed by considering the underlying pathogenetic mechanisms.

Furlow, M. and S. L. Diamond (2011). "Interplay between membrane cholesterol and ethanol differentially regulates neutrophil tether mechanics and rolling dynamics." Biorheology **48**(1): 49-64.

Using microfluidic assays at a 100 s-1 wall shear rate, we examined the effects of ethanol on cholesterol-loaded neutrophils with respect to: (1) collision efficiency and membrane tethering to P-selectin-coated microbeads, (2) rolling on P-selectin-coated surfaces, and (3) primary and secondary interactions with neutrophils pre-adhered to intercellular adhesion molecule-1 (ICAM-1). Using methyl-beta-cyclodextrin:cholesterol complexes, membrane cholesterol was increased over control by 4.6-fold (no ethanol), 3.6-fold (0.3% ethanol pre-loading), and 1.6-fold (0.3% ethanol post-loading). These treatments did not alter CD11b expression; however, PSGL-1 and L-selectin were lowered by cholesterol enrichment (+/-ethanol). Cholesterol enrichment enhanced microbead collision efficiency, which was abrogated by ethanol. Ethanol had no effect on elevation of tethering fraction by cholesterol enrichment. Incubation of cholesterol-loaded neutrophils with ethanol resulted in significantly longer membrane tethers, due to tether lifetime enhancement. On P-selectin-coated surfaces, cholesterol-enriched neutrophils exposed

to ethanol rolled faster and with more variability than cholesterol-enriched neutrophils. Ethanol reduced homotypic collision efficiency of cholesterol-loaded neutrophils without effect on tethering fraction or secondary collision efficiency. Tether length during cholesterol-loaded neutrophil homotypic collisions was enhanced by ethanol, in part due to increased L-selectin/PSGL-1 bond tether lifetime. Overall, ethanol attenuated cholesterol-induced adhesion increases while increasing membrane fluidity as indicated by tether length.

Furness, R. W. (1985). "Ingestion of plastic particles by seabirds at Gough Island, South Atlantic Ocean." Environmental Pollution Series A: Ecological & Biological **38**(3): 261.

Furness, R. W. (1985). "Plastic particle pollution: Accumulation by procellariiform seabirds at Scottish colonies." Marine Pollution Bulletin **16**(3): 103-106.

Plastic particles were found in the gizzards of Leach's petrels, Manx shearwaters and fulmars from Scottish colonies, but were not found in 21 British storm petrels. Fulmars ingested larger particles than did Leach's petrels. The volume of plastic was equivalent to 59% of relaxed gizzard volume in most contaminated bird, but only equivocal statistical evidence for an influence of ingested plastic on body mass could be obtained.

Furst, A. (2007). "Thermal utilization of plastic waste material in the cement industry - potential impacts on the forest." Forstschutz Aktuell **38**: 26-28.

The production of cement is an energy-intensive process. Increasing production costs due to cost pressure from cheap cement imports have forced the cement industry to reduce production costs. Expensive fossil fuels have increasingly been replaced by alternative combustibles (e.g. plastic waste material) - cement works contribute therefore to a great extent to waste disposal. The authorities shall prescribe and enforce measures to be taken to control air pollution limit values. Strict intake control of the used alternative energy sources shall ensure that the levels of the relevant pollutants are maintained below the limit values. Adequate air pollution monitoring (e.g. local Biomonitoring grids) shall be used to effectively control the prescribed measures.

Furtado, R., et al. (2016). "White-faced storm-petrels Pelagodroma marina predated by gulls as biological monitors of plastic pollution in the pelagic subtropical Northeast Atlantic." Marine Pollution Bulletin **112**(1/2): 117-122.

Marine plastic pollution is rapidly growing and is a source of major concern. Seabirds often ingest plastic debris and are increasingly used as biological monitors of plastic pollution. However, virtually no studies have assessed plastics in seabirds in the deep subtropical North Atlantic. We investigated whether remains of white-faced storm-petrels (WFSP) present in gull pellets could be used for biomonitoring. We analysed 263 pellets and 79.0% of these contained plastic debris originating in the digestive tract of WFSP. Pellets with no bird prey did not contain plastics. Most debris were fragments (83.6%) with fewer plastic pellets (8.2%). Light-coloured plastics predominated (71.0%) and the most frequent polymer was HDPE (73.0%). Stable isotopes in toe-nails of WFSP containing many versus no plastics did not differ, indicating no individual specialisation leading to differential plastic ingestion. We suggest WFSP in pellets are highly suitable to monitor the little known pelagic subtropical Northeast Atlantic.

Gabbar, H. A., et al. (2017). "DC Thermal Plasma Design and Utilization for the Low Density Polyethylene to Diesel Oil Pyrolysis Reaction." Energies **10**(6).

Growing worldwide concerns regarding the environmental consequences of heavy dependence on fossil fuels, particularly climate change, are likely to constrain excessive use of fossil fuels in the near future. [...]plastic to oil pyrolysis could have a positive environmental impact by providing alternative fuels and reducing the carbon footprint of incineration [5]. [...]the steady increase in energy consumption coupled with environmental pollution promotes the evolution of alternative fuels such as plastic pyrolysis oil. Because of the increasing cost and decreasing space of landfills, traditional methods of plastic waste recycling such as landfilling and incineration cause irreversible environmental problems, including high NO2 and CO2 emissions [6]. The thermal plasma also accelerates reaction kinetics and improve thermal cracking and the emission enthalpy can be adjusted easily by electric power tuning [29]. [...]DC thermal plasma torches can act as a catalyst due to their excellent properties such as high energy density, high temperature range, and high chemical reactivity [30]. Oxidation and combustion is avoided and its occurrence can increase char by up to 40–55 wt. % [35]. Since the reaction residence time is longer than few seconds, a batch reactor or pressurized batch reactor is used.

Gabriel, A. and K. Menrad (2015). "Market acceptance and consumers' willingness-to-pay for plants in biodegradable pots." Acta Horticulturae.

In the last decades, society-driven topics like recycling and reduction of plastic waste increased efforts to utilize biodegradable materials. Up to now, a successful introduction of biodegradable flower pots on the German plant market has been hampered due to insufficient processing and marketing efforts. Although most plant buyers disclose high ecology-oriented attitudes, this does not result automatically in a higher willingness-to-pay for higher-priced biodegradable pots. In our study, 562 customers of six retail flower shops and garden centers in western and southern Germany were asked directly after buying certain potted plants (ornamentals, young vegetable plants, and herbs) offered in the shops - side-by-side in standard plastic and in biodegradable pots. Interviewers recorded the customers' choice in their shopping trolley and asked questions about the intention of the purchase, knowledge of biodegradable materials and characteristics of the buyer himself. The analysis exposes that the respondents showed both high interests in biodegradable pots and an increased willingness-to-pay additional price charges of 15-48% depending on the kind of potted plant. Especially for edible and vegetable plants the consumers showed an increased willingness-to-pay within the range of the additional costs of producing plants in biodegradable pots. Furthermore, the survey results revealed that quality and environmental aspects are higher-ranked product attributes than the price of biodegradable pots. An extended market potential can be created by combining these biodegradable pots with organically produced plants.

Gadush, M., et al. (2011). "The university of texas at Austin-protein and metabolite analysis facility." Journal of Biomolecular Techniques **1)**: S47.

The Protein and Metabolite Analysis Facility at the University of Texas at Austin is a joint effort of the College of Pharmacy, Center for Research on Environmental Disease (CRED), and the Institute for Cellular and Molecular Biology (ICMB). Services and collaborative research are offered for the detection, characterization and quantification of biomolecules. The Facility's goals are to provide sensitive protein identification and modification analyses, to provide custom peptide syntheses, to offer services for the identification and quantification of metabolites, nutrients and xenobiotics, to implement novel analytical methods, to improve the sensitivity of existing analyses, to provide consultation on the selection and implementation of analytical methods, to offer training in the usage and applications of the instrumentation, and to provide technical expertise in support of individual research goals. The ICMB portion of the Core contains an ABI Procise 492 cLC protein sequencer, a Protein Technologies Inc. Symphony

peptide synthesizer, two Bio-rad Duoflows and a GE Heathcare AKTA protein purification systems, two Beckman System Gold HPLC systems, a Berthold Technologies Mithras luminescence and fluorescence detector, an Invitrogen gel electrophoresis set-up, an Art Robbins Instruments Phoenix crystallography robot and a LC-MALDI-TOF/TOF (an ABI 4700 with a LC Packings Ultimate Nano-LC system with a Probot spotting robot). In the College of Pharmacy, the Core has an Applied Biosystems 4000 Q-trap LC MS/MS system with ESI, APCI and nanospray sources coupled with a Shimadzu LC-20AD HPLC system, ThermoFinnigan LCQ ion trap mass spectrometer with ESI, APCI and microspray interfaces combined with a Michrom Magic 2002 HPLC system, a ThermoFinnigan Trace MS GC-quadropole with EI positive, negative CI and selected ion monitoring (SIM), an ABI Voyager-DE Pro MALDI-TOF and a Bio-rad Bioplex 200 fluorescent microbead array system.

Gaggino, R., et al. (2014). Ecological roofing tiles made with rubber and plastic wastes. 1st Asia Pacific Rubber Conference 2013, APRC 2013, September 5, 2013 - September 6, 2013, Suratthani, Thailand, Trans Tech Publications Ltd.

The general objective of this research work was to contribute to the environmental decontamination. Its specific objective was to develop sustainable roofing tiles from the ecological, technical and economical points of view. These roofing tiles are made from recycled materials such as plastics from industry, and rubber from tires into disuse. In this way this technology contributes in the decontamination of the environment, since it uses waste materials that are buried in municipal land without any use, or accumulated and burned in landfills, causing pollution. The procedure used was the thermo-molding compaction. The available amounts of plastic waste are abundant. According to data provided in 2012 by the Ministry of Health and Environment of Argentina, Argentina produces 1,639 tons/year. The available amounts of rubber tires are also abundant. According to data provided in 2012 by the National Institute of Industrial Technology -INTI, Argentina generates more than 100,000 tons/year. Plastics and rubber are non bio-degradables materials, so nature can not absorb them as other waste. One purpose of this research work was to provide an alternative to other traditional building technologies that consume non-renewable resources, or produce negative environmental impact. The main technical advantages of these roofing tiles respect to other traditional such as ceramic or concrete tiles are their excellent resistance to hail and freezing, high flexural resistance, low specific weight, and low water absorption. (2014) Trans Tech Publications, Switzerland.

Gagne, F. (2017). "Toxicity and disruption of quorum sensing in Aliivibrio fisheri by environmental chemicals: Impacts of selected contaminants and microplastics." Journal of Xenobiotics **7**(1): 15-20.

The purpose of this study was to examine the effects of dissolved and particulate compounds on quorum sensing in the marine luminescent bacterium Aliivibrio fisheri. Bacteria were exposed to increasing concentrations of CuSO<inf>4</inf> (Cu²⁺), gadolinium chloride (Gd³⁺), 20-nm silver nanoparticles (nanoAg) and 1-3 mum microplastic polyethylene beads for 250 min. During this period, luminescence measurements were taken at 5-min intervals. Toxicity was first examined by measuring luminescence output at 5-min and 30-min incubation time. Based on the effective concentration that decreases luminescence by 20% (EC20), the compounds were toxic at the following concentrations in decreasing toxicity: Cu²⁺ (3.2 mg/L) < nanoAg (3.4 mg/L, reported) < Gd³⁺ (34 mg/L) < microplastics (2.6 g/L). The data revealed that luminescence changed non-linearly over time. In control bacteria, luminescence changed at eight specific major frequencies between 0.04 and 0.27 cycle/min after Fourier transformation of time-dependent luminescence data. The addition of dissolved Cu²⁺ and Gd³⁺ eliminated the amplitude changes at these frequencies in a concentration-dependent manner, indicating loss of quorum sensing between bacteria at concentrations below EC20. In the presence of nanoAg and microplastic beads, the decreases in amplitudes were modest but compressed the luminescence profiles, with shorter frequencies appearing at concentrations well below EC20. Thus, loss of communication between bacteria occurs at non-toxic concentrations. In addition, with exposure to a mixture of the above compounds at concentrations that do not produce effects for Gd³⁺, nanoAg and microplastics, Cu²⁺ toxicity was significantly enhanced, suggesting synergy. This study revealed for the first time that small microplastic particles and nanoparticles can disrupt quorum sensing in marine bacteria. Copyright © F. Gagne et al., 2017.

Gagné, F., et al. (2019). "Polystyrene nanoparticles induce anisotropic effects in subcellular fraction of the digestive system of freshwater mussels." Current Topics in Toxicology **15**: 43.

The release of nanoplastics (NP) from the weathering and degradation of plastics represents one of the major concerns for the environment given their pervasiveness in cells. A methodology for the detection of anisotropic changes induced by polystyrene NP is proposed using fluorescence polarization. The commercially available probe fluorescein octadecyl ester (FOE) has the property to interact in hydrophobic environments (phospholipids) which could be measured by fluorescence polarization spectroscopy. Although increasing the concentrations of 50 nm polystyrene NP in buffer alone did not change polarization, the addition of the subcellular fraction increased polarisation of the dye in a concentration-dependent manner. The assay was performed in mussels exposed to primary-treated effluents and revealed increased anisotropy of the subcellular fraction of the digestive gland suggesting NP-like effects. Although lipid contents were significantly correlated with fluorescence polarization ($r = 0.65$; $p < 0.001$), the increase in polarization was not entirely explained by changes in lipid droplets. In conclusion, polystyrene NP induces anisotropic effects at the subcellular fraction of the digestive gland as determined with the FOE probe. Mussels exposed to primary-treated effluents displayed NP-like anisotropic effects suggesting that these effluents contain NPs.

Gagne, F., et al. (2019). "Detection of polystyrene nanoplastics in biological samples based on the solvatochromic properties of Nile red: application in Hydra attenuata exposed to nanoplastics." Environmental Science & Pollution Research **26**(32): 33524-33531.

The release of nanoplastics (NP) from the weathering of microplastics is a major concern for the environment.

Gagné, F., et al. (2019). "Detection of polystyrene nanoplastics in biological samples based on the solvatochromic properties of Nile red: application in <i>Hydra attenuata</i> exposed to nanoplastics." Environmental science and pollution research international **26**(32): 33524-33531.

The release of nanoplastics (NP) from the weathering of microplastics is a major concern for the environment. Methods for the detection of NP in biological tissues are urgently needed because of their ability to penetrate not only in tissues but also in cells. A simple fluorescence-based methodology for the detection of polystyrene NP in biological tissues is proposed using the solvatochromic properties of Nile red. Although NPs alone increased somewhat Nile red fluorescence, a characteristic hypsochromic shift in the emission spectra was found when the dye and NP were incubated with subcellular tissue fraction. To explain this, the probe and NPs (50 and 100 nm) were prepared in the presence of increasing concentrations of two detergents (Tween-20, Triton X-100) as a proxy to phospholipids. The data revealed that both detergents readily increased fluorescence values when added to the NP and Nile red. The addition of NPs in tissue extracts blue-shifted further the emission spectra to 623 nm from the normal Nile red-lipid peak at 660 nm. The fluorescence intensity was proportional to the NP concentration. A methodology is thus proposed for the detection of NPs in laboratory-exposed organisms based on the solvatochromic properties of Nile red. The methodology was used to detect the presence of NP and changes in polar lipid contents in Hydra attenuata exposed to polystyrene NP.

Gago, J., et al. (2015). "First observation on neustonic plastics in waters off NW Spain (spring 2013 and 2014)." Marine Environmental Research **111**: 27-33.

This paper examines the presence and distribution of plastic particles in waters off the NW Spanish Atlantic coast. A pilot sampling program was initiated in 2013 to study the presence of plastic particles in surface waters. A total of 41 neuston samples were collected using a manta trawl fitted with a 333 mu m mesh (21 samples in 2013 and 20 samples in 2014). Several types of plastic particles were observed in 95% of the stations. A total of 1463 plastic microparticles (5 mm and <20 mm; MPS) were counted. Average concentrations recorded were 0.034 plus or minus 0.032 and 0.176 plus or minus 0.278 mps m-2 and 0.005 plus or minus 0.005 and 0.028 plus or minus 0.043 MPS m-2, respectively for 2013 and 2014. Results on this emerging topic are discussed as a preliminary step towards implementation of the Marine Strategy Framework Directive in the region. Harmonization of protocols for determination of plastic particles is urgently needed in order to compare results between regions and to ensure coherence in the implementation of the MSFD. This aspect is also important at a worldwide scale.

Gajendiran, A., et al. (2016). "Microbial degradation of low-density polyethylene (LDPE) by Aspergillus clavatus strain JASK1 isolated from landfill soil." 3 Biotech **6**(1): 52.

Polythene and plastic waste are found to accumulate in the environment, posing a major ecological threat. They are found to be considered non-degradable, once it enters the environment it has been found to remain there indefinitely. However, significant attention has been placed on biodegradable polymer, identification of microbes with degradative potential on plastic material. The aim of the present investigation was to biodegrade low-density polyethylene (LDPE) using potential fungi isolated from landfill soil. Based on 18S rRNA analyses the isolated strain was identified as Aspergillus clavatus. LDPE degradation by A. clavatus was monitored for 90 days of incubation in aqueous medium. The degradation was confirmed by changes in polyethylene weight, CO₂ evolution by Strum test, infrared spectra and morphological changes by SEM and AFM analysis.

Gajst, T., et al. (2016). "Sea surface microplastics in Slovenian part of the Northern Adriatic." Marine Pollution Bulletin **113**(1-2): 392-399.

Plastics are the most common material of marine litter and have become a global pollution concern. They are persistent in the environment where they gradually degrade into increasingly smaller particles-microplastics (MP). Our study presents results of sea-surface monitoring for MP in the Slovenian part of the Trieste Bay in the Northern Adriatic Sea. In 17 trawls conducted over a 20-month period we found a high average concentration of 406x10³MPparticles/km². Over 80% of the particles were identified as polyethylene. The significant variability of MP concentrations obtained on different sampling dates is explained by use of surface current maps and a recently developed Markov chain marine litter distribution model for the Adriatic Sea.

Galafassi, S., et al. (2019). "Plastic sources: A survey across scientific and grey literature for their inventory and relative contribution to microplastics pollution in natural environments, with an emphasis on surface water." Science of the Total Environment **693**: 133499.

Plastic debris are at present recognized as an emerging potential threat for natural environments, wildlife and humans. In the past years an increasing attention has been addressed to investigate the presence and concentration of plastic debris in the ecosystems, including surface waters. Scientific literature extensively describes the ingestion by aquatic fauna, the transfer into food webs and the potential action as a vector for toxic compounds or alien microorganisms. Although the scientific community addresses this issue with considerable effort, many questions remain open. In particular, new sources of microplastics have been recently recognized, possibly representing major environmental inputs compared to those previously considered. In addition to the already renowned sources such as the embrittlement of plastic litter and microbeads released from personal care products, microplastic can be released also by washing of synthetic clothes, abrasion of vehicles tyres and from the weathering of different kind of paints. This review tries to exhaustively enumerate all the possible sources of plastic litter that have been identified so far and to report quantitative assessments of their inputs on microplastics pollution to natural environments reported in scientific and grey literature, with an emphasis on surface waters.

Galambos, C., et al. (2013). "In utero embryonic intracardiac injection under biomicroscopy guidance: A cutting-edge technology to study embryonic lung development in vivo." Pediatric and Developmental Pathology **16 (2)**: 131.

Background: Approximately 14 per 10 000 live-born humans suffer from pulmonary hypoplasia (PH) often causing neonatal death. Although the pathomechanism of PH is poorly understood emerging data suggest a key role for pulmonary vessels and blood flow in regulating lung development. Therefore, there is a pressing need to utilize novel tools that permit in vivo manipulation of embryonic vasculature at early development stages. We aimed to develop a method that allows us to study the role of blood flow in lung development in vivo. Design(s): We devised a novel technique involving in utero fetal intracardiac injection under high-resolution ultrasound biomicroscopy-guidance (IHB) to identify perfused pulmonary vessels. We injected wild-type mouse embryos at early embryonic stage (E10.5-E12.5) using three different tracers; endothelial specific FITC-tomato lectin (FITC-TL), erythrocyte specific FITC-wheat germ lectin (FITC-WGL) and FITC-labeled microbeads (FBs). Intracardiac injection guaranteed that these tracers only highlight perfused vessels. We captured images of whole-mount fluorescent-labeled peripheral lung buds with confocal microscope and 3D reconstructions were performed by IMARIS software. We analyzed FITC-TL vs. PECAM labeled peripheral vasculature. Identification of FITC-WGL erythrocytes and FBs within peripheral vessels confirmed perfusion. Result(s): IHB provides direct vascular access to the developing mouse embryo at early time points; the technique is survivable and highly reproducible. Significant overlap was seen on merged PECAM and FITC-TL images of pulmonary vessels at all ages. FITC-WGL erythrocytes and FBs were present all throughout the lung vasculature including the developing peripheral microvessels around the growing lung buds. Conclusion(s): Our technique allows, for the first time, a performance of an embryonic ''pulmonary angiogram'' to show true embryonic blood flow in living, developing mouse lung. Our data suggest that most pulmonary vessels are perfused at a very early gestational age. This surprising finding led us to postulate that a blood perfused pulmonary vascular network is, in fact, necessary for proper lung growth and altered blood flow may play a role in the pathomechanism of PH. With this technique we are not only able to further study the role of embryonic pulmonary blood flow but we can also deliver a variety of agents directly to the embryo (bypassing the placental barrier) including genes, viruses, stem cells, and drugs to address the developmental pathobiology of the lung.

Galgani, F., et al. (2014). "Monitoring the impact of litter in large vertebrates in the Mediterranean Sea within the European Marine Strategy Framework Directive (MSFD): Constraints, specificities and recommendations." Marine Environmental Research **100**: 3-9.

In its decision (2010/477/EU) relating to the European Marine Strategy Framework Directive (MSFD, 2008/56/EC), the European Commission identified the following points as focuses for monitoring:. (i) 10.1.1: Trends in the amount, source and composition of litter washed ashore and/or deposited on coastlines,. (ii) 10.1.2: Trends in the amount and composition of litter in the water column and accumulation on the sea floor,. (iii) 10.1.3: Trends in the amount, distribution and composition of micro-particles (mainly microplastics), and. (iv) 10.2.1: Trends in the amount and composition of litter ingested by marine animals.Monitoring the impacts of litter will be considered further in 2014. At that time, the strategy will be discussed in the context of the Mediterranean Sea, providing information on constraints, protocols, existing harm and research needed to support monitoring efforts.The definition of targets and acceptable levels of harm must take all factors into account, whether entanglement, ingestion, the transport and release of pollutants, the transport of alien species and socio-economic impacts. It must also reflect on the practical deployment of "ingestion" measures (10.2.1). The analysis of existing data will reveal the potential and suitability of some higher trophic level organisms (fish, turtles, birds and mammals) for monitoring the adverse effects of litter. Sea turtles appear to be useful indicator species, but the definition of an ecological quality objective is still needed, as well as research on alternative potential indicator species. © 2014 Elsevier Ltd.

Galgani, F., et al. (2011). "Marine pollution: let us not forget beach sand." Environmental Sciences Europe **23**(40).

Background: Assessing the chemical or bacterial contamination in marine waters and sediments is a very common approach to evaluate marine pollution and associated risks. However, toxicity and organic pollution of beach sands have not yet been considered, except in adjacent waters. In the present study, the toxicity and the chemical contamination of natural beach sands collected 20 m from the shoreline at two sites located on the Mediterranean Sea (Marseille and La Marana, Corsica) were studied.

Gallagher, A., et al. (2016). "Microplastics in the Solent estuarine complex, UK: An initial assessment." Marine Pollution Bulletin **102**(2): 243-249.

Microplastics are known to be an increasing component found within both marine sediments and the water column. This study carried out an initial assessment of the levels of microplastics present within the Solent estuarine complex, focusing specifically on the water column. A plankton net trawl survey was carried out, with samples analysed using visual observation and Fourier Transform Infrared Spectroscopy (FT-IR). The study identified significant quantities of plastics, ranging in shape, with hot spots found at confluence points within the estuary. Though the FT-IR analysis was inconclusive, the nature of the samples indicates the effect of oceanographic conditions on the prevalent types of microplastics found, which in turn identifies key local sources such as wastewater treatment plants and the plastics industry as being the dominant inputs. Copyright © 2015 Elsevier Ltd.

Gallego, M. G., et al. (2016). "Gelatine-Based Antioxidant Packaging Containing Caesalpinia decapetala and Tara as a Coating for Ground Beef Patties." Antioxidants **5**(2): 31.

The development of antioxidant-active packaging has numerous advantages, such as the reduction of synthetic additives in food, the reduction of plastic waste and food protection against oxidation reactions. Different concentrations of extracts of the plants Caesalpinia decapetala (CD) and Caesalpinia spinosa "Tara" (CS) were incorporated into gelatine films as natural antioxidants. The physical, mechanical and antioxidant properties of these films were studied. Films containing plant extracts at a high concentration had lower tensile strength with higher elongation at break points, compared to the control film ($p < 0.05$). Films exhibited antioxidant activity in the oxygen radical absorbance capacity (ORAC) and Trolox equivalence antioxidant capacity (TEAC) assays when added at 0.2%. The application of gelatine film containing CD and CS was found to be effective in delaying lipid oxidation and deterioration of beef patty quality during storage. Therefore, the films prepared in this study offered an alternative edible coating for the preservation of fresh food.

Gallo, F., et al. (2018). "Marine litter plastics and microplastics and their toxic chemicals components: the need for urgent preventive measures." Environmental Sciences Europe **30**(1): 13.

Persistent plastics, with an estimated lifetime for degradation of hundreds of years in marine conditions, can break up into micro- and nanoplastics over shorter timescales, thus facilitating their uptake by marine biota throughout the food chain. These polymers may contain chemical additives and contaminants, including some known endocrine disruptors that may be harmful at extremely low concentrations for marine biota, thus posing potential risks to marine ecosystems, biodiversity and food availability. Although there is still need to carry out focused scientific research to fill the knowledge gaps about the impacts of plastic litter in the marine environment (Wagner et al. in Environ Sci Eur 26:9, 2014), the food chain and human health, existing scientific evidence and concerns are already sufficient to support actions by the scientific, industry, policy and civil society communities to curb the ongoing flow of plastics and the toxic chemicals they contain into the marine environment. Without immediate strong preventive measures, the environmental impacts and the economic costs are set only to become worse, even in the short term. Continued increases in plastic production and consumption, combined with wasteful uses, inefficient waste collection infrastructures and insufficient waste management facilities, especially in developing countries, mean that even achieving already established objectives for reductions in marine litter remains a huge challenge, and one unlikely to be met without a fundamental rethink of the ways in which we consume plastics. This document was prepared by a working group of Regional Centres of the Stockholm and Basel Conventions and related colleagues intended to be a background document for discussion in the 2017 Conference of the Parties (COP) of the Basel Convention on hazardous wastes and the Stockholm Convention on persistent organic pollutants (POPs). The COP finally approved that the issue of plastic waste could be dealt by its Regional Centres and consistently report their activities on the matter to next COP's meetings.

Galloway, T. S., et al. (2017). "Interactions of microplastic debris throughout the marine ecosystem." Nature Ecology & Evolution **1**(5): 116.

Marine microscopic plastic (microplastic) debris is a modern societal issue, illustrating the challenge of balancing the convenience of plastic in daily life with the prospect of causing ecological harm by careless disposal. Here we develop the concept of microplastic as a complex, dynamic mixture of polymers and additives, to which organic material and contaminants can successively bind to form an 'ecocorona', increasing the density and surface charge of particles and changing their bioavailability and toxicity. Chronic exposure to microplastic is rarely lethal, but can adversely affect individual animals, reducing feeding and depleting energy stores, with

knock-on effects for fecundity and growth. We explore the extent to which ecological processes could be impacted, including altered behaviours, bioturbation and impacts on carbon flux to the deep ocean. We discuss how microplastic compares with other anthropogenic pollutants in terms of ecological risk, and consider the role of science and society in tackling this global issue in the future.

Gambardella, C., et al. (2018). "Ecotoxicological effects of polystyrene microbeads in a battery of marine organisms belonging to different trophic levels." Marine Environmental Research **141**: 313-321.

The aim of this study was to detect ecotoxicological effects of 0.1mum polystyrene microbeads in marine organisms belonging to different trophic levels. MP build up, lethal and sub-lethal responses were investigated in the bacterium Vibrio anguillarum (culturability), in the green microalga Dunaliella tertiolecta (growth inhibition), in the rotifer Brachionus plicatilis (mortality and swimming speed alteration) and in the sea urchin Paracentrotus lividus (immobility and swimming speed alteration) exposed to a wide range of microplastic (MP) concentrations (from 0.001 to 10mgL⁻¹). Survival was not affected in all organisms up to 10mgL⁻¹, while algal growth inhibition, rotifer and sea urchin larvae swimming behaviour alterations were observed after exposure to MPs. Ingestion was only observed in rotifers and it was directly correlated with sub-lethal effects. These results account for the ecotoxicological risk associated to the polystyrene microbeads, which are able to affect different endpoints in primary producers and consumers (rotifers and sea urchins) since no effects were observed in decomposers. This study points out the importance of using a battery of marine organisms belonging to different trophic levels by studying acute toxicity of MPs at low and high contamination levels, and investigating sub-lethal responses. Further investigations aimed at studying the transfer of these materials through the web are particularly recommended.

Gambardella, C., et al. (2017). "Effects of polystyrene microbeads in marine planktonic crustaceans." Ecotoxicology and Environmental Safety **145**: 250-257.

Plastic debris accumulates in the marine environment, fragmenting into microplastics (MP), causing concern about their potential toxic effects when ingested by marine organisms. The aim of this study was to verify whether 0.1 micro m polystyrene beads are likely to trigger lethal and sub-lethal responses in marine planktonic crustaceans. MP build-up, mortality, swimming speed alteration and enzyme activity (cholinesterases, catalase) were investigated in the larval stages of Amphibalanus amphitrite barnacle and of Artemia franciscana brine shrimp exposed to a wide range of MP concentrations (from 0.001 to 10 mg L⁻¹) for 24 and 48 h. The results show that MP were accumulated in crustaceans, without affecting mortality. Swimming activity was significantly altered in crustaceans exposed to high MP concentrations (>1 mg L⁻¹) after 48 h. Enzyme activities were significantly affected in all organisms exposed to all the above MP concentrations, indicating that neurotoxic effects and oxidative stress were induced after MP treatment. These findings provide new insight into sub-lethal MP effects on marine crustaceans.

Gambardella, C., et al. (2019). "Microplastics do not affect standard ecotoxicological endpoints in marine unicellular organisms." Marine Pollution Bulletin **143**: 140-143.

In this study, the acute toxicity of microplastics (MPs) on unicellular organisms as marine decomposers and microalgae was assessed, by evaluating standards endpoints included in International Standard Organization (ISO) protocols. The bacteria Vibrio fischeri and the diatom Phaeodactylum tricornutum were exposed to different sizes (1-500mum) of polyethylene MPs in order to evaluate bioluminescence inhibition and microalgal growth. No acute toxicity was

found on bacteria or microalgae in an order of magnitude above environmentally relevant concentrations, suggesting that tested MPs did not affect the investigated biological processes. In conclusion, standard ecotoxicological endpoints are not sufficiently sensitive to assess the potential effects of MPs on decomposers and primary producers, conversely to nanoplastics. These findings highlight that the current approach for MP risk assessment in unicellular species should be revised, by providing alternative endpoints to be included in standardized protocols, able to monitor the fate and biological effects of MPs.

Gambino, G., et al. (2020). "Dynamics of interaction and effects of microplastics on planarian tissue regeneration and cellular homeostasis." Aquatic Toxicology **218**: 105354.

Increasing microplastics pollution of marine and terrestrial water is a concerning issue for ecosystems and human health. Nevertheless, the interaction of microplastics with freshwater biota is still a poorly explored field. In order to achieve information concerning the uptake, distribution and effect of microplastics in planarians, Dugesia japonica specimens have been fed with mixtures of food and differently shaped and sized plastic particles. Feeding activity and food intake were non-altered by the presence of high concentrations of different types of plastic particles. However, the persistence of microplastic within the planarian body was a function of size/shape, being small spheres (<10mum in diameter) and short fibers (14mum large and 5/6mum length) more persisting than larger spheres and longer fibers which were eliminated almost entirely by ejection in a few hours. Transmission electron microscopy analysis demonstrated that at least part of microplastics was phagocytized by the enterocytes. Chronic exposure to small plastic did not alter the regenerative ability but caused a significant reduction of the gut epithelium thickness and lipid content of enterocytes, together with the induction of apoptotic cell death, modulation of Djgata 4/5/6 expression and reduced growth rate. The ability of microplastic to perturb planarian homeostasis is concerning being them extremely resilient against mechanical and chemical insults and suggests possible harmful effects upon other more susceptible species in freshwater ecosystems.

Gamperl, H., et al. (2013). "Capture of tissue-factor-bearing microparticles with using annexin-V bound magnetic beads." Onkologie **7)**: 266.

A number of recent articles indicate that MPs are important regulators of cellular interactions under physiological and pathological conditions. They have been found in all body fluids and seem to play a regulative role in blood clotting, they enhance cell adhesiveness and increase cell aggregation. In addition, they mediate cell-to-cell communication by transferring cell surface receptors, mRNA, and miRNA from the cell of origin to target cells. MPs have also been found to be active in several diseases such as inflammation, sepsis and cancer where they may contribute to metastasis. They can be released by epithelial cells, thrombocytes and cancer cells and are composed of vesicles formed by double layer membrane and characteristically express tissue factor at the surface. Once exposed, the tissue factor instantly associates with FVII. This TF/FVIIa-complex is as well capable to initiate the extrinsic pathway of coagulation, as to activate PARs by its protease activity. There is an ongoing discussion if the composition of the emerging MP-complexes is decisive for their specific way of action. Thus both the quantitative detection and the possibility of investigating the composition of the microparticles are of high scientific interest. Here, we present a fast and specific method to isolate microparticles from body fluids, such as malignant effusion and plasma, using a sequence of centrifugation and capture by annexin-V magnetic MicroBeads. We proved the specificity and sensitivity by detecting the MPs in a modern flow-cytometer as defined by their size and the expression of tissue factor before and after annexin- V MicroBead capture. In addition, we show that the captured MPs are still functionally active by using a commercially available MP-activity assay. The captures MPs can then be used for further characterization.

Ganan-Calvo, A. M., et al. (2006). "Straightforward production of encoded microbeads by Flow Focusing: potential applications for biomolecule detection." International Journal of Pharmaceutics **324**(1): 19-26.
Fluorescently encoded polymeric microparticles are acquiring great importance in the development of simultaneous multianalyte screening assays. We have developed a very versatile and straightforward method for the production of dye-labeled microparticles with a very reproducible size distribution and freely-chosen and discernible fluorescent properties. Our method combines Flow Focusing technology with a solvent evaporation/extraction procedure in a single step, yielding spherical, non-aggregate and non-porous particles. We have designed a multi-coloured bead array which includes the possibility of modifying the surface properties of the microparticles, which offer excellent properties for covalent attachment of biomolecules such as peptides, oligonucleotides, proteins, etc. We also show the potential of the fluorescently labeled microspheres for the detection of biomolecule (peptides and oligonucelotides) interactions using flow cytometry.

Ganapa, T. S., et al. (2016). "Behavior of cells embedded in fibrin beads." Tissue Engineering - Part A **22 (Supplement 1)**: S138.
Researchers need better in vitro wound healing models to solve chronic wound issues. Current wound healing models utilize only one type of cell and the cells were coated outside of the microbeads. In addition, fabrication techniques involved heat and potentially harmful solvents. In this study, we have created a fibrin bead fabrication technique that does not require any harmful solvents or heat. Fibroblasts and keratinocytes are encapsulated within the fibrin microbeads so that researchers can track migration and proliferation of these cells in 2-D and 3-D in novel wound healing models for up to 1 week. Three different models for fibrin analysis were created and examined: fibrin beads containing cells of either keratinocytes or fibroblasts on a cell culture plate, beads on a layer of mixed fibrinogen and thrombin, and beads between two layers of fibrinogen and thrombin. The results for cell migration and proliferation showed that each cell behaves differently on certain surfaces. Fibroblasts and keratinocytes migrate and proliferate best on a plastic surface. Both cells migrate slowest inside a 3D fibrin construct because cells can migrate in all radial directions at random, resulting in overall slower movement. Fibrin beads create tunable microenvironments to sustain and optimize the performance of each cell type implanted into a wound-healing model. These microbeads can be implanted into a more realistic wound-healing model which will lead to greater understanding in the field as well as using cells for treatment by delivering cells in beads.

Gandara e Silva, P. P., et al. (2016). "Leachate from microplastics impairs larval development in brown mussels." Water Research **106**: 364-370.
Microplastic debris is a pervasive type of contaminant in marine ecosystems, being considered a major threat to marine biota. One of the problems of microplastics is that they can adsorb contaminants in extremely high concentrations. When released from the particle, these contaminants have the potential to cause toxic effects in the biota. So far, reports of toxic effects are mostly linked with the direct exposure of organisms through ingestion of contaminated microplastics. There is little information on the toxicity of leachates from microplastics to marine organisms. In this study, we conducted experiments to evaluate the toxicity of leachates from virgin and beached plastic pellets to embryo development of the brown mussel (Perna perna). We compared the efficiency of two test procedures, and evaluated

the toxicity of beached pellets collected in a coastal marine protected area. We observed that mussel embryo is sensitive to leachate from both virgin and beached pellets. However, the toxicity of the leachate from beached pellets was much higher than that of virgin pellets. We suggest contaminants adsorbed onto the surface of beached pellets were responsible for the high toxicity of leachate from beached pellets, while the toxicity of leachate from virgin pellets was mainly due to plastic additives. Our results suggest microplastic debris may be harmful even if ingestion is not the only or main pathway of interaction of marine organisms with contaminated plastic debris.

Gander, P. (2006). "Plastics packaging keeps options open." Materials Recycling Week **187**(23): 37-37.

The article focuses on how the range of polymers in use in plastic packaging is forcing the call for alternative recovery methods in recycling in Great Britain. It was stated that the plastics industry ha to come up with options to traditional recycling, in addition to energy-from-waste. Ministers are willing to consider incineration as an option which was discussed in the Department for Environment, Food and Rural Affairs' proposals for waste strategy review. It was hoped that the time may come when plastics recyclers try to expel green biodegradables.

Gandhi, J. K., et al. (2015). "Enhanced Viability of Endothelial Colony Forming Cells in Fibrin Microbeads for Sensor Vascularization." Sensors **15**(9): 23886-23902.

Enhanced vascularization at sensor interfaces can improve long-term function. Fibrin, a natural polymer, has shown promise as a biomaterial for sensor coating due to its ability to sustain endothelial cell growth and promote local vascularization. However, the culture of cells, particularly endothelial cells (EC), within 3D scaffolds for more than a few days is challenging due to rapid loss of EC viability. In this manuscript, a robust method for developing fibrin microbead scaffolds for long-term culture of encapsulated ECs is described. Fibrin microbeads are formed using sodium alginate as a structural template. The size, swelling and structural properties of the microbeads were varied with needle gauge and composition and concentration of the pre-gel solution. Endothelial colony-forming cells (ECFCs) were suspended in the fibrin beads and cultured within a perfusion bioreactor system. The perfusion bioreactor enhanced ECFCs viability and genome stability in fibrin beads relative to static culture. Perfusion bioreactors enable 3D culture of ECs within fibrin beads for potential application as a sensor coating.

Ganz, K. R., et al. (2015). "Enhancing the Detection of Giardia duodenalis Cysts in Foods by Inertial Microfluidic Separation." Applied & Environmental Microbiology **81**(12): 3925-3933.

The sensitivity and specificity of current Giardia cyst detection methods for foods are largely determined by the effectiveness of the elution, separation, and concentration methods used. The aim of these methods is to produce a final suspension with an adequate concentration of Giardia cysts for detection and a low concentration of interfering food debris. In the present study, a microfluidic device, which makes use of inertial separation, was designed and fabricated for the separation of Giardia cysts. A cyclical pumping platform and protocol was developed to concentrate 10-ml suspensions down to less than 1 ml. Tests involving Giardia duodenalis cysts and 1.90-mum microbeads in pure suspensions demonstrated the specificity of the microfluidic chip for cysts over smaller nonspecific particles. As the suspension cycled through the chip, a large number of beads were removed (70%) and the majority of the cysts were concentrated (82%). Subsequently, the microfluidic inertial separation chip was integrated into a method for the detection of G. duodenalis cysts from lettuce samples. The method greatly reduced the concentration of background debris in the final suspensions (10-fold reduction) in comparison to that obtained by a conventional method. The method also recovered an average of 68.4% of cysts from 25-g lettuce samples and had a limit of detection (LOD) of 38 cysts. While the recovery of cysts by inertial separation was slightly lower, and the LOD slightly higher, than with the conventional method, the sample analysis time was greatly reduced, as there were far fewer background food particles interfering with the detection of cysts by immunofluorescence microscopy.

Gao, B., et al. (2007). "Studies on preparing and adsorption property of grafting terpolymer microbeads of PEI-GMA/AM/MBA for bilirubin." Journal of Chromatography B: Analytical Technologies in the Biomedical & Life Sciences **853**(1-2): 62-69.

Crosslinking copolymer microbeads with a diameter range of 100-150 microm were synthesized by suspension copolymerization of glycidyl methacrylate (GMA), acrylamide (AM) and N,N'-methylene bisacrylamide (MBA). Subsequently, polyethyleneimine (PEI) was grafted on the surfaces of the terpolymer microbeads GMA/AM/MBA via the ring-opening reaction of the epoxy groups, and the grafting microbeads PEI-GMA/AM/MBA were prepared. In this paper, the adsorption property of the grafting microbeads for bilirubin was mainly investigated, and the effects of various factors, such as pH value, ionic strength and grafting degree of PEI on the surface of grafting microbeads and the adsorption capacity of the grafting microbeads for bilirubin were examined. The batch adsorption experiment results show that by right of the action of grafted polyamine macromolecules PEI, the grafting microbeads PEI-GMA/AM/MBA have quite strong adsorption ability for bilirubin; the isotherm adsorption conforms to Freundlich equation. The pH value of the medium affects the adsorption capacity greatly, As in the nearly neutral solutions with pH 6, the grafting microbeads have the strongest adsorption ability for bilirubin, whereas in acidic and basic solutions their adsorption ability is weak. The ionic strength hardly affects the adsorption ability of the grafting microbeads. The grafting degree of PEI on the surfaces of the grafting microbeads also has a great effect on the adsorption capacity, and higher the grafting degree of PEI on the surface of the microbead PEI-GMA/AM/MBA, the stronger is the adsorption ability of the microbeads.

Gao, F., et al. (2019). "Study on the capability and characteristics of heavy metals enriched on microplastics in marine environment." Marine Pollution Bulletin **144**: 61-67.

In this study we examined the adsorption characteristics of heavy metals on microplastic through laboratory test and field test. We demonstrated that polyvinyl chloride, polypropylene, polyethylene, polyamides and polyformaldehyde could adsorb lead, copper and cadmium in the simulating solution, and the heavy metals showed higher adsorbance on PVC and PP particles compared with PA, PE and POM. In the field experiment, the adsorption rate and concentration of heavy metals varied significantly among different plastic types and locations. The adsorbability of PP and PVC toward Pb and Mn was strongly correlated with the metal concentration in seawater. We also compared the adsorption quantity of PP to heavy metals and polycyclic aromatic hydrocarbons which resulted in an order of magnitude within one month. During the adsorption, the surface morphology of the microplastics which were washed and corroded by seawater underwent a rough-smooth-rough changing process, and different materials had great differences.

Gao, M., et al. (2019). "Effects of polyethylene microplastic on the phytotoxicity of di-n-butyl phthalate in lettuce (Lactuca sativa L. var. ramosa Hort)." Chemosphere **237**: 124482.

The increase in the proportion of microplastics in the environment has intensified the interest in phthalate and microplastic contamination in recent years. In this study, we investigated the response of photosynthetic parameters and the antioxidant system of lettuce to di-n-butyl phthalate (DBP) stress and exposure to various concentrations of microplastic polyethylene (MP) for different durations (14 d and 28 d). Lettuce growth, photosynthetic parameters, and chlorophyll content were reduced significantly after MP- and DBP-only treatments and after the combined (MP + DBP) treatments with both pollutants (P < 0.05), when compared with the control. Our findings indicated that the exposure to MP can inhibit growth, hinder photosynthesis, and interfere with the antioxidant defense system in lettuce. Specifically, compared with the DBP-only treatment group, in all MP + DBP treatment groups, the lettuce growth parameters (dry and fresh weights of the leaves and roots and the number of leaves) decreased (P<0.05). Moreover, the photosynthetic rate, stomatal conductance, transient transpiration rate, fluorescence parameters, chlorophyll content of leaves, and activity of Rubisco decreased, but the intercellular CO₂ concentration increased in all MP + DBP treatment groups. The reduction in photosynthesis was attributed to the limitation of non-porosity and inhibition of the photoelectron flow, and the increase in exogenous MP content aggravated the effect of DBP on photosynthesis in lettuce. Compared with the DBP-only group, in all MP + DBP treatment groups, the content of superoxide radicals and hydrogen peroxide in lettuce leaves and roots increased. Antioxidant levels increased with the increase in MP content, except in the 1.0 mg mL⁻¹ MP treatment after 14d. Although the antioxidant system exhibited certain protective effects in the latter treatment, the cell membranes were still damaged. The degree of damage to cells decreased with the growth of lettuce, but the damage to root tissue always remained higher than that of the leaves. In conclusion, exposure to exogenous MP exacerbated the damage to lettuce by DBP.

Gao, W., et al. (2008). "Rapid isothermal detection assay: a probe amplification method for the detection of nucleic acids." Diagnostic Microbiology & Infectious Disease **60**(2): 133-141.
Simple, accurate, and stable diagnostic tests are essential to control viral infectious diseases such as avian influenza virus. The current technologies are often inaccessible to people who need them, mainly because of the specialized equipment and the need for highly trained technologists. Here, we describe a rapid isothermal nucleic acid detection assay (RIDA) that can be used to detect both DNA and RNA targets. Using chemically modified probes, we designed a lateral-flow (LF) immunoassay that can be used in combination with RIDA for equipment-free nucleic acid target detection. RIDA is a "probe amplification" assay that uses the single-strand nicking activity of restriction nicking endonucleases to repeatedly cleave synthetic probes hybridizing to the same target sequences. In the RIDA-LF combined assay, chemically labeled probes are covalently conjugated to magnetic microbeads, which is propitious to separate cleaved probes from the reaction solution. The cleaved probes in the solution are then detected with an LF immunoassay. The real-time assay shows that RIDA is able to specifically detect target sequences in 5 to 15 min. The RIDA-LF combined assay can specifically detect nucleic acid targets without sophisticated equipment. In this report, our data suggest that RIDA is a flexible simple assay that could be applied for point-of-care detection. The modified-RIDA described in this report further extends the application of this technology.

Gao, W., et al. (2016). "Magnetic Driving Flowerlike Soft Platform: Biomimetic Fabrication and External Regulation." Acs Applied Materials & Interfaces **8**(22): 14182-14189.
Nature-inspired actuators that can be driven by various stimuli are an emerging application in mobile microrobotics and microfluidics. In this study, a soft and multiple-environment-adaptive robotic platform with ferromagnetic particles impregnated in silicon-based polymer is adopted to fabricate microrobots for minimally invasive locomotion and control interaction with their

environment. As an intelligent structure of platform, the change of its bending, deformation, and flapping displacement is rapid, reversible, and continuously controllable with sweeping and multicycle magnetic actuation. The bending angle of the soft platform (0.2 mm in thickness and 8.5 mm in length) can be deflected up to almost 90degree within 2.7 s. Experiments demonstrated that the flexible platform of human skin-like material in various shapes, that is, flowerlike shapes, can transport a cargo to targeted area in air and a variety of liquids. It indicates excellent magnetic-actuation ability and good controllability. The results may be helpful in developing a magnetic-driven carrying platform, which can be operated like a human finger to manipulate biological objects such as single cells, microbeads, or embryos. Especially, it is likely to be used in harsh chemical and physical circumstances.

Gao, X., et al. (2002). "Quantum-dot nanocrystals for ultrasensitive biological labeling and multicolor optical encoding." Journal of Biomedical Optics **7**(4): 532-537.
Semiconductor nanoparticles in the size range of 2-6 nm are of great current interest, not only because of their size-tunable properties but also because of their dimensional similarity with biological macromolecules (e.g., nucleic acids and proteins). This similarity could allow an integration of nanomaterials with biological molecules, which would have applications in medical diagnostics, targeted therapeutics, and high-throughput drug screening. Here we report new developments in preparing highly luminescent and biocompatible CdSe quantum dots (QDs), and in synthesizing QD-encoded micro- and nano-beads in the size range of 100 nm-10 microm. We show that the optical properties of ZnS-capped CdSe quantum dots are sensitive to environmental factors such as pH and divalent cations, leading to the potential use of quantum dots in molecular sensing. We also show that chemically modified proteins can be used to coat the surface of water-soluble QDs, to restore their fluorescence, and to provide functional groups for bioconjugation. For multiplexed optical encoding, we have prepared large microbeads with sizes similar to that of mammalian cells, and small nanobeads with sizes similar to that of viruses.

Gao, Y., et al. (2013). "Automating quantum dot barcode assays using microfluidics and magnetism for the development of a point-of-care device." Acs Applied Materials & Interfaces **5**(8): 2853-2860.
The impact of detecting multiple infectious diseases simultaneously at point-of-care with good sensitivity, specificity, and reproducibility would be enormous for containing the spread of diseases in both resource-limited and rich countries. Many barcoding technologies have been introduced for addressing this need as barcodes can be applied to detecting thousands of genetic and protein biomarkers simultaneously. However, the assay process is not automated and is tedious and requires skilled technicians. Barcoding technology is currently limited to use in resource-rich settings. Here we used magnetism and microfluidics technology to automate the multiple steps in a quantum dot barcode assay. The quantum dot-barcoded microbeads are sequentially (a) introduced into the chip, (b) magnetically moved to a stream containing target molecules, (c) moved back to the original stream containing secondary probes, (d) washed, and (e) finally aligned for detection. The assay requires 20 min, has a limit of detection of 1.2 nM, and can detect genetic targets for HIV, hepatitis B, and syphilis. This study provides a simple strategy to automate the entire barcode assay process and moves barcoding technologies one step closer to point-of-care applications.

Garaba, S. P., et al. (2018). "Sensing Ocean Plastics with an Airborne Hyperspectral Shortwave Infrared Imager." Environmental Science & Technology **52**(20): 11699-11707.
Here, we present a proof-of-concept on remote sensing of ocean plastics using airborne

shortwave infrared (SWIR) imagery. We captured red, green, and blue (RGB) and hyperspectral SWIR imagery with equipment mounted on a C-130 aircraft surveying the "Great Pacific Garbage Patch" at a height of 400 m and a speed of 140 knots. We recorded the position, size, color, and type (container, float, ghost net, rope, and unknown) of every plastic piece identified in the RGB mosaics. We then selected the top 30 largest items within each of our plastic type categories (0.6-6.8 m in length) to investigate SWIR spectral information obtained with a SASI-600 imager (950-2450 nm). Our analyses revealed unique SWIR spectral features common to plastics. The SWIR spectra obtained (N = 118 items) were quite similar both in magnitude and shape. Nonetheless, some spectral variability was observed, likely influenced by differences in the object optical properties, the level of water submersion, and an intervening atmosphere. Our simulations confirmed that the ~1215 and ~1732 nm absorption features have potential applications in detecting ocean plastics from spectral information. We explored the potential of SWIR remote sensing technology for detecting and quantifying ocean plastics, thus provide relevant information to those developing better monitoring solutions for ocean plastic pollution.

Garaba, S. P. and H. M. Dierssen (2018). "An airborne remote sensing case study of synthetic hydrocarbon detection using short wave infrared absorption features identified from marine-harvested macro- and microplastics." Remote Sensing of Environment **205**: 224.

The abundance and disiribuiion of plastic debris in natural waters is largely unknown due to limited comprehensive monitoring. Here, optical properties of dry and wet marine-harvested plastic debris were quantified to explore the feasibility of plastic debris optical remote sensing in the natural environment. We measured the spectral reflectance of microplastics (< 5 mm) from the North Atlantic Ocean, macroplastics (> 5 mm) washed ashore along the USA west coast and virgin plastic pellets over a wavelength range from 350 to 2500 nm. Compared to the spectral variability of multi-colored dry macroplastics, the measured dry marine-harvested microplastic reflectance spectra could be represented as a single bulk average spectrum with notable absorption features at -931. 1215, 1417 and 1732 nm. The wet marine-harvested microplastics had similar spectral features to the dry microplastics but the magnitude was lower over the measured spectrum. When spectrally matched to the reference library of typical dry virgin pellets, the mean dry marine-harvested microplastics reflectance had moderate similarities to low-density polyethylene, polyethylene terephthalate, polypropylene and polymethyl methacrylate. This composition was consistent with the subset sampled with the Fourier Transform Infrared (FTIR) spectrometer and what has been reported globally. The absorption features at 1215 and 1732 nm were observable through an intervening atmosphere and used to map the distributions of synthetic hydrocarbons at a landfill and on man-made structures from airborne visible-infrared imaging spectrometer (AV1RIS) imagery, indicating the potential to remotely sense dry washed ashore and land-origin plastics. These same absorption features were identifiable on wet marine-harvested microplastics, but the ability to conduct remote sensing of microplastics al the ocean surface layer will require more detailed radiative transfer analysis and development of high signal-to-noise sensors. The spectral measurements presented here provide a foundation for such advances towards remote detection of plastics from various platforms.

Garaba, S. P. and H. M. Dierssen (2020). "Hyperspectral ultraviolet to shortwave infrared characteristics of marine-harvested, washed-ashore and virgin plastics." Earth System Science Data **12**(1): 77-86.

Combating the imminent environmental problems associated with plastic litter requires a synergy of monitoring strategies, clean-up efforts, policymaking and interdisciplinary scientific research. Lately, remote sensing technologies have been evolving into a complementary monitoring strategy that might have future applications in the operational detection and tracking of plastic litter at repeated intervals covering wide geospatial areas. We therefore present a dataset of Lambertian-equivalent spectral reflectance measurements from the ultraviolet (UV, 350 nm) to shortwave infrared (SWIR, 2500 nm) of synthetic hydrocarbons (plastics). Spectral reflectance of wet and dry marine-harvested, washed-ashore, and virgin plastics was measured outdoors with a hyperspectral spectroradiometer. Samples were harvested from the major accumulation zones in the Atlantic and Pacific oceans, suggesting a near representation of plastic litter in global oceans. We determined a representative bulk average spectral reflectance for the dry marine-harvested microplastics dataset available at https://doi.org/10.21232/jyxq-1m66 (Garaba and Dierssen, 2019c). Similar absorption features were identified in the dry samples of washed-ashore plastics: dataset available at https://doi.org/10.21232/ex5j-0z25 (Garaba and Dierssen, 2019a). The virgin pellets samples consisted of 11 polymer types typically found in floating aquatic plastic litter: dataset available at https://doi.org/10.21232/C27H34 (Garaba and Dierssen, 2017). Magnitude and shape features of the spectral reflectance collected were also evaluated for two scenarios involving dry and wet marine-harvested microplastics: dataset available at https://doi.org/10.21232/r7gg-yv83 (Garaba and Dierssen, 2019b). Reflectance of wet marine-harvested microplastics was noted to be lower in magnitude but had similar spectral shape to that of dry marine-harvested microplastics. Diagnostic absorption features common in the marine-harvested microplastics and washed-ashore plastics were identified at ∼931, 1215, 1417 and 1732 nm. In addition, we include metrics for a subset of the marine-harvested microplastics related to particle morphology, including sphericity and roundness. These datasets are also expected to improve and expand the scientific evidence-based knowledge of optical characteristics of common plastics found in aquatic litter. Furthermore, these datasets have potential use in radiative transfer simulations exploring the effects of plastics on ocean colour remote sensing and developing algorithms applicable to remote detection of floating plastic litter.

Garces-Ordonez, O., et al. (2019). "Marine litter and microplastic pollution on mangrove soils of the Cienaga Grande de Santa Marta, Colombian Caribbean." Marine Pollution Bulletin **145**: 455-462.
Marine litter pollution has become a complex global problem, because of the negative ecological and socioeconomic impacts as well as the human health risks that it represents. In Colombia, mangroves are affected by inadequate solid waste management, which results in litter accumulation. Additionally, the information related to this problem is limited avoiding the development of prevention and reduction strategies. For the first time, pollution by marine litter and microplastics were evaluated in mangrove soils of the Cienaga Grande de Santa Marta, where 540+/-137 and 31+/-23 items/ha of marine litter were determined in mangroves near and away from populated centers respectively. Plastics represented between 73 and 96% of litter, and microplastic quantity oscillated between 31 and 2,863 items/kg finding the highest concentrations in mangroves near to the population. This study contributes to the knowledge of the marine litter problem in mangroves of the Colombian Caribbean, becoming a help for their conservation.

Garcés-Ordóñez, O., et al. (2019). "Marine litter and microplastic pollution on mangrove soils of the Ciénaga Grande de Santa Marta, Colombian Caribbean." Marine Pollution Bulletin **145**: 455.
Marine litter pollution has become a complex global problem, because of the negative ecological and socioeconomic impacts as well as the human health risks that it represents. In Colombia, mangroves are affected by inadequate solid waste management, which results in

litter accumulation. Additionally, the information related to this problem is limited avoiding the development of prevention and reduction strategies. For the first time, pollution by marine litter and microplastics were evaluated in mangrove soils of the Ciénaga Grande de Santa Marta, where 540 ± 137 and 31 ± 23 items/ha of marine litter were determined in mangroves near and away from populated centers respectively. Plastics represented between 73 and 96% of litter, and microplastic quantity oscillated between 31 and 2,863 items/kg finding the highest concentrations in mangroves near to the population. This study contributes to the knowledge of the marine litter problem in mangroves of the Colombian Caribbean, becoming a help for their conservation.

Garcia, T. M., et al. (2020). "Microplastics in subsurface waters of the western equatorial Atlantic (Brazil)." Marine Pollution Bulletin **150**: 110705.

We provide a baseline assessment of the density and types of microplastics in the western equatorial Atlantic. The highest microplastics density was found in coastal stations near urbanized sites, large tropical estuaries, and fishing grounds. With regard to microplastics composition, most of the identified particles were fibers/filaments, styrofoam, hard and soft plastic, paint, and glass/acrylic. Fibers/filaments were the most abundant (~80%) and occurred at all stations, in both types of mesh nets. Hard plastic particles were frequent (78%) only in the 120mum mesh net. The mean density recorded in the 120mum mesh net was about seven times greater than that in the 300mum mesh net, suggesting that the larger mesh size net did not lead to an accurate description of microplastics density in the pelagic environment or the degree of risk to which organisms are exposed.

García-altares, M., et al. (2015). "The novel ovatoxin-g and isobaric palytoxin (so far referred to as putative palytoxin) from Ostreopsis cf. ovata (NW Mediterranean Sea): structural insights by LC-high resolution MS^sup n." Analytical and bioanalytical chemistry **407**(4): 1191-1204.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Blooms of the benthic dinoflagellate Ostreopsis cf. ovata are a concern in the Mediterranean Sea, since this species produces a wide range of palytoxin-like compounds listed among the most potent marine toxins. This study focused on two analogs of palytoxin found in cultures of six strains of O. cf. ovata isolated from the south of Catalonia (NW Mediterranean Sea). In addition to some already known ovatoxins, our strains produced two minor compounds, ovatoxin-g and the so far called putative palytoxin, whose structures had not been elucidated before. Insufficient quantity of these compounds impeded a full nuclear magnetic resonance (NMR)-based structural elucidation; thus, we studied their structure in crude algal extracts through liquid chromatography-electrospray ionization high-resolution mass spectrometry^sup n^ (LC-ESI-HRMS^sup n^) in positive ion mode. Under the used MS conditions, the molecules underwent fragmentation at many sites of their backbone and a large number of diagnostic fragment ions were identified. As a result, tentative structures were assigned to both ovatoxin-g and the putative palytoxin, the latter being identified as a palytoxin isomer and re-named as isobaric palytoxin.

Garcia-Garin, O., et al. (2019). "Boops boops as a bioindicator of microplastic pollution along the Spanish Catalan coast." Marine Pollution Bulletin **149**: 1.

Microplastic pollution is a growing cause of concern for the marine environment, particularly in the Mediterranean Sea, which is considered to be one of the most polluted seas worldwide. In

this study, the gastrointestinal tracts of 102 bogues (Boops boops), sampled from three areas off the Catalan coast (Spain) subject to different degrees of industrialization, were analysed to assess microplastic ingestion and thus estimate local levels of microplastic pollution. Microplastics were detected in 46% of samples analysed. As expected, the abundance and frequency of occurrence of ingested microplastics were higher off the most anthropized area of Barcelona. The majority of ingested microplastics were blue fragments ranging 0.1–0.5 mm, and the most common polymer type was polypropylene. The results of this study indicate the area off Barcelona as a possible area of concentration for microplastics, further supporting the use of B. boops as a bioindicator to assess microplastic pollution.

Garcia-Valverde, M. T., et al. (2018). "Lab-on-a-Valve Mesofluidic Platform for On-Chip Handling of Carbon-Coated Titanium Dioxide Nanotubes in a Disposable Microsolid Phase-Extraction Mode." Analytical Chemistry **90**(7): 4783-4791.

Mesofluidic lab-on-a-valve (LOV) platforms have been proven suitable to accommodate automatic micro-solid-phase extraction (muSPE) approaches with on-chip handling of micrometer-bead materials in a fully disposable mode to prevent sample cross-contamination and pressure-drop effects. The efficiency of the extraction process notably depends upon the sorptive capacity of the material because the sorbent mass is usually down to 10 mg in LOV devices. Nanomaterials, capitalizing upon their enhanced surface-to-volume ratio and diversity of potential chemical moieties, are appealing alternatives to microbead sorbents. However, the handling and confinement of nanomaterials in fluidic chip structures have been challenging to date. This is most likely a consequence of the aggregation tendency of a number of nanomaterials, including carbon-based sorbents, that leads to excessive back-pressure in flowing systems along with irreproducible bead loading. This paper addresses these challenges by ad hoc synthesis of hybrid nanomaterials, such as porous carbon-coated titanium dioxide nanotubes (TiO₂-NT@pC). Tailoring of the surface polarity of the carbon coating is proven to foster the dispersion of TiO₂-NT@pC in LOV settings while affording superior extraction capability of moderately nonpolar species from aqueous matrices. The determination of trace-level concentrations of butylparaben (BPB) and triclosan (TCS) in seawater samples is herein selected as a proof-of-concept of the exploitation of disposable nanomaterials in LOV. The mesofluidic platform accommodating muSPE features online hyphenation to liquid chromatography/tandem mass spectrometry (LC/MS/MS) for reliable determination of the target analytes with excellent limits of detection (0.5 and 0.6 ng/L for BPB and TCS, respectively) and intermediate precision (relative standard deviation <5.8%). For 5.0 mL of sample and 200 muL of eluent, enrichment factors of 23 and 14 with absolute extraction efficiencies of 90% +/- 14% and 58 +/- 8% for BPB and TCS, respectively, were obtained. The relative recovery values of 107% (BPB) and 97% (TCS) in seawater demonstrate the applicability of online LOV-LC/MS/MS using TiO₂-NT@pC for handling troublesome environmental samples.

Garcia-Xolalpa, H. L., et al. (2012). "Analysis of CD27/CD27L and CD30/CD30L in T lymphocytes exposed to dengue virus." Immunology **1)**: 634.

Purpose/Objective: To analyze if the co-stimulatory molecules CD27/ CD27L and CD30/CD30L are differentially expressed in T Lymphocytes exposed to dengue virus. Material(s) and Method(s): Peripheral blood mononuclear cells were obtained from Buffy coats from healthy donors by differential centrifugation over Fycoll-paqueTMPLUS. The T lymphocyte subpopulation was purified by anti-CD3-coated magnetic microbeads and these CD3+ T cell were assayed for the expression of CD27/CD27L and CD30/CD30L upon culture with: a)

Concanavalina A, b) dengue virus, c) dengue virus plus Concanavalina A and d) medium alone. After incubation for 36 h at 37degreeC in 5% CO_2, the expression of the co-stimulatory molecules was analyzed by flow cytometry. Result(s): The expression of CD27 and CD30 in Concanavalina A stimulation cells was twice as much as that of un-stimulated cells. Preincubation with dengue virus inhibited such a response, no significant differences were observed in the expression of CD27L/CD30L on T lymphocytes cultured under the same conditions. Conclusion(s): The CD27/CD27L and CD30/CD30L co-stimulatory molecules are related to the proliferation of T cells. Dengue virus seems to downregulate the expression of these co-stimulatory molecules, partially explaining the abnormal proliferation of T lymphocytes observed in vitro assays. Supported by SIP:20120911, and COFAA-IPN.

Gardon, T., et al. (2018). "Microplastics Affect Energy Balance and Gametogenesis in the Pearl Oyster Pinctada margaritifera." Environmental Science & Technology **52**(9): 5277.

Plastic pollution in the environment is increasing at global scale. Microplastics (MP) are derived from degradation of larger plastic items or directly produced in microparticles form (< 5 mm). Plastics, widely used in structures and equipment of pearl farming, are a source of pollution to the detriment of the lagoon ecosystem. To evaluate the impact of MP on the physiology of Pinctada margaritifera, a species of ecological and commercial interests, adult oysters were exposed to polystyrene microbeads (micro-PS of 6 and 10 µm) for 2 months. Three concentrations, 0.25, 2.5, and 25 µg L–1, and a control were tested. Ingestion and respiration rate and assimilation efficiency were monitored on a metabolic measurement system to determine the individual energy balance (Scope For Growth, SFG). Effects on reproduction were also assessed. The assimilation efficiency decreased significantly according to micro-PS concentration. The SFG was significantly impacted by a dose-dependent decrease from 0.25 µg L–1 ($p < 0.0001$), and a negative SFG was measured in oysters exposed to 25 µg L–1. Gonads may have provided the missing energy to maintain animals' metabolism through the production of metabolites derived from germ cells phagocytosis. This study shows that micro-PS significantly impact the assimilation efficiency and more broadly the energy balance of P. margaritifera, with negative repercussions on reproduction.

Garfall, A. L., et al. (2013). "Autologous agvhd associated with infusion of t-cells with engineered specificity for NY-ESO-1 and lage-1 following high-dose melphalan and asct in patients with multiple myeloma." Biology of Blood and Marrow Transplantation **1)**: S134.

Autologous stem cell transplantation (auto-SCT) is uncommonly associated with acute graft-versus-host disease (aGVHD)-like syndromes that are typically mild and self-limited; incidence is increased when auto-SCT is coupled with infusion of ex vivo expanded/costimulated Tcells. We describe here a gastrointestinal GVHD-like syndrome in multiple myeloma (MM) patients treated with auto-SCT and T-regulatory-cell (T<inf>reg</inf>)-depleted, autologous Tcells genetically modified to express a T-cell receptor with engineered specificity for a HLA-A*02-restricted epitope common to cancer-testis antigens NY-ESO-1 and LAGE-1. Subjects were HLA-A2+ and had high-risk MM with confirmed target expression. After initial therapy, T-cells were harvested via apheresis for transduction and culture with anti-CD3/-CD28-antibody-conjugated microbeads. Stem cells were then mobilized with cyclophosphamide +/- bortezomib. Subjects received melphalan 200 mg/m² on day -2 and >2 x 10⁶ CD34+ cells/kg on day 0. On day +2, autologous T-cells were infused (avg. 9x10⁹, range 7-10x10⁹; gene-modified avg. 33%, range 18-38%). Of the first 3 subjects treated, all developed persistent fever and grade 3-4 diarrhea beginning between days 2-7. Abdominal imaging was obtained in 2 subjects and demonstrated marked

wall thickening in the small and large bowel. Bowel biopsies from all subjects demonstrated aGVHD. The syndrome resolved spontaneously on day +37 in subject #1, but subjects #2 and #3 required immunosuppression with steroids. With recognition of this syndrome, prophylactic administration of oral budesonide and beclomethasone was implemented. The syndrome was then observed in only 1 of 7 subsequently treated subjects; in this subject, symptoms developed only after prophylactic budesonide was discontinued due to inability to administer the drug while the subject was ventilator-dependent with pneumonia. In subjects #2 and #3, bowel biopsy specimens were assayed by qPCR for the presence of the engineered cells, which were found to be present in all biopsy specimens from both subjects. Q-RT-PCR analysis of biopsy tissues showed absence of transcripts for both NY-ESO-1 and LAGE-1 antigens and accumulation. In conclusion, immunotherapy with Treg-depleted, NY-ESO-1/ LAGE-directed autologous T-cells after high-dose melphalan is associated with a steroid-responsive and preventable immune enteritis possibly mediated by infiltration of the GI tract by the engineered autologous T-cells.

Garg, R., et al. (2009). "Leishmania infantum amastigotes enhance HIV-1 production in cocultures of human dendritic cells and CD4 T cells by inducing secretion of IL-6 and TNF-alpha." PLoS Neglected Tropical Diseases [electronic resource] **3**(5): e441.

BACKGROUND: Visceral leishmaniasis has emerged as an important opportunistic disease among patients infected with HIV-1. Both HIV-1 and the protozoan parasite Leishmania can productively infect cells of the macrophage-dendritic cell lineage.

METHODOLOGY/PRINCIPAL FINDINGS: Here we demonstrate that Leishmania infantum amastigotes increase HIV-1 production when human primary dendritic cells (DCs) are cocultured together with autologous CD4(+) T cells. Interestingly, the promastigote form of the parasite does not modulate virus replication. Moreover, we report that amastigotes promote virus replication in both cell types. Our results indicate that this process is due to secretion of parasite-induced soluble factors by DCs. Luminex micro-beads array system analyses indicate that Leishmania infantum amastigotes induce a higher secretion of several cytokines (i.e. IL-1alpha, IL-2, IL-6, IL-10 and TNF-alpha) and chemokines (i.e. MIP-1alpha, MIP-1beta and RANTES) in these cells. Studies conducted with pentoxifylline and neutralizing antibodies revealed that the Leishmania-dependent augmentation in HIV-1 replication is due to a higher secretion of IL-6 and TNF-alpha.

CONCLUSIONS/SIGNIFICANCE: Altogether these findings suggest that the presence of Leishmania within DC/T-cell conjugates leads to an enhancement of virus production and demonstrate that HIV-1 and Leishmania can establish complex interactions in such a cellular microenvironment.

Garg, R., et al. (2009). "Leishmania infantum Amastigotes Enhance HIV-1 Production in Cocultures of Human Dendritic Cells and CD4 super(+) T Cells by Inducing Secretion of IL-6 and TNF-I." PLoS Neglected Tropical Diseases **3**(5): 1.

Background Visceral leishmaniasis has emerged as an important opportunistic disease among patients infected with HIV-1. Both HIV-1 and the protozoan parasite Leishmania can productively infect cells of the macrophage-dendritic cell lineage. Methodology/Principal Findings Here we demonstrate that Leishmania infantum amastigotes increase HIV-1 production when human primary dendritic cells (DCs) are cocultured together with autologous CD4 super(+) T cells. Interestingly, the promastigote form of the parasite does not modulate virus replication. Moreover, we report that amastigotes promote virus replication in both cell types. Our results indicate that this process is due to secretion of parasite-induced soluble factors by DCs. Luminex micro-beads array system analyses indicate that Leishmania infantum amastigotes induce a higher secretion of several cytokines (i.e. IL-1I-, IL-2, IL-6, IL-10 and TNF-I-) and chemokines (i.e. MIP-1I-, MIP-1I2 and RANTES) in these cells. Studies conducted with pentoxifylline and neutralizing antibodies revealed that the Leishmania-dependent augmentation in HIV-1 replication is due to a higher secretion of IL-6 and TNF-I-. Conclusions/Significance Altogether these findings suggest that the presence of Leishmania within DC/T-cell conjugates leads to an enhancement of virus production and demonstrate that HIV-1 and Leishmania can establish complex interactions in such a cellular microenvironment. Author Summary Visceral leishmaniasis (VL) is a potentially deadly parasitic disease afflicting millions worldwide. Although itself an important infectious illness, VL has also emerged as an opportunistic disease among patients infected with HIV-1. This is partly due to the increasing overlap between urban regions of high HIV-1 transmission and areas where Leishmania is endemic. Furthermore, VL increases the development and clinical progression of AIDS-related diseases. Conversely, HIV-1-infected individuals are at greater risk of developing VL or suffering relapse. Finally, HIV-1 and Leishmania can both productively infect cells of the macrophage-dendritic cell lineage, resulting in a cumulative deficiency of the immune response. We therefore studied the effect of Leishmania infantum on HIV-1 production when dendritic cells (DCs) are cocultured with autologous CD4 super(+) T cells. We show that amastigotes promote virus replication in both DCs and lymphocytes, due to a parasite-mediated production of soluble factors by DCs. Micro-beads array analyses indicate that Leishmania infantum amastigotes infection induces a higher secretion of several cytokines in these cells, and use of specific neutralizing antibodies revealed that the Leishmania-induced increase in HIV-1 replication is due to IL-6 and TNF-I-. These findings suggest that Leishmania's presence within DC/T-cell conjugates leads to an enhanced HIV-1 production.

Garlapati, D. (2019). "Comments on the paper "Marine microfiber pollution: A review on present status and future challenges"." Marine Pollution Bulletin **141**: 187.

Garley, M., et al. (2018). "Differences and similarities in the phenomenon of NETs formation in oral inflammation and in oral squamous cell carcinoma." Journal of Cancer **9**(11): 1958-1965.

Taking into account the previously reported relationship between inflammation and carcinogenesis, and the scant amount of data concerning the role of neutrophil extracellular traps (NETs) in carcinogenesis, we decided to study the process of extracellular trap formation in patients with inflammation as well as in patients with cancer occurring in the same location. For preliminary isolation of neutrophils (PMNs), we used PolymorphprepTM, then sorted with Microbeads. The cells were recorded in the incubation chamber with a BD Pathway 855 microscope system. Flow cytometric data (MPO+ neutrophils) were acquired on FACSCalibur flow cytometer. Amounts of cfDNA were determined by Abcam's Circulating DNA Quantification Kit. Neutrophils of patients with inflammation and of subjects with stage I/II oral squamous cell carcinoma (OSCC) produce increased amounts of NETs, while stage III/IV OSCC were comparable with the control group. In all of the studied groups of cells stimulation with LPS and rhIL-17 produced more NETs in relation to unstimulated cells. Neutrophil supernatant of inflammation patients and stage I/II cancer patients demonstrated the increased level of cfDNA, which decreased at stage III/IV. Patients with oral inflammations showed an increased rate of MPO+ neutrophils, which was lower than in stage I/II cancer patients and not significantly different than in Stage III/IV cancer patients and the control group. The direction of changes in NETs formation seems to be a new common element shared by inflammation and early stage cancer. Changes in the formation of NETs observed in patients with advanced cancer, other than an early phase or inflammation, indicate an alternative range of NETs involvement depending on different phases of this disease.

Garnham, G. W., et al. (1992). "Accumulation of cobalt, zinc and manganese by the estuarine green microalga Chlorella salina immobilized in alginate microbeads." Environmental Science and Technology **26**(9): 1764-1770.

This paper describes cobalt, zinc, and manganese accumulation by Chlorella salina immobilized in calcium alginate microbeads, investigated by use of the radioisotopes ⁶⁰Co, ⁵⁴Mn, and ⁶⁵Zn. A rapid biosorption of the metals to C. salina cell walls and the alginate matrix, which was independent of light, temperature, or the metabolic inhibitor CCCP, was followed by a slower energy-dependent phase of uptake. Under similar conditions, immobilized cells accumulated greater amounts of Co, Zn, or Mn than free cells due to an increased active phase of uptake. Accumulation was also dependent on cell density in the alginate beads, with a greater uptake of cobalt at the highest cell densities. Desorption of cobalt from loaded beads was increased by decreasing pH and increasing concentrations of the cations, probably due to exchange of cobalt bound to the cell wall/alginate matrix for H⁺ or cations.

Garnier, Y., et al. (2019). "Evaluation of microplastic ingestion by tropical fish from Moorea Island, French Polynesia." Marine Pollution Bulletin **140**: 165-170.

Microplastics are ubiquitous throughout the oceans, yet few studies have documented their occurrence in marine organisms associated with coral reefs. Four genera of adult fish were sampled (Myripristis spp., Siganus spp., Epinephelus merra and Cheilopogon simus) from different trophic guilds around the tropical island of Moorea, French Polynesia. Digestive tracts from 133 adult fish were surveyed and microplastics were found in 28 tracts (21%). Abundance of ingested microplastic pieces per individual fish varied from 1 to 3 pieces, with an average of 1.25 +/- 0.13 ingested microplastic pieces. Microplastics size ranged from 0.031 to 2.44 mm and 70% of microplastics did not exceed 0.3 mm in size. Overall, this study shows that the number and size of microplastic ingested per trophic groups are independent of trophic guild. Additional studies are needed to sample in other tropical regions in order to have a better assessment of microplastic occurrence in coral reefs. Copyright © 2019 Elsevier Ltd

Garrido, S., et al. (2019). "Effect of microplastics on the toxicity of chlorpyrifos to the microalgae Isochrysis galbana, clone t-ISO." Ecotoxicology & Environmental Safety **173**: 103-109.

It is highly likely that phytoplanktonic organisms will interact with MPs in the ocean, and consequently with the pollutants sorbed onto their surfaces. Microalgae play an essential role in maintaining the balance of the marine ecosystem due to the fact that they are a primary producer and the base of marine trophic chains. Therefore, their fitness represents an important index in the assessment of water quality. The objectives of this study were i) to assess the toxicity of MPs and the pesticide chlorpyrifos (CPF) to the microalgae, Isochrysis galbana, clone t-ISO and ii) to ascertain whether the presence of MPs affects the toxicity of CPF. Microalgae growth rate was selected as the endpoint and a commercial virgin PE micronized powder was chosen as a micro-plastic model, with mean size ranging from 2 to 6micro m, assayed until 25mgL⁻¹. CPF was tested at concentrations ranging from 0 to 4mgL⁻¹. A constant concentration of MPs (5mgL⁻¹) was loaded with increasing doses of CPF (0-3mgL⁻¹) with a 2h incubation period. Bioassays were performed at 20degreeC, in glass tubes of 50ml, with air and constant light and an exposure time of 72h. Cell counts were performed using a Coulter Counter Multisizer III and HPLC was used to quantify the partition of this pollutant among MPs and water. Although microalgae growth was not impacted by MPs,

growth was clearly affected by exposure to CPF from 2mgL⁻¹ and above, with a total growth inhibition at concentrations over 3mgL⁻¹. Subsequent to incubation, 80% of CPF was sorbed onto MP surfaces. Two different dose-response curves resulted from CPF bioassays depending on the presence of MP, with lower percentages of inhibition when CPF was presented through MP. Thus, the adsorption of CPF onto MP surfaces modulates the toxicity of CPF on I. galbana growth through a reduction in its toxicity, as CPF is adsorbed onto MP surfaces which are less bio-available to the algal cells.

Gasbarrino, K., et al. (2015). "Effects of statins on adiponectin receptor expression on circulating monocytes in hypertensive and dyslipidemic subjects." Arteriosclerosis, Thrombosis, and Vascular Biology. Conference: American Heart Association's Arteriosclerosis, Thrombosis and Vascular Biology/Peripheral Vascular Disease **35**(SUPPL. 1).

Introduction: Ample evidence exists in support of the anti-inflammatory and athero-protective properties of statins. AdipoR1 and AdipoR2 are receptors of adiponectin, which is an adipose tissue secreted protein with anti-inflammatory properties. Reduced AdipoR1/R2 expression is associated with hypertension, diabetes, and dyslipidemia. The aim of this ongoing study is to investigate whether statin treatment can affect the expression of AdipoR1/R2 on circulating monocytes in high-risk hypertensive and dyslipidemic subjects. Method(s): Subjects with hypertension and dyslipidemia were recruited from the Vascular Health Clinic at McGill University, Montreal. All subjects had clinical indication for statin therapy, were statin naive, and were prescribed low dose statin. After initiation of statin therapy, subjects were followed-up every 3-4 months for the length of one year. Blood samples were collected on the day of recruitment (baseline [pre-statins]) and at each follow-up (f/u) visit. Blood monocytes were isolated using a Magnetic Cell-Sorting technique with CD14+ Human Microbeads. RNA was isolated from monocytes to assess mRNA expression of AdipoR1/R2 using quantitative RT-PCR. Recruitment and f/u visits are ongoing. Result(s): A total of 13 subjects were recruited with 8 subjects having had at least one f/u visit. Baseline age of subjects (n=8) was 65.9 +/- 9.2 years, with 62.5% of subjects being men, and 37.5% diabetic. Statin significantly decreased total cholesterol (pre: 5.8+/-0.7 mmol/L, post: 4.1+/-0.5 mmol/L, P= 0.001) and LDL levels (3.9+/-0.6 mmol/L, 2.1+/-0.3 mmol/L, P<0.001). When assessing all f/u combined, AdipoR1 and AdipoR2 mRNA expression on circulating monocytes was increased post-statin therapy by 1.37 and 1.41-fold, respectively, when compared to baseline levels, with a significant difference found in AdipoR2 (P=0.05). Furthermore, a trend for progressive increase in AdipoR1/R2 mRNA expression was detected across all f/u. Conclusion(s): Statin treatment in hypertensive and dyslipidemic subjects led to increased AdipoR1/R2 mRNA expression on circulating monocytes, which illustrates a novel mechanism through which statins may exert its anti-inflammatory effects and protect against cardiovascular diseases.

Gasbarrino, K., et al. (2015). "Monocyte profiling of adiponectin receptors may be a potential systemic marker of plaque instability in subjects with carotid atherosclerotic disease." Canadian Journal of Cardiology **1)**: S281-S282.

BACKGROUND: Current guidelines for stroke prevention in patients with carotid atherosclerotic plaques, recommend carotid endarterectomy (CEA), based only on the degree of carotid artery stenosis. However, stenosis alone is an incomplete feature of stroke risk. Thus, understanding the mechanisms that contribute to plaque instability may lead to accurate patient risk stratification. Adipose tissue is a source of adipokines, such as adiponectin, that can mediate the crosstalk between adipose tissue and the vascular wall. Adiponectin possesses anti-inflammatory and vasculoprotective properties. Through its effects on receptors, AdipoR1 and AdipoR2, it may have the potential to protect against plaque development. Decreased circulating adiponectin levels (specifically its high molecular weight [HMW] isoform) and a lower abundance of AdipoR1/R2 on monocytes are associated with type 2 diabetes and coronary artery disease in humans. The aim of this study is to investigate HMW adiponectin levels and AdipoR1/R2 expression on monocytes, as potential systemic markers of plaque instability. METHOD(S): Consecutive patients scheduled for CEA were recruited from vascular clinics at the MUHC. Carotid plaque specimens and pre-operative blood samples were obtained. Vascular pathologists categorized the instability of the plaques according to gold-standard histological classifications. HMW adiponectin levels were measured using ELISA. Blood monocytes were isolated using a Magnetic Cell-Sorting technique with CD14+ Human Microbeads. RNA was isolated from monocytes to assess mRNA expression of AdipoR1/ R2 via quantitative RT-PCR. RESULT(S): All specimens were graded as either stable (n=20) or unstable plaques (n=18). Significant differences were found in HMW adiponectin levels between patients with stable versus unstable plaques (4.17 [3.02-9.84] mg/ml and 2.33 [1.23-5.66] mug/ml, respectively; p=0.028), while AdipoR2 mRNA expression on total monocytes was inversely associated with greater plaque instability (p=0.039). Logistic regression analyses demonstrated that AdipoR2 expression on monocytes can significantly predict the odds of having an unstable plaque versus a stable plaque. For age- and sexadjusted model, plaques were 3.3 times more likely to be unstable with each unit decrease in AdipoR2 gene expression, while further adjustments for BMI, increased the odds of having an unstable plaque by a factor of 4.2 (OR=4.15; 95% CI=1.13-15.32); p=0.033). CONCLUSION(S): HMW adiponectin and AdipoR2 mRNA expression on monocytes may act as important markers to discriminate between subjects with stable and unstable plaques. Recruitment of CEA patients for this study is ongoing.

Gaspar, K., et al. (2010). "Frequency and function of CD4⁺CD25⁺FOXP3⁺ regulatory T cells in atopic dermatitis." Journal of Investigative Dermatology **2)**: S40.

Atopic dermatitis (AD) is a chronic inflammatory skin disease resulted partly of type I and type IV hypersensitivity reactions triggered by T helper 2 (Th2) cells. The explanations behind the Th2 dominance in the disease are still controversial. We addressed the question whether the Th2 cell domination is associated with a reduction and/or functional impairment of CD4⁺CD25⁺FOXP3⁺ regulatory T cells (Treg) essential for the maintenance of Th1- Th2 balance. Peripheral blood of AD patients with severe clinical symptoms and extremely high serum IgE levels (>2000 U/ml) were investigated. Flow cytometry was utilised to determine the percentage of CD4⁺CD25^{bright}FOXP3⁺ Tregs and CLA⁺CD4⁺CD25^{bright}FOXP3⁺ Tregs in the samples of AD patients and healthy controls. For detection of suppressor activity of CD4⁺CD25⁺ Tregs, they were cocultured with CD4⁺CD25- effector T cells, and for T cell stimulation, anti-CD3/CD28 microbeads were applied alone or with Staphylococcus Enterotoxin B (SEB). The proliferation of the cells was measured by EZ4U colorimetric cell proliferation assay. Significantly increased number of CD4⁺CD25^{bright}FOXP3⁺ Tregs and also of CLA⁺ CD4⁺CD25^{bright}FOXP3⁺ Tregs were found in the peripheral blood of AD patients compared to healthy individuals. The degree of suppressor activity of CD4⁺CD25⁺ regulatory T cells were decreased in both anti-CD3/CD28 and SEB stimulated subgroups compared to control. Our data suggest coincidently with the literature that the pathogenesis of AD cannot be explained with the absence of CD4⁺CD25⁺FOXP3⁺ Treg cells, moreover the number of these cells is increased in the peripheral blood. At the same time the function of Tregs may be impaired.

Gaspari, J., et al. (2013). "EDTA-treatment to remove inhibitory effect of serum substances without increasing negative control bead MFI in micro-bead assays." Human Immunology **1)**: 62.

Aim: To study an effect of ethylenediaminetetraacetic acid (EDTA) on negative control (NC) bead mean fluorescence intensity (MFI) in Luminex micro-bead assays. Background(s): Inhibitory substances can mask HLA antibody specificity detection. Dithiothreitol (DTT) was reported to be effective for reducing interference from inhibitory substances (Kosmoliaptsis V, Transplantation 2009). However, we often observe an increase in the NC bead MFI with DTT treatment as reported (Zachary AA, Hum Immunol 2009). EDTA was also reported to be effective in reducing interference from inhibitory substances (Schnaidt M, Transplantation 2011). Method(s): Except for the pre-treatment of serum, One Lamba LABScreen Phenotype (PRA) and Single Antigen (SAB) reagents are used according to manufacturer instructions. Ten serum samples were selected that exhibited high NC bead MFI (>1000) with DTT-treatment (5mM at 37C for 30 minutes) in PRA beads (N=7) or SAB (N=3), requiring adsorption by Adsorb Out beads (One Lambda). NC bead MFI and specificity assignment of untreated, EDTA-treated (final concentration of 5mM; 20uL of 0.05M EDTA added to 180uL serum), and DTT-treated serum samples were compared. Result(s): NC bead MFI showed no significant difference between untreated and EDTA-treated serum (r=0.999), indicating that EDTA-treatment does not increase NC bead MFI. NC bead MFI was >1000 in 3/10 untreated serums, 3/10 EDTA-treated serums, and 10/10 DTT-treated serums. The NC bead MFI was successfully reduced after treatment with Adsorb Out in the 3 EDTA-treated serums. Specificity assignment and antibody strength between EDTA-treated and DTT-treated serum was consistent in all samples tested. Conclusion(s): EDTA is an effective treatment to remove interference from inhibitory substances without increasing NC bead MFI.

Gasperi, J., et al. (2014). "Assessment of floating plastic debris in surface water along the Seine River." Environmental Pollution **195**: 163-166.

This study is intended to examine the quality and quantity of floating plastic debris in the River Seine through use of an extensive regional network of floating debris-retention booms; it is one of the first attempts to provide reliable information on such debris at a large regional scale. Plastic debris represented between 0.8% and 5.1% of total debris collected by weight. A significant proportion consisted of food wrappers/containers and plastic cutlery, probably originating from voluntary or involuntary dumping, urban discharges and surface runoff. Most plastic items are made of polypropylene, polyethylene and, to a lesser extent, polyethylene terephthalate. By extrapolation, some 27 tons of floating plastic debris are intercepted annually by this network; corresponding to 2.3 g per Parisian inhabitant per year. Such data could serve to provide a first evaluation of floating plastic inputs conveyed by rivers. [ABSTRACT FROM AUTHOR]

Gassel, M. and C. M. Rochman (2019). "The complex issue of chemicals and microplastic pollution: a case study in North Pacific lanternfish." Environmental Pollution **248**: 1000-1009.

Marine plastic debris, including microplastics (<5 mm in size), comprises a suite of chemical ingredients and sorbed chemical contaminants. Thus, microplastics are a potential, and debated, source of anthropogenic chemicals for bioaccumulation and biomagnification. Several studies have investigated the role of microplastics as a vector of contaminants to marine organisms via modeling exercises, laboratory experiments, and field studies. Here, we examined relationships among chemical contaminants and microplastics in lanternfish (family Myctophidae), an important link in marine food webs, from the North Pacific Ocean as a case study from the field. We compared the body burden of several chemical groups (bisphenol A [BPA], nonylphenol [4-NP], octylphenol [4n-OP], alkylphenol ethoxylates [APEs], pesticides, polychlorinated biphenyls [PCBs], and polybrominated diphenyl ethers [PBDEs]) in fish caught within and outside the North Pacific Subtropical Gyre where plastic is known to accumulate. We also tested whether there was a relationship between chemical concentrations in fish and plastic density at each sampling location. Mean concentrations of common plastic constituents (BPA, 4-NP, 4n-OP, APEs, and total PBDEs) were comparable between myctophids collected within and outside the North Pacific Gyre. Pesticides were higher in lanternfish caught outside the gyre and were associated with lower plastic density. Total PCBs were also higher in fish outside the gyre. In contrast, lower chlorinated PCB congeners were higher in fish residing in the accumulation zone and were correlated with higher plastic density. This finding is consistent with other studies demonstrating an association between lower chlorinated PCBs and plastics in biota and suggests that microplastic may be a transport mechanism for some chemicals in nature.

Gatidou, G., et al. (2019). "Review on the occurrence and fate of microplastics in Sewage Treatment Plants." Journal of Hazardous Materials **367**: 504-512.

Microplastics are plastic fragments lower than 5 mm that are detected in the environment causing various effects on organisms. Several research articles have recognized Sewage Treatment Plants as important sources of polyethylene and polypropylene beads, polyester, polyamide and other types of microplastics. For their determination, techniques such as visual identification using microscope, Fourier-transform infrared and RAMAN spectroscopy are used, while chemical oxidation, enzymatic maceration and density separation are applied as pretreatment methods for the removal of the inorganic and organic content. Microplastics' concentrations range up to 3160 particles L⁻¹, 125 particles L⁻¹ and 170.9 x 10³ particles Kg⁻¹ TS dw in raw, treated wastewater and sludge, respectively. Their removal during wastewater treatment ranges between 72% and 99.4%; the main processes that contribute to their removal are primary and secondary treatment, while the effect of tertiary treatment depends on the applied technology. Entrapment in suspended solids and accumulation to sludge are the major mechanisms governing their fate. A standardized protocol for samples' collection and pretreatment as well as microplastics' isolation and characterization is needed; future reseach should investigate the possible chemical and physical changes of microplastics during treatment, and their role as carriers for the transfer of emerging micropollutants. Copyright © 2018 Elsevier B.V.

Gattani, Y. S. (2010). "Floating multiparticulate drug delivery systems: An overview." International Journal of Pharma and Bio Sciences **1 (2) (no pagination)**(6).

In recent scientific and technological advancement have been made in the research and development of rate controlled oral drug delivery systems overcoming physiological adversities, such as short gastric residence times (GRT) and unpredictable gastric emptying times (GET).

Furthermore, absorption windows in the proximal gut can limit the bioavailability of orally administered compounds and can be a major obstacle to the development of controlled release formulations for important drugs. Methods to increase the residence of drug formulations at or above the absorption window are discussed in this review¹. Several approaches are currently utilized in the prolongation of the GRT, including floating drug delivery system (FDDS), also known as hydro dynamically balanced systems (HBS), swelling and expanding systems, modified shape systems and high density system. In this review, the current status of floating multiparticulate drug delivery systems including hollow microspheres (micro balloons), low density floating micro pellets and floating micro beads (acrylic resin based), microcapsules etc, their evaluation parameter, advantages, application, limitation and future potential for oral control drug delivery are discussed.

Gattas-Asfura, K., et al. (2014). "Covalent layer-by-layer assembly of hyperbranched polymers on alginate microcapsulesto impart stability and permselectivity." Journal of Materials Chemistry B **2**(46): 8208-8219.

The microencapsulation of cells has shown promise as a therapeutic vehicle for the treatment of a wide variety of diseases. While alginate microcapsules provide an ideal cell encapsulation material, polycations coatings are commonly employed to enhance stability and impart permselectivity. In this study, functionalized hyperbranched alginate and dendrimer polymers were used to generate discreet nanoscale coatings onto alginate microbeads via covalent layer-by-layer assembly. The bioorthogonal Staudinger ligation scheme was used to chemoselectively crosslink azide functionalized hyperbranched alginate (alginate-hN₃) to methyl-2-diphenylphosphino-terephthalate (MDT) linked PAMAM dendrimer (PAMAM-MDT). Covalent layer-by-layer deposition of PAMAM-MDT/alginate-hN₃ coatings onto alginate microbeads resulted in highly stable coatings, even after the inner alginate gel was liquefied to form microcapsules. The permselectivity of the coated microcapsules could be manipulated via the charge density of the PAMAM, the number of layers deposited, and the length of the functional arms. The cytocompatibility of the resulting PAMAM-MDT/alginate-hN₃ coating was evaluated using a beta cell line, with no significant detrimental response observed. The biocompatibility of the coatings in vivo was also found comparable to uncoated alginate beads. The remarkable stability and versatile nature of these coatings provides an appealing option for bioencapsulation and the release of therapeutic agents.

Gauquie, J., et al. (2015). "A qualitative screening and quantitative measurement of organic contaminants on different types of marine plastic debris." Chemosphere **138**: 348-356.

Chemical compounds present on plastic were characterised on different types of plastic litter and beached pellets, using a general GC–MS screening method. A variety of plastic related compounds, such as building blocks, antioxidants, additives and degradation products, were identified next to diverse environmental pollutants and biofilm compounds. A validated method for the analysis of PAHs and PCBs on beached pellets at the Belgian Coast, showed concentrations of ∑ 16 EPA-PAHs of 1076–3007 ng g −1 plastic, while the concentrations of ∑ 7 OSPAR-PCBs ranged from 31 to 236 ng g −1 plastic. The wide variety of plastic compounds retrieved in the general screening showed the importance of plastic as a potential source of contaminants and their degradation products. [ABSTRACT FROM AUTHOR]

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Gavini, V., et al. (2014). "Formulation & in-vitro evaluation of wax incorporated floating beads of silymarin." International Journal of PharmTech Research **6**(6): 1824-1832.

Among modified-release oral dosage form increasing interest has currently turned to systems designed to achieve prolonged residence at the site of drug delivery. Among different controlled release systems microbeads offer prolonged residence time and controlled release in stomach. Silymarin (SLM) is an effective hepatoprotective drug used in therapeutic practice today. However, its absorption is in stomach and needs to be retained in the same for prolonged period. So Silymarin is suitable candidate to develop into wax incorporated alginate beads. The objective of this study was to formulate and evaluate wax incorporated alginate microbeads loaded with Silymarin. The alginate microbeads of Silymarin with variable concentrations of waxes (White bees wax & Carnauba wax) were prepared by Melt Extrusion-Ionotropic gellation method. The prepared microbeads were characterized for their pre-formulation and post formulation parameters. Compatibility studies proved that there was no interaction between Silymarin and waxes used. Silymarin beads were roughly spherical in nature, which was confirmed by Scanning electron microscopy. Silymarin beads with normal frequency distribution were obtained. A maximum of 94.75% drug entrapment efficiency was obtained. The in-vitro performance of Silymarin beads showed controlled release up to 12 hrs depending on the wax concentration. Finally it can be concluded that the formulated sodium alginate gel beads with white bees wax were more feasible and effective than carnauba wax beads in encapsulating SLM and thereby increasing the effectiveness of the drug. Copyright © 2014, Sphinx Knowledge House. All Rights Reserved.

Gawai, K. J. and D. S. Ramteke (2017). "Characterisation of municipal solid waste of household and Sukali dumping depot of Amravati city." Asian Journal of Environmental Science **12**(2): 107-113.

Increasing population and urbanization created various problems among which solid waste management is the one. It arouses the problem of public health and environmental deterioration. Lifestyle of unconcern people is the root cause of this problem. Proper characterization of municipal solid waste is the first fundamental step for the planning of municipal waste management services. Based on composition/characterization of waste, appropriate waste processing technologies can be selected and implemented. Characterisation of the solid waste at the duping site shows the presence of high percentage of organic matter (24%) and inert material (25%) in the waste. Characterisation of the solid waste of the household samples shows high percentage of organic waste (55%) and low inert material (8.37%). Thus, it indicates that the proper on site (household level) segregation of different components of the waste viz., organic waste, plastic waste, metals, glass, paper, can reclaim the resources and better use it. It can be concluded that the way we manage will decide how well prepared we are for the better future.

Gayathri, J., et al. (2018). "Acute sensitivity of three Cladoceran species to different types of microplastics in combination with thermal stress." Environmental Pollution **239**: 733-740.

Microplastics (<5 mm, MP) are ubiquitously distributed in the environment, causing increasing concern regarding their potential toxicity to organisms. To date, most research has focussed on the impacts of MPs on marine and estuarine organisms, with fewer studies focussing on the effects of microplastics on freshwater ecosystems, especially under different environmental

conditions. In the present study, the sensitivity of two temperate Cladoceran species, Daphnia magna and Daphnia pulex, and a smaller tropical species Ceriodaphnia dubia, to primary microplastics (PMP) and secondary (weathered) microplastics (SMP) was assessed. A prolonged acute toxicity assay (up to 72 or 96 h) was performed at 18 degrees , 22 degrees , and 26 degrees C, to determine the influence of temperature as an additional stressor and survival data were analysed using toxicokinetic-toxicodynamic (TK-TD) model. Acute sensitivity of D. magna and D. pulex to both PMP and SMP increased sharply with temperature, whereas that of C. dubia remained relatively stable across temperatures. C. dubia was the most sensitive species at 18 degrees C, followed by D. pulex and D. magna, which were of comparable sensitivity. However, this ranking was reversed at 26 degrees C as could be seen from the No Effect Concentration (NEC) estimates of the TK-TD model. In addition, SMP and PMP had a similar effect on D. magna and D. pulex, but PMP was more toxic to C. dubia. Effects on survival were strongly time-dependent and became substantially more severe after the standard 48 h test period. Our results indicate that sensitivity to microplastics may differ between species for different types of microplastics, and could be drastically influenced by temperature albeit at high exposure concentrations.

Gayathri, J., et al. (2019). "Reproductive toxicity of primary and secondary microplastics to three cladocerans during chronic exposure." Environmental Pollution **249**: 638-646.

Microplastics (<5 mm) are distributed ubiquitously in natural environments. The majority of microplastics in aquatic environments are shown to have rough surfaces due to various weathering processes (secondary microplastics; SMP), while laboratory studies predominantly utilise pristine microplastics (primary microplastics; PMP). Here we present the results from a study comparing the chronic effects of pristine PMP and artificially weathered SMP to three different Cladoceran species (Daphnia magna, Daphnia pulex, Ceriodaphnia dubia). We assessed the impact of PMP and SMP on reproductive output using various measured parameters, including time of first brood, size of first brood, size of first three broods, cumulative number of neonates, total number of broods and terminal length of test animals. Our results show that reproductive output of all species declined in a dose-dependent manner. The No Observed Effect Concentration (NOEC) was less than the lowest tested concentration (10² p/mL) for at least one measured endpoint for all species and both PMP and SMP. Further, it was inferred that species sensitivity varied inversely with body size for most endpoints, resulting in C. dubia being the most sensitive species; and D. magna being the least sensitive species under study. In addition, PMP appeared to have greater toxic potential as compared to SMP. This study is the first to directly compare the chronic toxicity of both pristine and weathered microplastic particles on three freshwater toxicological model organisms. Our results indicate that sensitivity in reproduction and growth to microplastics may differ between species and type of microplastic exposed; highlighting the importance of using multiple species and structural types of particles.

Gazzola, M. V., et al. (2012). "Haploidentical TCR-alpha/beta and CD19-depleted hematopoietic stem cell transplantation in a case of scid." Journal of Clinical Immunology **1)**: S161-S162.

Introduction: Severe combined immunodeficiency (SCID) is a primary immunodeficiency (PID) with incidence < 1:100.000 newborns, characterized by early onset, failure to thrive, diarrhea, infections. Neonatal screenings are not implemented in our country. Treatment of choice is urgent hematopoietic stem cell transplantation (HSCT). Objective(s): We report the haplo-HSCT of a SCIDRAG1 baby with pneumonia by P.jiroveci. Method(s): 4-month-old female, weight 6.3kg, height 60cm (50degree percentile). Previously two perforated otitis, oral Candidiasis,

bronchopneumonia. Admitted to ICU for respiratory failure (P.jiroveci pneumonia, Rotavirus gastroenteritis), requiring assisted ventilation. CBC: lymphocytopenia (700 lymphocytes/mm3). Result(s): Immunophenotype: 8% CD3+CD4+CD8- (CD45RA+CD45RO-) T-cells ; 0% CD8+; 0% CD19+; 91% CD16/56+ ; negative CD25, CD38, HLA-DR. Molecular analysis identified RAG1 mutation, supporting SCID T-B-NK+ diagnosis. HSCT: haploidentical from father. TCRalphabeta-CD19- depletion with biotinylated anti-alphabeta antibody, anti-biotin antibody+magnetic microbeads, CliniMACS system, was highly effective (TCRalphabeta 5 log; CD19 3,2 log). Graft composition: 32.8x106/kg CD34+, 21.6x106/kg TCRgammadelta. Conditioning regimen: Treosulfan, Fludarabine, rabbit antilymphocyte serum. No subsequent immunosuppression. PMN-platelets engraftment: day +17 and +15 respectively. Progressive clinical and radiological improvement, independence from mechanical ventilation on day +14. Donor chimerism 100% (day+14). At day +100, CBC is stable at 700 lymphocytes/mm3. Immunophenotype: 2% CD3 (1% CD4, 1% CD8), 82% CD19, 13% CD16/56+. Chimerism 87% Donor (CD19 100%, CD3 99% ; CD16/56+ 84%). The baby is well at home, without infections. No signs of GvHD. Conclusion(s): TCRalphabeta-CD19-depleted TCRgammadelta-enriched haplo-HSCT seems useful in SCID cases with severe active infections, allowing early partial immune reconstitution and recovery from infections without GvHD. Longer follow-up is needed to assess outcome.

Gbewonyo, K. and D. I. Wang (1983). "Confining mycelial growth to porous microbeads: a novel technique to alter the morphology of non-newtonian mycelial cultures." Biotechnology & Bioengineering **25**(4): 967-983.

In an effort to alter the filamentous morphology of Penicillium chrysogenum cells, a technique was developed to confine the growth of the mycelia to porous celite beads. The pore matrix of these beads was found to be very effective for entrapping mycelial cells and spores. The entrapped spores were used to initiate the fermentations in shake flask cultures. Significant increases in final cell densities were obtained in the confined cell cultures reaching up to 60 g/L cells. This is nearly double the cell concentration attainable in free cell cultures grown in the absence of beads. Cell loadings up to 0.55 g cells per bead were obtained in the confined cell cultures. In the later stages of the fermentations, the specific oxygen uptake rates in the confined cell cultures were found to decrease with respect to free cell cultures.

Gbewonyo, K. and D. I. C. Wang (1983). "Enhancing gas-liquid mass transfer rates in non-Newtonian fermentations by confining mycelial growth to microbeads in a bubble column." Biotechnology and Bioengineering **25**(12): 2873-2887.

The performance of a penicillin fermentation was assessed in a laboratory-scale bubble column fermentor, with mycelial growth confined to the pore matrix of celite beads. Final cell densities of 29 g/L and penicillin titres of 5.5 g/L were obtained in the confined cell cultures. In comparison, cultures of free mycelial cells grown in the absence of beads experienced dissolved oxygen limitations in the bubble column, giving only 17 g/L final cell concentrations with equally low penicillin titres of 2 g/L. The better performance of the confined cell cultures was attributed to enhanced gas liquid mass transfer rates, with mass transfer coefficients (k sub(L)a) two to three times higher than those determined in the free cell cultures. Furthermore, the confined cell cultures showed more efficient utilization of power input for mass transfer, providing up to 50% reduction in energy requirements for aeration.

Ge, J., et al. (2017). "Expression and antiviral function of TLR7 in chronic hepatitis B patients and its up-regulation by PEG-IFN-alpha-2a therapy." Hepatology International **11 (1 Supplement 1)**: S21.

Background: Therapeutic strategy to activate host innate immunity, like toll-like receptor 7 (TLR7) agonist, had a great potential for the treatment of chronic hepatitis B (CHB). Here we investigated the expression of TLR7 in CHB patients with or without Peg-IFN-alpha-2a therapy and explored the mechanism contributing its antiviral function in vitro. Method(s): PBMC samples were collected from 31 healthy controls (HC) and 80 CHB patients; including 25 HBeAg-positive CHB patients received Peg-IFN-alpha-2a therapy. TLR7 expression in PBMC cells and liver tissues were evaluated using realtime RT-PCR and microarray analysis, respectively. HepG2.2.15 cells were incubated with conditioned media (CM) from PBMC treated with the TLR7- ligand imiquimod. HBV replication was analyzed by Southern blot and the antiviral cytokines production was examined by ELISA and antibody neutralization assay. CD19 + B cells were sorted by MicroBeads and were stimulated with imiquimod in the presence of IFN-alpha or not. B cells proliferation, activation, cytokines and antibody production were determined by FACS and ELISPOT analysis. Result(s): TLR7 expression in PBMC and liver tissue was significant higher in CHB patients than HC ($p = 0.003$) and had a positive correlation with ALT levels ($p<0.001$, $r = 0.333$). To examine the TLR7-mediated antiviral effect in vitro, exposure of HepG2.2.15 cells to the CM form HC or CHB PBMC strongly inhibited HBV replication and antigen expression, largely depend on the production of IFN-alpha. Interesting, more pronounced inhibition of HBV replication and induction of IFN-alpha were observed in CM from CHB, as compared to HC. Further, longitudinal analysis revealed that TLR7 levels in PBMC were steadily increased during 48 weeks of Peg-IFN-alpha-2a therapy and its expression at 24 weeks of treatment were much higher in group with off-treatment complete response (HBeAg seroconversion and HBV DNA<200 IU/ml for at least 6 months after the end of therapy, $n = 7$) than non-off treatment complete responders group ($n = 18$, $p = 0.006$). Consistently, peg-IFN-alpha-2a or recombinant IFN-alpha treatment were able to upregulate TLR7 expression in CD19 + B cells. Moreover, IFN-alpha was able to work synergistically with imiquimod to augment HBcAg specific B cells proliferation (CFSE staining), activation (CD69, CD80, CD86), cytokines (TNF-alpha, IL-6, IFN-gamma) and antibody (IgM, IgG) production. Conclusion(s): Our results suggested that TLR7 exerted its inhibitory effect on HBV replication by IFN-alpha secretion, while its expression and antiviral effect were enhanced in CHB patients. Moreover, TLR7 expression was up-regulated by Peg-IFN-alpha-2a therapy and its lig and could work synergistically with IFN-alpha to enhance B cells function, implying the application of sequential therapeutic strategy with Peg- IFN-alpha-2a and TLR7-ligand in CHB patients.

Ge, J., et al. (2017). "Expression signature of MicroRNA-155 in chronic hepatitis B patients and it regulates interferon-gamma production in natural killer cells." Hepatology International **11 (1 Supplement 1)**: S286.

Background: MicroRNAs (miRNA) can be detected in the serum and peripheral blood mononuclear cells (PBMCs) and have been reported to be differently regulated in a variety of liver diseases. miR-155 had been identified as a key modulator of cellular functions in both innate and adaptive immunity. The aim of this study was to clarify the relationship between the expression of miR-155 and clinical outcome in patients with Chronic Hepatitis B (CHB). Method(s): A total of 21 healthy controls (HC) and 120 patients with chronic HBV infection, including 41 telbivudine based therapy and 24 peg-IFN-alpha-2a treated CHB patients, were enrolled in this study. miR- 155 expression in PBMC and serum samples were evaluated by realtime RT-PCR, respectively. CD56+NK cells were sorted by MicroBeads and were electronically transfected with miR-155 mimic. Cytokines production and gene expression in NK cells were determined by FCAS Flow assay and realtime RT-PCR. Result(s): miR-155 expression in PBMC (CHB vs HC, $p = 0.560$; CHB vs IT, $p<0.001$) and serum samples (CHB vs HC, $p = 0.757$; CHB vs IT, p = 0.013) from CHB patients with abnormal ALT levels was comparable to HC, but higher than immunotolerant carriers and inactive carriers. There was a positive correlation between miR-155 expression and ALT levels in CHB patients (p = 0.002, r = 0.495). Accompanied with the reduction of ALT levels, miR-155 expression in PBMC was gradually decreased during telbivudine or peg-IFN-alpha- 2a therapy. Interestingly, telbivudine-treated patients achieved HBeAg seroconversion at week 52 exhibited higher miR-155 expression levels at baseline than non-responders (p = 0.007). Furthermore, we found that miR-155 (p = 0.002) and IFN-gamma expression (p = 0.015) in NK cells was significantly down-regulated in CHB compared with HC. Inversely, SCOS1, a target of miR-155, was up-regulated in NK cells of CHB. Finally, reconstitution of miR- 155 in NK cells from CHB patients led to a decrease in SCOS1 expression (p = 0.008) and an increase in IFN-gamma production (p = 0.001). Conclusion(s): Our study established the correlations between miR-155 expression and liver inflammation or treatment outcome during HBV infection and antiviral therapy. The in vitro data suggested that miR- 155 down-regulation in NK cells of CHB impaired IFN-gamma production by targeting SOCS1, which may contribute to immune defects and immunopathogenesis during chronic HBV infection.

Gebert, A., et al. (2004). "Antigen Transport into Peyer's Patches: Increased Uptake by Constant Numbers of M Cells." American Journal of Pathology **164**(1): 65-72.

Membranous (M) cells are specialized epithelial cells of the Peyer's patches that sample antigens from the gut lumen, thereby enabling the host to respond immunologically. Recent studies suggest that this transport can be up-regulated within hours by de novo formation of M cells from enterocytes. To test this hypothesis, we used an in vivo model and induced the transcytosis of tracers in Peyer's patches by application of Streptococcus pneumoniae R36a into the gut lumen. Using cell-type-specific markers, we quantified M cells in the Peyer's patch domes, lymphocytes associated with M cells, and the transport rate for experimentally applied microbeads after 3 hours of exposure to R36a. The transport of latex microbeads was significantly increased by +131% in the R36a-treated patches as compared to buffer controls (P < 0.001). While in controls, each M cell was associated with 2.05 +/- 0.64 lymphocytes, a significant increase (+55.1%; P < 0.001) was determined in the R36a-treated patches. However, no statistical difference was detected in the percentage of M cells in the dome epithelia (46.0 +/- 4.6% versus 45.5 +/- 3.8%). It is concluded that bacteria-induced up-regulation of particle transport in Peyer's patch domes is due to an increased transport rate of the M cells, but not to a de novo formation of M cells. The data support the hypothesis that M cells represent a separate cell lineage that does not derive from enterocytes on the domes.

Gebhardt, C. and S. Forster (2018). "Size-selective feeding of Arenicola marina promotes long-term burial of microplastic particles in marine sediments." Environmental Pollution **242**(Part B): 1777-1786.

Despite of their ubiquitous distribution in marine sediments, the role of benthic fauna in microplastic transport at the sea floor has received little attention yet. The present study investigated the influence of bioturbation activity of the polychaete Arenicola marina on microplastic transport and burial in marine sediments. Sediment ingestion was assessed in a long term mesocosm experiment with exposure times ranging from 106 to 240 days, using three particle tracers with different particle diameters (microplastic: 500 and 1000 micro m, respectively; luminophores: 130 micro m). Sediment grain size distributions were assessed after experiment termination in all feeding layers at 8-12 cm depth to determine the influence of size-selective feeding of A. marina on median grain size and microplastic retention. Burial of microplastic occurred in all mesocosms up to a depth of 20 cm and was strongly dependent on individual sediment feeding rates. For low bioturbation conditions, both microplastic and luminophore concentrations exhibited an exponential decrease with increasing sediment depth, indicating particle burial via feeding funnel transport. Particle concentrations remained high in the uppermost 4 cm of the sediment. At high bioturbation rates, no microplastic particles remained in near-surface sediment layers, but a distinct accumulation of microplastic was observed in the feeding layer, suggesting the discrimination of plastic particles during feeding. In contrast, luminophores displayed a similar accumulation, but additionally showed uniform distributions above feeding layers, indicating ingestion and defecation by polychaetes. In accordance with these findings, an overall coarsening of median grain sizes was observed in all feeding layers, indicating the retention of large microplastic due to size-selective feeding. These findings demonstrate the ability of the conveyor belt-feeding polychaete A. marina to promote unidirectional transports of microplastic >=500 micro m and the potential for the long-term retention of these particles in marine sediments.

Gehui, W., et al. (2012). "Molecular Distribution and Stable Carbon Isotopic Composition of Dicarboxylic Acids, Ketocarboxylic Acids, and α-Dicarbonyls in Size-Resolved Atmospheric Particles From Xi'an City, China." Environmental Science & Technology **46**(9): 4783-4791.

Size-resolved airborne particles (9-stages) in urban Xi'an, China, during summer and winter were measured for molecular distributions and stable carbon isotopic compositions of dicarboxylic acids, ketocarboxylic acids, and α-dicarbonyls. To our best knowledge, we report for the first time the size-resolved differences in stable carbon isotopic compositions of diacids and related compounds in continental organic aerosols. High ambient concentrations of terephthalic (tPh, 379 ± 200 ng m-3) and glyoxylic acids (ωC2, 235 ± 134 ng m-3) in Xi'an aerosols during winter compared to those in other Chinese cities suggest significant emissions from plastic waste burning and coal combustions. Most of the target compounds are enriched in the fine mode (<2.1 µm) in both seasons peaking at 0.7-2.1 µm. However, summertime concentrations of malonic (C3), succinic (C4), azelaic (C9), phthalic (Ph), pyruvic (Pyr), 4-oxobutanoic (ωC4), and 9-oxononanoic (ωC9) acids, and glyoxal (Gly) in the coarse mode (>2.1 µm) are comparable to and even higher than those in the fine mode (<2.1 µm). Stable carbon isotopic compositions of the major organics are higher in winter than in summer, except oxalic acid (C2), ωC4, and Ph. δ13C of C2 showed a clear difference in sizes during summer, with higher values in fine mode (ranging from -22.8‰ to -21.9‰) and lower values in coarse mode (-27.1‰ to -23.6‰). The lower δ13C of C2 in coarse particles indicate that coarse mode of the compound originates from evaporation from fine mode and subsequent condensation/adsorption onto pre-existing coarse particles. Positive linear correlations of C2, sulfate and ωC2 and their δ13C values suggest that ωC2 is a key intermediate, which is formed in aqueous-phase via photooxidation of precursors (e.g., Gly and Pyr), followed by a further oxidation to produce C2. [ABSTRACT FROM AUTHOR]

Geilfus, N. X., et al. (2019). "Distribution and impacts of microplastic incorporation within sea ice." Marine Pollution Bulletin **145**: 463-473.

Microplastics (plastic particles <5mm) are an emerging concern in Arctic sea ice with measured concentrations orders of magnitude higher than in surface seawater. However, incorporation of microplastics into sea ice, and their impact on sea ice properties, is unknown. We added

microplastic particles in a microcosm experiment to determine microplastic distributions and effects on sea ice properties. Microplastic additions did not affect sea ice growth, but high concentrations of microplastics at the ice surface resulted in high ice salinity and changes in sea ice albedo. Field studies in the Gulf of Bothnia (Baltic Sea) showed sea ice concentration of microplastics from 8 to 41 particles per liter of melted ice, wich were much lower than those found to impact sea ice properties in the microcosm experiments. However, should microplastic concentrations increase, microplastic incorporation in sea ice may impact sea ice albedo.

Geissler, M., et al. (2011). "Air stream-mediated vortex agitation of microlitre entities on a fluidic chip." Lab on a Chip **11**(10): 1717-1720.

The method presented in this paper uses air flux to induce spiral motion in small-scale (e.g., microlitre) fluid entities in an efficient, technologically convenient manner. The set-up entails a manifold that modulates the air flux and projects it onto a liquid-containing reservoir. The flow behaviour of the liquid phase has been visualized through the dissolution of rhodamine B crystallites and the motion of fluorescent microbeads. In addition, the method proved effective to restoring a suspension of spherical particles upon sedimentation, promoting displacement and capture of the beads within a microfluidic system.

Gemmell, C. H. (1997). "A flow cytometric immunoassay to quantify adsorption of complement activation products (iC3b, C3d, SC5b-9) on artificial surfaces." Journal of Biomedical Materials Research **37**(4): 474-480.

Crosslinked agarose microspheres and various polystyrene microspheres were analyzed for complement components after incubation with serum at 37 degrees C for times up to 2 h. Quantification involved direct flow cytometric analysis of the beads after the bound complement proteins were indirectly fluorescently tagged by use of a monoclonal antibody against a complement protein: C5b-9, iC3b, C3d, C4d, Bb, C3a, and C1q. Calibration with fluorescein microbead standards demonstrated that the membrane attack complex (SC5b-9) was surface bound on all surfaces and that the surface concentration gradually increased to levels as high as 0.5 micrograms/cm2. Further, the surface bound represented a substantial percentage of the total generated. The iC3b level on polystyrene beads rapidly reached 0.09 micrograms/cm2 and the C3d levels were an order of magnitude less. On agarose beads the iC3b levels continually rose to 0.17 micrograms/cm2 and, as before, the C3d levels were substantially lower. The surface concentration of C4d and Bb on both surfaces were significant but less than 1.0 ng/cm2. There was minimal evidence of C3a and C1q adsorption for any surface. Use of amino-polystyrene beads moderately reduced the level of bound iC3b, C3d, and SC5b-9, whereas carboxylated beads reduced the levels by almost a factor of two. The appreciable amounts of iC3b and SC5b-9 consistently noted on the artificial surfaces tested in this paper suggests that for these two activation products in vitro analysis of material induced complement activation should also include surface analysis.

Genc, A. N., et al. (2020). "Modeling transport of microplastics in enclosed coastal waters: A case study in the Fethiye Inner Bay." Marine Pollution Bulletin **150 (no pagination)**(110747).

In this study, transport and possible accumulation of microplastic marine litter in enclosed coastal waters are modeled numerically. The model is applied to the Fethiye Inner Bay, located in Fethiye-Gocek Specially Protected Area. In modeling studies, three dimensional coastal hydrodynamics, transport and water quality numerical model HYDROTAM-3D was used. The current climate was prepared by modeling long-term circulation patterns due to wind, wave and density stratifications. Following the hydrodynamic studies, the advection and diffusion of 3 mm size polystyrene particles by the coastal currents in the surface waters of Fethiye Inner Bay were simulated. The coastal regions where the microplastic pollution will be concentrated and transported were determined by the modeling scenarios. It has been found that microplastic accumulation is expected in the southwest and east coastal waters of the Fethiye Inner Bay. The results of the model will contribute to the databases for sustainable protection of the marine environments. Copyright © 2019 Elsevier Ltd

Geng, T., et al. (2014). "Single-cell forensic short tandem repeat typing within microfluidic droplets." Analytical Chemistry **86**(1): 703-712.

A short tandem repeat (STR) typing method is developed for forensic identification of individual cells. In our strategy, monodisperse 1.5 nL agarose-in-oil droplets are produced with a high frequency using a microfluidic droplet generator. Statistically dilute single cells, along with primer-functionalized microbeads, are randomly compartmentalized in the droplets. Massively parallel single-cell droplet polymerase chain reaction (PCR) is performed to transfer replicas of desired STR targets from the single-cell genomic DNA onto the coencapsulated microbeads. These DNA-conjugated beads are subsequently harvested and reamplified under statistically dilute conditions for conventional capillary electrophoresis (CE) STR fragment size analysis. The 9-plex STR profiles of single cells from both pure and mixed populations of GM09947 and GM09948 human lymphoid cells show that all alleles are correctly called and allelic drop-in/drop-out is not observed. The cell mixture study exhibits a good linear relationship between the observed and input cell ratios in the range of 1:1 to 10:1. Additionally, the STR profile of GM09947 cells could be deduced even in the presence of a high concentration of cell-free contaminating 9948 genomic DNA. Our method will be valuable for the STR analysis of samples containing mixtures of cells/DNA from multiple contributors and for low-concentration samples.

Gennip, S. J. V., et al. (2019). "In search for the sources of plastic marine litter that contaminates the Easter Island Ecoregion." Scientific Reports **9**(1): 19662.

Subtropical gyres are the oceanic regions where plastic litter accumulates over long timescales, exposing surrounding oceanic islands to plastic contamination, with potentially severe consequences on marine life. Islands' exposure to such contaminants, littered over long distances in marine or terrestrial habitats, is due to the ocean currents that can transport plastic over long ranges. Here, this issue is addressed for the Easter Island ecoregion (EIE). High-resolution ocean circulation models are used with a Lagrangian particle-tracking tool to identify the connectivity patterns of the EIE with industrial fishing areas and coastline regions of the Pacific basin. Connectivity patterns for "virtual" particles either floating (such as buoyant macroplastics) or neutrally-buoyant (smaller microplastics) are investigated. We find that the South American shoreline between 20degreeS and 40degreeS, and the fishing zone within international waters off Peru (20degreeS, 80degreeW) are associated with the highest probability for debris to reach the EIE, with transit times under 2 years. These regions coincide with the most-densely populated coastal region of Chile and the most-intensely fished region in the South Pacific. The findings offer potential for mitigating plastic contamination reaching the EIE through better upstream waste management.

Gent, M. R., et al. (2009). "Recycling of plastic waste by density separation: prospects for optimization." Waste Management & Research **27**(2): 175-187.

A review of existing industrial processing and results of alternative processing investigations for separating solid mixtures and specifically recycling plastic waste by density separation is presented. Media density separation is shown to be fundamental for separation and/or pre-concentration in the recycling of plastics. The current use of static media processes limits the capacity and size of material that can be treated commercially. Investigations have shown that the hydroscopic properties of plastics can be reduced to improve such separations. This indicates that an alternative processing method is required to increase the commercial recovery of recyclable plastics. Cylindroconical and cylindrical cyclone-type media separators, such as those used for processing coal, are reviewed and suggested as a potential substitute. Both have superior production capacities and are able to process a larger range in particle sizes treated. A summary of results of investigations with cyclone media devices for recycling plastics is presented.

Gentile, R., et al. (2012). "Human gallbladder is a highly available source of stem cells with multiple endodermic mature fates potentiality." Digestive and Liver Disease **2)**: S66.

Background and aim: Biliary tree stem/progenitor cells (BTSCs) have been identified in human extrahepatic bile ducts and are able to generate in vitro and in vivo mature cells of the hepato-biliary and pancreatic endocrine lineages. The aims have been to investigate in normal and pathological gallbladders: i) the presence and location of BTSCs and ii) the possibility to isolate, culture and differentiate BTSCs. Material(s) and Method(s): Gallbladders were obtained from organ donors and from laparoscopic surgery for symptomatic cholelithiasias. Tissues or isolated cells were characterized by flow-cytometry, histology, immunohistochemistry (IH), immunofluorescence for stem/progenitor and mature cells markers. Ep- CAM+ cells were immunoselected by magnetic microbeads and were plated onto plastic in Kubota's Medium for self-replication and successively transferred to distinct differentiation media. In vivo studies were conducted in an experimental model of liver fibrogenesis (carbon tetrachloride administered to SCID mice twice a week for7 weeks). Result(s): The in situ IH demonstrated that, in normal and pathological gallbladders, the surface epithelium contained cells with the phenotype of BTSCs. Tissue digestion resulted in the isolation of15+/-3.7 and13.3+/-3.6 million viable cells from normal (N=5) and pathological gallbladder (N=5), respectively. Flow-cytometry demonstrated that, before immunoselection, cell population was constituted by an average of44.7% and26.9% EpCAM+ cells from normal and pathological gallbladders, respectively. In vitro, in Kubota's Medium, single EpCAM sorted cells showed a clonogenic capacity maintaining an endodermal-like phenotype for more than a month. When transferred into differentiation conditions, EpCAM+ cells differentiated to distinct fates resulting in cords of albumin-secreting hepatocytes, branching ducts of secretin receptor+ cholangiocytes or functional pancreatic islets. In vivo, EpCAM+ cells injected into fibrotic livers of SCID mice resulted in repopulation of mice livers by human albumin-producing hepatocytes. Conclusion(s): Normal and pathological gallbladders contain easily isolable cells with the phenotype and the biological properties of BTSCs. Thus, gallbladders constitute a highly available candidate source for regenerative medicine of liver and diabetes.

George, M. and T. E. Abraham (2006). "Polyionic hydrocolloids for the intestinal delivery of protein drugs: Alginate and chitosan - a review." Journal of Controlled Release **114**(1): 1-14.

The protein pharmaceutical market is rapidly growing, since it is gaining support from the recombinant DNA technology. To deliver these drugs via the oral route, the most preferred route, is the toughest challenge. In the design of oral delivery of peptide or protein drugs, pH sensitive hydrogels like alginate and chitosan have attracted increasing attention, since most of the synthetic polymers are immunogenic and the incorporation of proteins in to these polymers require harsh environment which may denature and inactivate the desired protein. Alginate is a

water-soluble linear polysaccharide composed of alternating blocks of 1-4 linked alpha-l-guluronic and beta-d-mannuronic acid residues where as chitosan is a co polymer of d-glucosamine and N-acetyl glucosamine. The incorporation of protein into these two matrices can be done under relatively mild environment and hence the chances of protein denaturation are minimal. The limitations of these polymers, like drug leaching during preparation can be overcome by different techniques which increase their encapsulation efficiency. Alginate, being an anionic polymer with carboxyl end groups, is a good mucoadhesive agent. The pore size of alginate gel microbeads has been shown to be between 5 and 200 nm and coated beads and microspheres are found to be better oral delivery vehicles. Cross-linked alginate has more capacity to retain the entrapped drugs and mixing of alginate with other polymers such as neutral gums, pectin, chitosan, and eudragit have been found to solve the problem of drug leaching. Chitosan has only limited ability for controlling the release of encapsulated compound due to its hydrophilic nature and easy solubility in acidic medium. By simple covalent modifications of the polymer, its physicochemical properties can be changed and can be made suitable for the peroral drug delivery purpose. Ionic interactions between positively charged amino groups in chitosan and the negatively charged mucus gel layer make it mucoadhesive. The favourable properties like biocompatibility, biodegradability, pH sensitiveness, mucoadhesiveness, etc. has enabled these polymers to become the choice of the pharmacologists as oral delivery matrices for proteins.

Gerber, P. F., et al. (2014). "Comparison of commercial enzyme-linked immunosorbent assays and fluorescent microbead immunoassays for detection of antibodies against porcine reproductive and respiratory syndrome virus in boars." Journal of Virological Methods **197**: 63-66.

The objective of this study was to compare the ability of two commercial enzyme-linked immunosorbent assays (ELISAs) and an in-house fluorescent microbead immunoassay (FMIA) to detect IgG antibodies against porcine reproductive and respiratory syndrome virus (PRRSV) types 1 and 2 in serum and oral fluids from boars infected experimentally. Samples from uninfected control pigs and PRRSV-negative field samples were also used. Serum samples were tested by ELISAs (IDEXX Se, HIPRA Se) and an in-house FMIA-Se for detection of PRRSV types 1 and 2. Oral fluids were tested by ELISAs (IDEXX-SO, IDEXX-OF, HIPRA-OF) for detection of PRRSV types 1 and 2. Among the sera, IDEXX-Se and HIPRA-Se had similar sensitivity and specificity ($p > 0.05$); however, IDEXX-Se detected positive animals earlier than HIPRA-Se ($p < 0.05$). FMIA-Se had the highest false-positive rates in known negative field samples (1/205 for IDEXX-Se, 5/205 for HIPRA-Se, and 37/205 for FMIA-Se; $p < 0.01$). Serum and oral fluid samples had similar detection rates and antibody kinetics using the IDEXX tests. There was a higher detection rate in serum than oral fluid using the HIPRA assays. In this study, the nucleocapsid protein utilized as antigen in the FMIAs yielded a low specificity. IDEXX-Se had the earliest detection and similar sensitivity and specificity to the HIPRA-Se.

Gerber, P. F., et al. (2015). "Subclinical avian hepatitis E virus infection in layer flocks in the United States." Veterinary Journal **206**(3): 304-311.

The objective of this study was to determine patterns of avian HEV infection in naturally infected chicken farms. A total of 310 serum samples and 62 pooled fecal samples were collected from 62 chicken flocks on seven commercial in-line egg farms in the Midwestern United States and tested for avian HEV circulation. Serum samples were tested for the presence of anti-avian HEV IgY antibodies by a fluorescent microbead immunoassay (FMIA) which was developed for this study. The FMIA was validated using archived samples of chickens with known exposure (n=96) and compared to the results obtained with an enzyme-linked immunosorbent assay (ELISA) based on the same capture antigen. There was an overall substantial agreement between the two assays (kappa =0.63) with earlier detection of positive chickens by the FMIA (P=0.04). On the seven farms investigated, the overall prevalence of anti-avian HEV IgY antibodies in serum samples from commercial chickens was 44.8% (20-82% per farm). Fecal samples were tested for avian HEV RNA by a nested reverse-transcriptase PCR. The overall detection rate of avian HEV RNA in fecal samples was 62.9% (0-100% per farm). Sequencing analyses of partial helicase and capsid genes showed that different avian HEV genotype 2 strains were circulating within a farm. However, no correlation was found between avian HEV RNA detection and egg production, egg weight or mortality. In conclusion, avian HEV infection is widespread among clinically healthy laying hens in the United States.

Gerdes, Z., et al. (2019). "Microplastic-mediated transport of PCBs? A depuration study with Daphnia magna." PLoS ONE **14**(2).

The role of microplastic (MP) as a carrier of persistent organic pollutants (POPs) to aquatic organisms has been a topic of debate. However, the reverse POP transport can occur if relative contaminant concentrations are higher in the organism than in the microplastic. We evaluated the effect of microplastic on the PCB removal in planktonic animals by exposing the cladoceran Daphnia magna with a high body burden of polychlorinated biphenyls (PCB 18, 40, 128 and 209) to a mixture of microplastic and algae; daphnids exposed to only algae served as the control. As the endpoints, we used PCB body burden, growth, fecundity and elemental composition (%C and %N) of the daphnids. In the daphnids fed with microplastic, PCB 209 was removed more efficiently, while there was no difference for any other congeners and ΣPCBs between the microplastic-exposed and control animals. Also, higher size-specific egg production in the animals carrying PCB and receiving food mixed with microplastics was observed. However, the effects of the microplastic exposure on fecundity were of low biological significance, because the PCB body burden and the microplastic exposure concentrations were greatly exceeding environmentally relevant concentrations.

Gerdes, Z., et al. (2019). "A novel method for assessing microplastic effect in suspension through mixing test and reference materials." Scientific Reports **9**(1): 10695.

The occurrence of microplastic in the environment is of global concern. However, the microplastic hazard assessment is hampered by a lack of adequate ecotoxicological methods because of conceptual and practical problems with particle exposure. In the environment, suspended solids (e.g., clay and cellulose) in the same size range as microplastic, are ubiquitous. Therefore, it must be established whether the addition of microplastic to these background levels of particulate material represents a hazard. We present a novel approach employing a serial dilution of microplastic and reference particles, in mixtures, which allows disentangling the effect of the microplastic from that of the other particulates. We demonstrate the applicability of the method using an immobilization test with Daphnia magna exposed to polyethylene terephthalate (test microplastic; median particle diameter ~5 micro m) and kaolin clay (reference material; ~3 micro m). In the range of the suspended solids test concentrations (0-10 000 mg L⁻¹), with microplastic contributing 0-100% of total mass, the LC₅₀ values for the plastic mixtures were significantly lower compared to the kaolin exposure. Hence, the exposure to polyethylene terephthalate was more harmful to the daphnids than to the reference material alone. The estimated threshold for the relative contribution of the test microplastic to suspended matter above which significantly higher mortality was observed was 2.4% at 32 mg of the solids L⁻¹. This approach has a potential for standardization of ecotoxicological testing of particulates, including microplastic.

Gerlach, E., et al. (1985). "The vascular endothelium: A survey of some newly evolving biochemical and physiological features." Basic Research in Cardiology **80**(5): 459-474.

The morphological, biochemical and functional characterization of the vascular endothelium has become possible through the broad use of electron microscopic methods, the successful elaboration and application of techniques for the isolation and cultivation of endothelial cells in vitro and through sophisticated studies on vessel and organ preparations, both in vitro and in vivo. In this survey emphasis is placed on certain methodological aspects of endothelial cell culture as well as on biochemical, physiological and pathophysiological features of the vascular endothelium. Endothelial cells can be propagated in culture dishes, the most commonly applied method, on suspended microbeads (dextrane, polyacrylamide), a technique giving large yields, or on thin porous membranes, a procedure suited for the study of transport processes across the endothelial layer. Different structural, biochemical and functional properties of the luminal (apical) and abluminal (basal) cell membrane determine important polarity features of the endothelium. Endothelial cells exhibit a variety of biochemical pathways and are characterized by high metabolic activities. Of particular interest is the large content of ATP in endothelial cells of different vascular origin. The rapid intracellular degradation of adenine nucleotides to nucleosides and bases, which are constantly released, is balanced on synthesis, mainly via salvage pathways. In endothelial cells of microvascular origin uric acid predominates by far as the final purine degradative because of the presence of xanthine dehydrogenase in these cells; in the macrovascular endothelium purine breakdown proceeds only to hypoxanthine, since xanthine dehydrogenase is lacking. In this connection interrelations between nucleotide catabolism in myocardial tissue and in coronary endothelial cells are discussed, also with respect to the participation of endothelial xanthine oxidase in the formation of oxygen radicals during post-ischemic reperfusion of the heart. Vascular endothelial cells of different origin are also capable of a rapid extracellular degradation of ATP, ADP and AMP to adenosine by means of specific ecto-nucleotidases. The subsequent fate of extracellularly formed adenosine appears to be different for endothelial cells of microvascular (preferential adenosine uptake) and macrovascular origin (preferential extracellular adenosine accumulation), thus implying functional consequences for platelet aggregation. Experimentally well supported aspects of endothelial functions under physiological and pathophysiological conditions include: - the involvement of metabolic properties of the endothelium in the separation of the intra- and extravascular space (barrier function, e.g. intraendothelial trapping of adenosine, active participation in leukocyte emigration); - the facilitation of CO<inf>2</inf>-release in the lung (endothelial carboanhydrases); - the participation in the regulation of vascular resistance (formation of angiotensin II and degradation of bradykinin by means of angiotensin converting enzyme, formation of not yet identified endothelium derived relaxing factor(s) [EDRF] in response to various intraluminally present vasodilating substances); - the establishment of an antithrombogenic luminal surface of the vessel wall (release of PGI<inf>2</inf>, adenosine, antithrombin III and plasminogen activator, intravascular degradation of adenine nucleotides to adenosine by endothelial ecto-nucleotidases, activation of protein C by endothelial thrombomodulin, heparan and antithrombin III containing endothelial glycocalyx).

Gerlach, G. F., et al. (2015). "Microbead Implantation in the Zebrafish Embryo." Journal of Visualized Experiments(101).

The zebrafish has emerged as a valuable genetic model system for the study of developmental biology and disease. Zebrafish share a high degree of genomic conservation, as well as similarities in cellular, molecular, and physiological processes, with other vertebrates including humans. During early ontogeny, zebrafish embryos are optically transparent, allowing researchers to visualize the dynamics of organogenesis using a simple stereomicroscope. Microbead implantation is a method that enables tissue manipulation through the alteration of factors in local environments. This allows researchers to assay the effects of any number of signaling molecules of interest, such as secreted peptides, at specific spatial and temporal points within the developing embryo. Here, we detail a protocol for how to manipulate and implant beads during early zebrafish development.

Germanov, E. S., et al. (2018). "Microplastics: no small problem for filter-feeding megafauna." Trends in Ecology & Evolution **33**(4): 227-233.

Microplastic pollution can impact filter-feeding marine megafauna, namely mobulid rays, filter-feeding sharks, and baleen whales. Emerging research on these flagship species highlights potential exposure to microplastic contamination and plastic-associated toxins. Research and its wide communication are needed to understand the magnitude of the issue and improve marine stewardship.

Gestoso, I., et al. (2019). "Plasticrusts: A new potential threat in the Anthropocene's rocky shores." Science of the Total Environment **687**: 413-415.

Plastic debris is one of the most extensive pollution problems our planet is facing today and a particular concern for marine environment conservation. The dimension of the problem is so large that it is possible our current era will generate an anthropogenic marker horizon of plastic in earth's sedimentary record. Here we present a new type of plastic pollution, the 'plasticrusts', plastic debris encrusting the rocky surface, recently discovered in the intertidal rocky shores of a volcanic Atlantic island. The potential impact that these new 'plasticrusts' may have needs to be further explored, as e.g. potential ingestion by intertidal organisms could suppose a new pathway for entrance of plastics into marine food webs. Consequently, its inclusion as a potential new marine debris category in management and monitoring actions should be pondered.

Gewert, B., et al. (2017). "Abundance and composition of near surface microplastics and plastic debris in the Stockholm Archipelago, Baltic Sea." Marine Pollution Bulletin **120**(1-2): 292-302.

We collected plastic debris in the Stockholm Archipelago using a manta trawl, and additionally along a transect in the Baltic Sea from the island of Gotland to Stockholm in a citizen science study. The samples were concentrated by filtration and organic material was digested using hydrogen peroxide. Suspected plastic material was isolated by visual sorting and 59 of these were selected to be characterized with Fourier transform infrared spectroscopy. Polypropylene and polyethylene were the most abundant plastics identified among the samples (53% and 24% respectively). We found nearly ten times higher abundance of plastics near central Stockholm than in offshore areas (4.2 x 10⁵ plastics km⁻² compared to 4.7 x 10⁴ plastics km⁻²). The abundance of plastic debris near Stockholm was similar to urban areas in California, USA, and the overall abundance in the Stockholm Archipelago was similar to plastic abundance reported in the northwestern Mediterranean Sea. Copyright © 2017 The Authors

Ghadiriasli, R., et al. (2018). "Identification of odorous compounds in oak wood using odor extract dilution analysis and two-dimensional gas chromatography-mass spectrometry/olfactometry. (Special Issue: Fading lemonade challenge/Where are modern flow techniques heading to?/Current trends in supercritical fluid chromatography/Instrumental analysis of microplastics.)." Analytical and bioanalytical

chemistry **410**(25): 6595-6607.

Over the centuries, oak wood has been used in the maturation process of alcoholic beverages imparting aroma and flavor notes. Whereas several studies have dealt with the impact of oak wood on the chemical composition of, for example, wine aroma, only limited information is available on the odorant composition of unmodified and raw oak wood itself. To close this gap, a combination of human sensory and chemo-analytical techniques was applied for the elucidation of the chemical composition of oak odor, comprising extraction of the volatile fraction of oak wood by means of solvent-assisted flavor evaporation (SAFE) and subsequent mild concentration of the distillate. Odor extract dilution analysis (OEDA), which is based on gas chromatography-olfactometry (GC-O), was then applied for the targeted characterization of the odor-active compounds. Overall, a total of 97 odorants was identified via gas chromatography-mass spectrometry/olfactometry (GC-MS/O) and heart-cut two-dimensional gas chromatography-mass spectrometry/olfactometry (2D-GC-MS/O). The majority of these odorants comprised a series of terpenes, mainly mono- and sesquiterpenes, aldehydes, acids, and lactones, as well as a number of odorants containing a phenolic core moiety. Several odorants are reported here for the first time as volatile organic compounds in oak wood. Identification of the molecular composition of oak wood odor helps to establish a better understanding of the distinctive smell of oak wood, and offers the basis for unveiling its potential effects on humans when being exposed to oak wood smell in daily life.

Ghamsari, L., et al. (2016). "Genome-scale neoantigen screening using ATLASTM prioritizes candidates for immunotherapy in a non-small cell lung cancer patient." Journal for ImmunoTherapy of Cancer. Conference: 31st Annual Meeting and Associated Programs of the Society for Immunotherapy of Cancer, SITC **4**(Supplement 1).

Background Despite the unprecedented efficacy of checkpoint inhibitor (CPI) therapy in treating some cancers, the majority of patients fail to respond. Several lines of evidence support that the mutational burden of the tumor influences the outcome of CPI therapies. Capitalizing on neoantigens derived from non-synonymous somatic mutations may be a good strategy for therapeutic immunization. Current approaches to neoantigen prioritization involve mutanome sequencing, in silico epitope prediction algorithms, and experimental validation of cancer neoepitopes. We sought to circumvent some of the limitations of prediction algorithms by prioritizing neoantigens empirically using ATLASTM, a technology developed to screen T cell responses from any subject against their entire complement of potential neoantigens. Methods Exome sequences were obtained from peripheral blood mononuclear cells (PBMC) and tumor biopsies from a non-small cell lung cancer patient who had been successfully treated with pembrolizumab. The tumor exome was sequenced and somatic mutations identified. Individual DNA sequences (399 nucleotides) spanning each mutation site were built, cloned and expressed in E. coli co-expressing listeriolysin O. Polypeptide expression was validated using a surrogate T cell assay or by Western blotting. Frozen PBMCs, collected pre- and post-therapy, were used to derive dendritic cells (MDDC), and CD8⁺ T cells were enriched and expanded using microbeads. The E. coli clones were pulsed onto MDDC in an ordered array, then co-cultured with CD8⁺ T cells overnight. T cell activation was detected by analyzing cytokines in supernatants. Antigens were identified as clones that induced a cytokine response that exceeded 3 standard deviations of the mean of ten negative controls, then their identities compared with T cell epitopes predicted using previously described algorithms. Results Peripheral CD8⁺ T cells, screened against 100 mutated polypeptides derived from the patient's tumor, were responsive to five neoantigens prior to CPI intervention and seven post-treatment. One was identified as a T cell target both pre- and post-CPI therapy. Five neoantigens did not contain epitopes predicted by in silico methods. Conclusions These data represent evidence that multiple patient-specific neoantigens can be identified through functional evidence of T cell response from peripheral blood without epitope prediction. By profiling natural and CPI-enhanced immunity to neoantigens, a broad catalog of T cell targets can be identified for development of immunotherapies that engage T cells against cancer to improve outcomes for patients for whom current therapies are insufficient.

Ghamsari, L., et al. (2017). "Genome-scale neoantigen screening using ATLASTM prioritizes candidate antigens for immunotherapy in a non-small cell lung cancer patient." Cancer Research. Conference: American Association for Cancer Research Annual Meeting **77**(13 Supplement 1).

Despite the unprecedented efficacy of checkpoint blockade (CPB) therapy in treating some cancers, the majority of patients fail to respond. Several lines of evidence support that the combination of CPB and neoantigen vaccine prolongs survival curves in cancer patients. Capitalizing on neoantigens derived from non-synonymous somatic mutations is a good strategy for therapeutic immunization. Current approaches to neoantigen prioritization involve mutanome sequencing, in silico epitope prediction algorithms, and experimental validation of cancer neoepitopes. Even the best in class in silico epitope prediction algorithms lack the accuracy necessary for efficacious personalized cancer vaccines. We sought to circumvent some of the limitations of currently available prediction algorithms by prioritizing neoantigens empirically using ATLASTM, a technology developed to screen T cell responses from any subject against their entire complement of potential neoantigens. Exome sequences were obtained from peripheral blood mononuclear cells (PBMC) and tumor biopsies from a non-small cell lung cancer patient who had been successfully treated with pembrolizumab. The tumor exome was sequenced and somatic mutations were identified. Individual DNA sequences (399 nucleotides) spanning each mutation site were built, cloned and expressed in E. coli co-expressing listeriolysin O. Polypeptide expression was validated using a surrogate T cell assay or by Western Blotting. Frozen PBMCs, collected pre- and post-therapy, were used to derive dendritic cells (MDDC). Both CD4+ and CD8+ T cells were enriched and expanded using microbeads. The E. coli clones were pulsed onto MDDC in an ordered array, then co-cultured either with CD8+ or with CD4+ T cells overnight. T cell activation was detected by analyzing cytokines in supernatants. Antigens were identified as clones that induced a cytokine response that exceeded three standard deviations of the mean of all negative control wells, then their identities compared with T cell epitopes predicted using previously described algorithms. We found biological evidence for neoantigens that were specifically responsive to peripheral CD8+ and CD4+ T cells, derived from the patient's tumor, pre- and post-CPB intervention. Some of these neoantigens were identified as a T cell target both pre- and post-CPB therapy. We identified neoantigens for which no epitopes were predicted by in silico methods. These data represent evidence that multiple patient-specific neoantigens can be identified through functional evidence of T cell response from peripheral blood without epitope prediction. By profiling natural and CPB-enhanced immunity to neoantigens, a broad catalog of T cell targets can be identified for development of immunotherapies that engage T cells against cancer to improve outcomes for patients for whom current therapies are ineffective.

Ghayebzadeh, M., et al. (2020). "Estimation of plastic waste inputs from land into the Caspian Sea: A significant unseen marine pollution." Marine Pollution Bulletin **151 (no pagination)**(110871).

It has been proven that there is an extensive bulk of plastic debris in marine ecosystems. The present study analyzed solid waste generation, its management and final disposal methods in Caspian Sea coastal countries, and the amount of plastic waste entering the Caspian Sea. The results showed that, on average, more than 90% of waste in the Caspian Sea coastal countries is mismanaged. According to our estimates, 425 kilotons (Kt) of plastic waste was generated by Caspian Sea coastal countries in 2016, of which, with high probability, 58-155 Kt find their way to the Caspian Sea. It is estimated that without improved waste management infrastructures, the amount of plastic waste entering the Caspian Sea will increase to 68-182 Kt by 2030, an increase of about 15%. Accordingly, the related cumulative environmental and health problems could be more severe. All countries located in the coastal areas of the Caspian Sea should revise their solid waste and plastic waste management programs to protect that sensitive marine ecosystem. Copyright © 2020 Elsevier Ltd

Ghazarian, A. and S. B. Oppenheimer (2014). "Microbead analysis of cell binding to immobilized lectin. Part II: Quantitative kinetic profile assay for possible identification of anti-infectivity and anti-cancer reagents." Acta Histochemica **116**(8): 1514-1518.

There has been a re-emergence of the use of lectins in a variety of therapeutic venues. In addition lectins are often responsible for the binding of pathogens to cells and for cancer cell clumping that increases their escape from body defenses. It is important to define precisely the activity of inhibitors of lectin-binding that may be used in anti-infection and anti-cancer therapeutics. Here we describe a kinetic assay that measures the activity of saccharide inhibitors of lectin binding using a model system of yeast (Saccharomyces cerevisiae) and lectin (Concanavalin A, Con A) derivatized agarose microbeads that mimics pathogen-cell binding. We show that old methods (part I of this study) used to identify inhibitor activity using only one sugar concentration at one time point can easily provide wrong information about inhibitor activity. We assess the activity of 4 concentrations of 10 saccharides at 4 different times in 400 trials and statistically evaluate the results. We show that d-melezitose is the best inhibitor of yeast binding to the lectin microbeads. These results, along with physical chemistry studies, provide a solid foundation for the development of drugs that may be useful in anti-infectivity and anti-cancer therapeutics.

Ghimire, S., et al. (2020). "Sampling and degradation of biodegradable plastic and paper mulches in field after tillage incorporation." Science of the Total Environment **703**: 135577.

Plastic biodegradable mulch (plastic BDM) is tilled after use, but there is concern about incomplete degradation and potential impact on subsequent crops, and we lack a reliable method to measure mulch degradation post soil-incorporation. We conducted two field experiments to (i) develop a sampling method to estimate the amount of mulch (fragments size >2.36 mm) in the field post soil-incorporation, and (ii) assess the amount of BDM in the soil after four consecutive years of mulch incorporation. In Expt. 1, we used the quartering method to reduce soil from a 1 m² field sample area to a representative 19 L sample. In Expt. 2, we applied and tilled four plastic BDMs: BioAgri, Naturecycle, Organix AG, and an experimental mulch; and one paper mulch, WeedGuardPlus, in their respective plots for four consecutive years. Starting in year 2, we sampled soil with the quartering method each spring and fall to determine mulch recovery. With respect to the total amount of mulch applied, average mulch recovery in the fall for the three commercial plastic BDMs was 71%, 50%, and 35% after second, third and fourth applications, respectively. For the experimental mulch, the average recovery was 80%, 69%, and 54% in the fall after second, third, and fourth applications, respectively. Recovery was slightly lower in spring than in preceding fall all years. For WeedGuardPlus, average recovery was 14%-20% in each fall, and no recovery in any spring (complete degradation). The results show that the quartering method reliably estimates the amount of mulch in a field and BDMs degrade over time in the field even with repeated

applications, but complete degradation takes >1 year. While a few standards (e.g., ASTM D5988) specify how to determine biodegradation of plastics in soil under controlled laboratory conditions, our sampling method assesses plastic degradation under diverse field conditions.

Ghioltean, L. M. (2015). "CONDIDERATION CONCERNING THE NEED OF SUSTAINABLE ECOLOGICAL DESIG." Journal of Industrial Design and Engineering Graphics **10**(2): 15.

In the case of each new product the ecological design for a sustainable development imposes the choices of correct materials and "clean" technologies with minimum energy consumption, of proper technologies of materials recycling with full awareness of consumers. The paper presents the stages the industrial product devising passed through. References are made to the principles and key factors of modern design with emphases on policies of material recycling. Plastic materials and possibilities of their recuperation are in focus. Products made from recycled materials are presented. Finally, the use of plastic waste in Romania is analysed, by comparing the activity of firms in different regions of the country.

Ghodbane, M., et al. (2015). "Development of a low-volume, highly sensitive microimmunoassay using computational fluid dynamics-driven multiobjective optimization." Microfluidics & Nanofluidics **18**(2): 199-214.

Immunoassays are one of the most versatile and widely performed biochemical assays and, given their selectivity and specificity, are used in both clinical and research settings. However, the high cost of reagents and relatively large sample volumes constrain the integration of immunoassays into many applications. Scaling the assay down within microfluidic devices can alleviate issues associated with reagent and sample consumption. However, in many cases a new device is designed and empirically optimized for each specific analyte, a costly and time consuming approach. In this paper, we report the development of a microfluidic bead-based immunoassay which, using antibody coated microbeads, can potentially detect any analyte or combination of analytes for which antibody coated microbeads can be generated. We also developed a computational reaction model and optimization algorithm that can be used to optimize the device for any analyte. We applied this technique to develop a low volume IL-6 immunoassay with high sensitivity (358 fM, 10 pg/mL) and a large dynamic range (4 orders of magnitude). This device design and optimization technique can be used to design assays for any protein with an available antibody and can be used with a large number of applications including biomarker discovery, temporal in vitro studies using a reduced number of cells and reagents, and analysis of scarce biological samples in animal studies and clinical research settings.

Ghodbane, M., et al. (2015). "Development of microfluidic immunoassays for multiplexed biomarker measurements." Artificial Organs **39 (5)**: A19-A20.

Objective: Immunoassays are widely utilized due to their ability to quantify a vast assortment of biomolecules relevant to biological research and clinical diagnostics. We seek to develop microfluidic approaches to performing multiplex assays capable of simultaneously measuring multiple analytes, especially inflammation markers, in a single sample. Method(s): Several approaches have been explored towards miniaturizing multiplexed immunoassays based on cytometric bead assays. The first approach is a continuous flow immunoassay which automates the serial incubation steps required using magnetic microbeads. The device uses a magnetic actuation scheme to transfer microbeads into a blood sample and subsequent reagents required for the assay. A second device is a batch format which uses a packed bead bed which allows each solution to be serially infused over the packed beads. Finally, we are exploring a semi-batch approach utilizing beads suspended in aqueous droplets. Using magnetic and

electrical actuation beads can be separated and recombined with sample, and reagent droplets allowing serial processing of discrete measurements. Result(s): We have demonstrated the ability to track the concentration of a time-varying sample with multiple analytes simultaneously (cytokines IL-6 and TNF-alpha) (Figure 1) as well as measuring 6 proteins in 32 samples simultaneously using only 4.2 muL of sample volume (Figure 2). We expect the semi-batch approach will allow high frequency sampling and analysis of temporal varying biomarker concentration in blood. Conclusion(s): We expect a fully integrated assay to allow high frequency measurements of inflammatory biomarkers during mechanical circulatory support procedures such as CPB and ECMO. Serial determination of biomarker levels during the early post-operative period promises to be a valuable tool for the evaluation of peri-operative morbidity in pediatric patients, especially myocar-dial and cerebral damage.

Ghorashian, S., et al. (2016). "A novel second generation CD19 CAR for therapy of high risk/relapsed paediatric CD19⁺ acute lymphoblastic leukaemia and other haematological malignancies: Preliminary results from the carpall study." Blood. Conference: 58th Annual Meeting of the American Society of Hematology, ASH **128**(22).

Introduction: Recent clinical trials with T cells engineered to express 2nd generation CD19 chimeric antigen receptors (CARs) unprecedented anti-leukemic responses. We have developed a novel CD19CAR with a new scFv in the 41BBz format (CAT-41BBz CAR) which confers enhanced cytotoxicity and cytokine secretion in response to stimulation with CD19⁺ targets in vitro as well as equivalent in vivo anti-tumour efficacy to the FMC63 41BBZ CAR in use in clinical studies. We have designed, optimized and validated GMP-grade CAR T cell production using this novel CAR. Based on these data, we have recently initiated a Phase I clinical study (CARPALL) of this novel CAR in pediatric patients with relapsed ALL and other CD19⁺ hematological malignancies to determine the safety profile and durability of responses to CD19CART therapy. This will be critical in determining whether CD19CAR T cells are best used as a stand-alone therapy or as a bridge to stem cell transplant (SCT). Method(s): We initially optimized our GMP production methodology in terms of activation method, cytokine milieu and expansion conditions on healthy donor peripheral blood mononuclear cells (PBMCs) to give optimal transduction efficiency and preserve early memory subsets within the CAR T cell product. We have subsequently validated this methodology using unstimulated leucaphereses from 5 lymphopenic patients with ALL. PBMCs were activated with anti-CD3/CD28 microbeads (Dynabeads CTS) and then lentivirally transduced with the CAT CAR vector. T cells were then expanded in the WAVE bioreactor before bead removal on a magnetic system and cryopreservation. Patients on study receive lymphodepletion with fludarabine and cyclophosphamide followed by a single dose of 10⁶ CAR⁺ T cells/kg and are then monitored as an in-patient for 14 days post infusion for toxicities such as cytokine release syndrome or neurotoxicity. The primary endpoints of the study are toxicity and the proportion of patients achieving molecular CR at 1 month post CD19CAR T cell infusion. Following this, patients undergo intensive monitoring of disease status for a total of 2 years post infusion. To determine the durability of responses, patients achieving a molecular CR will be monitored closely for the re-emergence of molecular level disease without additional consolidative therapy or SCT Results: We were able to generate the target dose of 1x10⁶ CAR⁺ T cells/kg in 6 of 7 production runs (involving 2 healthy donors and 5 patients) to date, all of which met sterility release criteria. Transduction efficiency was on average 37% (range 7-84%, see table 1). Mean viral copy was 4.2 (range 1.2-5.8). Memory T cells of stem cell-like phenotype (CAR⁺ CCR7⁺ CD45RA⁺ CD95⁺ CD127⁺) formed a mean of 9% (range

0-31%), central memory T cells (CAR⁺ CCR7⁺ CD45RA⁻) formed a mean of 43% (range 16-70%) and effector memory T cells formed a mean of 31% (range 0-77%) of the final CAR T cell product. The percentage of CAR T cells expressing dual exhaustion markers (TIM3⁺ PD-1⁺) was on average 5% (range 2-8%). So far 2 patients have been treated. Conclusions We have optimized and successfully validated a robust GMP production method for CD19CAR T cells lentivirally transduced with a novel CD19CAR. Preliminary results of therapy with CAT- 41BBz CAR T cells in initial patients on the clinical study will be presented.

Ghosal, S., et al. (2018). "Molecular identification of polymers and anthropogenic particles extracted from oceanic water and fish stomach - a Raman micro-spectroscopy study." Environmental Pollution **233**: 1113-1124.

Pacific Ocean trawl samples, stomach contents of laboratory-raised fish as well as fish from the subtropical gyres were analyzed by Raman micro-spectroscopy (RMS) to identify polymer residues and any detectable persistent organic pollutants (POP). The goal was to access specific molecular information at the individual particle level in order to identify polymer debris in the natural environment. The identification process was aided by a laboratory generated automated fluorescence removal algorithm. Pacific Ocean trawl samples of plastic debris associated with fish collection sites were analyzed to determine the types of polymers commonly present. Subsequently, stomach contents of fish from these locations were analyzed for ingested polymer debris. Extraction of polymer debris from fish stomach using KOH versus ultrapure water were evaluated to determine the optimal method of extraction. Pulsed ultrasonic extraction in ultrapure water was determined to be the method of choice for extraction with minimal chemical intrusion. The Pacific Ocean trawl samples yielded primarily polyethylene (PE) and polypropylene (PP) particles >1 mm, PE being the most prevalent type. Additional microplastic residues (1 mm - 10 micro m) extracted by filtration, included a polystyrene (PS) particle in addition to PE and PP. Flame retardant, deca-BDE was tentatively identified on some of the PP trawl particles. Polymer residues were also extracted from the stomachs of Atlantic and Pacific Ocean fish. Two types of polymer related debris were identified in the Atlantic Ocean fish: (1) polymer fragments and (2) fragments with combined polymer and fatty acid signatures. In terms of polymer fragments, only PE and PP were detected in the fish stomachs from both locations. A variety of particles were extracted from oceanic fish as potential plastic pieces based on optical examination. However, subsequent RMS examination identified them as various non-plastic fragments, highlighting the importance of chemical analysis in distinguishing between polymer and non-polymer residues.

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Ghosh, S., et al. (2014). "Measurement of spatiotemporal intracellular deformation of cells adhered to collagen matrix during freezing of biomaterials." Journal of Biomechanical Engineering **136**(2): 021025.

Preservation of structural integrity inside cells and at cell-extracellular matrix (ECM) interfaces is a key challenge during freezing of biomaterials. Since the post-thaw functionality of cells depends on the extent of change in the cytoskeletal structure caused by complex cell-ECM adhesion, spatiotemporal deformation inside the cell was measured using a newly developed microbead-mediated particle tracking deformetry (PTD) technique using fibroblast-seeded dermal equivalents as a model tissue. Fibronectin-coated 500 nm diameter microbeads were internalized in cells, and the microbead-labeled cells were used to prepare engineered tissue with type I collagen matrices. After a 24 h incubation the engineered tissues were directionally frozen, and the cells were imaged during the process. The microbeads were tracked, and spatiotemporal deformation inside the cells was computed from the tracking data using the PTD method. Effects of particle size on the deformation measurement method were tested, and it was found that microbeads represent cell deformation to acceptable accuracy. The results showed complex spatiotemporal deformation patterns in the cells. Large deformation in the cells and detachments of cells from the ECM were observed. At the cellular scale, variable directionality of the deformation was found in contrast to the one-dimensional deformation pattern observed at the tissue scale, as found from earlier studies. In summary, this method can quantify the spatiotemporal deformation in cells and can be correlated to the freezing-induced change in the structure of cytosplasm and of the cell-ECM interface. As a broader application, this method may be used to compute deformation of cells in the ECM environment for physiological processes, namely cell migration, stem cell differentiation, vasculogenesis, and cancer metastasis, which have relevance to quantify mechanotransduction.

Ghosh, S. and A. R. Horrocks (1996). "THE PRODUCTION OF HIGH TENACITY TAPES FROM WASTE POLYPROPYLENE." Recycling Textile & Plastic Waste: 127-133.

The article discusses the production of high tenacity tapes from recycled polymer wastes. Many recycled polyolefins were converted to plant containers and timber substitutes but only high quality products are capable of maintaining high levels of mechanical, physical and chemical performance. In the textile industry, the reuse of poly-ethylene terephthatlate or pressurized drink containers as raw materials for melt extrusion into fibers is considered important. A study was conducted on the effects of adding waste on the tensile, physical and chemical properties of polypropylene tapes. It was revealed that tape strength decreased with increasing recycled material concentration.

Ghosh, S. K., et al. (2010). "Anharmonic interaction signals for acoustic detection of analyte." Analytical Chemistry **82**(9): 3929-3935.

The challenges with frequency-based acoustic detection systems in sensitive, selective, and reliable quantitative estimation of surface-bound analyte are well-known. These systems are traditionally used in their linear incarnations; i.e., the measurement frequency is the same as the driving frequency. However, it was found in this work that interactions of adsorbents with sensor surface show significant anharmonicity even at low drive amplitudes. In particular, using streptavidin-coated polystyrene microbeads on an oscillating quartz surface in air, it has been demonstrated through modeling and experiments that the anharmonic signal from microparticle to surface interaction is significantly higher relative to that from bare quartz and orders of magnitude higher than relative shifts in resonant frequency. The signal is proportional to the number of microparticles and holds a well-defined functional relationship with the amplitude of oscillation, distinct to the nature of interaction with the surface for a given analyte. This approach, thus, can be used for ultrasensitive and quantitative detection of surface adsorbents and characterization of different kinds of surface interactions, distinguishing specific from nonspecific adsorbents. The modeling also reveals a direct functional relationship between the measured anharmonic signal and the interaction potential of the adsorbent with the surface.

Ghosh, S. K. and A. P (2019). "Plastics in municipal solid waste: What, where, how and when?" Waste Management and Research **37**(11): 1061-1062.

Ghubade, A., et al. (2009). "Dielectrophoresis assisted concentration of micro-particles and their rapid quantitation based on optical means." Biomedical Microdevices **11**(5): 987-995.

The detection and counting of micro particles having sizes comparable to biological entities can provide a tremendous impetus to rapid diagnostics and clinical applications. MEMS technology has already been used in capture and detection of such micron size entities in miniscule concentrations. For this purpose a concentration step is normally added prior to the detection process. A variety of methodologies are used for quantization of such micron size particles/entities including change in permittivity, medium impedance, magnetic permeability and other means. Although optical studies have been extensively performed prior to this, it has not been used for quantization of the micro particles. We have designed, developed and characterized a MEMS counter which captures micron size fluorescent beads using delectrophoresis (DEP) and monitors their accumulation in a 12 mumx230 mum size channel and monitors this accumulation as growth of overall fluorescence. The field is generated by a set of finely placed interdigitated microelectrodes. As we apply an alternating voltage at 10 V<inf>pp</inf> for a range of different frequencies we are able to capture the flowing beads and concentrate them by several orders of magnitude. This is also followed by their quantification in terms of growing fluorescence signal. For quantitating the fluorescence values a CCD (charge couple device) module fitted over an inverted fluorescence microscope is used that visualizes the whole capture process and a Labview based image acquisition software simultaneously calculates the signal intensity over these frames and arranges it temporally. Our work will have tremendous utility in developing a rapid bacterial counting procedure and will be a valuable tool in microbiological laboratories. © 2009 Springer Science+Business Media, LLC.

Giacalone, J. C., et al. (2019). "Generation of an immortalized human choroid endothelial cell line (iChEC-1) using an endothelial cell specific promoter." Microvascular Research **123**: 50-57.

Age-related macular degeneration (AMD) is a common cause of blindness worldwide. While recent studies have revealed that the loss of choroidal endothelial cells (ChECs) is critical to the disease pathogenesis of dry AMD, in vitro studies are needed to fully elucidate the disease mechanism. However, these studies remain hindered due to the lack of publically available human ChEC lines. To address this need, ChECs were harvested form donor tissue and enriched for by using magnetic cell separation using anti-CD31 conjugated microbeads. Next, lenti-viral vectors with endothelial-specific promoters driving genes necessary for immortalization, CDH5p-hTERT and CDH5p TAg, were generated. Stable integration of both gene cassettes allowed cells to maintain their proliferative state and yielded an immortalized cell line (iChEC-1). Immunocytochemical analysis of iChEC-1 confirmed the expression of important ChEC markers such as CA4, a marker of choriocapillaris endothelial cells, CDH5, and CD34, pan-endothelial cell markers. qRT-PCR analysis of expanded clones from iChEC-1 further showed that the line maintained expression of other important endothelial markers, vWF, PECAM1, and PLVAP, similar to primary cells. Functional responses were characterized by tube-forming assays and repopulation of decellularized choroid with the immortalized cell line. In conclusion, the iChEC-1 line presents a suitable immortalized human ChEC line for future in vitro studies of AMD.

Giaever, I. (1978). "A simple visual surface immunology test." Journal of Immunological Methods **24**(1-2): 57-61.

A new general immunology test is described which is capable of detecting protein in the 1 mug/ml range. First an antigen is adsorbed in a small area of a glass surface. The glass is exposed to an antibody solution and the antibody will attach specifically to the antigen. Next the slide is washed, dried and sprayed lightly with plastic particles that stick to the protein layers on the glass. Now when the glass slide is exposed to an acid the antigen-antibody bonds are broken, the antibodies will leave the surface removing some of the plastic particles and leaving an easily visible spot behind.

Giallongo, C., et al. (2016). "Mesenchymal stem cells (MSC) promotes tumor microenvironment transformation driving granulocyte-like myeloid derived suppressor cells (G-MDSC) activation in smoldering and multiple myeloma patients." Haematologica **101 (Supplement 1)**: 251.

Background: A well-recognized feature of multiple myeloma (MM) is the intimate relationship between plasma cells (PC) and BM microenvironment, which is mainly composed of mesenchymal stromal cells (MSC), endothelial cells, immune cells and extracellular matrix. Granulocytic-Myeloid-derived suppressor cells (G-MDSC) accumulate in the tumor microenvironment during tumor development. MDSC promote tumor growth and invasion, immunosuppression and host immune evasion by suppressing lymphocyte activation and antigen recognition. Even though it has been demonstrated that G-MDSC are increased in MM microenvironment, the role of MSC in promoting immunosuppressive microenvironment through activation of G-MDSC remains unexplored. Aim(s): Analyzing MSC from MGUS, Smoldering myeloma (SMM) and MM patients in promoting tumor microenvironment transformation. Method(s): Human peripheral blood mononucleated cells (PBMC) isolated from

healthy subjects (HS) were cultured alone, with HS- (n=8), MGUS- (n=6), SMM- (n=4) or MM-MSC (n=12, 8 patients at diagnosis and 4 relapsed) at 1:100 ratio. After one week, PBMC were collected. G-MDSC were isolated using anti- CD66b magnetic microbeads and the phenotype (CD11b+CD33+CD14- HLADR-) was confirmed by cytofluorimetric analysis. Immunosuppression was analyzed after incubation with autologous T cells CFSE+ stimulated by phytohaemagglutinin (PHA-P). Result(s): G-MDSC educated by SMM- and MM-MSC co-cultures (MSCed-GMDSC) exhibited suppressive effect with a reduction of T cell proliferation (p<0.001) compared to G-MDSC control (isolated from PBMC cultured in medium alone). Notably, neither MDSC control nor HS- or MGUS-MSCed-G-MDSC showed suppressive ability. Before incubation with T cells, the expression of immunomodulatory factors was investigated by real-time PCR in SMM- and MM-MSCed-G-MDSC compared to MGUS-MSCed-G-MDSC. SMM- and MMMSCed-G-MDSC up-regulated Arg1 (56.4+/-18.2 and 24.9+/-13, p<0.001), NOS2 (82+/-35 and 21+/-18, p<0.001), TNFalpha (10+/-3 and 45.7+/-28.8, p<0.05) and CEBPA (90+/-23 and 65+/-19, p<0.001), a transcription factor promoting suppressive phenotype. Adding Bortezomib (5 nM) to co-culture of SMM- and MM-MSC with PBMC, isolated G-MDSC lost immunosuppressive ability. Analysis of MM-MSC from 4 patients revaluated after 3 bortezomib-based therapy followed by autologous stem cell transplantation showed that their immunological dysfunction was reverted after therapy. Since it has been reported that neutrophils can acquire monocytic characteristics in response to inflammatory signals, G-MDSC control and MSCed-G-MDSC were plated onto dentine disks (DDs) for 3 days. A significant digestive activity was observed only in DDs with MM-MSCed-GMDSC (p=0.002) and was lost by MM-MSCed-G-MDSC isolated from co-culture with Bortezomib. Moreover, compared to MGUS-MSCed-G-MDSC, SMM- and MM-MSCed-G-MDSC up-regulated PROK2 expression (5.2+/-1.2 and 7.6+/-2, p<0.05), a chemotactic and pro-angiogenic factor. Investigating effect on angiogenesis in vitro, MM-MSCed-G-MDSC induced tube formation. On the contrary, this effect was not observed in the condition with MM-MSCed-G-MDSC isolated from co-culture with Bortezomib. Summary/Conclusions: MSC from SMM and MM but not MGUS patients are able to activate G-MDSC favoring indirectly transformation of microenvironment in a "tumor" milieu with consequent immune escape and PC growth and survival. Their immunological dysfunction can be reverted by bortezomib exposure.

Giambona, A., et al. (2016). "Embryo-fetal erythroid cell selection from celomic fluid allows earlier prenatal diagnosis of hemoglobinopathies." Prenatal Diagnosis **36**(4): 375-381.

OBJECTIVE: Celocentesis, which involves aspiration of celomic fluid at 7-9 weeks' gestation, can potentially provide early prenatal diagnosis of single-gene disorders. The main barrier to wide acceptability of this technique is contamination of the sample by maternal cells. This problem can be overcome through selection of embryo-fetal erythroid precursors, which are found in celomatic fluid.

METHOD: Embryo-fetal erythroid precursors were selected by an anti-CD71 MicroBeads method or by direct micromanipulator pickup of the cells selected on the basis of their morphology.

RESULTS: In our series of 302 singleton pregnancies at high risk for hemoglobinopathies, Celocentesis provided a sample of celomic fluid in all cases. In 100 (33.1%) samples, maternal contamination was absent or very low (< 5%), and unambiguous results were obtained without the need for any preliminary procedures. In 160 (53%) cases, the contamination was between 5% and 60%, and selection of embryo-fetal erythroid precursors was successfully achieved by anti-CD71 MicroBeads. In 42 (13.9%) cases, the contamination was > 60%, and selection of embryo-fetal cells was achieved by micromanipulation. In all 302 cases, there was concordance between DNA obtained from celomic fluid samples and fetal or newborn DNA.

CONCLUSIONS: Celocentesis can be a reliable procedure for earlier prenatal diagnosis of fetal monogenic diseases.

Giambona, A., et al. (2015). "Earlier antenatal diagnosis of hemoglobinopathies by coelocentesis." Blood **126 (23)**: 2133.

Embedded Image In countries with a high prevalence of hemoglobinopathy carriers, the only realistic approach to control the birth of new patients with thalassemia major or sickle cell disease is population screening in combination with invasive prenatal diagnosis[1]. In the early 1990's, molecular definition of the thalassemia defects, development of procedures for their detection by DNA analysis and introduction of amniotic fluid sampling (amniocentesis) or chorionic villus sampling (CVS) led to early prenatal diagnosis at 16 and 11 weeks, respectively [2]. An alternative technique for earlier diagnosis is celocentesis [3]. At the end of week 4 of gestation, the developing exocoelomic cavity (ECC) splits the extra-embryonic mesoderm into two layers, the somatic mesoderm lining the trophoblast and the splanchnic mesoderm covering the secondary yolk sac and the embryo. The ECC is the largest anatomical space inside the gestational sac between 5 and 9 weeks of gestation and is surrounded by celomic fluid (CF), which contains cells of fetal origin [4-5]. This fluid can be sampled by a technique that involves the ultrasound-guided insertion of a needle through the vagina from as early as 7 weeks of gestation. Previous studies utilizing coelocentesis for prenatal determination of single-gene defects reported variable success ranging from 58 to 95% because of presence of maternal cell contamination (MCC) [6]. In this work we demostred as this problem can be overcome through the identification of embryo-fetal erythroid precursors presented in the coelomatic fluid and their specific selection. 302 couples from different regions of Italy, at risk for s thalassemia or sickle cell disease asked for prenatal diagnosis by coelocentesis that was carried out at between 6+6 and 9+2 weeks' gestation. Coelomic fluid samples with no or very low (<5%) maternal contamination (100 samples) were successfully analyzed without preliminary treatment. In samples with >5% maternal contamination, two different procedures were used to isolate embryo-fetal cells: the first technique involved positive selection of embryo-fetal erythroid precursors by anti-CD71 MicroBeads (160 samples), the second procedure was through the use of a micromanipulator (42 samples). In 68/300 (22.6%) cases the fetus was affected by s-thalass/s-thalassemia and 66 women chosen to terminate the pregnancy. Two families decided to continue the pregnancy for ethical reasons despite the documented presence of an affected fetus. The antenatal diagnosis was confirmed in all 66 cases by molecular analysis of placental tissue after termination (Table 1). In 232/300 (77.4%) cases the fetus was diagnosed as being normal or a carrier for s-thalassemia or sicke cell disease. The results obtained after coelocentesis were confirmed by amniocentesis or postnatally. In two case (0.66%) was no obtained a reliable diagnosis because no fetal cells were found (Table 1). The findings of this study in a large number of pregnancies investigated by coelocentesis, demonstrate that embryo-fetal erytroid cell selection from coelomatic fluid allows reliable and earlier prenatal diagnosis of hemoglobinopathies. This technique is attractive to parents because it provides prenatal diagnosis of genetic disease at least 4 weeks earlier respect to traditional procedures reducing anxiety of parents and from a clinical point of view this procedure would allow women to undergo medical TOP at 8-10 weeks of gestation which is less traumatic and safer than second trimester surgical TOP. (Table Presented).

Giangrande, A., et al. (1985). "Electron microscopy and microprobe analysis of dialysis contaminants." Life Support Systems **3 Suppl 1**: 73-76.

A migration of plastic particles from haemodialysis circuit to blood has been recognized to be cause of storage inflammation. Its origin from segments of silicone tubing has been demonstrated by in vivo and in vitro experiments. A similar finding with a peculiar histology picture has been observed in patients who used only PVC and PU-PVC tubing. In this case too microprobe analysis revealed the presence of silicon (Si) in fibril inclusions of liver and spleen cells. TEM, SEM and EDS of cuprophane dialyzer perfusates filtered through Nuclepore revealed the presence of particles with an intense Si Ka. The release from the dialyzer of silicon containing contaminants seems to be an additional risk for uremic patients.

Giani, D., et al. (2019). "Microplastics occurrence in edible fish species (Mullus barbatus and Merluccius merluccius) collected in three different Geographical Sub-Areas of the Mediterranean Sea." Marine Pollution Bulletin **140**: 129-137.

The gastrointestinal tracts of 229 demersal fish belonging to two species (Mullus barbatus, Merluccius merluccius) were examined for microplastic ingestion. Samples were collected in 3 different FAO Geographical Sub-Areas (GSA-9, GSA-17, GSA-19) of the Mediterranean Sea. Ingested microplastics were characterized using a stereo-microscope: observed, photographed, measured and categorized according to size class, shape and colour. Plastic fragments (ranging from 0.10 to 6.6 mm) were detected in 23.3% of the total investigated fish; a total of 65 plastic particles (66% constituted by fibers) were recorded. The percentage of plastic ingestion shows high variability between the two species and among the different sampling area. The highest frequency (48%) was found in European hake from GSA-19. These preliminary results represent a baseline for the implementation of the Marine Strategy Framework Directive descriptor 10 in Italy as well as an important step for detecting microplastics in bioindicator species from different GSAs.

Giarrizzo, T., et al. (2019). "Amazonia: the new frontier for plastic pollution." Frontiers in Ecology & the Environment **17**(6): 309-310.

Brazil's Amazon region is currently subject to increasing deforestation as well as hydropower development, mining, and other activities associated with adverse environmental impacts (Fearnside [6]). Recent pilot studies in the lower Xingu River and the Amazon estuary revealed microplastic particles in the digestive tracts of 13 freshwater and 14 marine fish species, 20 of which are commonly consumed by humans (Pegado I et al i . First account of plastic pollution impacting freshwater fishes in the Amazon: ingestion of plastic debris by piranhas and other serrasalmids with diverse feeding habits. [Extracted from the article]

Gibbs, J. G. and Y. P. Zhao (2009). "Design and characterization of rotational multicomponent catalytic nanomotors." SMALL **5**(20): 2304-2308.

Multicomponent rotational nanomotors consisting of Pt-coated TiO(2) nanoarms grown upon approximately 2.01-microm-diameter silica microbeads designed by dynamic shadowing growth are presented. When exposed to H(2)O(2), the structures rotate about an axis through the center of the microbead and perpendicular to the TiO(2) nanoarm at a rate of 0.15 Hz per % H(2)O(2) concentration. The rotational frequency increases parabolically when the surface tension of the solution is altered by the addition of sodium dodecyl sulphate; both relationships are explainable by a nanobubble-ejection model.

Gicquel, T., et al. (2014). "Monosodium urate (MSU) induced IL-1beta via a purinergic receptor/NLRP3-inflammasome pathway from macrophages." Fundamental and Clinical Pharmacology **1)**: 3.

Monosodium Urate (MSU) has been described as a danger signal activating NLRP3-inflammasome pathway. We investigated the role of P2 purinergic receptors in the activation of NLRP3-inflammasome pathway after MSU treatment in human macrophages. Monocytes from healthy donors were obtained from buffy coat (EFS, Rennes) using human CD14 Microbeads separation kit. Macrophages were obtained after differentiation from monocytes by incubation with rhGM-CSF for 7 days. P2R transcription was extinguished by electroporating specific siRNA. mRNA expression was evaluated by RT-qPCR and production of proinflammatory cytokines was measured in the supernatant using ELISA. MSU crystals (500mug/ mL) were able to induce the release of IL-1beta from human monocyte-derived macrophages induced by low concentration of LPS (0.1mug/mL) at 6 h. Moreover, caspase-1 inhibitor (z-YVAD-fmk) dose-dependently decreased production of IL-1beta after LPS + MSU treatment. Quantitative PCR analysis showed that treatment with LPS and MSU induced a significant increase in the expression of NLRP3 and IL-1beta after treatment with LPS alone or associated with MSU at 6 h. Furthermore, we also showed that MSU treatment induced P2X7R mRNA expression at 6 h by RT-qPCR. Electroporation of siRNAs directed against P2 receptor led to an efficient knock-down of P2R mRNA in macrophages at 24 h and 48 h. We showed that siP2X7R, but not siP2X4R, was able to reduce the release of IL-1beta from macrophages stimulated by LPS + MSU at 6 h. Moreover we observed that A-740003, a P2X7 purinergic receptor antagonist decreased IL-1beta production after treatment with LPS and MSU. Our results show the involvement of purinergic receptor and NLRP3 inflammasome pathway in the secretion of IL-1beta from MSU-stimulated human macrophages and suggest that blockade of the NLRP3 inflammasome or P2X7 receptor represents a novel potential therapeutic approach to control inflammation.

Gicquel, T., et al. (2013). "Involvement of purinergic receptors and NLRP3-inflammasome pathway in the ATP-induced cytokine release from macrophages." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **187**(MeetingAbstracts).

Idiopathic pulmonary fibrosis (IPF) is a progressive interstitial pneumonitis consecutive to recurrent episodes of acute lung injury associated with inflammatory process and collagen deposition in the interstitium. Adenosine triphosphate (ATP) has been described as a danger signal activating NLRP3-inflammasome and the pro-inflammatory cytokine IL-1beta release in lung in chronic inflammation and in tissue remodelling. NLRP3-inflammasome pathway activation appears as the corner stone of many inflammatory diseases including pulmonary fibrosis. We investigated the role of ATP and P2X<inf>2</inf> purinergic receptor in the activation of NLRP3-inflammasome pathway in human macrophages. Monocytes from healthy donors were obtained from buffy coat (EFS, Rennes) using human CD14 Microbeads separation kit. Macrophages were obtained after differentiation from monocytes by incubation with rhGM-CSF for 7 days. mRNA expression was evaluated by RT-qPCR, cytokines production was measured in the supernatant using ELISA. NLRP3 and P2X<inf>2</inf>R expression was evaluated by immunohistochemistry. We showed that ATPgammaS (300 muM) and BzATP (250 muM), stable analogs of ATP are able to potentiate the release of IL-1beta from human monocyte-derived macrophages induced by low concentration of LPS (0.1 mug/mL), if supernatant was removed, the effect disappeared at 24h. Furthermore LPS and BzATP induced

an increase in IL-1beta mRNA expression at 5h by RT-qPCR. LPS also elicited IL-1alpha and IL-6 expression and production but was not affected by ATP agonists treatment. Immunochemistry revealed that NLRP3 and P2X<inf>2</inf>R proteins were constitutively expressed by macrophages compared with the control. Quantitative PCR analysis showed that treatment with LPS and BzATP induced NLRP3 expression however P2X<inf>2</inf>R transcript levels were not significantly increased after treatment with LPS alone or associated with BzATP at 5h. We also observed that P2X<inf>2</inf>R antagonists, A-438079 (100 muM) and A-740003 (100 muM), were able to reduce the release of IL-1beta, but not IL-1alpha and IL-6 production from macrophages stimulated by purinergic receptor agonists. Our results show the involvement of P2X<inf>2</inf>R-NLRP3 inflammasome pathway in the secretion of IL-1beta from ATP-stimulated human macrophages and suggest that P2X<inf>2</inf>R were not involved in IL-1alpha and IL-6 release and suggests that blockade of the P2X<inf>2</inf> receptor represents a novel potential therapeutic approach to control fibrosis in lung injury.

Gicquel, T., et al. (2012). "Involvement of purinergic receptors and NLRP3 inflammasome pathway in the ATP-induced cytokine release and MMPs/TIMP imbalance in macrophages." Fundamental and Clinical Pharmacology **26 (SUPPL.1)**: 44.

Adenosine triphosphate (ATP) has been described as a danger signal activating Nod-like receptor family, pyrin domain containing 3 (NLRP3) Inflammasome and the proinflammatory cytokine IL-1beta release in lung. This pathway has been previously described to be involved in various inflammatory diseases including fibrosis. We investigated the role of ATP as a danger signal and purinergic receptors in the activation of NLRP3-Inflammasome pathway in human macrophages. Moreover, we evaluated the influence of the activation by ATP in the release of proinflammatory cytokines and the balance MMPs/TIMP. Monocytes from healthy donors were obtained from buffy coat (EFS, Rennes) using human CD14 Microbeads (Miltenyi) separation kit. Macrophages were obtained after differentiation from monocytes by incubation with rhGM-CSF for 7 days. Cytokines and MMPs production was measured in the supernatant using ELISA or zymography. NLRP3 expression was evaluated by immunohistochemistry. LPS and ATP elicited an increased production of IL-6, IL-18 or IL-1beta at 4 h 30 and 24 h. TIMP-1 secretion, a pro-fibrogenic cytokine was also increased at 4 h 30 and 24 h. Gelatinase expression, mainly MMP-9 was increased at 24 h as observed in zymography and confirmed by ELISA. In addition, NLRP3 protein expression was increase at 24 h in LPS+ATP primed cells. To investigate the involvement of purinergic receptors, macrophages were pretreated with suramine, an antagonist of P2 receptors. Suramine significantly reduced the production of TIMP-1 at 4 h 30 and 24 h as well as IL-1beta and IL-6. These results showed that ATP could be a major endogenous danger signal that engages NLRP3 and P2 receptor leading to inflammatory process and cytokine release. This probably alters the MMPs/TIMP equilibrium which influences the extracellular matrix deposition and fibrosis.

Gieck, C. (2017). "Microplastics: The invisible danger." Pharmazeutische Zeitung **162**(23).

Gieseler, F., et al. (2014). "Using annexin V-coated magnetic beads to capture active tissue factor-bearing microparticles from body fluids." Cell Biology International **38**(2): 277-281.

Microparticles, found in all body fluids including peripheral blood, are important elements that regulate cellular interactions under both physiological and pathological conditions. They play an important role in blood clot formation and increased cell aggregation. However, little is known about the components of the microparticles and their mechanism of action. A method to quantify and assess the underlying mechanism of action of microparticles in pathologies is therefore desirable. We present a specific method to isolate cell-derived microparticles from malignant effusions using annexin V-coated magnetic microbeads. The microparticles can be detected by flow cytometry. Our results show that the microparticles can be isolated with >80% specificity when bound to annexin V-coated magnetic beads, which was originally developed for the detection of apoptotic cells. We also show that the isolated microparticles were still functionally active and can be used for further analysis. Thus, our method enables isolation as well as structural and functional characterisation of the microparticles which are produced in numerous patho-physiological situations. This should help gain a deeper insight into various disease situations, which in turn should pave the way for the development of novel drugs and specific therapy strategies.

Gifford, G. (2016). A Plethora of Plastic. Rockville, Maryland, American Speech-Language-Hearing Association. **21:** 4-4.

A letter to the editor is presented discussing the impact of plastic waste on the human body and the human food chain.

Gilbert, J. M., et al. (2016). "PLASTIC INGESTION IN MARINE AND COASTAL BIRD SPECIES OF SOUTHEASTERN AUSTRALIA." Marine Ornithology **44**(1): 21-26.

Plastic pollution is a significant problem in all oceans of the world and accounts for up to 90% of marine debris. Ingestion of plastic by seabirds and its effects are well documented, particularly in the Northern Hemisphere. However, fewer data exist for levels of plastic in seabird and coastal bird species in Australian waters or the southwestern Pacific. In this study, the stomach contents of a variety of seabirds and coastal birds (migratory and resident) were analysed for plastic. Nine (30%) of the birds sampled contained plastic. The median mass of plastic per bird was 41.7 mg and median number of pieces was 3.0. Shearwaters Puffinus spp. had significantly higher plastic mass and number of pieces than other species, and the most common type of plastic was manufactured. However, industrial pellets also contributed substantially. Plastics were primarily dark in colour. No clear indication of the influence of plastic ingestion on body condition could be found, however, internal physical damage and intestinal blockage was noted. Further assessment of the incidence and the effects of plastic ingestion in seabird and coastal bird species in Australian waters is required.

Gilbert, R. G., et al. "Trickle Irrigation: Emitter Clogging and Other Flow Problems." Agricultural Water Management Vol 3, No 3, p 159-178, 1980/1981. 7 Fig, 7 Tab, 17 Ref.

Emitter clogging is the greatest problem of the trickle irrigation systems which are used to deliver water to row and tree crops. A comprehensive four-year study was conducted to develop water treatment methods for preventing emitter clogging and maintaining long-term operation of the trickle irrigation system under actual field conditions. The study evaluated eight trickle emitter systems in combination with six water treatments using Colorado River water in southwestern Arizona. Emitter clogging was found to be related to emitter design and to the degree of filtration treatments of the river water. Only the long-path, spiral-grooved, manual flush emitter design performed efficiently with only screen filtration. Although the expandable diaphragm emitter never developed clogging problems, it failed because of increased flow rates caused by eight reactions with the chemically conditioned water or physical and biological decomposition of the flexible rubber diaphragm. The automatic flushing emitters were most susceptible to malfunction and clogging problems, especially if they were not installed verticaly on the lateral lines. For emitters unaffected by material deterioration, the continuous acid treatment alone was just as effective in reducing emitter clogging as a combination of continuous or intermittent chlorine and acid treatments. The dominant cause of emitter clogging and flow reduction was physical factors. The combined development of biological and chemical deposits was the second, relatively minor, cause of these problems. The major physical factors involved were sand grains and plastic particles. Care should be taken to avoid the introduction of these particles into the lines during installation and repair. (Carroll-FRC)

Gilbreath, A., et al. (2019). "Multiyear Water Quality Performance and Mass Accumulation of PCBs, Mercury, Methylmercury, Copper, and Microplastics in a Bioretention Rain Garden." Journal of Sustainable Water in the Built Environment **5**(4).

A multiyear water quality performance study of a bioretention rain garden located along a major urban transit corridor east of San Francisco Bay was conducted to assess the efficacy of bioretention rain gardens to remove pollutants. Based on data collected in three years between 2012 and 2017, polychlorinated biphenyls (PCBs) and suspended sediment concentrations (SSCs) were reduced (>90%), whereas total mercury (Hg), methylmercury (MeHg), and copper (Cu) were moderately captured (37%, 49%, and 68% concentration reduction, respectively). Anthropogenic microparticles including microplastics were retained by the bioretention rain garden, decreasing in concentration from 1.6 particles/L to 0.16 particles/L. Based on subsampling at 50- and 150-mm intervals in soil cores from two areas of the unit, PCBs, Hg, and MeHg were all present at the highest concentrations in the upper 100 mm in the surface media layers. Based on residential screening concentrations, the surface media layer near the inlet would need to be removed and replaced annually, whereas the rest of the unit would need replacement every 8 years. The results of this study support the use of bioretention in the San Francisco Bay Area as one management option for meeting load reductions required by San Francisco Bay total maximum daily loads, and provide useful data for supporting decisions about media replacement and overall maintenance schedules.

Gil-Delgado, J. A., et al. (2017). "Presence of plastic particles in waterbirds faeces collected in Spanish lakes." Environmental Pollution **220**(Part A): 732-736.

Plastic intake by marine vertebrates has been widely reported, but information about its presence in continental waterfowl is scarce. Here we analyzed faeces of waterbirds species (European coot, Fulica atra, mallard, Anas platyrhynchos and shelduck, Tadorna tadorna) for plastic debris in five wetlands in Central Spain. We collected 89 faeces of shelduck distributed in four lakes, 43.8% of them presented plastic remnants. Sixty percent of 10 faeces of European coot and 45% of 40 faeces of mallard contained plastic debris. Plastic debris found was of two types, threads and fragments, and were identified as remnants of plastic objects used in agricultural fields surrounding the lakes. Differences in prevalence of plastic in faeces, number of plastic pieces per excrement and size of the plastic pieces were not statistically significant between waterfowl species. Thus, our results suggest that plastic may also be frequently ingested by waterfowl in continental waters, at least in our study area. Future studies should address this potential problem for waterbird conservation in other wetlands to evaluate the real impact of this pollutant on waterbirds living in inland water.

Gilicze, O., et al. (2012). "Autoantibody and cardiovascular marker quantification in pericardial fluid and blood samples." European Journal of Clinical Investigation **1)**: 4.

Background: Cardiac involvement plays an important role in the morbidity and mortality of patients with antiphospholipid syndrome (APS) or other systemic autoimmune disorders, moreover mitral valve replacement surgery is quite often indicated among those who suffer from APS. Our aim was to screen for autoantibodies in pericardial fluid (PF) and blood samples

of patients undergoing bypass or valve replacement surgery without special symptoms of autoimmune diseases and to compare the level of cardiovascular factors among the autoantibody positive (AP) and negative cases and the previously diagnosed autoimmune cardiac surgery patients. Material(s) and Method(s): Antinuclear antibodies, anti-beta-2-glycoprotein I and anti-cardiolipin antibodies were determined by diagnostic ELISA kits. Multiplex microbead assay was used to measure cardiovascular factors (tPA, sCD40L, MCP-1, IL-8, IL-6, P-selectin). Result(s): Regarding the cardiovascular factors and cytokines no differences could be found between the bypass and valve groups. Whereas comparing the AP group to the valve- and the autoimmune group significant differences were found. The serum concentrations of sCD40L and t-PA were 1000 times higher in valve- than in autoimmune group, while the APs were half way between. In PF MCP-1 reached the highest level in valve group and the lowest in AP cases, and P-selectin also had noteworthy alterations. Analysing the blood-PF pairs: t-PA, MCP-1, sCD40L concentrations showed significant differences. Conclusion(s): Alternating levels of cytokines and cardiovascular factors of circulation and pericardial fluid may become biomarkers of several cardiovascular diseases or even diagnostic yield of this can be certain. We can also conclude that autoimmune diseases may be underdiagnosed.

Gilicze, O., et al. (2012). "Identification of lymphocyte populations and cardiovascular factors in pericardial fluid and blood samples among patients undergoing open heart surgery." International Journal of Cardiology **1)**: S129-S130.

Objective: Recent studies suggest that the composition of pericardial fluid (PF) is responsive to different conditions. Whereas scant literature is available on the normal - especially on the immunological composition of it. Lymphocytes are considered to have key role in the development of AMI and atherosclerosis. Numerous heart diseases are associated with altered levels of circulating cytokines and factors, but their presence and role is still unknown in the pericardium. Cytokines are regarded as possible therapeutic targets or biomarkers. Our aim was to identify and quantify lymphocyte populations and cardiovascular factors in PF and blood samples, correlate these findings with clinical parameters in the group of patients undergoing CABG versus those who underwent valve replacement surgery. Furthermore we divided the CABG group into 2 subgroups and compared our findings among those who had myocardial infarction and those did not. Method(s): Peripherial blood and PF samples were drawn simultaneously during open heart surgery with careful bloodless preparation of the pericardium. The study included 36 strictly selected patients - with 12 participants in each group. Cellular parameters were determined by flow cytometry after immunofluorescence staining. Multiplex microbead assay was used to measure cardiovascular factors. Result(s): As regarding the distribution of lymphocyte populations in both specimens no differences were shown between the CABG and the valve group. In the PF of both groups T-cells represented the dominant cell type - with a high percentage of memory type T-cells. We describe the first time the presence of lymphocytes of the natural immune system in PF. The level of monocyte chemoattractant protein 1 and interleukin-6 were higher in PF than in blood. The concentration of soluble CD40 ligand in blood was unexpectedly high. The level of monocyte chemoattractant protein 1 was significantly higher in the blood of CABG patients than in the valve group. We compared parameters in CABG patients who previously developed AMI with those who did not. The ratio of activated helper and cytotoxic T cells in pericardial fluid reached significantly higher level in the PF of AMI group than in non-AMI group. In pericardial fluid of AMI group the concentration of interleukin-6 was increased comparing to the non-AMI group. In blood samples tissue plasminogen activator showed significant differences. Conclusion(s): Our findings show that pericardial fluid is not only an ultafiltrate but also a transudate which composition may refer to

the statement of the cardiomyocytes thus diagnostic yield of this can be certain.

Gill, M. A., et al. (2008). "Plasmacytoid Dendritic Cells from Asthma Patients Secrete Less Interferon-[alpha] Upon Exposure to Respiratory Viruses." Journal of Allergy and Clinical Immunology **121**(2).

Methods Blood pDCs from 5 patients with allergic asthma and 4 healthy control subjects were purified using antibody-coated magnetic microbeads (Miltenyi Biotec) and cultured for 36 hours with either no virus, respiratory syncytial virus (RSV), or influenza A. IFN-Î± concentrations in the pDC culture supernatants were subsequently determined by ELISA.

Gillard, M., et al. (2018). "[Cutaneous foreign body granulomas following cervico-facial arterial embolization: Three cases]." Annales de Dermatologie et de Venereologie **145**(11): 659-664.

BACKGROUND: Foreign body granuloma is an inflammatory tissue reaction to exogenous material. Classically it appears on the face after aesthetic procedures. Herein we report for the first time three cases of facial granulomatous reactions to microbeads after arterial cervico-facial embolization.

PATIENTS AND METHODS: Three patients underwent embolization of the facial arteries using Embogold microbeads in a setting of epistaxis or tumoral hemostasis. Within 10 to 45 days painful, inflammatory, subcutaneous nodules appeared on the homolateral side of the face. Histological samples showed an inflammatory response with giant cells as well as the presence of microbeads in the skin. A favorable outcome was achieved with colchicine in one patient and with surgery in another; the third patient was lost to follow-up.

DISCUSSION: The embolizing microspheres produced a local inflammatory reaction, with destruction of the vascular wall and bead migration to facial tissue leading to a granulomatous reaction. The occurrence of three cases within a period of few weeks, with several different operators and batches of products, is surprising considering the long-standing use of the product. There was no common comorbidity in the patients and no suggestion of trauma. Retrospective analysis of the product batches was normal. Gold staining could play a role in severe inflammatory response to Embogold particles.

CONCLUSION: These three cases illustrate the value of discussing potential foreign body granulomatous reaction in cases of facial nodules following cervico-facial embolization. Colchicine may offer a valuable therapeutic alternative.

Gillibert, R., et al. (2019). "Raman Tweezers for Small Microplastics and Nanoplastics Identification in Seawater." Environmental Science & Technology **53**(15): 9003-9013.

Our understanding of the fate and distribution of micro- and nano- plastics in the marine environment is limited by the intrinsic difficulties of the techniques currently used for the detection, quantification, and chemical identification of small particles in liquid (light scattering, vibrational spectroscopies, and optical and electron microscopies). Here we introduce Raman Tweezers (RTs), namely optical tweezers combined with Raman spectroscopy, as an analytical tool for the study of micro- and nanoplastics in seawater. We show optical trapping and chemical identification of sub-20 mum plastics, down to the 50 nm range. Analysis at the single particle level allows us to unambiguously discriminate plastics from organic matter and mineral sediments, overcoming the capacities of standard Raman spectroscopy in liquid, intrinsically limited to ensemble measurements. Being a microscopy technique, RTs also permits one to assess the size and shapes of particles (beads, fragments, and fibers), with spatial resolution only limited by diffraction. Applications are shown on both model particles and naturally aged environmental samples, made of common plastic pollutants, including polyethylene, polypropylene, nylon, and polystyrene, also in the presence of a thin eco-corona. Coupled to suitable extraction and concentration protocols, RTs have the potential to strongly impact future research on micro and nanoplastics environmental pollution, and enable the understanding of the fragmentation processes on a multiscale level of aged polymers.

Gimenez-Lirola, L. G., et al. (2014). "Development and validation of a 4-plex antibody assay for simultaneous detection of IgG antibodies against Torque teno sus virus 1 (TTSuV1), TTSuV2, and porcine reproductive and respiratory syndrome virus types 1 and 2." Research in Veterinary Science **96**(3): 543-550.

A fluorescent microbead-based immunoassay (FMIA) for simultaneous detection of IgG antibodies against Torque teno sus virus 1 (TTSuV1), TTSuV2, porcine reproductive and respiratory syndrome virus type 1 (PRRSV-1) and PRRSV-2 was developed. Serum samples were obtained over time from 20 pigs. Twelve of 20 were exposed to TTSuV2 on day 0, 20/20 were vaccinated with a PRRSV-2 vaccine on day 35, and 20/20 were exposed to PRRSV-2 on day 63. Anti-TTSuV antibodies were detected in 30% of the pigs on day 0, and 90% by day 35. All PRRSV-2 vaccinated pigs had detectable anti-PRRSV-2 IgG 21 days after vaccination. Field samples from 17 farms were also tested. The seroprevalence of both PRRSV and TTSuV increased with age. Comparison of the PRRSV-2 FMIA to an ELISA revealed good correlation in young pigs but a high rate of false positives in older pigs. Cross-reaction between PRRSV types was a problem. © 2014.

Gimenez-Lirola, L. G., et al. (2014). "Simultaneous detection of antibodies against Apx toxins ApxI, ApxII, ApxIII, and ApxIV in pigs with known and unknown actinobacillus pleuropneumoniae exposure using a multiplexing liquid array platform." Clinical and Vaccine Immunology **21**(1): 85-95.

Surveillance for the presence of Actinobacillus pleuropneumoniae infection in a population plays a central role in controlling the disease. In this study, a 4-plex fluorescent microbead-based immunoassay (FMIA), developed for the simultaneous detection of IgG antibodies to repeat-in-toxin (RTX) toxins (ApxI, ApxII, ApxIII, and ApxIV) of A. pleuropneumoniae, was evaluated using (i) blood serum samples from pigs experimentally infected with each of the 15 known A. pleuropneumoniae serovars or with Actinobacillus suis, (ii) blood serum samples from pigs vaccinated with a bacterin containing A. pleuropneumoniae serovar 1, 3, 5, or 7, and (iii) blood serum samples from pigs with an unknown A. pleuropneumoniae exposure status. The results were compared to those obtained in a previous study where a dual-plate complement fixation test (CFT) and three commercially available enzyme-linked immunosorbent assays (ELISAs) were conducted on the same sample set. On samples from experimentally infected pigs, the 4-plex Apx FMIA detected specific seroconversion to Apx toxins as early as 7 days postinfection in a total of 29 pigs inoculated with 14 of the 15 A. pleuropneumoniae serovars. Seroconversion to ApxII and ApxIII was detected by FMIA in pigs inoculated with A. suis. The vaccinated pigs showed poor humoral responses against ApxI, ApxII, ApxIII, and ApxIV. In the field samples, the humoral response to ApxIV and the A. pleuropneumoniae seroprevalence increased with age. This novel FMIA (with a sensitivity of 82.7% and a specificity of 100% for the anti-ApxIV antibody) was found to be more sensitive and accurate than current tests (sensitivities, 9.5 to 56%; specificity, 100%) and is potentially an improved tool for the surveillance of disease and for monitoring vaccination compliance. Copyright © 2014, American Society for Microbiology. All Rights Reserved.

Gimenez-Lirola, L. G., et al. (2016). "Detection of African swine fever virus antibodies in serum and oral fluid specimens using a recombinant protein 30 (p30) dual matrix indirect ELISA." PLoS ONE **11**(9).

In the absence of effective vaccine(s), control of African swine fever caused by African swine fever virus (ASFV) must be based on early, efficient, cost-effective detection and strict control and elimination strategies. For this purpose, we developed an indirect ELISA capable of detecting ASFV antibodies in either serum or oral fluid specimens. The recombinant protein used in the ELISA was selected by comparing the early serum antibody response of ASFV-infected pigs (NHV-p68 isolate) to three major recombinant polypeptides (p30, p54, p72) using a multiplex fluorescent microbead-based immunoassay (FMIA). Non-hazardous (non-infectious) antibody-positive serum for use as plate positive controls and for the calculation of sample-to-positive (S:P) ratios was produced by inoculating pigs with a replicon particle (RP) vaccine expressing the ASFV p30 gene. The optimized ELISA detected anti-p30 antibodies in serum and/or oral fluid samples from pigs inoculated with ASFV under experimental conditions beginning 8 to 12 days post inoculation. Tests on serum (n=200) and oral fluid (n=200) field samples from an ASFV-free population demonstrated that the assay was highly diagnostically specific. The convenience and diagnostic utility of oral fluid sampling combined with the flexibility to test either serum or oral fluid on the same platform suggests that this assay will be highly useful under the conditions for which OIE recommends ASFV antibody surveillance, i.e., in ASFV-endemic areas and for the detection of infections with ASFV isolates of low virulence.

Gimenez-Lirola, L. G., et al. (2012). "Development of a novel fluorescent microbead-based immunoassay and comparison with three enzyme-linked immunoassays for detection of anti-Erysipelothrix spp. IgG antibodies in pigs with known and unknown exposure." Journal of Microbiological Methods **91**(1): 73-79.

A novel fluorescent microbead immunoassay (FMIA) using the recombinant polypeptide SpaA415 was developed for detection of anti- Erysipelothrix spp. IgG in pig sera. The diagnostic performance of the FMIA was evaluated on samples from pigs with known and unknown Erysipelothrix spp. exposure and compared to an in-house enzyme-linked immunosorbent assay (ELISA-1) based on the same capture antigen, and two commercially available ELISAs (ELISA-2 and ELISA-3). Sera from pigs experimentally infected with Erysipelothrix rhusiopathiae serotype 1a (n = 60) or 19 (n = 12), sera from pigs vaccinated with a commercial attenuated-live vaccine based on serotype 1a (n = 12) or a commercial bacterin based on serotype 2 (n = 12), and 90 field samples were utilized. The sensitivity on 22 true positive samples collected in the later stages of infection/post-vaccination was 100% for the FMIA and ELISA-1, 63.6% for ELISA-2 and 81.8% for ELISA-3. The earliest antibody response was detected 7. days post inoculation with the FMIA (77.8%) and ELISA-1 (11.1%), and at 14. days post-vaccination (dpv) with FMIA (50%) and ELISA-1 (50%). On field samples, a higher seroprevalence was found in pigs older than 21. days with all four assays. Kappa analysis indicated that the FMIA and ELISA-1 had almost complete agreement whereas the agreement was slight with ELISA-2 and fair with ELISA-3. The sensitivity of both immunoassays based on the rSpaA415 antigen was higher compared to that of the two commercial ELISAs. The rSpaA415 FMIA has great potential as an inexpensive ELISA alternative for detection of antibodies against E. rhusiopathiae in the future. © 2012 Elsevier B.V.

Gimenez-Lirola, L. G., et al. (2013). "Improving ante mortem diagnosis of Erysipelothrix rhusiopathiae infection by use of oral fluids for bacterial, nucleic acid, and antibody detection." Journal of Microbiological Methods **92**(2): 113-121.

Swine erysipelas is an economically important disease caused by Erysipelothrix rhusiopathiae. Pen-based collection of oral fluids has recently been utilized for monitoring infection dynamics in swine operations. The diagnostic performance of bacterial isolation, real-time PCR, and antibody detection by enzyme-linked immunosorbent assay (ELISA) and fluorescent microbead-based immunoassay (FMIA) methods were evaluated on pen-based oral fluid samples from pigs experimentally infected with E. rhusiopathiae (n=112) and from negative controls (n=32). While real-time PCR was a sensitive method with an overall detection rate of 100% (7/7 pens) one day post inoculation (dpi), E. rhusiopathiae was successfully isolated in only 28.6% (2/7 pens). Anti-Erysipelothrix IgM and IgG antibodies in pen-based oral fluids were detected at 4 to 5 dpi by FMIA and at 5 and 8 dpi by ELISA. The number of infected animals per pen, and in particular the timing of antimicrobial treatment administration impacted bacterial isolation and ELISA results. In oral fluid field samples, E. rhusiopathiae DNA was found in 23.3% of the samples while anti-E. rhusiopathiae IgG and IgM antibodies were found in 59.6% and 5.5% of the samples, respectively. The results suggest that an algorithm integrating oral fluids as specimen and real-time PCR and FMIA as detection methods is effective for earlier detection of an erysipelas outbreak thereby allowing for a more effective treatment outcome. © 2012 Elsevier B.V.

Gimenez-Lirola, L. G., et al. (2017). "Reactivity of porcine epidemic diarrhea virus structural proteins to antibodies against porcine enteric coronaviruses: diagnostic implications." Journal of Clinical Microbiology **55**(5): 1426-1436.

The development of porcine epidemic diarrhea virus (PEDV) antibody-based assays is important for detecting infected animals, confirming previous virus exposure, and monitoring sow herd immunity. However, the potential cross-reactivity among porcine coronaviruses is a major concern for the development of pathogen-specific assays. In this study, we used serum samples (n=792) from pigs of precisely known infection status and a multiplex fluorescent microbead-based immunoassay and/or enzyme-linked immunoassay platform to characterize the antibody response to PEDV whole-virus (WV) particles and recombinant polypeptides derived from the four PEDV structural proteins, i.e., spike (S), nucleocapsid (N), membrane (M), and envelope (E). Antibody assay cutoff values were selected to provide 100% diagnostic specificity for each target. The earliest IgG antibody response, mainly directed against S1 polypeptides, was observed at days 7 to 10 postinfection. With the exception of nonreactive protein E, we observed similar antibody ontogenies and patterns of seroconversion for S1, N, M, and WV antigens. Recombinant S1 provided the best diagnostic sensitivity, regardless of the PEDV strain, with no cross-reactivity detected against transmissible gastroenteritis virus (TGEV), porcine respiratory coronavirus (PRCV), or porcine deltacoronavirus (PDCoV) pig antisera. The WV particles showed some cross-reactivity to TGEV Miller and TGEV Purdue antisera, while N protein presented some cross-reactivity to TGEV Miller. The M protein was highly cross-reactive to TGEV and PRCV antisera. Differences in the antibody responses to specific PEDV structural proteins have important implications in the development and performance of antibody assays for the diagnosis of PEDV enteric disease.

Ginaldi, L., et al. (1997). "Altered lymphocyte antigen expressions in HIV infection: a study by quantitative flow cytometry." American Journal of Clinical Pathology **108**(5): 585-592.

To identify surface antigen changes that may contribute to the immune deficiency in infection with the human immunodeficiency virus (HIV), we quantified, by double-staining flow cytometry, the number of antigens of the main peripheral blood lymphocyte subsets from 30 HIV-positive persons and compared them with those of 19 HIV-negative healthy donors. Standard microbeads with different capacities to bind mouse immunoglobulins were used to convert the mean fluorescence intensity values into numbers of antigen molecules per cell, measured as antibody binding capacity. The level of expression of different lymphocyte antigens in HIV-infected patients differs from that seen in normal blood lymphocytes. Some of these

surface markers are decreased, whereas others are increased, and their expression is modulated depending on the specific cell subset considered. The expression of CD3, CD4, and CD8 on T lymphocytes is significantly decreased; moreover, CD3 is down-regulated on activated and nonactivated T lymphocytes and on CD4 and CD8 cells. In contrast, the expression of CD2 on T cells is significantly increased. Natural killer cells exhibit down-regulation of CD7, normal levels of CD8 and CD56, and overexpression of CD2. Our results also identified, for most of these antigens, quantitative differences in membrane expression according to different disease stages, as assessed by the CD4 T-cell count. Quantitative flow cytometry therefore may provide useful insights into the lymphocyte functional defects characterizing HIV infection.

Ginaldi, L., et al. (1998). "Levels of expression of CD19 and CD20 in chronic B cell leukaemias." Journal of Clinical Pathology **51**(5): 364-369.

Aims - To investigate whether the antigen levels of the B cell lineage markers CD19 and CD20 can distinguish between normal and neoplastic B cells or characterise distinct expression patterns among the chronic B cell leukaemias. Methods - Peripheral blood cells from 70 patients with B cell disorders and 17 healthy donors were analysed by quantative flow cytometry. Direct immunofluorescence staining was performed with phycoerythrin cojugated CD19 and CD20 monoclonal antibodies. Standard microbeads with different capacities to bind mouse immunoglobulins were used to convert the mean fluorescence intensity (MFI) values into number of antigen molecules/cell, expressed as antibody binding capacity (ABC). Results - CD19 and CD20 ABC values in leukaemic B cells differed from those of normal blood B lymphocytes. The results identified distinct profiles of CD19 and CD20 expression in the various types of B cell leukaemias. In all leukaemias studied except hairy cell leukaemia (HCL), CD19 expression was significantly lower than the mean (SD) value in normal B cells (22 (7) x 10³ molecules/cell), as follows: chronic lymphocytic leukaemia (CLL), 13 (7) x10³; B prolymphocytic leukaemia (B-PLL), 16 (9) x10³; splenic lymphoma with villous lymphocytes (SLVL), 15 (11) x 10³; mantle cell lymphoma (MCL), 10 (7) x 10³. In HCL there was strong CD19 expression (38 (16) x 10³). In contrast, the level of expression of membrane CD20 was higher than the mean (SD) value in normal B cells (94 (16) x 10³ molecules/cell) in MCL (123 (51) x 10³); B-PLL (129 (47) x 10³); SLVL (167 (72) x 10³); and HCL (312 (110) x 10³); while it was significantly lower (65 (11) x 10³) in CLL compared wtih normal B cells and the other B cell leukaemias. Conclusions - Quantitative determination of CD19 and CD20 may provide useful diagnostic information for the study of B lymphoproliferative disorders.

Ginaldi, L., et al. (1996). "Differential expression of T cell antigens in normal peripheral blood lymphocytes: a quantitative analysis by flow cytometry." Journal of Clinical Pathology **49**(7): 539-544.

AIMS: To obtain reference values of the level of expression of T cell antigens on normal lymphocyte subsets in order to disclose differences which could reflect their function or maturation stages, or both.

METHODS: Peripheral blood from 15 healthy donors was processed by flow cytometry with triple colour analysis. For each sample phycoerythrin (PE) conjugated CD2, CD4, CD5, CD8, and CD56 monoclonal antibodies were combined with Cy5-R-phycoerythrin (TC) conjugated CD3 and fluorescein isothiocyanate (FITC) conjugated CD7; CD2- and CD7-PE were also combined with CD3-TC and CD4-FITC. Standard microbeads with different capacities to bind mouse immunoglobulins were used to convert the mean fluorescence intensity (MFI) values of the lymphocyte subsets identified by multiparametric flow cytometry into the number of antigen molecules per cell, measured as antibody binding capacity (ABC).

RESULTS: CD4+ (helper/inducer) T cells exhibit a higher CD3 antigen expression compared with CD8+ (suppressor/ cytotoxic) T lymphocytes. Within the CD4+ T cells, the CD4+CD7- subset expressed a lower level of CD3 compared with CD4+CD7+ and CD8+CD7+ cells, and higher CD2 and CD5 expression than the main CD3+CD7+ subset. Major differences in antigen expression were also detected between CD3+ T cells and CD3-CD56+ natural killer (NK) cells: NK cells exhibited higher levels of CD7 and CD56 and lower levels of CD2 and CD5 than T cells. Significantly lower CD5 expression was also detected in the small CD5+ B lymphocyte subset compared with T cells.

CONCLUSIONS: Quantitative flow cytometry with triple colour analysis may be used to detect antigen modulations in disease states and to increase the accuracy of diagnosis by comparison with findings in normal counterparts.

Girardet, H. (2019). "Regenerative Economics for a sustainable world." Resurgence & Ecologist(313): 20-24.

The article discusses the regenerative practices towards sustainable development amid challenges facing in an ever-increasing understanding of the planetary crisis. The reliance of a global systemic externality of an urban-industrial civilisation on vast annual inputs of fossil fuel energy is tackled. Also explored are the underreported systemic crisis, pollution of the oceans with plastic detritus and significant value of ecosystems services.

Gladstone, D. E., et al. (2011). "Desensitization for mismatched Hematopoietic Stem Cell Transplantation (HSCT)." Blood. Conference: 53rd Annual Meeting of the American Society of Hematology, ASH **118**(21).

Introduction: Sensitization to donor HLA antigens is associated with an increased risk of engraftment failure in HLA mismatched hematopoietic stem cell transplantation (HSCT). However, the use of partially mismatched donors is increasing since, at best, only 30% of patients have an HLA identical sibling donor available for transplantation, and many are unable to find a matched unrelated donor in a timely fashion. A non-myeloablative, T cell replete regimen for HSCT that utilizes post-transplant high dose, cyclophosphamide for graft-versus-host-disease (GVHD) prophylaxis was pioneered at Johns Hopkins and has permitted transplantation of over 200 patients with HLA-haploidentical related donors. The use of HLA haplo-identical donors greatly increases the numbers of potential donors for most HSCT candidates. Review of the evaluations of 148 consecutive candidates for haplotransplantation revealed that 95% had at least one haplo-identical donor with an average of 2.7 donors/patient. However donor specific HLA antibody (DSHA) was observed in 10.8% of patients. We report here, successful desensitization of (DHSA) to levels safe for HSCT in six broadly sensitized patients who had poor-risk hematologic malignancies and for whom there were no other donors for whom HLA specific antibodies were not an issue. Method(s): The desensitization protocol was modified from that developed for renal transplant patients at the Johns Hopkins University Comprehensive Transplant Center and included alternate day, single volume plasmapheresis (PP) with low dose, 100mg/kg, anti-CMV hyper immune immunoglobulin (IVIg) under immunosuppression with tacrolimus and mycophenolate mofetil. Varying numbers of PP/IVIg treatments were scheduled prior to the non-myeloablative conditioning regimen according to each patient's DHSA level. PP/IVIg was stopped during conditioning. All but one patient received one additional PP/IVIg at transplant day -1. HLA antibodies were assessed by solid phase immunoassays using panels of pooled HLA antigens, HLA phenotypes, and single HLA antigens in microbead suspension array immunoassays (GenProbe Lifecodes Inc., San Diego, CA; One Lambda, Inc., Canoga Park, CA) Result(s) and Conclusion(s): All six patients prior to desensitization had DHSA at levels sufficient to yield positive flow cytometric crossmatch (FCXM)

tests defined as 12K molecules of equivalent soluble fluorochromes (MESFs). The donor specific antibodies were reduced to levels well below a positive FXCM in all six patients by the end of the PP/IVIG treatments and before transplantation through an average of 4.2 PP/IVIg treatments. The average reduction in the donor specific antibody strength was 71.5% (range: 52-91%). In three patients, the DHSA levels were reduced to negative by time of transplant. A fourth patient was transplanted with a DHSA level just below that consistent with a positive FCXM, but by three months post-transplant had completely eliminated the DHSA. Two patients received one additional post-transplant PP/IVIg, resulting in stable DSA levels well below a +FCXM. Sufficient post-transplant follow-up of more than four months was available for four patients of which 3 received grafts from haploidentical donors and 1 from an HLA-mismatched unrelated donor. All four of these fully engrafted with no acute GVHD episodes. These results demonstrate that desensitization can extend the opportunity for HSCT to sensitized patients with no other donor options. [Table Presented].

Glander, H. J., et al. (2002). "Deterioration of spermatozoal plasma membrane is associated with an increase of sperm lyso-phosphatidylcholines." Andrologia **34**(6): 360-366.

Spermatozoa with plasma membranes that lost their asymmetry or permeability for larger molecules can be identified by binding of annexin V to membrane phosphatidylserine (PS). Paramagnetic annexin-V-conjugated microbeads (AN-MB) can be used to eliminate these spermatozoa by magnetic activated cell sorting (MACS). Semen samples of six healthy volunteers with normal spermiogram parameters were divided into two sperm fractions by MACS as a function of bound AN-MB, and their individual lipid compositions were examined by matrix-assisted laser desorption and ionisation time-of-flight mass spectrometry (MALDI-TOF MS). As a model system, liposomes composed of phosphatidylcholines (PC) from egg yolk were digested by phospholipase A2 (PLA2). The MALDI-TOF mass spectra of organic extracts of both sperm subpopulations differed significantly. The ratio between lyso-phosphatidylcholine LPC 16 : 0 and PC 16 : 0/22 : 6 was approximately 2.5-4.7-fold higher (median 2.9) in the sperm group binding AN-MB than in spermatozoa with intact membrane unable to bind AN-MB. The ratio between LPC 22 : 6 and PC 16 : 0/22 : 6 was also enhanced in the spermatozoa with impaired membrane structure (factor in the range: 1.9-3.9; median 2.6). These alterations corresponded to the effects of PLA2 on artificial phospholipids. It is concluded that spermatozoa with deteriorated membrane and exposed PS are characterized by an increased lyso-phosphatidylcholine content that is likely generated by phospholipases.

Glaser, J. (2015). "Microplastics in the environment." Clean Technologies & Environmental Policy **17**(6): 1383-1391.

This section offers news briefs concerning clean technology and environmental policy, as of August 2015. Topics discussed include the celebration of the 150-year anniversary of German chemical company BASF, the release of the anticipated 180-page encyclica "Laudato Si" of Pope Francis which is focused on environmental concerns, and the release of the analytical report entitled "Energy and Climate Change by the International Energy Agency.

Glenn, J. (1990). "Progress in Plastics Recycling." BioCycle **31**(12): 50.

Pressure from municipal recycling programs has encouraged the plastics industry to address technologic and infrastructure problems in ensuring the recyclability of their products. Plastic waste from the consumer stream, as well as that from industrial streams such as the transportation and construction industries, has been earmarked for recycling in these programs.

Glynn, M. T., et al. (2014). "Rapid, low-cost and instrument-free CD4+ cell counting for HIV diagnostics in resource-poor settings." Lab on a Chip **14**(15): 2844-2851.

We present a novel, user-friendly and widely autonomous point-of-care diagnostic to enable HIV monitoring in resource-poor regions where the current pandemic is most prevalent. To specifically isolate magnetically tagged CD4+ cells directly from patient blood, the low-cost and disposable microfluidic chip operates by dual-force CD4+ cell magnetophoresis; whereby the interplay of flow and magnetic fields governs the trajectory of target cells depending on whether the cell binds to a magnetic microbead. Instrument-free pumping is implemented by a finger-actuated elastic membrane; tagged beads are laterally deflected by a small and re-useable permanent magnet. The single-depth and monolithic microfluidic structure can easily be fabricated in a single casting step. After their magnetophoretic isolation from whole blood, estimation of CD4+ cell concentrations is then measured by bright-field inspection of the capture chamber. In addition, an optional fluorescence measurement can be used for confirmation of the bright-field result if required. On-chip CD4+ estimation produces a linear response over the full range of medically relevant CD4+ cell concentrations. Our technology combines high-efficiency capture (93.0 plus or minus 3.3%) and cell enumeration.

Gnanaprakash, K., et al. (2011). "A review on floating drug delivery system of H<inf>2</inf> receptors." Research Journal of Pharmacy and Technology **4**(4): 502-509.

Peptic ulcer is the disorder of the upper gastro intestinal tract; hyperacidity is one of the main causes of peptic ulcer. Worldwide accepted clinical therapy of acid disease is based on H2 receptor antagonists. The four H<inf>2</inf> receptor antagonists currently available on market are cimetidine, ranitidine, famotidine, and nizatidine. Of the various technologies for gastro retentive dosage forms, the floating drug delivery system (FDDS). It's widely investigated since they are most promising dosage form to achieve reproducibility in a wide spectrum of biological conditions. This article presents, Factors affecting the gastric emptying and, hence, the gastric retention time of oral dosage forms, advantages and disadvantages of floating drug delivery system, potential drug candidates for gastroretentive drug delivery systems, drugs those are unsuitable for gastroretentive drug delivery systems, mechanism of floating systems, classification of anti ulcer drugs, H<inf>2</inf> receptor antagonists pharmacology, approaches of floating drug delivery system based on the mechanism of buoyancy, gastroretentive products available in the market, evaluation parameters. © RJPT All right reserved.

Gniadek, M. and A. Dabrowska (2019). "The marine nano- and microplastics characterisation by SEM-EDX: The potential of the method in comparison with various physical and chemical approaches." Marine Pollution Bulletin **148**: 210-216.

The marine microplastic (MMs) is an interdisciplinary problem. The polymer debris are ubiquitous (soil, hydrosphere, atmosphere) and the majority ends, transported by the freshwaters, in the global ocean system: from pelagial waters, surface gyres and benthos up to the animals at different trophic levels. Their quantitative, qualitative and eco-toxicological analyses, based on analytical, physical and chemical methods, are still a challenge due to the complex matrices, materials weathering, limited concentration, and size. Moreover, further fragmentation due to the waves and UV radiation leads to the constant increase of their surface. The aim of this article is to present the advantages, drawbacks and future perspectives of using SEM-EDX method in the analyses of marine polymer debris from macro to the nanoscale. Theoretical issues are presented in comparison to the commonly used approaches. The practical aspects will be discussed based on case studies. Examples of the results, high-resolution SEM pictures are included.

Gocenoglu Sarikaya, A., et al. (2016). "Adsorption of cinnabarinic acid from culture fluid with magnetic microbeads." Biomedical Chromatography **30**(2): 88-96.

In this study, antimicrobial pigment cinnabarinic acid (CA) was produced from Pycnoporus cinnabarinus in laboratory-scale batch cultures. Magnetic poly(ethylene glycol dimethacrylate-N-methacryloyl-l-tryptophan methyl ester) [m-poly(EGDMA-MATrp)] beads (average diameter = 53-103 micro m) were synthesized by copolymerizing of N-methacryloyl-l-tryptophan methyl ester (MATrp) with ethylene glycol dimethacrylate (EGDMA) in the presence of magnetite (Fe3O4) and used for the adsorption of CA. The m-poly(EGDMA-MATrp) beads were characterized by N2 adsorption/desorption isotherms (Brunauer Emmet Teller), X-ray photoelecron spectroscopy, scanning electron microscopy, infrared spectroscopy, thermal gravimetric analysis, electron spin resonance and swelling studies. The efficiency of m-poly(EGDMA-MATrp) beads for separation of CA from culture fluid was evaluated. The effects of pH, initial concentration, contact time and temperature on adsorption were analyzed. The maximum CA adsorption capacity of the m-poly(EGDMA-MATrp) beads was 272.9 mg g(-1) at pH 7.0, 25 degreeC. All the isotherm data can be fitted with the Langmuir, Freundlich and Dubinin-Radushkevich isotherm models. The adsorption process obeyed pseudo-second-order kinetic model. Thermodynamic parameters DELTAH = 5.056 kJ mol(-1), DELTAS = 52.44 J K(-1) mol(-1) and DELTAG = -9.424 kJ mol-(1) to -11.27 kJ mol-(1) with the rise in temperature from 4 to 40 degreeC indicated that the adsorption process was endothermic and spontaneous.

Gock, A., et al. (2018). "Legal Strategies to Cure the Plastic Planet: Corporate Marriage and Public Health Regulation of Single-Use Non-Biodegradeable Plastics." Journal of Law & Medicine **26**(2): 311-321.

The 2018 export ban of recyclables to China provides an additional important reason for Australia in particular to act internationally and domestically to reduce its plastic waste. The problems Australia faces from single-use non-biodegradable plastics are replicated in every nation on Earth. Focusing on the Australian context, this article examines regulatory approaches to the problem of plastic production, consumption and disposal and its negative impact on public and ecosystem health. It scrutinises the current legal framework for managing plastic waste at Commonwealth, State and international levels, advocating greater regulation. Its regulatory recommendations include a Pigouvian tax in the form of an excise on plastic production to alter consumer behaviour and raise revenue for further investment in reusable alternatives. They also involve mandatory corporate responsibility obligations, a concept we term "corporate marriage". Other alternative and additional measures to combat single-use plastic waste as utilised in other jurisdictions are proposed for Australian implementation.

Goddijn-Murphy, L. and B. Williamson (2019). "On Thermal Infrared Remote Sensing of Plastic Pollution in Natural Waters." Remote Sensing **11**(18).

Plastic pollution in the world's natural waters is of growing concern and currently receiving significant attention. However, remote sensing of marine plastic litter is still in the developmental stage. Most progress has been made in spectral remote sensing using visible to short-wave infrared wavelengths where optical physics applies. Thermal infrared (TIR) sensing could potentially monitor plastic water pollution but has not been studied in detail. We applied radiative transfer theory to predict TIR sensitivity to changes in the surface fraction of water covered by plastic litter and found that the temperature difference between the water surface and the surroundings controls the TIR signal. Hence, we mapped this difference for various months and times of the day using global SST (sea surface temperature) and t2m (temperature

at 2 m height) hourly estimates from the European Centre for Medium-Range Weather Forecasts (ECMWF), ERA5. The maps show how SST-t2m difference varied, altering the anticipated effectivity of TIR floating plastic litter remote sensing. We selected several locations of interest to predict the effectivity of TIR sensing of the plastic surface fraction. TIR remote sensing has promising potential and is expected to be more effective in areas with a high air–sea temperature difference.

Godoy, V., et al. (2019). "The potential of microplastics as carriers of metals." Environmental Pollution **255**(Pt 3): 113363.

Microplastics can adsorb chemical pollutants such as metals or pharmaceuticals, and transferred them along the food chain. In this work, an investigation of the adsorption of Cd, Co, Cr, Cu, Ni, Pb and Zn by five different types of microplastics was performed in Milli-Q water and natural waters (seawater, urban wastewater and irrigation water) via a series of batch adsorption experiments. The effects of concentration of metals and physicochemical characteristics of polymers were particularly studied.

Godoy, V., et al. (2019). "Physical-chemical characterization of microplastics present in some exfoliating products from Spain." Marine Pollution Bulletin **139**: 91-99.

Plastic pollution in oceans is a global problem, with growing research efforts focusing on the threat of microplastics (<5mm fractions). A source of microplastics pollution is derived from personal care products that contain polyethylene micro-spheres which are not captured by wastewater plants. In this work, ten personal care products (mainly scrubs) containing microplastics and marketed in Spain, were physico-chemically characterized. The obtained results proved that those microplastics had different particle size and are presented in high percentages in some cases, between 6 and 7% of the total product. Products with smaller particles usually showed higher concentrations than products with larger particles. Although all the microplastics were shown to be polyethylene, some impurities were observed that demonstrated the presence of silicates and oxides in the microplastics. Regards to morphology, the shape of the particles was irregular in general, although some completely spherical particles can be observed.

Gokcinar-Yagci, B., et al. (2016). "Isolation, characterisation and comparative analysis of human umbilical cord vein perivascular cells and cord blood mesenchymal stem cells." Cell & Tissue Banking **17**(2): 345-352.

Perivascular cells are known to be ancestors of mesenchymal stem cells (MSCs) and can be obtained from heart, skin, bone marrow, eye, placenta and umbilical cord (UC). However detailed characterization of perivascular cells around the human UC vein and comparative analysis of them with MSCs haven't been done yet. In this study, our aim is to isolate perivascular cells from human UC vein and characterize them versus UC blood MSCs (UCB-MSCs). For this purpose, perivascular cells around the UC vein were isolated enzymatically and then purified with magnetic activated cell sorting (MACS) method using CD146 Microbead Kit respectively. MSCs were isolated from UCB by Ficoll density gradient solution. Perivascular cells and UCB-MSCs were characterized by osteogenic and adipogenic differentiation procedures, flow cytometric analysis [CD146, CD105, CD31, CD34, CD45 and alpha-smooth muscle actin (alpha-SMA)], and immunofluorescent staining (MAP1B and Tenascin C). Alizarin red and Oil red O staining results showed that perivascular cells and MSCs had osteogenic and adipogenic differentiation capacity. However, osteogenic differentiation capacity of perivascular cells were found to be less than UCB-MSCs. According to flow cytometric analysis, CD146

expression of perivascular cells were appeared to be 4.8-fold higher than UCB-MSCs. Expression of alpha-SMA, MAP1B and Tenascin-C from perivascular cells was determined by flow cytometry analysis and immunfluorescent staining. The results appear to support the fact that perivascular cells are the ancestors of MSCs in vascular area. They may be used as alternative cells to MSCs in the field of vascular tissue engineering.

Gokhale, P. C., et al. (2015). "Modeling patient-derived lung cancer in mice: Preclinical tool for drug development." Cancer Research. Conference: 106th Annual Meeting of the American Association for Cancer Research, AACR **75**(15 SUPPL. 1).

Background: Genotype directed treatment is the standard of care for patients with advanced non-small cell lung cancer (NSCLC). However, acquired drug resistance invariably develops. There is a need to develop clinically relevant animal models from patients who have developed acquired resistance in order to study mechanisms of resistance and validate new therapeutic strategies. We have generated a portfolio of clinically relevant, early passage, patient-derived xenograft (PDX) models of lung cancer. Method(s): Tumor biopsies (core biopsies (n = 8), pleural effusions (n = 28) and surgical samples (n = 11)) were implanted subcutaneously (n = 39) or into the sub-renal capsule (n = 8) of NSG mice under an IRB approved protocol. After implanting 35 specimens, mostly from pleural effusions, several mice exhibited weight and fur loss. Histopathology revealed infiltration of the liver, skin and lungs by human derived T-cells consistent with graft-versus-host disease (GVHD). Subsequent pleural effusions were then subjected to CD45 depletion using a human CD45 microbead separation kit which eliminated the incidence of GVHD. Tumors from all three sources were allowed to grow and subsequently passaged only as subcutaneous implants in NSG mice. Molecular characterization of PDX models was performed using targeted next generation sequencing and tumor histology confirmed by H&E staining. Some established tumor models have also been propagated as cell lines in vitro. Result(s): 47 specimens were implanted with an overall take rate of ~30%. The initial take rate was 22% but increased to 66% following CD45 depletion. We have established 11 NSCLC adenocarcinoma and 3 small-cell lung cancer (SCLC) PDX models from patient samples. The models established thus far range from erlotinib resistant EGFR mutant models with T790M mutation (n = 3), MET amplification (n = 1), SCLC transformation (n = 2) or an unknown mechanism (n = 1); to models including SCLC with an NRAS Q61K mutation (n = 1); EML4-ALK resistant to crizotinib and ceritinib (n = 1); KRAS G12C mutation (n = 1); NUT-mid line carcinoma with BRD4 rearrangement (n = 1); pan wild-type (n = 2) and a PIK3CA mutation (n = 1). We have used these models to study therapeutic interventions. Treatment of the NRAS Q61K mutant SCLC with trametinib resulted in complete tumor regression. Pharmacodynamic analyses revealed inhibition of pERK 1/2 and induction of apoptosis. Data will be presented with further characterization and platform development of the lung PDX models. Notably, >50% of the models do show pulmonary metastases from the subcutaneous implant site. Conclusion(s): PDXs can be established from lung cancer patients undergoing routine clinical biopsies. Establishment of models from pleural effusions is also feasible following CD45 depletion to prevent GVHD. These models will provide unique information on mechanisms of drug resistance and can be used to evaluate pre-clinical therapeutic strategies.

Goldberger, J. R. (2018). "2018 AFHVS presidential address." Agriculture and Human Values **35**(4): 899-904.

In this address I discuss agricultural plastic use and plastic pollution mitigation strategies. I focus on agricultural plastic mulches, which offer many benefits to farmers, such as weed control, better moisture retention, and increased yield. The removal and disposal of widely used

polyethylene (PE) plastic mulch, however, have detrimental environmental and health impacts. Are biodegradable plastic mulches a promising alternative? Biodegradable plastic mulches ideally offer the same benefits as PE plastic mulch, but biodegrade in soil or composting environments. I describe social science research findings from a large USDA-funded project focused on the performance and adoptability of biodegradable plastic mulches for U.S. specialty crop production. I also provide agrifood scholars with ideas for future research on plastics.

Goldraich, M. and J. Kost (1993). "Glucose-sensitive polymeric matrices for controlled drug delivery." Clinical Materials **13**(1-4): 135-142.

Hydrogel matrices were prepared by chemical polymerization of solutions containing 2-hydroxyethyl methacrylate, N,N-dimethyl-aminoethyl methacrylate, tetraethylene glycol dimethacrylate, ethylene glycol and water solutions containing glucose oxidase, bacitracin or insulin. The hydrogels displayed faster and higher swelling and release rates at lower pH or at higher glucose concentrations. Swelling and release kinetics were also responsive to step changes in glucose concentration in the physiological range. The kinetics of the soluble and immobilized enzyme followed Michaelis Menten's kinetics. In the soluble state the enzyme was more active than the immobilized one due to mass transfer limitations, which may be overcome by preparation of microbead configuration.

Goldstein, M. C. (2012). Abundance and ecological implications of microplastic debris in the North Pacific Subtropical Gyre.

Plastic pollution in the North Pacific Subtropical Gyre (NPSG), dubbed the "Great Pacific Garbage Patch," has been the subject of substantial public concern. However, there is relatively limited scientific understanding of how microplastic affects pelagic ecosystems. The motivation for this dissertation is to provide scientific information on the extent and impact of microplastic in the NPSG. The dissertation is organized around two central questions: 1) What are the abundance, distribution, and characteristics of plastic microdebris in the NPSG? 2) What is the impact of this microplastic on the neustonic zooplankton and plastic-associated rafting communities? I documented widespread, though spatially and temporally variable, plastic pollution in the NPSG and adjacent water masses. The numerical majority of objects are small particles, but the majority of debris surface area is found in large objects. While plastic was highly variable on the submesoscale, an analysis of all available data showed that overall NPSG microplastic concentrations increased by two orders of magnitude between 1972-1988 and 1999-2010. I performed a laboratory weathering experiment on plastic pre-production pellets that suggested that changes in microplastic composition over the eastern North Pacific may be explained by differential rates of weathering between plastic types, and that carbonyl formation may be a proxy for the length of time a plastic object has weathered in the ocean. Microplastic interacted with marine life through its direct ingestion and by providing a hard substrate for oviposition and settlement. Thirty-three percent of lepadid barnacles collected in 2009 contained microplastic in their gastrointestinal tract. In contrast, neustonic zooplankton did not show significant ingestion of plastic microspheres during a series of at-sea incubation experiments. Oviposition in the oceanic insect Halobates sericeus was positively correlated with microplastic abundance. Most plastic-associated macroinvertebrates were known members of the rafting assemblage, but several potentially invasive taxa were also associated with debris. The diversity of taxa in the rafting assemblage increased with debris surface area, as predicted by the concept of island biogeography. This dissertation demonstrated that microplastic pollution is pervasive at the surface of the NPSG, and that ecological impacts include direct ingestion, release from substrate limitation, and enhanced dispersal. The introduction of microplastic to the NPSG may therefore represent a widespread alteration of the pelagic ecosystem.

Goldstein, M. C. and D. S. Goodwin (2013). "Gooseneck barnacles (Lepas spp.) ingest microplastic debris in the North Pacific Subtropical Gyre." PeerJ **1**: e184.

Substantial quantities of small plastic particles, termed "microplastic," have been found in many areas of the world ocean, and have accumulated in particularly high densities on the surface of the subtropical gyres. While plastic debris has been documented on the surface of the North Pacific Subtropical Gyre (NPSG) since the early 1970s, the ecological implications remain poorly understood. Organisms associated with floating objects, termed the "rafting assemblage," are an important component of the NPSG ecosystem. These objects are often dominated by abundant and fast-growing gooseneck barnacles (Lepas spp.), which predate on plankton and larval fishes at the sea surface. To assess the potential effects of microplastic on the rafting community, we examined the gastrointestinal tracts of 385 barnacles collected from the NPSG for evidence of plastic ingestion. We found that 33.5% of the barnacles had plastic particles present in their gastrointestinal tract, ranging from one plastic particle to a maximum of 30 particles. Particle ingestion was positively correlated to capitulum length, and no blockage of the stomach or intestines was observed. The majority of ingested plastic was polyethylene, with polypropylene and polystyrene also present. Our results suggest that barnacle ingestion of microplastic is relatively common, with unknown trophic impacts on the rafting community and the NPSG ecosystem.

Goldstein, M. C., et al. (2012). "Increased oceanic microplastic debris enhances oviposition in an endemic pelagic insect." Biology Letters **8**(5): 817-820.

Plastic pollution in the form of small particles (diameter less than 5 mm)-termed 'microplastic'-has been observed in many parts of the world ocean. They are known to interact with biota on the individual level, e.g. through ingestion, but their population-level impacts are largely unknown. One potential mechanism for microplastic-induced alteration of pelagic ecosystems is through the introduction of hard-substrate habitat to ecosystems where it is naturally rare. Here, we show that microplastic concentrations in the North Pacific Subtropical Gyre (NPSG) have increased by two orders of magnitude in the past four decades, and that this increase has released the pelagic insect Halobates sericeus from substrate limitation for oviposition. High concentrations of microplastic in the NPSG resulted in a positive correlation between H. sericeus and microplastic, and an overall increase in H. sericeus egg densities. Predation on H. sericeus eggs and recent hatchlings may facilitate the transfer of energy between pelagic- and substrate-associated assemblages. The dynamics of hard-substrate-associated organisms may be important to understanding the ecological impacts of oceanic microplastic pollution.

Goldstein, M. C., et al. (2013). "Scales of spatial heterogeneity of plastic marine debris in the northeast pacific ocean." PLoS ONE [Electronic Resource] **8**(11): e80020.

Plastic debris has been documented in many marine ecosystems, including remote coastlines, the water column, the deep sea, and subtropical gyres. The North Pacific Subtropical Gyre (NPSG), colloquially called the "Great Pacific Garbage Patch," has been an area of particular scientific and public concern. However, quantitative assessments of the extent and variability of plastic in the NPSG have been limited. Here, we quantify the distribution, abundance, and size of plastic in a subset of the eastern Pacific (approximately 20-40degreeN, 120-155degreeW) over multiple spatial scales. Samples were collected in Summer 2009 using surface and subsurface plankton net tows and quantitative visual observations, and Fall 2010 using surface net tows only. We documented widespread, though spatially variable, plastic pollution in this portion of the NPSG and adjacent waters. The overall median microplastic numerical concentration in Summer 2009 was 0.448 particles m(-2) and in Fall 2010 was 0.021 particles m(-2), but plastic concentrations were highly variable over the submesoscale (10 s of km). Size-frequency spectra were skewed towards small particles, with the most abundant particles having a cross-sectional area of approximately 0.01 cm(2). Most microplastic was found on the sea surface, with the highest densities detected in low-wind conditions. The numerical majority of objects were small particles collected with nets, but the majority of debris surface area was found in large objects assessed visually. Our ability to detect high-plastic areas varied with methodology, as stations with substantial microplastic did not necessarily also contain large visually observable objects. A power analysis of our data suggests that high variability of surface microplastic will make future changes in abundance difficult to detect without substantial sampling effort. Our findings suggest that assessment and monitoring of oceanic plastic debris must account for high spatial variability, particularly in regards to the evaluation of initiatives designed to reduce marine debris.

Golumbeanu, M., et al. (2017). "Marine litter watch app as a tool for ecological education and awareness raising along the Romanian Black Sea coast." Journal of Environmental Protection and Ecology **18**(1): 348-362.

Apart from their severe impact on the environment, marine and beach litter are causing problems to human activities that use and depend on the sea, while also raising human health concerns. European Member States are developing measures to tackle marine litter with the Marine Strategy Framework Directive (MSFD), but the database is still insufficient. The National Institute for Marine Research and Development 'Grigore Antipa' Constanta (NIMRD) has been actively involved in marine litter related activities, such as the participation in the CLEANSEA and MARLISCO projects, sea surveys for seabed marine litter monitoring, terrestrial surveys along Romanian Black Sea coast sectors for beach marine litter monitoring, laboratory analyses for macro- and micro-plastics, participation in actions to identify the main polluters, developing proposals for measures to reduce litter pollution of the marine environment (MSFD), beach cleaning activities, education and awareness raising campaigns, and introducing the Marine Litter Watch Mobile Application. Marine Litter Watch App was developed by the European Environment Agency and combines citizen engagement and modern technology to help tackle marine litter. Marine Litter Watch offers tools to collect and share comparable data on marine litter on beaches. It also provides a platform for marine litter communities to come together, share their knowledge and co-create approaches to monitoring marine litter. NIMRD is part of the Perseus and School Community and three Romanian beaches were included in the programme: 2 sandy beaches (Ammos - 417 m - and Flora - 181 m, in the Mamaia resort - urban) and 1 mixed beach (Vame Veche - 2 Mai - 2,323 m - rural). Surveys have been implemented both off-season (January, April 2015), as well as during the high tourist season (summer 2015), and the main wastes identified were cigarette butts and plastic containers.

Gomathi, N. and P. L. Rupesh (2016). "Study on the performance of plastic waste oil in CI engines: A review." Research Journal of Pharmaceutical, Biological and Chemical Sciences **7**(6): 1689-1696.

A sustainable energy and environment needed to be created by using alternate energy \instead of fossil fuels, creating a sustainable energy and environment. The consumption and production of plastic has been rising very rapidly due to its strength, durability, lighter weight and flexibility. The disposal of plastic has become a major problem due to its non-biodegradable nature. Pyrolysis is one of the common processes used to treat plastic waste. This paper deals with the study of pyrolysis process to convert plastic waste into crude oil. Comparison of various catalysts used for the pyrolysis process was also studied. The effects of the Plastic waste oil on the performance of diesel engines were also discussed in this study. It was observed that the pyrolysis process is the effective method to treat plastic waste and the obtained oil can be used as alternate fuel for CI engine.

Gómez-Sanabria, A., et al. (2018). "Carbon in global waste and wastewater flows – its potential as energy source under alternative future waste management regimes." Advances in Geosciences **45**: 105-113.

This study provides a quantification of the maximum energy that can be generated from global waste and wastewater sectors in the timeframe to 2050, as well as of the potential limitations introduced by different future waste and wastewater management regimes. Results show that considerable amounts of carbon are currently stored in waste materials without being recovered for recycling or made available for energy generation. Future levels of energy recovery when maintaining current states of waste and wastewater management systems are contrasted with those that can be attained under a circular system identified here as a system with successful implementation of food and plastic waste reduction policies, maximum recycling rates of all different types of waste streams, and once the recycling capacity is exhausted, incineration of remaining materials to produce energy. Moreover, biogas is assumed to be produced from anaerobic co-digestion of food and garden wastes, animal manure, and anaerobically treated wastewater. Finally, we explore the limits for energy generation from waste and wastewater sources should the efficiency of energy recovery be pushed further through development of existing technology. We find that global implementation of such an ideal system could increase the relative contribution of waste and wastewater sources to global energy demand from 2 % to 9 % by 2040, corresponding to a maximum energy potential of 64 EJ per year. This would however require widespread adoption of policies and infrastructure that stimulate and allow for large-scale waste prevention and separation, as well as highly advanced treatment processes. Giving priority to such efforts would enable circularity of the waste-energy system.

Gomgnimbou, M. K., et al. (2013). "Tuberculosis-spoligo-rifampin-isoniazid typing: an all-in-one assay technique for surveillance and control of multidrug-resistant tuberculosis on Luminex devices." Journal of Clinical Microbiology **51**(11): 3527-3534.

As a follow-up of the "spoligoriftyping" development, we present here an extension of this technique which includes the detection of isoniazid resistance-associated mutations in a new 59-plex assay, i.e., tuberculosis-spoligo-rifampin-isoniazid typing (TB-SPRINT), running on microbead-based multiplexed systems. This assay improves the synergy between clinical microbiology and epidemiology by providing (i) mutation-based prediction of drug resistance profiles for patient treatment and (ii) genotyping data for tuberculosis (TB) surveillance. This third-generation microbead-based high-throughput assay for TB runs on the Luminex 200 system and on the recently launched MagPix system (Luminex, Austin, TX). Spoligotyping patterns obtained by the TB-SPRINT method were 100% (n = 85 isolates; 3,655/3,655 spoligotype data points) concordant with those obtained by microbead-based and membrane-based spoligotyping. Genetic drug susceptibility typing provided by the TB-SPRINT method was 100% concordant with resistance locus sequencing (n = 162 for rpoB gene sequencing and n = 76 for katG and inhA sequencing). Considering phenotypic drug susceptibility testing (DST) as the reference method, the sensitivity and specificity of TB-SPRINT regarding Mycobacterium tuberculosis complex (n = 162 isolates) rifampin resistance were both

100%, and those for isoniazid resistance were 90.4% (95% confidence interval, 85 to 95%) and 100%, respectively. Used routinely in national TB reference and specialized laboratories, the TB-SPRINT assay should simultaneously improve personalized medicine and epidemiological surveillance of multidrug-resistant (MDR) TB. This assay is expected to play an emerging role in public health in countries with heavy burdens of MDR TB and/or HIV/TB coinfection. Application of this assay directly to biological samples, as well as development for extensively drug-resistant (XDR) TB detection by inclusion of second-line antituberculosis drug-associated mutations, is under development. With bioinformatical methods and data mining to reduce the number of targets to the most informative ones, locally adapted formats of this technique can easily be developed everywhere.

Gomiero, A. (2014). "The Contribution of OMICS Publishing Group to the Topic of Marine Litter and Micro Plastic Studies." Journal of Marine Science. Research & Development **4**(2): 1.

The environmental problem of marine litter is gaining even more scientific attention as more data are becoming available on its occurrence, abundance and geographical distribution. Due to its versatile chemical structure, plastic is extensively exploited in several industrial, commercial and medical applications. Approximately 50 percent of total production is made up of goods disposed of within one year of purchase and breaking down in the environment at an uncontrollable rate. Macroplastic litter often undergoes to mechanical, chemical and photo-degradation reaching microscopic size and thus harming marine organisms as it can be easily ingested or filter-fed. Given the continual fragmentation of plastic items, particle concentrations are likely to increase with decreasing size. This poses the attention on the emerging toxicological implications of even higher environmental concentrations of even smaller "microplastic" compounds.

Gomiero, A., et al. (2019). "First record of characterization, concentration and distribution of microplastics in coastal sediments of an urban fjord in south west Norway using a thermal degradation method." Chemosphere **227**: 705-714.

Plastic waste is of increasing concern in the aquatic environment. A large proportion of plastic waste is generated onshore from where it eventually reaches the marine environment, which is considered the main sink of plastic debris To date there is a substantial lack of knowledge on the composition of these accumulated polymers, their environmental levels and distribution in marine and coastal areas. Current efforts are underway to develop standardized methods to characterize and quantify the occurrence of microplastic in different environmental matrices using microscopy-oriented methods using Fourier Transformed Infra-Red (FTIR) or Raman techniques. However, time-consuming sample preparation, processing and interpretation of complex data limits their use within monitoring programs. As an alternative, a thermal degradation method based on a gas chromatographic mass spectrometer coupled with pyrolysis represents a validated method for qualitative and quantitative polymer analyses. A technique has been developed that combines sample preparation and thermo-analysis for identifying microplastics in samples of marine sediment. Quantification and polymeric composition of plastic particles found in sediment samples taken from ten sites located in Boknafjorden subjected to diverse sources of pollution and anthropogenic pressure were investigated. Plastic microparticles were extracted from 8kg of wet sediments per site, purified, size-fractionated thorough a set of stainless-steel certified sieves covering the range of 10-250 mum mesh size, pre-concentrated on fiberglass filters and whole filters analyzed by thermal desorption pyrolysis gas chromatography/mass spectrometry. Most of the detected polymers were identified as polypropylene, polyethylene, polyethylene terephthalate, polyvinylchloride, polystyrene or

polyamide. In most of the sites, the largest fraction of the extracted micro debris fell in the size range 10-40mum. Some shifts in size distribution were also observed in some sites and were likely related to the marine sea bottom currents and the influence of specific anthropogenic activities. The adopted thermal degradation method showed good sensitivity, reliability and rapidity and therefore represents a promising technique for microplastic analysis within monitoring activities.

Gomiero, A., et al. (2019). "First occurrence and composition assessment of microplastics in native mussels collected from coastal and offshore areas of the northern and central Adriatic Sea." Environmental Science & Pollution Research **26**(24): 24407-24416.

In recent years, the occurrence of microplastics in the aquatic environment has gathered increasing scientific interest. Several studies have shown that the ingestion of microplastics may negatively influence the physiology of marine organisms having different feeding strategies, particularly in those species which cannot discriminate between food sources. Recent studies highlighted the potential for such particles to accumulate in the food web, posing risks to human health via the consumption of seafood. Furthermore, early findings also indicated the role of microplastics as vectors of chemical pollutants either used as additives during synthesis of the plastics or adsorbed directly from seawater, i.e., PAHs, PCB, and surfactants. Despite the importance of microplastics in adsorption and transport of hydrophobic pollutants, little is known about their distribution and accumulation in marine food webs, or their direct and indirect harmful effects. The Adriatic Sea represents a semi-enclosed basin with a low water recirculation rate and high anthropogenic pressures associated with unsustainable fishing and inputs of contaminants. The body burden, accumulation rates, polymer composition, and recurring morphotypes of microplastics in native blue mussels (M. galloprovincialis) were examined. Organisms collected offshore were compared to those collected in coastal areas. Microplastics were recovered from the soft tissues of all analyzed mussels. Coastal organisms showed a load of 1.06-1.33 fragments g⁻¹ (wet weight) and 0.62-0.63 fibers g⁻¹ (wet weight) while offshore organisms showed an accumulation of 0.65-0.66 fragments g⁻¹ (wet weight) and 0.24-0.35 fibers g⁻¹ (wet weight). The size class distribution revealed a marked prevalence of smaller particles (20 mum to 40 mum range) and the most recurring polymer type in analyzed organisms was PE followed by PP, PET, and equal amounts of PS, PLY, and PVC. A significant site-, time-, and oceanographic-related distribution trend was observed. Based on the findings presented here, there is a clear need to implement a seafood safety monitoring program to better understand actual human health-related risks.

Gonçalves, C., et al. (2018). "Development of a method for the detection of polystyrene microplastics in paraffin-embedded histological sections." Histochemistry & Cell Biology **149**(2): 187-191.

The concerns about the presence of microplastics (MPs) in marine ecosystems have widely increased in the past years. This is reflected in a growing number of studies addressing the effects of exposure to these materials in indigenous, farmed and even laboratory marine animals subjected to toxicity-oriented bioassays. There have been, however, many constraints in the detection of MPs in biological tissues, as routine histological techniques tend to degrade these materials, which are especially sensitive to organic solvents. This issue hinders the application of standard histopathological procedures based on convenient paraffin wax-embedding protocols, with consequences for biomonitoring and bioassay procedures. The method described here was developed and validated for the detection of polystyrene microplastics in biological tissue processed for paraffin-based histology. The strategy was developed and tested from whole-soft body sections of marine mussels that internalised the MPs following dedicated bioassays. The protocol is based on the replacement of xylenes with isopropanol for the purpose of intermediate infiltration and deparaffinization. Special modifications for staining, mounting and archiving are needed and are detailed as well. The protocol is shown to be a highly cost- and time-effective procedure compatible with formalin-based fixatives plus standard sectioning and staining, yielding complete preservation of MPs and optimal tissue conditioning. The method also produced excellent results with pre-stained MPs, with fluorochromes included, altogether providing excellent localisation of polystyrene MPs in paraffin-processed biological tissue.

Goncalves, C., et al. (2019). "An assessment of the ability to ingest and excrete microplastics by filter-feeders: a case study with the Mediterranean mussel." Environmental Pollution **245**: 600-606.

Plastic debris has been recognized as a growing threat to marine biota due to its widespread distribution and possible interactions with marine species. Concerns over the effects of plastic polymers in marine ecosystems is reflected in the high number of toxicological studies, regarding microplastics (<5 mm) and marine fauna. Although several studies reported that organisms ingest and subsequently eliminate microplastics (MP), the potential effects at organ and tissue level remain unclear, especially considering exposure to different microplastic sizes and concentrations. The present study aimed at investigating potential pathophysiological effects of the ingestion of MP by marine filter-feeders. For the purpose, Mediterranean mussel (Mytilus galloprovincialis) was exposed to spherical polystyrene MP (2 and 10 micro m O) over short- and medium-term exposure periods, under single and combined concentrations that represent high, yet realistic doses (10 and 1000 MP mL⁻¹). Overall, results suggest rapid MP' clearance from water column by filtering, regardless of MP size. Ingestion occurred, identified by MP in the lumen of the gut (mostly in midgut region), followed by excretion through faeces. However, no MP were found in gills or digestive gland diverticula. Biochemical indicators for oxidative stress were generally irresponsive regardless of organ and time of exposure. Small foci of haemocytic infiltration in gastric epithelia were found, albeit not clearly related to MP ingestion. Globally, no evident histopathological damage was recorded in whole-body sections of exposed animals. The present findings highlight the adaptative ability of filter-feeding bivalves to cope with filtration of suspended MP, resulting in rapid elimination and reduced internal damage following ingestion of spherical MP. Nevertheless, the fact that the animals are able to translocate MP to the gut reveals that filter feeding organisms may indeed became a target of concern for fragmented materials with smaller, mixed sizes and sharper edges.

Gondal, M. A. and M. N. Siddiqui (2007). "Identification of different kinds of plastics using laser-induced breakdown spectroscopy for waste management." Journal of Environmental Science & Health Part A-Toxic/Hazardous Substances & Environmental Engineering **42**(13): 1989-1997.

Laser-Induced Breakdown Spectroscopy (LIBS) was applied for the identification of various kinds of plastics for management and recycling of plastic waste. In order to fingerprint these plastics, a laser-produced plasma emission was recorded for spectral analysis of various kinds of plastics. The plasma was generated by focusing a Nd:YAG laser radiation at wavelength = 1064 nm having laser energy = 40 mJ. The 6 main family of plastics tested are: Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE), Polypropylenes (PP), Polystyrene (PS), Polyethylene Terephthalate (PET) and Polyvinyl chloride (PVC). The capability of this technique is demonstrated by the analysis of the major constituents carbon and hydrogen present in polymer matrices. The LIBS signal intensity measured for carbon and hydrogen was detrimental

for the fingerprinting of various kinds of plastics. The C/H line intensity ratio was 1.68, 1.51, 1.42, 1.16, 1.01 and 0.91 for HDPE, LDPE, PS, PP, PET and PVC respectively. The detection limits of carbon and hydrogen were found to be approximately 6 micro g/g by applying 20 laser shots. The unique features of LIBS are: it is a simple, rapid, remote, real-time analysis without sampling requirements. The study demonstrated that LIBS could be applied as a best tool for sorting out different kinds plastics on a fast scale for waste management. The health hazards of different kinds of plastics are also described.

Gong, J., et al. (2018). "Biodegradation of Microplastic Derived from Poly(ethylene terephthalate) with Bacterial Whole-Cell Biocatalysts." Polymers **10**(12): 30.

At present, the pollution of microplastic directly threatens ecology, food safety and even human health. Polyethylene terephthalate (PET) is one of the most common of microplastics. In this study, the micro-size PET particles were employed as analog of microplastic. The engineered strain, which can growth with PET as sole carbon source, was used as biocatalyst for biodegradation of PET particles. A combinatorial processing based on whole-cell biocatalysts was constructed for biodegradation of PET. Compared with enzymes, the products can be used by strain growth and do not accumulated in culture solution. Thus, feedback inhibition of products can be avoided. When PET was treated with the alkaline strain under high pH conditions, the product concentration was higher and the size of PET particles decreased dramatically than that of the biocatalyst under neutral conditions. This shows that the method of combined processing of alkali and organisms is more efficient for biodegradation of PET. The novel approach of combinatorial processing of PET based on whole-cell biocatalysis provides an attractive avenue for the biodegradation of micplastics.

Gong, M., et al. (2009). "Centrifugal sedimentation for selectively packing channels with silica microbeads in three-dimensional micro/nanofluidic devices." Analytical Chemistry **81**(5): 2022-2026.

Incorporation of nanofluidic elements into microfluidic channels is one approach for adding filtration and partition functionality to planar microfluidic devices, as well as providing enhanced biomolecular separations. Here we introduce a strategy to pack microfluidic channels with silica nanoparticles and microbeads, thereby indirectly producing functional nanostructures; the method allows selected channels to be packed, here demonstrated so that a separation channel is packed while keeping an injection channel unpacked. A nanocapillary array membrane is integrated between two patterned microfluidic channels that cross each other in vertically separated layers. The membrane serves both as a frit for bead packing and as a fluid communication conduit between microfluidic channels. Centrifugal force-assisted sedimentation is then used to selectively pack the microfluidic channels using an aqueous silica bead suspension loaded into the appropriate inlet reservoirs. This packing approach may be used to simultaneously pack multiple channels with silica microbeads having different sizes and surface properties. The chip design and packing method introduced here are suitable for packing silica particles in sizes ranging from nanometers to micrometers and allow rapid (approximately 10 min) packing with high quality. The liquid/analyte transport characteristics of these packed micro/nanofluidic devices have potential utility in a wide range of applications, including electroosmotic pumping, liquid chromatographic separations, and electrochromatography.

Gong, M., et al. (2019). "Microbial biofilm formation and community structure on low-density polyethylene microparticles in lake water microcosms." Environmental Pollution **252**(Pt A): 94-102.

The occurrence of microplastics (MPs) in the environment has been gaining widespread attention globally. MP-colonizing microorganisms are important links for MPs contamination in

various ecosystems, but have not been well understood. To partially address this issue, the present study investigated biofilm formation by microorganisms originating from lake water on low-density polyethylene (LDPE) MPs using a cultivation approach and the surface-related effects on the MP-associated microbial communities using 16S rRNA high-throughput sequencing. With the addition of nonionic surfactants and UV-irradiation pretreatment that changed the surface properties of LDPE MPs, more microorganisms were colonized on LDPE surface. Microbial community analysis indicated that LDPE MPs were primarily colonized by the phyla Proteobacteria, Bacteroidetes and Firmicutes, and the surface roughness and hydrophobicity of MP were important factors shaping the LDPE MP-associated microbial community structure. Half of the top 20 most abundant genera colonizing on LDPE were found to be potential pathogens, e.g., plant pathogens Agrobacterium, nosocomial pathogens Chryseobacterium and fish pathogens Flavobacterium. This study demonstrated rapid bacterial colonization of LDPE MPs in lake water microcosms, the role of MPs as transfer vectors for harmful microorganisms in lake water, and provided a first glimpse into the effect of surface properties on LDPE MP-associated biofilm communities.

Gong, W., et al. (2019). "Comparative analysis on the sorption kinetics and isotherms of fipronil on nondegradable and biodegradable microplastics." Environmental Pollution **254**(Pt A): 112927.

Biodegradable plastics have been introduced and widely used as a promising alternative to traditional nondegradable plastics. However, the differences in sorption behavior of pesticides on nondegradable and biodegradable microplastics has been insufficiently studied. Here, four types of nondegradable [polyethylene (PE), polystyrene (PS), polyvinyl chloride (PVC), polypropylene (PP)] and two types of biodegradable [polylactic acid (PLA), polybutylene succinate (PBS)] microplastics were selected to investigate the sorption mechanism of fipronil based on their sorption kinetics and isotherms. The results indicated that the sorption rates of PLA and PBS were much higher than those of PE, PP, PVC and PS and that the sorption capacities of fipronil on microplastics followed the order of PBS>PLA>PP>PE>PS>PVC. The sorption kinetics followed a pseudo-second-order kinetics model (R²=0.953-0.998) for all tested microplastics. External mass transport and intraparticle diffusion were the main rate controlling steps of the sorption of fipronil on microplastics. Furthermore, isotherm results indicated that a Langmuir model provided the best fit for fipronil sorption on PE, PS, PVC and PP (R²=0.997-0.999), while a Freundlich model was the most appropriate model for PLA and PBS (R²=0.998-0.999). The presence of surface O-containing functional groups and the spatial arrangement of rubbery domains are likely to affect the sorption process. The results from this work suggest that microplastics, especially biodegradable ones, may play an important role in the fate and transport of pesticides, and their effects on soil organisms (e.g., earthworms) require further investigation.

Gong, X., et al. (2016). "High-performance fluorescence-encoded magnetic microbeads as microfluidic protein chip supports for AFP detection." Analytica Chimica Acta **939**: 84-92.

Fluorescence-encoded magnetic microbeads (FEMMs), with the fluorescence encoding ability of quantum dots (QDs) and magnetic enrichment and separation functions of Fe3O4 nanoparticles, have been widely used for multiple biomolecular detection as microfluidic protein chip supports. However, the preparation of FEMMs with long-term fluorescent encoding and immunodetection stability is still a challenge. In this work, we designed a novel high-temperature chemical swelling strategy. The QDs and Fe3O4 nanoparticles were effectively packaged into microbeads via the thermal motion of the polymer chains and the hydrophobic interaction between the nanoparticles and microbeads. The FEMMs obtained a highly uniform fluorescent property and long-term encoding and immunodetection stability and could be quickly magnetically separated and enriched. Then, the QD-encoded magnetic microbeads were applied to alpha fetoprotein (AFP) detection via sandwich immunoreaction. The properties of the encoded microspheres were characterized using a self-designed detecting apparatus, and the target molecular concentration in the sample was also quantified. The results suggested that the high-performance FEMMs have great potential in the field of biomolecular detection.

Gonzalez, C. T., et al. (2015). "Comparison of two methods for anti-platelet antibody detection: Flow cytometry and luminex." Tissue Antigens **85 (5)**: 368-369.

Platelet antibodies are the cause of several disease conditions as idiopathic thrombocytopenic purpura, neonatal alloimmune thrombocytopenia or multiplatelet transfusion refractoriness. Flow cytometry has been considered the most reliable method for detection of platelet reactive antibodies, displacing previous solid phase methods. Recently a new method based on LuminexO technology has been developed. Microbeads are coated with platelet antigens, allowing a highly sensitive detection of platelet antibodies. The aim of this study was to compare both methods for screening of platelet antibodies. A total of 19 sera were received for platelet antibodies detection during 1-year and tested in parallel by flow cytometry and by LuminexO method (PAK LxTM, Immucor). Flow cytometry method was performed according to the protocol described by Kiefel (2001), the relative fluorescence intensity was expressed as a mean channel number (MCN) and a MCN greater than 25% was considered positive. PAK LxTM Luminex method was performed according to the manufacturer's specifications. Results were concordant in all sera tested. Both methods identified the same six positive sera of nineteen received. PAK LxTM method also allowed the identification of platelet antigens recognized by antibodies (HPA) or HLA-I antigen. PAK LxTM can be a highly sensitive and specific method for detection of platelet antibodies in several auto/allo-immune conditions compared to flow cytometry. The major advantages of PAK LxTM method over flow cytometry are: 1) identification of platelet antigens recognized by antibodies (including HLA-I antigen); and 2) patients' platelets are not needed for detection of antibodies, which is important in cases of severe thrombocytopenia.

Gonzalez, E. J., et al. (2018). "Dry micro-polymeric inoculant of Azospirillum brasilense is useful for producing mesquite transplants for reforestation of degraded arid zones." Applied Soil Ecology **129**: 84-93.

Massive clear-cutting of wild stands of mesquite trees in the Mexican part of the Sonoran Desert result from high demand for this wood by the charcoal industry. Consequently, there is a need to develop techniques for reforestation of this tree in the desert and maintain its natural diversity at the same time. An outdoor nursery procedure to produce mesquite transplants from diversely originated seeds for reforestation of arid zones was developed. This procedure involved: (1) inoculation of the seedlings in the nursery with the plant growth-promoting bacteria (PGPB) Azospirillum brasilense immobilized in dry microbeads of alginate, and (2) developing a reliable way to monitor plant development and aerial volume in the nursery for the entire growth period of seven months before transplantation. Dry microbeads containing the PGPB and maintained at room temperature were tested for survival of bacteria for up to seven months. These dry microbeads maintained sufficient population levels of A. brasilense to inoculate the plant for the entire period. Inoculation with the PGPB enhanced all growth parameters of the plants, including biomass, aerial volume, root system, and chlorophyll pigments, but not the auxiliary photosynthetic pigments. The PGPB was specifically identified colonizing the roots of the transplants by fluorescent in situ hybridization for the entire growth period. Measuring a few simple parameters allowed development of a workable model for plant growth. This model was confirmed by data obtained from sacrificed plants whose parameters were measured directly. This study shows that outdoor nursery cultivation of inoculated mesquite transplants is feasible.

Gonzalez Siso, M. I., et al. (1997). "Enzyme encapsulation on chitosan microbeads." Process Biochemistry **32**(3): 211-216.

alpha -Amylase and invertase were immobilized on chitosan microbeads (typical size 2.5-4 micro m), and the influence of 2 variables (crosslinking and protein concentration) on the activity shown by the immobilized enzymes was studied by means of full factorial experimental designs. Microencapsulation on chitosan beads has shown to be an effective immobilization method for both enzymes. The immobilization yield (activity of immobilized enzyme per unit activity of free enzyme) was 0.4% for alpha -amylase and 11% for invertase; a value of 10.7% was previously found for lactase. The difference in behaviour is explained in terms of substrate MW: it is probable that disaccharide molecules (sucrose or lactose) are small enough to enter the microbeads, whereas starch molecules are too large.

Gonzalez-Fernandez, C., et al. (2018). "Cellular responses of Pacific oyster (Crassostrea gigas) gametes exposed in vitro to polystyrene nanoparticles." Chemosphere **208**: 764-772.

While the detection and quantification of nano-sized plastic in the environment remains a challenge, the growing number of polymer applications mean that we can expect an increase in the release of nanoplastics into the environment by indirect outputs. Today, very little is known about the impact of nano-sized plastics on marine organisms. Thus, the objective of this study was to investigate the toxicity of polystyrene nanoplastics (NPs) on oyster (Crassostrea gigas) gametes. Spermatozoa and oocytes were exposed to four NPs concentrations ranging from 0.1 to 100 mg L⁻¹ for 1, 3 and 5 h. NPs coated with carboxylic (PS-COOH) and amine groups (PS-NH₂) were used to determine how surface properties influence the effects of nanoplastics. Results demonstrated the adhesion of NPs to oyster spermatozoa and oocytes as suggested by the increase of relative cell size and complexity measured by flow-cytometry and confirmed by microscopy observations. A significant increase of ROS production was observed in sperm cells upon exposure to 100 mg L⁻¹ PS-COOH, but was not observed with PS-NH₂, suggesting a differential effect according to the NP-associated functional group. Altogether, these results demonstrate that the effects of NPs occur rapidly, are complex and are possibly associated with the cellular eco-corona, which could modify NPs behaviour and toxicity.

Gonzalez-Fernandez, C., et al. (2019). "Do transparent exopolymeric particles (TEP) affect the toxicity of nanoplastics on Chaetoceros neogracile?" Environmental Pollution **250**: 873-882.

The potential presence of nanoplastics (NP) in aquatic environments represents a growing concern regarding their possible effects on aquatic organisms. The objective of this study was to assess the impact of polystyrene (PS) amino-modified particles (50nmPSNH₂) on the cellular and metabolic responses of the diatom Chaetoceros neogracile cultures at two essential phases of the growth cycle, i.e. exponential (division) and stationary (storage) phases. Both cultures were exposed for 4 days to low (0.05mugmL⁻¹) and high (5mugmL⁻¹) concentrations of PS-NH_{2.} Exposure to NP impaired more drastically the major cellular and physiological parameters during exponential phase than during the stationary phase. Only an increase in ROS production was observed at both culture phases following NP exposures. In exponential phase cultures, large decreases in chlorophyll content,

esterase activity, cellular growth and photosynthetic efficiency were recorded upon NP exposure, which could have consequences on the diatoms life cycle and higher food-web levels. The observed differential responses to NP exposure according to culture phase could reflect i) the higher concentration of Transparent Exopolymer Particles (TEP) at stationary phase leading to NP aggregation and thus, probably minimizing NP effects, and/or ii) the fact that dividing cells during exponential phase may be intrinsically more sensitive to stress. This work evidenced the importance of algae physiological state for assessing the NP impacts with interactions between NP and TEP being one key factor affecting the fate of NP in algal media and their impact to algal' cells.

Gonzalez-Jauregui, M., et al. (2019). "Stomach flushing technique applied to quantify microplastics in Crocodilians." MethodsX **6**: 2677-2685.

The impact of microplastics on wildlife is a recent problem for which methods to evaluate exposure still need development. Being able to identify and quantify microplastics (particles < 5mm) in the gastric contents of live crocodiles allows us to evaluate exposure, at both individual and population level, and also its contribution as transporter of other contaminants. The method was validated to determine and quantify microplastics in crocodile stomach contents recovered during an experiment where a known amount of this contaminant was given to crocodiles via oral administration. Through stomach flushing we were able to recover more than 80 % of the total volume of microplastic administrated to each crocodile. In summary, the method used during the experiment consists of 1) immobilization of the crocodile; 2) extraction of microplastics from stomach contents obtained through stomach flushing; 3) separation, identification and quantification of recovered microplastic fragments using microscopy and FTIR. *Low cost method that uses a small number of materials, does not take long to produce results and can easily be performed in the field or the laboratory.*Effective in extracting stomach contents (95 %).*High (>80 %) and good (>60 %) recovery efficiencies within two and four days after ingestion of microplastics by crocodiles.

Gonzalez-Pujana, A., et al. (2018). "Alginate microcapsules for drug delivery." Springer Series in Biomaterials Science and Engineering **11**: 67-100.

Currently, conventional drug delivery systems do not provide adequate therapeutic profiles for the management of multiple diseases. In this regard, cell encapsulation technology emerges as a suitable alternative. Undoubtedly, one of the most employed biomaterials for this purpose is alginate, since it presents multiple advantages that favor the development of this technology. Importantly, the thorough study concerning the purification and modification of the polymer has led to biocompatible alginates, a vital advancement for the correct function of the system. Furthermore, the possibility to entrap different cell types together with the plausibility of engineering cells to produce disparate therapeutic biomolecules has given rise to numerous applications. That is the case of relevant and prevalent diseases nowadays such as diabetes, cancer, or neurological diseases. Intensive research in the field has resulted in promising preclinical studies in animal models that have instigated the conduction of several clinical trials. Nonetheless, addressing some current challenges regarding aspects such as biosafety or biofunctionalization seems to be a prerequisite before the clinical translation. Copyright © Springer Nature Singapore Pte Ltd. 2018.

Gonzalez-Soto, N., et al. (2019). "Impacts of dietary exposure to different sized polystyrene microplastics alone and with sorbed benzo[a]pyrene on biomarkers and whole organism responses in mussels Mytilus galloprovincialis." Science of the Total Environment **684**: 548-566.

Due to their hydrophobicity and relatively large surface area, microplastics (MPs) can act as carriers of hydrophobic pollutants in the ocean and may facilitate their transfer to organisms. This study examined effects of dietary exposure to polystyrene MPs of 0.5 and 4.5 micro m alone and with sorbed benzo[a]pyrene (BaP) on mussels Mytilus galloprovincialis in order to elucidate the effects of MP size and the presence of sorbed BaP on the organism. MPs were provided daily, mixed with algae, during 26 days at equivalent mass (0.058 mg/L), corresponding to 1000 particles/mL for 4.5 micro m MPs and to 7.44x10⁵ particles/mL for 0.5 micro m MPs. Effects were determined on early cellular biomarkers in hemocytes, structure and cell type composition of digestive tubules (DTs), histopathology and whole organism responses (condition index (CI), clearance rate (CR), food absorption efficiency (AE), respiration rate (RR) and scope for growth (SFG)). BaP concentrations in mussels increased with time, in particular when sorbed to smaller MPs. Large MPs were abundant in the lumen of stomach and DTs, but were also occasionally found within epithelial cells. Effects in all treatments increased with exposure time. MPs with sorbed BaP were more toxic than MPs alone according to hemocyte viability and catalase activity and to the quantitative structure of DT epithelium. Higher toxicity of small MPs compared to larger ones was recorded for DNA damage and cell composition of DTs. At tissue level a slight increase in prevalence of inflammatory responses occurred in all exposed groups. At whole organism level a compensatory effect was observed on absorption efficiency across MP treatments at day 26, resulting in increased SFG in mussels exposed to small MPs with sorbed BaP. This could be related to an increased energy need to deal with stress observed in biomarkers. Further work is required to understand the Trojan horse effect of a variety of plastic type, size, shape combinations together with a wide variety of pollutants.

Goodey, A., et al. (2001). "Development of multianalyte sensor arrays composed of chemically derivatized polymeric microspheres localized in micromachined cavities." Journal of the American Chemical Society **123**(11): 2559-2570.

The development of a chip-based sensor array composed of individually addressable polystyrene-poly(ethylene glycol) and agarose microspheres has been demonstrated. The microspheres are selectively arranged in micromachined cavities localized on silicon wafers. These cavities are created with an anisotropic etch and serve as miniaturized reaction vessels and analysis chambers. A single drop of fluid provides sufficient analysis media to complete approximately 100 assays in these microetch pits. The cavities possess pyramidal pit shapes with trans-wafer openings that allows for both fluid flow through the microreactors/analysis chambers and optical access to the chemically sensitive microspheres. Identification and quantitation of analytes occurs via colorimetric and fluorescence changes to receptor and indicator molecules that are covalently attached to termination sites on the polymeric microspheres. Spectral data are extracted from the array efficiently using a charge-coupled device allowing for the near-real-time digital analysis of complex fluids. The power and utility of this new microbead array detection methodology is demonstrated here for the analysis of complex fluids containing a variety of important classes of analytes including acids, bases, metal cations, metabolic cofactors, and antibody reagents.

Goosen, M. F. A., et al. (1997). "Electrostatic droplet generation for encapsulation ion of somatic tissue: Assessment of high-voltage power supply." Biotechnology Progress **13**(4): 497-502.

The production of alginate microbeads with and without somatic tissue was investigated using an electrostatic droplet generator with a custom-made fixed (5.7 kV) and variable (0-20 kV) high-voltage power supply. The effects of applied potential, needle size, and alginate concentration were assessed as well as the immobilization of carnation callus cells. The high-voltage output from the power supply depended on whether the low-voltage input was increasing or decreasing. This hysteresis effect may be due to the electrical properties of the oscillator in the high-voltage source. While a short electrode distance and a high needle gauge were important for producing small alginate bead diameters (e.g., 100 mu m), alginate concentration in the range 1-3% (w/v) was not a key factor. Somatic tissue encapsulated using 2% sodium alginate retained viability over a 2-month culture period.

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Gordon, J. N., et al. (2008). "Matrix metalloproteinase-3 production by gut IgG plasma cells in chronic inflammatory bowel disease." Inflammatory Bowel Diseases **14**(2): 195-203.

BACKGROUND: In both ulcerative colitis (UC) and Crohn's disease (CD) there is a marked increase in mucosal IgG plasma cells (PC), although their precise role is not well established. In this study we isolated gut PCs from patients with IBD and normal controls and analyzed cytokine production, matrix metalloproteinase (MMP)-3 and tissue inhibitor of metalloproteinase (TIMP)-1 production, and PC longevity ex vivo.

METHODS: Lamina propria mononuclear cells (LPMCs) were isolated from patients with CD (n = 19), UC (n = 27), and normal controls (n = 42). PCs were further selected by immunomagnetic isolation using CD138 microbeads. Cytokine, MMP-3, and TIMP-1 expression was investigated by Taqman polymerase chain reaction (PCR), enzyme-linked immunosorbent assay (ELISA), Western blotting, and confocal microscopy. PC lifespan in vitro was studied by ELISpot analysis.

RESULTS: PCs from both controls and IBD patients contained high levels of transcripts for TGFbeta, whereas they did not contain significant transcripts for IL-4, IL-5, IL-10, IFNgamma, TNF, or IL-12p40. PCs from patients with CD and UC expressed significantly higher levels of MMP-3 protein and transcripts than controls ($P < 0.0001$). The vast majority of MMP-3-expressing PCs were IgG+ve. In culture, IgA PCs from both IBD patients and controls persisted for only a few days, but IgG PCs from IBD patients persisted for at least 3 weeks.

CONCLUSIONS: We have demonstrated that IgG PCs from patients with IBD express large amounts of MMP-3 and that they appear to be long-lived. These results identify a new pathway by which IgG PCs may damage the gut.

Gore, P. M., et al. (2017). "Keratin-Nylon 6 engineered microbeads for adsorption of Th (IV) ions from liquid effluents." Journal of Environmental Chemical Engineering **5**(6): 5655-5667.

The applicability of novel porous microbeads (average diameter of about 2.0 mm) of alpha -keratin engineered with Nylon 6, have been investigated for the adsorption of radioactive and non-biodegradable Th (IV) ions from the effluents. Thorium ion uptake on the intrinsically compatible adsorbent system was investigated using experimental analysis and kinetic studies.

The developed system demonstrates maximum adsorption efficiency of 66.26% under ecologically optimal conditions i.e. pH=7, with 1000 ppm initial Th (IV) concentration at 303 K for 120 min. The experimental results reveal that the adsorption kinetics study best fits with the Dubinin-Radushkevich isotherm model (R²=0.993) and Intra-particle diffusion kinetics model (R²=0.995). The kinetic models namely Pseudo-first order, Pseudo-second order, particle diffusion, & Elovich were used for the adsorption study, and were compared and calculated using linear & nonlinear regression methods thermodynamic analysis revealed the spontaneity, viability and exothermic nature of the adsorption process with free energy change (Delta G⁰) of -11.48 kJ/mol. Further, the inter-polymer miscibility and compatibility was explored by atomistic molecular modelling and extended Flory-Huggins theory via Materials Studio software on geometrically minimized repeat units of Cysteine (functional group of alpha -keratin) and Nylon 6, employing Discover, Amorphous Cell, Forcite and Blends modules, which showed results to be consistent with FT-IR studies, revealing strong hydrogen bonding.

Gorman, D., et al. (2019). "Organic contamination of beached plastic pellets in the South Atlantic: Risk assessments can benefit by considering spatial gradients." Chemosphere **223**: 608-615.

Microplastics are important vectors for the transport and accumulation of persistent organic contaminants in coastal and marine environments. We determined the concentration of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) associated with microplastic pellets collected along a 39-km stretch of Brazil's South Atlantic coastline to understand the spatial dynamics and potential risk posed by these contaminants. Total PAH concentrations ranged from 1,454 to 6,002ngg⁻¹ and regularly exceeded the threshold effect level (TEL) for sediments defined by the United States Environmental Protection Agency. Sampling stations, spaced evenly along the coastline (i.e., 3-km intervals) exhibited a general north-to-south decline in the concentrations of some PAHs, but this spatial gradient was complicated by small-scale differences in the concentrations and composition of associated contaminants. Similarly, analysis of individual isomer ratios revealed further complexity driven by differences in the contribution of petrogenic versus pyrolytic inputs which pose different levels of risk to marine organisms. PCB concentrations ranged from 0.8 to 104.6ngg⁻¹ and were dominated by low chlorinated congeners likely to have originated from major industrial areas to the north. Overall, this study highlights the challenge of directly linking microplastic pollution with the potential toxicological effects of organic contaminants in coastal waters. We recommend that monitoring programs should explicitly consider both the origin (i.e., pellet sources and dispersal pathways) and nature of organic contamination (i.e., concentration and composition) when assessing the risks for biota and human health.

Gorodetsky, R., et al. (1999). "Fibrin microbeads (FMB) as biodegradable carriers for culturing cells and for accelerating wound healing." Journal of Investigative Dermatology **112**(6): 866-872.

We have developed biodegradable fibrin-derived microbeads as potent cell carriers. The fibrin-derived microbeads, 50-200 microm in diameter, were tested for their attachment to a wide range of cell types. Fibrin-derived microbeads were shown to be greatly haptotactic to cells (such as endothelial cells, smooth muscle cells and fibroblasts), which respond to fibrinogen in contrast to keratinocytes and different cell lines derived from leukocytic lineage. The cells on fibrin-derived microbeads could be maintained for more than 10 d and achieved a high density. 31P-nuclear magnetic resonance was employed to monitor phosphate metabolism in cells, with densities on the order of 100 million cells per g of fibrin-derived microbeads. The 31P-nuclear

magnetic resonance adenosine triphosphate and phosphocreatine signals, equivalent to the signal obtained with perfused normal skin, indicated that metabolism of cells on fibrin-derived microbeads was responsive to oxygenation and nutrients. Light, fluorescent, and confocal laser microscopy revealed that the porous fibrin-derived microbeads accommodate up to 200-300 cells due to their high surface area which minimized contact inhibition. Cells could degrade the fibrin-derived microbeads and be transferred to seed culture flasks without trypsinization. In a pig skin wound healing model, fibrin-derived microbeads + fibroblasts were transplanted into full thickness punch wounds. This procedure was compared with other treatment modalities, such as the addition of human platelet-derived growth factor BB or fibrin-derived microbeads alone. By the third day after wounding, only the wounds in which fibroblasts on fibrin-derived microbeads were added showed significant formation of granulation tissue. Based on the above, we project many uses of our novel fibrin-derived microbead technology for cell culturing, wound healing and tissue engineering.

Gorokhova, E. (2015). "Screening for microplastic particles in plankton samples: how to integrate marine litter assessment into existing monitoring programs?" Marine Pollution Bulletin **99**(1/2): 271-275.

Microplastics (MPs) are a newly recognized type of environmental pollution in aquatic systems; however no monitoring of these contaminants is conducted, mostly due to the lack of routine quantification. In the net samples collected with a 90- micro m WP2 net, pelagic MP abundance was quantified by light microscopy and evaluated as a function of inshore-offshore gradient, depth, and season; the same samples were used for zooplankton analysis. The MP abundance was ~10²-10⁴ particles m⁻³, with no significant inshore-offshore gradient during summer but increasing offshore in winter. MP abundance in deeper layers was positively affected by zooplankton abundance in the upper layers and significantly lower during winter compared to summer. These findings indicate heterogeneity of MP distribution due to biotic and abiotic factors and suggest that samples collected for other purposes can be used for quantification of MPs in the Baltic Sea, thus facilitating integration of MP assessment into existing monitoring schemes.

Gorschluter, A., et al. (2002). "Electro-magnetic base technology for estremely sensitive immunosensors and DNA-chips." Biomedizinische Technik **47 Suppl 1 Pt 1**: 213-216.

We report on the development of an innovative electro-magnetic base technology for estremely sensitive sensors allowing the electrical detection of biological analytes like antigenes or DNA as well as a simple multiple detection of binding forces occurring at specific bonds between proteins. The technology is based on the strong impact of specifically captured magnetic microbeads on an electrical current generated in a fluid by a small sensor chip with an array of activated microelectrodes. The new technological principle with the on-chip detection of analytes will be suitable for large scale applications due to its mass production compatible technologies and allow an alternative way to monitor relevant substances without the consumption of critical additional solutions and reagents.

Goss, H., et al. (2018). "Thalassia testudinum as a potential vector for incorporating microplastics into benthic marine food webs." Marine Pollution Bulletin **135**: 1085-1089.

Seagrasses are among the most productive shallow water ecosystems, serving a diverse assemblage of fish and invertebrates. Tropical seagrass communities are dominated by the turtle grass Thalassia testudinum, whose wide, flattened blades host diverse epibiont communities. Amidst its epibionts, T. testudinum may also be accumulating microplastics, which are a ubiquitous marine pollutant even in remote locales. To assess the extent of microplastic

accumulation, seagrass samples were collected from Turneffe Atoll, which lies offshore but parallel with a major urban center. Seventy-five percent of Thalassia blades had encrusted microplastics, with microfibers occurring more than microbeads and chips by a ratio of 59:14. Grazers consumed seagrasses with higher densities of epibionts. Potential mechanisms for microplastic accumulation include entrapment by epibionts, or attachment via biofilms. This study is the first to document microplastics on marine vascular plants, suggesting that macroherbivory is a viable pathway for microplastic pollution to enter marine food webs. Copyright © 2018 Elsevier Ltd

Goth, W., et al. (2018). "Rapid empirical characterization of sub-diffuse reflectance imaging from MOHS surgery skin samples." Lasers in Surgery and Medicine **50 (Supplement 29)**: S10.

Background: Spatial Frequency Domain Imaging (SFDI) is a label free imaging technique which is sensitive to tissue microstructure. Recent studies have used SFDI in the sub-diffuse regime (sd-SFDI), where the influence of absorption is minimized and the signal is predominantly sensitive to differences in cellular and nuclear structure relevant to tumour pathology. As abnormal microstructure is the primary diagnostic indicator in Mohs micrographic surgery (MMS), sd-SFDI provides the opportunity for tumour identification without sectioning and staining the sample, a significant bottleneck in MMS workflows. However, the processing time for existing non-linear sd-SFDI models needs further improvements to realize near real-time image rendering. Here, we present a linearized empirical model of sub-diffusive scattering and apply it to sf-SFDI data from optical phantoms and human MMS skin samples. Study Design/Materials and Method: Optical phantoms of polystyrene microbeads [d=0.1-1.0mm] at varying reduced scattering coefficients [mus'=1-3 mm-1] were imaged at high spatial frequencies [f>0.5mm-1], corresponding to the tissue sub-diffuse scattering regime. Excised human MMS skin samples were imaged and compared to accompanying H&E stained histology, which were examined by expert histopathologists. An existing non-linear model and our new linearized empirical model were fit to collected sd-SFDI data. Result(s): Our empirical model coefficients showed high sensitivity to changes in scattering particle concentration and size in the optical phantoms. The model parameters highlighted regions of basal cell carcinoma tumour, epidermis, dermis, fat, and other features on the human skin cancer samples. These parameters were additionally used to segment the MMS samples, and corresponded well with the regions demarcated by histology. Our linearized model required less than 1 second to process 1 million pixels, whereas the non-linear model required over 5 hours. Conclusion(s): The proposed empirical model is a rapid and powerful tool to quantify sd-SFDI data without the need for extensive modeling and fitting, reducing the processing time of existing non-linear models by several orders of magnitude. The high sensitivity of our model to different microstructural constituents in experimental results provides a potential path to a streamlined MMS workflow.

Gotze, R., et al. (2016). "Physico-chemical characterisation of material fractions in residual and source-segregated household waste in Denmark." Waste Management **54**: 13-26.

Physico-chemical waste composition data are paramount for the assessment and planning of waste management systems. However, the applicability of data is limited by the regional, temporal and technical scope of waste characterisation studies. As Danish and European legislation aims for higher recycling rates evaluation of source-segregation and recycling chains gain importance. This paper provides a consistent up-to-date dataset for 74 physico-chemical parameters in 49 material fractions from residual and 24 material fractions from source-segregated Danish household waste. Significant differences in the physico-chemical properties of residual and source-segregated waste fractions were found for many parameters related to organic matter, but also for elements of environmental concern. Considerable differences in potentially toxic metal concentrations between the individual recyclable fractions within one material type were observed. This indicates that careful planning and performance evaluation of recycling schemes are important to ensure a high quality of collected recyclables. Rare earth elements (REE) were quantified in all waste fractions analysed, with the highest concentrations of REE found in fractions with high content of mineral raw materials, soil materials and dust. The observed REE concentrations represent the background concentration level in non-hazardous waste materials that may serve as a reference point for future investigations related to hazardous waste management. The detailed dataset provided here can be used for assessments of waste management solutions in Denmark and for the evaluation of the quality of recyclable materials in waste. Copyright © 2016 Elsevier Ltd.

Goudanavar, P. S., et al. (2010). "Design and Characterization of diclofenac sodium microbeads by ionotropic gelation technique." International Journal of Pharma and Bio Sciences **1 (2) (no pagination)**(44).

Sustained release oral product namely microbeads for Diclofenac sodium prepared by ionotropic gelation technique using Sodium alginate alone and combination with Hydroxypropyl methyl cellulose, Chitosan, Pectin as release rate modifiers, and investigated for flow behavior, particle size, swelling properties, surface study by SEM, and in vitro drug release potential. While increase in the concentration of sodium alginate and other polymer dispersions increased sphericity, size distribution, mean particle size. Drug entrapment efficiency approached nearly 95%. Increasing calcium chloride concentration decreases the mean diameter of the microbeads, no appreciable change in morphology, and drug release behaviors. In vitro drug release was dependent on the pH of the medium and concentration of polymer dispersions. Among the nine formulation batches F5, F7 and F9 were found to show optimum sustained effect. The mechanism of drug release from the microbeads was found to be followed super case-II transport.

Gouin, T., et al. (2019). "Toward the Development and Application of an Environmental Risk Assessment Framework for Microplastic." Environmental Toxicology & Chemistry **38**(10): 2087-2100.

Emissions of plastic waste to the environment and the subsequent degradation into microplastic particles that have the potential to interact with biological organisms represent a concern for global society. Current understanding of the potential impacts on aquatic and terrestrial population stability and ecosystem structure and function associated with emissions of microplastic particles is limited and insufficient to fully assess environmental risks. Multistakeholder discussions can provide an important element in helping to identify and prioritize key knowledge gaps in assessing potential risks. In the present review, we summarize multistakeholder discussions from a 1-d International Council of Chemical Associations-sponsored symposium, which involved 39 scientists from 8 countries with representatives from academia, industry, and government.

Gouin, T., et al. (2011). "A thermodynamic approach for assessing the environmental exposure of chemicals absorbed to microplastic." Environmental Science & Technology **45**(4): 1466-1472.

The environmental distribution and fate of microplastic in the marine environment represents a potential cause of concern. One aspect is the influence that microplastic may have on enhancing the transport and bioavailability of persistent, bioaccumulative, and toxic substances (PBT). In this study we assess these potential risks using a thermodynamic approach, aiming to prioritize

the physicochemical properties of chemicals that are most likely absorbed by microplastic and therefore ingested by biota. Using a multimedia modeling approach, we define a chemical space aimed at improving our understanding of how chemicals partition in the marine environment with varying volume ratios of air/water/organic carbon/polyethylene, where polyethylene represents a main group of microplastic.

Gove, J. M., et al. (2019). "Prey-size plastics are invading larval fish nurseries." Proceedings of the National Academy of Sciences of the United States of America **116**(48): 24143-24149.

Life for many of the world's marine fish begins at the ocean surface. Ocean conditions dictate food availability and govern survivorship, yet little is known about the habitat preferences of larval fish during this highly vulnerable life-history stage. Here we show that surface slicks, a ubiquitous coastal ocean convergence feature, are important nurseries for larval fish from many ocean habitats at ecosystem scales. Slicks had higher densities of marine phytoplankton (1.7-fold), zooplankton (larval fish prey; 3.7-fold), and larval fish (8.1-fold) than nearby ambient waters across our study region in Hawai'i. Slicks contained larger, more well-developed individuals with competent swimming abilities compared to ambient waters, suggesting a physiological benefit to increased prey resources. Slicks also disproportionately accumulated prey-size plastics, resulting in a 60-fold higher ratio of plastics to larval fish prey than nearby waters. Dissections of hundreds of larval fish found that 8.6% of individuals in slicks had ingested plastics, a 2.3-fold higher occurrence than larval fish from ambient waters. Plastics were found in 7 of 8 families dissected, including swordfish (Xiphiidae), a commercially targeted species, and flying fish (Exocoetidae), a principal prey item for tuna and seabirds. Scaling up across an ~1,000 km² coastal ecosystem in Hawai'i revealed slicks occupied only 8.3% of ocean surface habitat but contained 42.3% of all neustonic larval fish and 91.8% of all floating plastics. The ingestion of plastics by larval fish could reduce survivorship, compounding threats to fisheries productivity posed by overfishing, climate change, and habitat loss.

Govindasamy, S., et al. (2019). "Dataset on controlled production of polyhydroxyalkanoate-based microbead using double emulsion solvent evaporation technique." Data in Brief **23**: 103675.

A significant source of microplastics is from the usage of microbeads in the market since petrochemical plastic bead is a material used in cosmetic scrubs. A possible way to counteract the problem is by the substitution of synthetic plastic to natural biodegradable polymer. Polyhydroxyalkanoate (PHA) is a general class of thermoplastic microbial polymer and it is the best alternative to some petrochemical plastics due to its biodegradability. Some PHA has earned its way into cosmetic application due to its biocompatibility. This data article reports data on the development of biodegradable microbeads by using the double emulsion solvent evaporation technique. Our data describe the extraction of biopolymer from marine bacteria that was cultivated in shaken flask culture, removal of endotoxins using oxidizing agent, the production of microbeads using a peristaltic pump with a specific flowrate and silicon tubing, and the cytotoxicity of the microbeads.

Goyal, P. K. and R. E. B. Hanna (1988). "Nippostrongylus brasiliensis: immunogenicity of larval and adult worms in rats." International Journal for Parasitology **18**(1): 121-123.

Plastic resin-embedded sections of adult and larval N. brasiliensis were used as test antigens for indirect immunofluorescence labelling with serially diluted antisera collected from rats throughout the course of primary and secondary infections. With sheathed infective larvae, labelling was strongest over the sheath and cuticle, while the cuticle of exsheathed larvae appeared less antigenic. With adult sections the strongest labelling was over the egg shells and uterus wall, and over the cuticle. The early and vigorous humoral response of rats to N. brasiliensis infection may indicate that the host's immune system is particularly reactive to common antigens expressed by nematodes. The failure of the secondary infection to engender an anamnestic response may indicate that the immune system is fully saturated with parasite antigens from the earliest stages of infection. IgG formed the only measureable component of the circulating antibody pool except in the earliest stages of infection when IgM was present in significant amounts.

Grabias, B. and S. Kumar (2015). "A non-amplification, oligonucleotide-based sandwich hybridization assay for the detection of pathogens in blood." American Journal of Tropical Medicine and Hygiene **93 (4 Supplement)**: 551.

Novel technologies for the sensitive and reliable detection of infectious agents in blood are still needed. While the standard method of nucleic acid-based pathogen detection generally relies on PCR amplification of target DNA or RNA, complex genome sequences can be resistant to amplification, due to factors such as secondary or tertiary structure, and the potential for nonspecific amplification or sample interference could result in false positive or false negative results. Here, we describe a novel nanoparticle-based sandwich hybridization assay (SHA) for the detection of Plasmodium falciparum and Babesia microti parasites without the need for amplification of target sequences in genomic DNA. A uniquely identifiable "barcoded" magnetic microbead and biotinylated silica nanoparticle are conjugated to either P. falciparum- or B. microtispecific 30-mer oligonucleotides corresponding to sequences of the 18S ribosomal gene. For each parasite, the magnetic microbead and silica nanoparticle bead sets hybridize to a unique but adjacent region in the genome. Parasite burden can then be quantified and analyzed upon the binding of an Avidin-PE fluorophore to the target capture complexes via a Bio-Plex 200 instrument. Determination of the analytical sensitivity of the SHA for short complementary oligonucleotide sequences revealed a limit of detection of 10-10 M for both P. falciparum and B. microti probe sets. Analytical sensitivity studies conducted by spiking human blood with known counts of parasites revealed that SHA can reliably detect up to 10 P. falciparum- or B. microti-infected red cells per mL of blood. For comparison, in our hands PCR can detect 100 P. falciparum- or 1000 B. microti-infected red cells per mL of spiked blood. Thus, SHA offers a 10-100 fold enhanced sensitivity for the detection of these two intraerythrocytic parasites of global public health significance. Studies to determine the clinical sensitivity of SHA for these pathogens are in progress. Details of the method development and sensitivity and specificity data will be presented.

Graca, B., et al. (2017). "Sources and fate of microplastics in marine and beach sediments of the Southern Baltic Sea-a preliminary study." Environmental Science & Pollution Research **24**(8): 7650-7661.

Microplastics' (particles size <=5 mm) sources and fate in marine bottom and beach sediments of the brackish are strongly polluted Baltic Sea have been investigated. Microplastics were extracted using sodium chloride (1.2 g cm⁻³). Their qualitative identification was conducted using micro-Fourier-transform infrared spectroscopy (muFT-IR). Concentration of microplastics varied from 25 particles kg⁻¹ d.w. at the open sea beach to 53 particles kg⁻¹ d.w. at beaches of strongly urbanized bay. In bottom sediments, microplastics concentration was visibly lower compared to beach sediments (0-27 particles kg⁻¹ d.w.) and decreased from the shore to the open, deep-sea regions. The most frequent microplastics dimensions ranged from 0.1 to 2.0 mm, and transparent fibers were predominant. Polyester, which is a popular fabrics component, was the most common type of microplastic in both marine bottom (50%) and beach sediments (27%). Additionally, poly(vinyl

acetate) used in shipbuilding as well as poly(ethylene-propylene) used for packaging were numerous in marine bottom (25% of all polymers) and beach sediments (18% of all polymers). Polymer density seems to be an important factor influencing microplastics circulation. Low density plastic debris probably recirculates between beach sediments and seawater in a greater extent than higher density debris. Therefore, their deposition is potentially limited and physical degradation is favored. Consequently, low density microplastics concentration may be underestimated using current methods due to too small size of the debris. This influences also the findings of qualitative research of microplastics which provide the basis for conclusions about the sources of microplastics in the marine environment.

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Graham, E. R. and J. T. Thompson (2009). "Deposit- and suspension-feeding sea cucumbers (Echinodermata) ingest plastic fragments." Journal of Experimental Marine Biology and Ecology **368**(1): 22-29.

Weathering of plastic bottles, bags, fishing line, and other products discarded in the ocean causes tiny fragments to break off. These plastic fragments may accumulate biofilms, sink, and become mixed with sediment, where benthic invertebrates may encounter and ingest them. Here we show that four species of deposit-feeding and suspension-feeding sea cucumbers (Echinodermata, Holothuroidea) not only ingest small (0.25 mm < maximum dimension <15 mm) nylon and polyvinyl chloride (PVC) fragments along with sediment, but also ingest significantly more plastic fragments than predicted given the ratio of plastic to sand grains in the sediment. During four-hour feeding trials, holothurians ingested between 2- and 20-fold more plastic per individual than expected for PVC fragments, and between 2- and 138-fold more for nylon line. In addition, two species ingested 4 mm diameter PVC pellets. The ecological relevance of plastic ingestion was assessed in the laboratory by counting and characterizing small plastic particles

discovered in sediment samples from the same field sites where our holothurians were collected. Substantial numbers of plastic fragments (105 to 214 fragments per liter of sediment) were found in samples from three different locations along the east coast of the U.S.A. In addition, plastic collected from the sediment from two of our field sites was analyzed for polychlorinated biphenyls (PCBs). Plastic from one site tested positive for Aroclor 1254 at a concentration of 0.0106 micro g g⁻¹. While the negative effects of macroscopic marine plastic debris on a host of organisms are well documented, ingestion of small plastic debris by a wide range of benthic organisms, including both primary and secondary consumers, has received little attention. Given that plastics readily adsorb PCBs and other organic pollutants in marine environments, ingestion of plastic from sediment may provide a heretofore-undescribed pathway of exposure for benthic marine invertebrates.

Graham, P., et al. (2019). "Microplastics uptake and egestion dynamics in Pacific oysters, Magallana gigas (Thunberg, 1793), under controlled conditions." Environmental Pollution **252**(Pt A): 742-748.

Microplastics debris (<5mm) are increasingly abundant in the marine environment, therefore, potentially becoming a growing threat for different marine organisms. Through aquatic animals, these can enter in the human food chain, and can be perceived as a risk for consumers' health. Different studies report the presence of particles in marketable shellfish including the world wide commercially grown Pacific oyster Magallana gigas (Thunberg, 1793). The aim of this study is to examine the potential risk of microplastics entering in the human food chain through this shellfish species, investigating the dynamics of the uptake, egestion (faeces) and rejection (pseudofaeces) of microplastics in Pacific oysters under controlled conditions. M. gigas collected from a farm in the San Teodoro lagoon (Italy), were exposed to 60 fluorescent orange polystyrene particles L⁻¹ of known sizes (100, 250 and 500mum). The uptake of each particle size was 19.4+/-1.1%, 19.4+/-2% and 12.9+/-2% respectively. After exposure M. gigas were left to depurate for 72h, during which 84.6+/-2% of the particles taken up were released whilst 15.4+/-2% were retained inside the shell cavity. No microplastic particles were found in the animals' soft tissues. The results of this study, suggest that depuration is an effective method to reduce presence of large microplastic particles, in the size range 100-500mum, in M. gigas. Importantly, the data suggests that the burden that could theoretically be up taken by consumers from these shellfish is negligible when compared to other routes.

Gramatzki, M., et al. (2014). "M.D." Biology of Blood and Marrow Transplantation **1)**: S160-S161.

In AML patients despite intensive chemotherapy and additional stem cell transplantation, residual leukemic stem cells (LSC) may lead to relapse. Therefore, elimination of LSC by targeted therapy may represent a promising therapeutic approach. Recently CD96was identified as marker antigen on AML LSC (Hosen et al., PNAS 104: 11008, 2007). Here, strategies for engineering autologous stem cell grafts as well as for in vivo targeting of residual AML stem cells by addressing CD96 for magnetic cell sorting (MACS) or antibody dependent cellular cytotoxicity (ADCC) are described. To evaluate the efficacy of purging LSC by MACS technology, stem cell containing grafts were spiked with CD96 positive AML cells. Using biotinylated CD96 antibody TH111 raised in our laboratory in combination with anti-Biotin-microbeads (Miltenyi) up to a 1000-fold depletion of targeted cells was achieved. Viability, cell count and the potential of HPC to proliferate and differentiate were not affected by this procedure as shown by flow cytometry and colony forming assays. Eradication of AML stems cells is also an issue after allogeneic stem cell transplantation. To target CD96+ AMLLSC by ADCC, chimeric antibodies containing wild type or affinity maturated variable regions in combination with an optimized human IgG1 Fc were generated. As shown by flow cytometry, the antigen binding affinity of the maturated antibody was enhanced (EC50 0.6 mug/ml vs. 2 mg/ml). Moreover, also NK cell mediated lytic properties against CD96-positive target cells were elevated (EC50: 0.02 mug/ml vs. 0.15 mug/ml) as analyzed in standard ADCC assays. Thus, the purging strategy may be beneficial for the development of graft-engineering strategies to avoid transplantation of AML-LSC and revitalize autologous stem cell transplantation in this indication. The in vivo application may possibly open additional therapeutic avenues in eliminating residual disease in autologous as well as allogeneic situations.

Gramatzki, M., et al. (2016). "CD96 antibody TH-111 eradicates AML-LSC from autografts and the Fc-engineered variant MSH-TH111e may be used in vivo." Biology of Blood and Marrow Transplantation **1)**: S200.

Introduction: Residing leukemic stem cells (LSC) account for the high rate of relapse in acute myeloid leukemia (AML) patients after autologous stem cell transplantation (ASCT). To improve the outcome of AML therapy the efficient elimination of these LSC is a prerequisite. CD96 detected by our monoclonal antibody TH-111 has been proposed as a target structure for selective elimination of LSC in AML. Here, a strategy is implemented to remove CD96-positive LSC from autologous grafts of AML patients by magnetic cell sorting (MACS). Since certain situations require the elimination of AML-LSC in the patient, a novel TH-111 based Fc-engineered CD96 antibody was designed for in vivo use. Method(s): Following biotinylation antibody TH-111 was used for MACS based separation of AML-LSC cells. Depletion efficiency of AML-LSC, cell viability and differentiation capacity of healthy hematopoietic progenitor cells (HPC) after depletion were analyzed. CD96 antibodies with Fc variants optimized for antibody-dependent cell-mediated cytotoxicity (ADCC) were generated and effector mechanisms evaluated. ADCC activity against cell lines and freshly isolated tumor cells was tested. Colony forming assays were performed to detect impact on healthy HPC. Result(s): The efficiency of antibody mediated LSC purging was determined by spiking a graft with AML. Using biotinylated CD96 antibody TH-111 and anti-biotin-microbeads, targeted cells could be depleted approx. 1000-fold with MACS technology. Viability of healthy HPC as well as their potential to proliferate and differentiate was not affected. Primary CD96-positive AML-LSC could be efficiently eliminated. The variable regions of an affinity maturated scFv were used to generate a full length CD96 antibody with an engineered IgG1-based Fc variant designated MSH-TH111e optimized for ADCC activity. FcgRIIIa (CD16a) expressing NK cells were efficiently recruited to lyse KG1a myeloid blasts as well as primary AML cells. For comparison a similarly designed CD34 antibody lysing CD34⁺ HPC of healthy donors as well as CD34⁺/CD96⁺ KG1a cells was used. Fc-optimized MSH-TH111e did not affect CD34⁺ HPC but eliminated KG1a blasts. The capacity of healthy HPC to proliferate and differentiate was not altered by MSH-TH111e treatment. Conclusion(s): Using CD96 as marker for AML-LSC, column based purging technology eliminates LSC from mixed cell populations. Therefore, graft-engineering strategies focusing on CD96 are feasible and avoid contamination of the autograft with AML-LSC. This may help to revitalize ASCT in AML. Fc-engineered CD96 antibody MSH-TH111e may provide an additional therapeutic option to eliminate residual disease in certain clinical situations including the setting of allogeneic stem cell transplantation.

Gramatzki, M., et al. (2015). "New strategy in stem cell transplantation for AML: CD96 antibody TH-111 removes leukemic stem cells from autografts." Annals of Hematology **1)**: S99.

Background: High relapse rates observed in AML patients after autologous stemcell transplantation (ASCT) due to residual leukemic stemcells (LSC) in the graft limit this approach. The monoclonal antibody TH111, raised in our laboratory, targets the CD96 antigen characteristically expressed on AML-LSC. Study design: Here, a strategy is developed to remove CD96 positive LSC from autologous grafts by magnetic cell sorting (MACS). In addition, antibody engineering improves antibody dependent cell-mediated cytotoxicity (ADCC) against residual LSC allowing therapeutic targeting in other situations. The efficiency of antibody mediated LSC purging was determined by spiking a graft with AML cells. Using biotinylated CD96 antibody TH111 and anti-biotin-microbeads, targeted cells could be depleted approx. 1000-fold with MACS technology. Viability of healthy hematopoietic progenitor cells (HPC) as well as their potential to proliferate and differentiate was not affected. Importantly, primary CD96-positiveAMLLSC could be efficiently eliminated from bone marrow aspirate of an AML patient. Recombinant DNA technologies were used to generate affinity maturated and ADCC-optimized CD96 antibodies. A chimeric antibody containing affinity maturated variable regions in combination with anADCC optimized human IgG<inf>1</inf> Fc was generated. In contrast to an Fc knock-out variant, this construct efficiently recruited NK cells and lysed CD96-positive AML-LSC. Result(s): Using CD96 as marker typical for AML-LSC, column based purging technology eliminates LSC from mixed cell populations. Moreover, a chimeric affinity maturated and Fc-optimized CD96 antibody was able to recruit NK cells for lysis of AML-LSC. Conclusion(s): Therefore, graft-engineering strategies focusing on CD96 may be feasible and avoid contamination with AML-LSC of the autograft. This strategy may help to revitalize ASCT in AML. The design of CD96 antibodies may open additional therapeutic avenues in eliminating residual disease in allogeneic situations as well.

Granby, K., et al. (2018). "The influence of microplastics and halogenated contaminants in feed on toxicokinetics and gene expression in European seabass (Dicentrarchus labrax). (Special Section: Environmental contaminants in seafood: new findings & innovation challenges.)." Environmental Research **164**: 430-443.

When microplastics pollute fish habitats, it may be ingested by fish, thereby contaminating fish with sorbed contaminants. The present study investigates how combinations of halogenated contaminants and microplastics associated with feed are able to alter toxicokinetics in European seabass and affect the fish. Microplastic particles (2%) were added to the feed either with sorbed contaminants or as a mixture of clean microplastics and chemical contaminants, and compared to feed containing contaminants without microplastics. For the contaminated microplastic diet, the accumulation of polychlorinated biphenyls (PCBs) and brominated flame retardants (BFRs) in fish was significantly higher, increasing up to 40 days of accumulation and then reversing to values comparable to the other diets at the end of accumulation. The significant gene expression results of liver (cyp1a, il1 beta , gst alpha) after 40 days of exposure indicate that microplastics might indeed exacerbate the toxic effects (liver metabolism, immune system, oxidative stress) of some chemical contaminants sorbed to microplastics. Seabass quickly metabolised BDE99 to BDE47 by debromination, probably mediated by deiodinase enzymes, and unlike other contaminants, this metabolism was unaffected by the presence of microplastics. For the other PCBs and BFRs, the elimination coefficients were significantly lower in fish fed the diet with contaminants sorbed to microplastic compared to the other diets. The results indicate that microplastics affects liver detoxification and lipid distribution, both of which affect the concentration of contaminants.

Grandhi, T. S., et al. (2014). "Aminoglycoside antibiotic-derived anion-exchange microbeads for plasmid DNA binding and in situ DNA capture." Acs Applied Materials & Interfaces **6**(21): 18577-18589.

Plasmid DNA (pDNA) therapeutics are being investigated for gene therapy and DNA vaccines against diseases including cancer, cystic fibrosis and AIDS. In addition, several applications in modern biotechnology require pDNA for transient protein production. Here, we describe the synthesis, characterization, and evaluation of microbeads ("Amikabeads") derived from the aminoglycoside antibiotic amikacin for pDNA binding and in situ DNA capture from mammalian cells. The parental aminoglycoside-derived microbeads (Amikabeads-P) acted as anion-exchange materials, and demonstrated high capacities for binding pDNA. Binding of pDNA was significantly enhanced following quaternization of the amines on the microbeads (Amikabeads-Q). Amikabeads were further employed for the disruption and extraction of DNA from mammalian cells, indicating their utility for in situ DNA capture. Our results indicate that Amikabeads are a novel material, with multiple reactive groups for further conjugation, and can have several applications in plasmid DNA biotechnology.

Gray, A. D. and J. E. Weinstein (2017). "Size- and shape-dependent effects of microplastic particles on adult daggerblade grass shrimp (Palaemonetes pugio)." Environmental Toxicology and Chemistry **36**(11): 3074-3080.

The incidence of microplastics in marine environments has been increasing over the past several decades. The objective of the present study was to characterize the size- and shape-dependent effects of microplastic particles (spheres, fibers, and fragments) on the adult daggerblade grass shrimp (Palaemonetes pugio). Grass shrimp were exposed to 11 sizes of plastic: spheres (30, 35, 59, 75, 83, 116, and 165 mum), fragments (34 and 93 mum), and fibers (34 and 93 mum) at a concentration of 2000 particles/400 mL (= 50 000 particles/L) for 3 h. Following exposure, grass shrimp were monitored for survival, ingested and ventilated microplastics, and residence time. Mortality ranged from 0% to 55%. Spheres and fragments <50 mum were not acutely toxic. Mortality rates in experiments with spheres and fragments >50 mum ranged from 5% to 40%. Mortality was significantly higher in the exposure to 93-mum fibers than other sizes tested (p < 0.001). The shape of the particle had a significant influence on the number of particles ingested by the shrimp (p < 0.001). The residence time of particles in the gut ranged from 27 to 75 h, with an average of 43.0 +/- 13.8 h. Within the gills, the residence time ranged from 27 to 45 h, with an average of 36.9 +/- 5.4 h. The results suggest that microplastic particles of various sizes and shapes can be ingested and ventilated by adult daggerblade grass shrimp, resulting in acute toxicity. Environ Toxicol Chem 2017;36:3074-3080. © 2017 SETAC.

Gray, A. D., et al. (2018). "Microplastic in two South Carolina Estuaries: Occurrence, distribution, and composition." Marine Pollution Bulletin **128**: 223-233.

Here we report on the distribution of microplastic contamination in two developed estuaries in the Southeastern United States. Average concentration in intertidal sediments of Charleston Harbor and Winyah Bay, both located in South Carolina, U.S.A., was 413.8+/-76.7 and 221.0+/-25.6particles/m², respectively. Average concentration in the sea surface microlayer of Charleston Harbor and Winyah Bay was 6.6+/-1.3 and 30.8+/-12.1particles/L, respectively. Concentration in intertidal sediments of the two estuaries was not significantly different (p=0.58), however, Winyah Bay contained significantly more microplastics in the sea surface microlayer (p=0.02). While microplastic concentration in these estuaries was comparable to that reported for other estuaries worldwide, Charleston Harbor contained a high abundance of black microplastic fragments believed to be tire wear particles. Our research is the first to survey microplastic contamination in Southeastern U.S. estuaries and to provide insight on the nature and extent of contamination in these habitats.

Gray, M. W., et al. (2015). "Particle processing and gut kinematics of planktotrophic bivalve larvae." Marine Biology **162**(11): 2187-2201.

Although the clearance rates of planktotrophic bivalve larvae have been widely reported, post-oral particle processing is less well understood. Using a series of exposures to differently colored fluorescent polystyrene microbeads, we quantify several post-oral process in the larval gut, including gut fullness, gut passage time, and degree of mixing by modeling larval guts as a continuously stirred tank reactor (CSTR), plug flow reactor (PFR) or combinations of the two in series. We also varied several experimental conditions to understand how these affected estimates of gut kinematic parameters. We found the larval guts of M. galloprovincialis aged 2 and 7 days post-fertilization, had gut exchange time >1h and were best described either as a CSTR or CSTR in series with a PFR. Mixing stomach contents likely aids post-oral particle selection, physical breakdown of ingested material, and accelerates the diffusion of digestive enzymes in the gut volume. Reactor models also provided estimates of ingestion rates, which were compared to those obtained by other authors who measured rates of bead accumulation. In accordance with reactor theory, ingestion rates were negatively and nonlinearly correlated with gut passage times and positively related to maximal gut fullness. Collectively, these studies provide new insight on the digestive strategy of planktotrophic bivalve larvae.

Greco, A., et al. (2014). "Gene expression profiling of IgM monoclonal gammopathy of undetermined significance (IgM-MGUS)." Blood. Conference: 56th Annual Meeting of the American Society of Hematology, ASH **124**(21).

The 2nd IWWM tried to define reproducible criteria for the diagnosis of IgM-MGUS and Waldenstrom's Macroglobulinemia. IgM-MGUS was defined as asymptomatic condition characterized by serum IgM monoclonal protein (MC) without morphologic evidence of bone marrow (BM) lymphoplasmacytic infiltration. The proposal of the guidelines was to classify as MGUS also patients with equivocal evidence of BM infiltration, such as those presenting clonal B-cells by multiparameter flow cytometry (MFC) in the absence of morphologic evidence of BM infiltration, as well as those with equivocal BM infiltrates not confirmed by immunophenotypic studies. Patients The diagnosis of IgM-MGUS was made in 11 patients (6 males, 5 females) according to the consensus panel criteria. The median age at diagnosis was 73 (range, 60-77). Ten patients had K light chains. The median erythrocyte sedimentation rate was 11. The MC level at diagnosis ranged from 0.1 to 1.2 g/dL (median 0.4). Only one patient had MC value > 1.0 g/dL. The median IgM value was 697 mg/dL (range 116-1790). Five of 11 IgM-MGUS patients showed a small clonal B-cell population (light-chain-isotype-positive B-cells) detected by MFC without histologic evidence of BM infiltration. Therefore, patients were divided in 2 groups: group 1 (n=5) showing a clonal B-cell population, and group 2 (n=6) with polyclonal B-cells at MFC. Methods and results We isolated BM CD19+ cells in the 11 IgM-MGUS patients using Miltenyi Microbeads and performed microarray with Affymetrix-HG-U133 Plus 2.0 array. Gene set enrichment analysis (GSEA) was performed and different sets of genes were defined based on REACTOME pathways, KEGG pathways and GO Biological Process Terms. Interestingly, 17 top-ranking gene sets including differently expressed genes, reached a nominal p-value lower than 0.001; 2 gene sets were upregulated (while 15 gene sets were downregulated in monoclonal vs. polyclonal IgM-MGUS (table 1). No genes resulted significantly differentially expressed between group 1 and group 2 using a classic SAM test for microarrays and correcting for multiple testing with a false discovery rate (FDR) threshold of 5%. Similarly, IgM and MC were not differentially expressed between the two groups, although IgM showed a nominal p-value of 0.09 (t-test). However, when using linear regression to explain each gene expression data as a function of both IgM and MC, UBTF, TRIM5, FLJ35816, RDH10 genes were selected based on a FDR equal to 5%, applied to the F-statistic p-value. In particular, the model fitting UBTF had a p-value of 9.461e-07 and an adjusted R-squared of 0.9786; table 2 displays the coefficients of the model and the related p-values, showing a positive co-regulation of UBTF with MC. Conclusions In conclusion, microarray of IgM-MGUS gives insights into gene expression differences in IgM-MGUS. Notably, UBTF is a transcription factor which plays a crucial role in the transcription of rRNA in ERK-pathway, suggesting a possible role of ERK-pathway in IgM-MGUS. Additional gene expression measurements are ongoing in a larger cohort of IgM-MGUS patients. (Table Presented).

Green, B. C. and C. L. E. Johnson (2019). "Characterisation of microplastic contamination in sediment of England's inshore waters." Marine Pollution Bulletin **(no pagination)**(110788).

Plastic litter is an increasingly significant problem in the marine environment. Our study looks at a cost-effective method to quantify larger fractions of microplastics in marine sediments as an opportunistic addition to standard benthic infauna sampling. A subsample of microplastics (>1 mm) were enumerated and categorised from sediment samples collected as part of standard benthic habitat monitoring in twenty-two Marine Protected Areas across English inshore waters. Microplastic particles were found in 61.2% of the samples collected, with mean density per study site ranging from 0.2 in Dover to Deal MCZ to 42.7 in The Mersey Estuary Special Protection Area microplastic particles per 0.1 m². High densities of plastic were found at remote sites, as well as those closer to urban or industrialised areas. Spatial protection measures such as MPAs are not themselves a suitable tool to tackle marine plastic pollution which should be addressed upstream at source. Copyright © 2019

Green, D. S. (2016). "Effects of microplastics on European flat oysters, Ostrea edulis and their associated benthic communities." Environmental Pollution **216**: 95-103.

Plastic pollution is recognised as an emerging threat to aquatic ecosystems, with microplastics now the most abundant type of marine debris. Health effects caused by microplastics have been demonstrated at the species level, but impacts on ecological communities remain unknown. In this study, impacts of microplastics on the health and biological functioning of European flat oysters (Ostrea edulis) and on the structure of associated macrofaunal assemblages were assessed in an outdoor mesocosm experiment using intact sediment cores. Biodegradable and conventional microplastics were added at low (0.8 mug L(-1)) and high (80 mug L(-1)) doses in the water column repeatedly for 60 days. Effects on the oysters were minimal, but benthic assemblage structures differed and species richness and the total number of organisms were ~1.2 and 1.5 times greater in control mesocosms than in those exposed to high doses of microplastics. Notably, abundances of juvenile Littorina sp. (periwinkles) and Idotea balthica (an isopod) were ~2 and 8 times greater in controls than in mesocosms with the high dose of either type of microplastic. In addition, the biomass of Scrobicularia plana (peppery furrow shell clam) was ~1.5 times greater in controls than in mesocosms with the high dose of microplastics. This work indicates that repeated exposure to high concentrations of microplastics could alter assemblages in an important marine habitat by reducing the abundance of benthic fauna.

Green, D. S., et al. (2017). "Microplastics Affect the Ecological Functioning of an Important Biogenic Habitat." Environmental Science & Technology **51**(1): 68-77.

Biological effects of microplastics on the health of bivalves have been demonstrated elsewhere, but ecological impacts on the biodiversity and ecosystem functioning of bivalve-dominated habitats are unknown. Thus, we exposed intact sediment cores containing European flat oysters (Ostrea edulis) or blue mussels (Mytilus edulis) in seawater to two different densities (2.5 or 25

?g L-1) of biodegradable or conventional microplastics in outdoor mesocosms. We hypothesized that filtration rates of the bivalves, inorganic nitrogen cycling, primary productivity of sediment dwelling microphytobenthos, and the structure of invertebrate benthic assemblages would be influenced by microplastics. After 50 days, filtration by M. edulis was significantly less when exposed to 25 ?g L-1 of either type of microplastics, but there were no effects on ecosystem functioning or the associated invertebrate assemblages. Contrastingly, filtration by O. edulis significantly increased when exposed to 2.5 or 25 ?g L-1 of microplastics, and porewater ammonium and biomass of benthic cyanobacteria decreased. Additionally the associated infaunal invertebrate assemblages differed, with significantly less polychaetes and more oligochaetes in treatments exposed to microplastics. These findings highlight the potential of microplastics to impact the functioning and structure of sedimentary habitats and show that such effects may depend on the dominant bivalve present. [ABSTRACT FROM AUTHOR]

Green, D. S., et al. (2016). "Effects of conventional and biodegradable microplastics on a marine ecosystem engineer (Arenicola marina) and sediment nutrient cycling." Environmental Pollution **208**(Part B): 426-434.

Effects of microplastic pollution on benthic organisms and ecosystem services provided by sedimentary habitats are largely unknown. An outdoor mesocosm experiment was done to realistically assess the effects of three different types of microplastic pollution (one biodegradable type; polylactic acid and two conventional types; polyethylene and polyvinylchloride) at increasing concentrations (0.02, 0.2 and 2% of wet sediment weight) on the health and biological activity of lugworms, Arenicola marina (Linnaeus, 1758), and on nitrogen cycling and primary productivity of the sediment they inhabit. After 31 days, A. marina produced less casts in sediments containing microplastics. Metabolic rates of A. marina increased, while microalgal biomass decreased at high concentrations, compared to sediments with low concentrations or without microplastics. Responses were strongest to polyvinylchloride, emphasising that different materials may have differential effects. Each material needs to be carefully evaluated in order to assess their risks as microplastic pollution. Overall, both conventional and biodegradable microplastics in sandy sediments can affect the health and behaviour of lugworms and directly or indirectly reduce primary productivity of these habitats.

Green, D. S., et al. (2019). "Exposure to microplastics reduces attachment strength and alters the haemolymph proteome of blue mussels (Mytilus edulis)." Environmental Pollution **246**: 423-434.

The contamination of marine ecosystems with microplastics, such as the polymer polyethylene, a commonly used component of single-use packaging, is of global concern. Although it has been suggested that biodegradable polymers, such as polylactic acid, may be used to replace some polyethylene packaging, little is known about their effects on marine organisms. Blue mussels, Mytilus edulis, have become a "model organism" for investigating the effects of microplastics in marine ecosystems. We show here that repeated exposure, over a period of 52 days in an outdoor mesocosm setting, of M. edulis to polyethylene microplastics reduced the number of byssal threads produced and the attachment strength (tenacity) by ~50%. Exposure to either type of microplastic altered the haemolymph proteome and, although a conserved response to microplastic exposure was observed, overall polyethylene resulted in more changes to protein abundances than polylactic acid. Many of the proteins affected are involved in vital biological processes, such as immune regulation, detoxification, metabolism and structural development. Our study highlights the utility of mass spectrometry-based proteomics to assess the health of key marine organisms and identifies the potential mechanisms by which microplastics, both conventional and biodegradable, could affect their ability to form and maintain reefs.

Green, D. S., et al. (2018). "A comparison of sampling methods for seawater microplastics and a first report of the microplastic litter in coastal waters of Ascension and Falkland Islands." Marine Pollution Bulletin **137**: 695-701.

To date there is no gold standard for sampling microplastics. Zooplankton sampling methods, such as plankton and Neuston nets, are commonly used to estimate the concentrations of microplastics in seawater, but their ability to detect microplastics is limited by their mesh size. We compared different net-based sampling methods with different mesh sizes including bongo nets (>500mum), manta nets (>300mum) and plankton nets (>200mum and >400mum) to 1litre bottle grabbed, filtered (0.45mum) samples. Concentrations of microplastics estimated using net-based methods were ~3 orders of magnitude less than those estimated by 1litre grab samples. Some parts of the world with low human populations, such as Ascension Island and the Falkland Islands, lack baseline data on microplastics. Using the bottle grab sampling method we found that microplastic litter was present at these remote locations and was comparable to levels of contamination in more populated coastal regions, such as the United Kingdom.

Greene, K. L. and D. J. Tonjes (2014). Degradable Plastics And Their Potential For Affecting Solid Waste Systems. Southampton, W I T Press. **180**.

Plastic waste forms a substantial part of municipal solid waste and has caused environmental concerns, particularly due to the chemical contamination of the environment and effects from persistent litter. Plastics also complicate waste management processes, such as by having poor recovery rates through recycling and causing contamination in composting operations. One potential means of addressing some of these challenges is through degradable plastics, which unlike conventional plastics, are designed to decompose at an accelerated rate in specific environments. Degradable plastics aim to address the end-of-life of plastic products and are intended to reduce the environmental impacts associated with their use and management. The first generation of degradable plastics did not meet marketing claims; some of the more recent formulations, partly as a consequence of third party certifications, are more compliant. However, many plastics that are labelled as degradable do not decompose very readily, and it is not clear that litter will be diminished to any great degree through their use. In addition, user confusion regarding degradable definitions is common. Multiple formulations mean that not all degradable plastics address compost contamination and most degradable plastics do not address other problems associated with plastics waste management. Therefore it is not clear that degradable plastics constitute a major technological advance. In fact, they may be more harmful than helpful to waste management systems at this time. Here we discuss how these materials perform in different aspects of solid waste programs: recycling, composting, WTE incineration and landfills, as well as the potential for these plastics to reduce litter problems, both on land and at sea.

Gregory, M. R. (1991). "The hazards of persistent marine pollution: Drift plastics and conservation islands." Journal of the Royal Society of New Zealand **21**(2): 83-100.

Plastic litter and debris of all kinds is conspicuous on many contemporary shorelines, most frequently near populated and industrial centres, but also on remote and seldom-visited or uninhabited islands, including Raoul, Campbell and Auckland Islands. Pollution by plastics is aesthetically distasteful and unnecessary, and also creates a number of environmental problems: e.g. death and/or debilitation of wildlife through entanglement; blockages to the intestinal tract through ingestion leading to starvation and death, or ulceration of delicate tissues by jagged fragments; reduction in quality of life and reproductive performance. Larger items may also hazard shipping. An encrusting pseudoplanktic biota, similar to that found on floating Sargassum and other seaweeds has been recognised on drift plastics. Alien species, rafted on drifting plastic, could endanger the flora and fauna of protected and conservation island ecosystems. The sources of plastic pollution can be both distant (the truly 'oceanic' debris which has drifted from afar) and regional and local (e.g. shipping, fishing and recreational boating activities). Data compiled during a recent clean-up campaign on beaches of the inner Hauraki Gulf islands suggest that nearby land-based sources are also important. There is need to educate the public about the environmental problems arising from the indiscriminate disposal of plastics and other persistent synthetic compounds. It is unlikely that these problems can ever be solved by regulation, although, along with technological advances, that could alleviate them.

Gregory, M. R. (1999). "Plastics and South Pacific Island Shores: Environmental Implications." Ocean & Coastal Management **42**(6): 603.

Findings from recent studies on many of the islands of the South Pacific have indicated that waste plastics are a major pollutant of shorelines, and nearby coastal and oceanic waters. Several different environmental impacts from this type of waste plastic pollution are described, including death and debilitation of wildlife associated with entanglement or ingestion of plastic materials, reductions in reproductive performance, and hazards to shipping. In addition, waste plastics may serve as a vector for the introduction of alien taxa. Aesthetic impacts of these types of waste materials are also described. Most of these problematic plastic wastes are derived from the indiscriminate disposal of wastes by vessels at sea. Potential urban sources of these highly problematic wastes are also identified.

Greiner, A. D. and M. B. Timmons (1998). "Evaluation of the nitrification rates of microbead and trickling filters in an intensive recirculating tilapia production facility." Aquacultural Engineering **18**(3): 189-200.

Downflow floating polystyrene bead (micro-bead) and trickling media biofilters were tested simultaneously using common influent water from a 53 msuperscript 3 fish rearing tank stocked with tilapia (Oreochromis Nilotica x Aurea) at a density of 168 kg/msuperscript 3. The physical characteristics of the 2 bio-filter media used were: 1.0 mm diameter polystyrene spheres with a density of 16 kg/msuperscript 3 and specific surface area 3936 msuperscript 2/msuperscript 3 (referred to as micro-beads); and 5.1 cm diameter polyethylene packing material (Norpak) with specific surface area 164 msuperscript 2/msuperscript 3. Nitrification rates increased linearly with influent total ammonia nitrogen (TAN) concentrations up to a concentration of 2.5 mg/litre for both the micro-bead and trickling filters. There was no further increase in nitrification rate above 2.5 mg/litre that was statistically significant. The trickling filter had a specific nitrification rate 7.5 times higher than the micro-bead filter, although volumetric nitrification rates were 3.2 times greater for the micro-beads than the trickling filter. The study failed to show any relationship for either type of filter between the hydraulic loading rate and the nitrification rate at hydraulic loading rates between 469 and 1231 msuperscript 3/msuperscript 2 per day.

Greiner, J., et al. (2011). "The mutated region of cytoplasmatic nucleophosmine 1 (NPM1) elicits both CD4+ and CD8+ T cell responses." Blood. Conference: 53rd Annual Meeting of the American Society of

Hematology, ASH **118**(21).
Introduction: In AML, mutations in the nucleophosmin (NPM1) gene are one of the most frequent molecular alterations and predominantly occur in AML with normal cytogenetics. Patients with NPM1 mutation without FLT3-ITD mutation show a favourable prognosis of their disease. The functional role of mutated NPM1 for the improved clinical outcome is under evaluation. Immune responses might be involved in the clinical outcome of the disease. In this work, we demonstrate both CD4+ and CD8+ T cell responses against the mutated region of NPM1. Method(s): The entire amino acid sequences of the NPM1 wild type protein as well as of the mutated cytoplasmic NPM1 types A, B, C and D were screened for HLA-A*0201 binding T cell epitopes using the algorithms of the SYFPEITHI, the Rankpep and the HLA-Bind software programs. Ten peptides with most favourable characteristics were subjected to ELISpot analysis for interferon-gamma and granzyme B in 22 healthy volunteers and 27 AML patients to test specific T cell responses of CD8+ T cells. Tetramer assays against the two most interesting epitopes have been performed and chromium release assays have been used to show the cytotoxicity of peptide-specific T cells to lyse T2 cells and leukemic blasts. Moreover, HLA-DR binding epitopes were screened in algorithmic analysis and HLA-DR*0701 binding peptides were exploited to stimulate CD4+ T cells. In the presence of overlapping peptide stimulated CD4+ T cells, NPM1-A specific CD8+ T cells revealed augmented interferon-gamma and granzyme B secretion and up-regulation of intracellular interferon-gamma. CD4+, CD4-CD8+, CD4-CD8- cell fractions were separated from PBMCs of HLA-A2+DR*0701+ healthy volunteers using a combination of CD4 and CD8 MicroBeads. Result(s): Two epitopes (P3 and P9) derived from the NPM1-mutated protein showed specific T cell responses in healthy volunteers and AML patients. In NPM1-mutated AML patients 33% showed immune responses of CD8+ T cells against peptide P3 and 42% against peptide P9. Specific lysis was detected in chromium release assays NPM1 peptide-primed effector T cells generated from NPM1-mutated AML patients. Tetramer assays showed peptide-specific T cells. To obtain a robust and effective immune response against tumor cells, the activation of CD4 + helper T cells is crucial. Thus NPM1-peptide-A overlapping MHC class II epitopes were searched by primary structure analysis program. Based on plenary search, eight favourable overlapping peptides OL 1-8 were synthesized and exploited for CD4+ T cell stimulation. In granzyme B ELISPOT assay, OL8 co-pulsed NPM1-A CD8+ T cells indicated notable S.I., in contrast other OL1-7 disabled to increase granzyme B secretion. To ensure that Th1 cytokine secretion, under the condition of CD8+ and CD4+ T cells mixed culture, was resulted from NPM1-A CD8+ T cells but not HLA-DR epitope stimulated CD4+ T cells activation, HLA-A2 blocking effect was confirmed in ELISPOT assay. NPM1-A CD8+ T cells co-pulsed with OL6, 7 and 8 showed lesser interferon-gamma secretion after HLA-A2 blocking antibody exposure as 73, 35 and 57%. Of note, 83-94% of granzyme B secretion levels were reduced by HLA-A2 blockade administration, and by which NPM1-A CD8+ T cells seemed to be the most probable IFN-gamma and granzyme B producers and CD4+ T cells to interfere with CD8+ T cells. Conclusion(s): Taken together, mutated NPM1 is a promising target structure for specific immunotherapies in AML patients.

Grencikova, A., et al. (2018). "Microplastics as contaminants - scope, fate, and environmental impacts." Interdisciplinary Toxicology **11 (1)**: 72.
Microplastics represent emerging pollutants of global importance. They are small enough to be ingested by a wide range of organisms and at nano-scale, they may cross some biological barriers. As well as microplastics, chemical additives added to plastics during manufacture which may leach out upon ingestion, can enter food chains and potentially cause humans serious health problems. In this article, we discuss the sources of plastic microparticles, summarize

known informations about their behaviour at wastewater treatment plants and potential impacts of microplastics in the environment.

Grenvall, C., et al. (2015). "Concurrent Isolation of Lymphocytes and Granulocytes Using Prefocused Free Flow Acoustophoresis." Analytical Chemistry **87**(11): 5596.

Microchip-based free flow acoustophoresis (FFA) in combination with two-dimensional cell prefocusing enables concurrent multiple target outlet fractionation of leukocytes into subpopulations (lymphocytes, monocytes, and granulocytes); we report on this method here. We also observed significantly increased accuracy in size-based fractionation of microbeads as compared to previously presented FFA multiple outlet systems. Fluorescence microscopy illustrates the importance of two-dimensional prefocusing where a sample mixture of 3, 7, and 10 μ beads are separated into well-confined particle streams and collected in their respective target outlets. Flow cytometry data for lymphocytes and granulocytes, respectively, in their corresponding outlets verify concurrent isolation of leukocyte subpopulations with high purity (95.2 ± 0.6% and 98.5 ± 0.7%) and high recovery (86.5 ± 10.9% and 68.4 ± 10.6%). A relatively low purity and high recovery of monocytes (25.2% ± 5.4% and 83.1 ± 4.3%) was obtained in the third target outlet. No subpopulation bias was observed. These data demonstrate an unprecedented separation of leukocyte subpopulations at flow rates of ~100 μL/min and ~1 M cells/mL sample concentrations, not previously reported in acoustofluidic systems. Two-dimensional prefocusing FFA with multiple target outlets is a viable alternative to current methods for particle fractionation and cell isolation, requiring a minimum of sample preparation and lowering analysis time and cost.

Grenzi, P. C., et al. (2012). "Post-transplant anti-mica antibodies and kidney graft outcome." Transplantation **10S)**: 1159.

The aim of the study was to investigate the association between the presence of post-transplant MICA antibodies (Ab) and graft loss due to chronic allograft nephropathy (CAN). The study was conducted in a cohort of 511 first kidney graft (TX) recipients (R) transplanted in our center and with a functional graft for at least three years at the time of inclusion in the study. Two hundred Tx were with deceased donors, and 311 were with living donors. Two serum samples were collected for determination of the presence of MICA Ab: the first was collected at the beginning of the study and the second one was collected at least three years thereafter (second serum samples were collected from 362 of the 381 patients surviving with the graft). MICA Ab were determined by Luminex microbeads technology using the kit LABScreen Mixed (One Lambda). Some samples (248/511) were tested in parallel with the kit Lifecodes Single Antigen - LSATM-MIC (Gen-Probe). Curves of graft loss due to chronic allograft nephropathy (CAN) were calculated with the Kaplan-Meier method and compared with the log-rank test. Result(s): MICA Ab were detected in 10.5% and 11.3% of the first and the second serum samples, respectively. Only 8% of the R changed Ab status between the two samples collected with a minimum interval of three years: 4.4% turned positive and 3.6% turned negative. The comparison of the results obtained with the 246 sera tested with both commercial kits showed concordance in 77.2% of the sera; 2.8% and 19.9% of the sera were positive only when tested with the One Lambda and the Gen-Probe kits, respectively. Minimum follow-up of the recipients after the first Ab determination was 6.13 years. The presence of MICA antibodies was not associated with CAN-associated graft loss, considering the results obtained with any of the kits utilized for detection of MICA Ab, and also considering separately transplants of kidneys from living anddeceased donors. In conclusion, this study does not provide evidence for a relationship between the presence of post-transplant MICA antibody and graft loss due to CAN. It remains to

be tested whether different results would be obtained considering only donor specific anti-MICA antibodies.

Greve, G., et al. (2017). "Preferential in vitro and in vivo induction of endogenous retrovirus transcription from A monoallelic chromosome 7Q in Decitabine (DAC) Treated AML Blasts." Blood. Conference: 59th Annual Meeting of the American Society of Hematology, ASH **130**(Supplement 1).

Background: Hypomethylating agents (HMAs) show an encouraging but not yet well-understood activity in AML/MDS patients (pts) with adverse cytogenetics, such as-7/7q-, often embedded in A complex, monosomal karyotype (Lubbert et al., Haematologica 2012). Integrative methylome/transcriptome studies have provided evidence for aberrant hypermethylation/silencing on monoallelic gene loci, including tumor suppressor genes (TSGs, Kotini et al., Nat. Biotechnol. 2015). Recently, an alternative mechanism of HMA action was described (Roulois et al., Chiappinelli et. al, Cell 2015): induction of silenced endogenous retroviral (ERV) dsRNA transcription, resulting in activation of an interferon-mediated, antitumor immune response (", viral mimicry",). To unravel in vivo HMA activity in different (cyto)genetic backgrounds, we hypothesized that in AML haploinsufficient for 7q, transcriptional repression of monoallelic genes in this region may be preferentially reversed by HMA treatment. Material(s) and Method(s): For identification of genes induced by HMAs, two AML cell lines were selected, ELF-153 (ELF) and UCSD-AML1 (AML1): copy number variations were analyzed by Genome-Wide Human SNP Array 6.0 (Affymetrix), and revealed no monosomies but loss of 7p, in AML1 loss of one entire chromosome 7 was the only numerical aberration. Cells were treated with DAC at equitoxic and-effective concentrations for 4 days, harvested on day 5. Total RNA was depleted of ribosomal RNA (Ribo-Zero rRNA Removal Kit, Illumina) and cDNA libraries (strand-specific, 50 bp) were sequenced with >=, 33 million paired-end reads, read quality checked with FastQC (>=, 95% > Q30). Alignment to the reference genome hg19 was performed with TopHat2, read-counting with HTseq, differential expression testing with DESeq2 (protein-coding transcripts only). Selected target genes were validated by RT-qPCR. Peripheral blood mononuclear cells (PBMC) were collected from 9 AML pts (5 pts with 7q-, 4 cytogenetically normal [CN] pts) treated with DAC (i.v. 20 mg/m² for 5 days) within the DECIDER trial (NCT00867672). Leukemic blasts before treatment and at day 8 were isolated using automatic magnetic sorting of cells labeled with anti-human CD34 and CD117 MACS microbeads. Result(s): DAC treatment of AML1 and ELF cells resulted in massive transcriptome changes in both cell lines, with 1,704 genes induced in AML1 (total of 3,583) and 1,206 in ELF (total of 1,867, adjusted FDR < 0.01). Comparing DAC-induced expression changes only of genes on 7q, we identified 43 genes significantly differentially expressed only in AML1 cells (up: 15), 24 only in ELF (up: 21), and 19 in both (up: 12). The 15 genes on 7 q that were selectively upregulated in AML1 included 3 with TSG features: zyxin (ZYX, up 6.0-fold) homeodomain interacting protein kinase 2 (HIPK2, up 3.8fold), and high mobility group box transcription factor 1 (HBP1, up 3.1-fold). However, the most heavily upregulated transcripts in AML1 were the endogenous retrovirus 3 group member 1 (ERV3-1, up 86.4-fold in AML1 vs 14.3-fold in ELF) and the neighboring zinc finger 117 (ZNF117, up 119.4-fold in AML1vs. 6.5-fold in ELF), both transcribed from the ERV3-1 promoter. ERV3-1 induction was accompanied by induction of the interferon type I response genes retinoic acid inducible gene I (RIG-I) and interferon regulatory factor 7 (IRF7) in both cell lines. Therefore, we next interrogated induction of these genes by DAC in vivo, utilizing serially sorted, matched primary AML blasts (purified before and 3 days after DAC administration). Stronger induction of ERV3-1 and RIG-I mRNA was seen in the 7q-pts compared to the CN pts: By qRT-PCR, median ERV3-1 and RIG-I expression was induced 1.5-and 1.4-fold, respectively, in the pts with 7q-(range: 1.1-2.1 and 1.0-3.2), 1.1-and 0.7-fold,

respectively, in the CN pts (range: 0.8-1.7 and 0.3-0.9). Conclusion(s): We successfully developed an unbiased RNA-seq approach of AML cell lines either mono-or bi-allelic for 7q, demonstrating that DAC treatment preferential upregulates several monoallelic TSGs, and massively activates the ERV3-1 gene (implicated in ", viral mimicry",). Induction of ERV3-1 and the dsRNA sensor RIG-I was validated in vivo, and preferentially seen in 7q-AML purified primary blasts. Thus, under clinically established treatment conditions, both the ERV and an interferon response gene can be activated by DAC, supporting A combination with immunotherapy.

Greven, A. C., et al. (2016). "Polycarbonate and polystyrene nanoplastic particles act as stressors to the innate immune system of fathead minnow (Pimephales promelas)." Environmental Toxicology and Chemistry **35**(12): 3093-3100.

Water pollution with large-scale and small-scale plastic litter is an area of growing concern. Macro-plastic litter is a well-known threat to aquatic wildlife; however, the effects of micro-sized and nano-sized plastic particles on the health of organisms are not well understood. Small-scale plastic particles can easily be ingested by various aquatic organisms and potentially interfere with their immune system; therefore, the authors used a freshwater fish species as a model organism for nanoplastic exposure. Characterization of polystyrene (41.0 nm) and polycarbonate (158.7 nm) nanoplastic particles (PSNPs and PCNPs, respectively) in plasma was performed, and the effects of PSNPs and PCNPs on the innate immune system of fathead minnow were investigated. In vitro effects of PSNPs and PCNPs on neutrophil function were determined using a battery of neutrophil function assays. Exposure of neutrophils to PSNPs or PCNPs caused significant increases in degranulation of primary granules and neutrophil extracellular trap release compared to a nontreated control, whereas oxidative burst was less affected. The present study outlines the stress response of the cellular component of fish innate immune system to polystyrene and polycarbonate nanoparticles/aggregates and indicates their potential to interfere with disease resistance in fish populations.

Grewe, P. H., et al. (2000). "Coronary morphologic findings after stent implantation." American Journal of Cardiology **85**(5): 554-558.

Clinical studies demonstrated a reduction of acute complications by high-pressure stenting. This study was performed to correlate the histomorphologic changes of the vessel wall after coronary stenting with stent expansion pressure. We studied the effects of intravital and postmortem stenting on coronary morphology in human hearts. Artifact-free analysis and morphometry of the artery segments' cross section was performed after plastic resin embedding and cutting and grinding sectioning. By comparing intra- and postmortem findings we demonstrated that postmortem stent implantation can serve as an adequate model to study the mechanical effects of coronary stenting. A consistent histologic feature was eccentric stent expansion. Larger calcified areas of the vessel wall were not deformed by implanted stents. The highest degree of vessel injury and deformation was apparent in anatomically "nondiseased" or only slightly fibrotic parts of the arterial wall. Dissections were predominantly located directly adjacent to calcified plaques and appeared as "half-moon"-like tears reaching into the arterial media. A statistically significant stent lumen gain was found when the implantation pressure was increased up to 15 atm. Stent symmetry was not influenced by the applied implantation pressure but depended mostly on local coronary morphology. Thus, increasing implantation pressures during coronary stenting seemed to improve the stenting result up to 15 atm. When applying histomorphologic criteria, the higher pressures (>15 atm) did not cause further optimization of stent expansion. Morphometric analysis of stents implanted postmortemly and intravitally revealed comparable results. Postmortem stenting seems to be an appropriate model for studying stent expansion and stenting results in human coronary arteries.

Griffioen, M., et al. (2006). "Detection and functional analysis of CD8+ T cells specific for PRAME: a target for T-cell therapy." Clinical Cancer Research **12**(10): 3130-3136.

PURPOSE: Preferentially expressed antigen on melanomas (PRAME) is an interesting antigen for T-cell therapy because it is frequently expressed in melanomas (95%) and other tumor types. Moreover, due to its role in oncogenic transformation, PRAME-negative tumor cells are not expected to easily arise and escape from T-cell immunity. The purpose of this study is to investigate the usefulness of PRAME as target for anticancer T-cell therapies.

EXPERIMENTAL DESIGN: HLA-A*0201-subtyped healthy individuals and advanced melanoma patients were screened for CD8+ T cells directed against previously identified HLA-A*0201-binding PRAME peptides by IFN-gamma enzyme-linked immunosorbent spot assays and tetramer staining. PRAME-specific T-cell clones were isolated and tested for recognition of melanoma and acute lymphoid leukemia (ALL) cell lines. PRAME mRNA expression was determined by quantitative real-time reverse transcription-PCR.

RESULTS: In 30% to 40% of healthy individuals and patients, PRA(100-108)-specific CD8+ T cells were detected both after in vitro stimulation and directly ex vivo after isolation by magnetic microbeads. Although CD45RA- memory PRA(100-108)-specific T cells were found in some individuals, the majority of PRA(100-108)-tetramer+ T cells expressed CD45RA, suggesting a naive phenotype. PRA(100-108)-tetramer+ T-cell clones were shown to recognize and lyse HLA-A*0201+ and PRAME+ melanoma but not ALL cell lines. Quantitative real-time reverse transcription-PCR showed significantly lower PRAME mRNA levels in ALL than in melanoma cell lines, suggesting that PRAME expression in ALL is below the recognition threshold of our PRA(100-108)-tetramer+ T cells.

CONCLUSION: These data support the usefulness of PRAME and in particular the PRA(100-108) epitope as target for T-cell therapy of PRAME-overexpressing cancers.

Grigorakis, S. and K. G. Drouillard (2018). "Effect of Microplastic Amendment to Food on Diet Assimilation Efficiencies of PCBs by Fish." Environmental Science & Technology **52**(18): 10796.

Diet assimilation efficiencies (AEs) of polychlorinated biphenyls (PCBs) absorbed to microplastics and food were determined in goldfish (Carassius auratus). Microplastics were spiked with 14 environmentally rare PCBs and incorporated into fish pellets previously spiked with a technical PCB mixture (Aroclor 1254). Five diet treatments were created having microplastic contents of 0, 5, 10, 15, 20, and 25% and fed to fish within 24 h of the diet creation. Fish from each treatment were fed a microplastic amended food pellet and PCB AEs were determined by mass balance. Microplastic-associated PCBs had lower AEs (geomean 13.36%) compared to food matrix-associated PCBs (geomean 51.64%). There were interactions between PCB AEs and the microplastic content of the diet. PCBs affiliated with microplastics became more bioavailable with increasing microplastic content of food while food matrix-associated PCB bioavailability declined when microplastic contents exceeded 5%. Despite controlling for microplastic-food contact time, there was some evidence for redistribution of lower KOW food matrix-associated PCBs onto microplastics causing a decrease in their AE relative to nonplastic and low plastic containing diets. The low bioavailability of microplastic-associated PCBs observed in the present study provides further support to indicate that microplastics are unlikely to increase POPs bioaccumulation by fish in aquatic systems.

Grigorakis, S., et al. (2017). "Determination of the gut retention of plastic microbeads and microfibers in goldfish (Carassius auratus)." Chemosphere **169**: 233-238.

Microplastics are ubiquitous pollutants in aquatic habitats and commonly found in the gut contents of fish yet relatively little is known about the retention of these particles by fish. In this study, goldfish were fed a commercial fish food pellet amended with 50 particles of one of two microplastics types, microbeads and microfibers. Microbeads were obtained from a commercial facial cleanser while microfibers were obtained from washed synthetic textile. Following consumption of the amended pellet, fish were allowed to feed to satiation on non-amended food followed by fasting for periods ranging from 1.5 h to 6 days. Fish sacrificed at different time points were dissected to remove gut contents and the digesta contents retention and microplastic retention was determined. Although a small number of microplastic particles were retained in fish GI-tracts after 6 days (0-3 particles/50), the retention of microplastics was generally similar to the retention of bulk digesta contents. According to a breakpoint regression model fitted to digesta contents and microplastic particles, the 50% and 90% evacuation times were 10 h and 33.4 h, respectively. The results of this study indicate that neither microbeads nor microfibers are likely to accumulate within the gut contents of fish over successive meals.

Grissom, P., et al. (2013). "Microtubule-binding peptides from the long, kinetochore-associated protein, CENP-F." Molecular Biology of the Cell. Conference: Annual Meeting of the American Society for Cell Biology, ASCB **24**(24).

We have identified CENP-F as a kinetochore protein that binds better to curling oligomers of tubulin, e.g., those at the ends of kinetochore-associated microtubules (MTs), than to tubulin in the straight protofilaments characteristic of a taxol-stabilized MT. C-DNAs that encode parts of CENP-F have been expressed in bacteria and the resulting polypeptides examined for tubulin curl- and MT-binding properties. N-terminal segments of CENP-F bind better to curls than MTs, while the C-terminal region of the protein prefers MTs. Sucrose gradient sedimentation and gel filtration chromatography of a 68 kDa polypeptide from CENP-F's N-terminus (N3) indicate that this "protein" is an elongate dimer in solution and that it does not bind soluble tubulin. Electron microscopy of N3 shows a flexible rod, 45.1 +/- 4.8 nm long, which is shorter than the summed lengths of the 3 segments in N3 that are predicted by amino acid sequence to be alpha-helical coiled coils; apparently this protein is folded. Pull-downs of N3 by different amounts of tubulin in either MTs or curls suggest saturable binding with dissociation constants of 155 and 94 nM, respectively. Electron microscopy of N3 interacting with rings of tubulin induced by Dolostatin 10 have not revealed an obvious binding site, but cross-linking studies, using disuccinamidyl suberate (DSS), indicate that N3 binds tubulin on a surface that would be masked by adjacent protofilaments in a MT wall but exposed on a curling protofilament. Both N3 and a ~60 kDa fragment from CENP-F's Cterminus (C10s) will follow the ends of depolymerizing MTs in vitro. Microbeads coated with C10s show processive movement and do not affect the rate of MT shortening compared with control MTs depolymerizing in the absence of added proteins; beads coated with N3 accelerate MT shortening, suggesting that they roll and may gather up tubulin protofilaments as they peel back from the MT wall. The implications of these findings for the role(s) CENP-F may play in mitosis will be discussed.

Gross, M. (2015). "Oceans of plastic waste." Current Biology **25**(3): 93-96.

Plastic waste accumulates in the oceans and eventually breaks down to small particles known as microplastics. These can be taken up by hundreds of different species, but research is only beginning to explore their effects on organisms and their fate in the food web.

Gross, S. J., et al. (2011). "Rapid and novel prenatal molecular assay for detecting aneuploidies and microdeletion syndromes." Prenatal Diagnosis **31**(3): 259-266.

OBJECTIVES: To develop a targeted aneuploidy and microdeletion detection platform for use in the prenatal setting, to assess the integrity of the platform with a robust validation system, and to prospectively determine the performance of the platform under routine clinical conditions.

METHODS: To generate proxies for the various disorders assessed by the assay for analytical validation purposes, cells from ten microdeletion syndromes as well as from common aneuploidies were spiked into cleared amniotic fluid. Genomic DNA was isolated, labeled, and hybridized to microbeads that have been coupled to DNA derived from Bacterial Artificial Chromosome (BAC) from the relevant regions targeted by the array. Beads were read using a flow cytometric multiplex bead array detection system. In the prospective part of the study, 104 amniotic fluid samples were collected and analyzed.

RESULTS: All microdeletion syndromes and aneuploidies were validated in a blinded fashion. In the prospective study, the total number of readable samples was 101 of 104 (97%). All sample results were confirmed independently.

CONCLUSION: The bead array approach is a rapid and reliable test for detecting aneuploidies and microdeletions. This assay has the potential to provide the benefit of expanded molecular cytogenetic testing to pregnant women undergoing invasive prenatal diagnosis. This approach may be especially useful in parts of the world where cytogenetic personnel and facilities may be limited.

Grossmann, K., et al. (2014). "Simple detection of celiac-disease specific antibodies and total IgA in one reaction environment." Clinical Chemistry and Laboratory Medicine **52 (11)**: eA140.

The novel CytoBead CeliAK assay allows the simultaneous analysis of endomysial IgA-antibodies (EmA), anti-tissue transglutaminase enzyme (tTG)-and anti-deamidated gliadin peptide (DGP) IgA-antibodies as well as the determination of total IgA in one well. The assay runs on glass slides with tripartite wells, left: two different microbeads (MP) coated with tTG or DGP, middle: monkey esophagus, and right: MP coated with anti-IgA. The assay was assessed visually and by AKLIDES. Overall, sera of 377 patients and controls (155 celiac disease (CD), 5 IgA-deficient, 127 with other diseases, 90 blood donors) were run. Each CD patient was positive for at least one of anti-tTG, anti-DGP or EmA resulting in diagnostic sensitivity of 100%. All IgA-deficient patients were IgA negative. Diagnostic specificity for anti-tTG, anti-DGP, and EmA was 100%, 93.3%, and 100%, respectively. By automated evaluation, the diagnostic sensitivity for anti-tTG and anti-DGP was 97.4% and 88.3%, respectively and the diagnostic specificity within the blood donor group 100% and 97.8%, respectively. Routine anti-tTG ELISA and anti-DGP ELISA showed a diagnostic sensitivity of 99.4% and 77.9%, respectively, whereas the diagnostic specificity using the blood donor group was 97.7% and 95.5%, respectively. Thus, the novel assay provides the unique opportunity to detect CD-specific antibodies and exclude IgA-deficiency simultaneously and shows excellent diagnostic sensitivity and specificity.

Grossmann, K., et al. (2014). "A novel cytobead immunoassay for simultaneous detection of celiac-disease specific antibodies and total IgA." Clinical Chemistry and Laboratory Medicine **1)**: S283.

BACKGROUND: The novel CytoBead CeliAK assay allows the simultaneous analysis of endomysial IgA-antibodies (EmA), anti-tissue transglutaminase enzyme (tTG)-and anti-deamidated gliadin peptide (DGP) IgA-antibodies as well as the determination of total IgA in one reaction environment. METHOD(S): The assay runs on glass slides with tripartite wells, left: two different microbead populations (MP) coated with tTG or DGP, middle: monkey esophagus, and right: MP coated with anti-IgA. The assay was interpreted visually by conventional fluorescence microscope and by the digital imaging platform AKLIDES. Overall, sera of 377 patients and controls (155 celiac disease (CD) patients, 5 IgA-deficient patients, 127 patients with other

diseases, 90 blood donors) were run. RESULT(S): By visual evaluation, positivity of anti-tTG, anti-DGP, EmA, and total IgA in the CD patient group was 99.4%, 91%, 98%, and 100%, respectively. Altogether, each CD patient serum exhibited at least one positive result for anti-tTG, anti-DGP or EmA resulting in diagnostic sensitivity of 100%. All IgA-deficient patients were classified correctly as IgA negative. The diagnostic specificity using blood donors as control group for anti-tTG, anti-DGP, and EmA was 100%, 93.3%, and 100%, respectively. By automated evaluation with AKLIDES, the diagnostic sensitivity for anti-tTG and anti-DGP was 97.4% and 88.3%, respectively and the diagnostic specificity within the blood donor group 100% and 97.8%, respectively. Routine anti-tTG ELISA and anti-DGP ELISA showed a diagnostic sensitivity of 99.4% and 77.9%, respectively, whereas the diagnostic specificity using the blood donor group was 97.7% and 95.5%, respectively. CONCLUSION(S): Thus, the novel assay provides the unique opportunity to detect CD-specific antibodies and exclude IgA-deficiency simultaneously and shows excellent diagnostic sensitivity and specificity.

Grossmann, K., et al. (2011). "Multiplex assessment of non-organ-specific autoantibodies with a novel microbead-based immunoassay." Cytometry Part A: The Journal of the International Society for Analytical Cytology **79**(2): 118-125.

Advances in immunofluorescence assay development paved the way for the simultaneous detection of several antibodies in one sample, for the serological diagnosis of systemic rheumatic diseases. Standardized automated screening of such antibodies can be achieved by HEp-2 cell-based indirect immunofluorescence (IIF) using a multicolor fluorescence imaging technical platform. To create a common platform for both screening and specific antibody assessment, multiplex measurement of antibodies using fluorescence-coded immobilized microbeads was employed on the same platform. The multicolor fluorescence detection system VideoScan (AKLIDES) was used for the fluorescence analysis of a multiplex microbead-based immunoassay (MIA). First, immunoglobulin G (IgG) was covalently coupled to one microbead population in duplicate and in three independent experiments. The coupled IgG was detected by a CyTM5-conjugated secondary antibody. Thus, intra- and interassay coefficients of variation (CV) were obtained. Second, a multiplex determination of antinuclear autoantibodies (ANA) to Scl-70, Sm, dsDNA, SS-A (Ro60), CENP-B, and La/SS-B by solid-phase MIA was investigated, using 72 sera from patients with autoimmune diseases such as systemic lupus erythematosus and systemic sclerosis (SS). The reproducibility study revealed intra-assay CVs ranging from 3.2% to 9.9%, and interassay CVs ranging from 9.6% to 14.7%. The detection of Scl-70-, Sm-, CENP-B-, and La/SS-B-ANA with MIA showed very good agreement with the ELISA results (kappa = 1.0). The resulting relative sensitivities and specificities for Scl-70-, Sm-, CENP-B-, dsDNA-, and La/SS-B-ANA were 100%, respectively, with the exception of dsDNA (specificity 97%). Multiplex detection by immobilized fluorescence-coded microbeads using multicolor fluorescence is a reliable method for the assessment of rheumatic-disease-specific antibodies. Multicolor fluorescence analyses with pattern detection algorithms provide a common platform technique for both the screening of ANA by cell-based IIF and specific antibody assessment by multiplex detection.

Gruber, H. E., et al. (1997). "Human intervertebral disc cells from the annulus: three-dimensional culture in agarose or alginate and responsiveness to TGF-beta1." Experimental Cell Research **235**(1): 13-21.

Cell culture procedures were developed for use with surgical and normal control specimens of the annulus of the human intervertebral disc. Cells were established in monolayer explant culture and seeded into three-dimensional growth environments of alginate or agarose; under these growth conditions cells assumed a rounded phenotype and formed colonies. A novel

method of layering suspensions of cells onto cell well inserts proved technically much easier than the microbead culture method. Immunohistochemistry was utilized to demonstrate in vitro production of the following extracellular matrix components: types I, II, III, and VI collagen, 4-S-chondroitin sulfate, and keratan sulfate. Young and old age- and gender-matched cells grown in the presence of TGF-beta1 showed significant enhancement of proliferation after 4 days of exposure to TGF-beta with a lessened mitogenic response present after 10 days. Molecular studies of proteoglycan gene expression showed that at 4 days young normal cells had increased biglycan, but not decorin, message levels. Decorin expression was unchanged at Day 4 and decreased or shut off by Day 10.

Grundy, S., et al. (2012). "Microarray analysis of COPD pulmonary CD8 cells." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **185**(MeetingAbstracts).

Rationale CD8 cells numbers are increased in the lungs of patients with Chronic Obstructive Pulmonary Disease (COPD). Relatively little is understood about the function of these cells. It is hypothesised that there is an autoimmune component to COPD. In other autoimmune diseases down regulation of the T cell receptor (TCR) has been documented leading to T cell dysfunction. Our aim was to study the gene expression profile of TCR and associated signalling genes within CD8 cells in COPD. Methods Pulmonary CD8 cells were isolated from explanted lung distal from tumour of patients with COPD and control smokers with normal lung function undergoing surgery for lung cancer. CD8 cells were positively selected from enriched lymphocytes using magnetic microbeads (Miltenyi) and RNA extracted. Paired circulating CD8 cells were isolated from COPD PBMCs using magnetic microbeads . RNA from circulating and pulmonary CD8 cells was analysed using affymetrix human genome u133 plus 2.0 array. The regulation of the components of the TCR and its downstream signalling molecules were studied in circulating and pulmonary CD8 cells in COPD and pulmonary CD8 cells in controls. Results CD8 cells were obtained from 6 patients with COPD (Mean FEV<inf>1</inf> 57% predicted) and 6 smokers (Mean FEV<inf>1</inf> 89% predicted). The purity of pulmonary CD8s was >89% and circulating CD8s cells >93%. Principal Component Analysis revealed no differences between COPD and control pulmonary CD8 cells. There were significant differences between pulmonary and circulating CD8 cells in COPD. Taking a cut off of fold change >1.5 and q value <0.05, 6 TCR component genes were down-regulated in pulmonary CD8 cells compared to circulating CD8 cells in COPD (Table 1). Furthermore, 6 downstream signalling molecules were differentially regulated between pulmonary and circulating CD8 cells. The important effector cytokines interleukin-2 and interferon-gamma were significantly up-regulated in pulmonary CD8 cells. Conclusions The lack of difference between disease and control pulmonary CD8s suggests that the development of COPD does not alter the pulmonary CD8 phenotype in smokers. However, this study may be underpowered to detect such disease specific differences. There were differences between circulating and pulmonary CD8 cells, indicating that smokers have a specific phenotype of CD8 cells within the lungs; There is down-regulation of TCR in pulmonary CD8 cells. This has been associated with T cell dysfunction in other autoimmune diseases. The up-regulation of effector cytokines suggests there may be non-TCR dependent activation contributing to the behaviour of pulmonary CD8 cells in COPD. (Table Presented).

Gruner, M., et al. (2014). "Increased proteasome activator 28 gamma (PA28gamma) levels are unspecific but correlate with disease activity in rheumatoid arthritis." BMC Musculoskeletal Disorders **15**: 414.

BACKGROUND: PA28gamma (also known as Ki, REG gamma, PMSE3), a member of the ubiquitin-and ATP-independent proteasome activator family 11S, has been proved to show proteasome-dependent and -independent effects on several proteins including tumor suppressor p53, cyclin-dependent kinase inhibitor p21 and steroid receptor co-activator 3 (SCR-3). Interestingly, PA28gamma is overexpressed in pathological tissue of various cancers affecting e. g. breast, bowl and thyroids. Furthermore, anti-PA28gamma autoantibodies have been linked to several autoimmune disorders. The aim of this study was to develop and evaluate a novel and sensitive PA28gamma sandwich ELISA for the quantification of PA28gamma serum levels in patients with cancer and autoimmune diseases for diagnostic and prognostic purposes.

METHODS: PA28gamma-specific polyclonal antibodies and recombinant His-tagged PA28gamma were purified and used to develop a sandwich ELISA for the detection of circulating PA28gamma. With this new assay, PA28gamma serum levels of patients with various cancers, rheumatoid arthritis (RA), Sjogren's syndrome (SS), adult-onset Still's disease (AOSD) and different connective-tissue diseases (CTD) were compared with healthy control subjects. Anti-PA28gamma autoantibodies were additionally confirmed using a newly developed microbead assay.

RESULTS: The developed PA28gamma sandwich ELISA showed a high specificity with a detection limit of 3 ng/ml. A significant up-regulation of circulating PA28gamma was detected in the sera of patients with cancer, RA, SS and CTD. A significant correlation was observed dependent on age as well as anti-PA28gamma autoantibody levels with circulating PA28gamma protein levels. Furthermore, PA28gamma serum levels showed a correlation with disease activity in patients with RA under treatment with the T-cell directed biological compound abatacept according to disease activity score 28 (DAS28) and erythrocyte sedimentation rate (ESR).

CONCLUSION: The application of PA28gamma as a novel biomarker for diagnostic purposes of a specific disease is limited, since elevated levels were observed in different disorders. However, the correlation with disease activity in patients with RA suggests a prognostic value, which needs to be addressed by further studies. Therefore our results show that PA28gamma is a useful marker which should be included in studies related to novel treatments, e.g. abatacept.

Gryshkov, O., et al. (2013). "111 Cryopreservation of stem cells inside alginate 3D constructs after high-voltage encapsulation." Cryobiology **67**(3): 429.

Application of stem cells in regenerative medicine require improving cryopreservation protocols for long term storage, especially for tissue-imitating 3D constructs containing cells. Encapsulation of stem cells into alginate-based 3D constructs that repeat an extracellular matrix may provide a mild environment during cryopreservation as well as the possibility for large-scale expansion. Furthermore, smaller alginate micro-beads 3 mu m offer additional advantages over larger ones due to higher specific surface area, less water content and improved heat and mass transfer. The gel-like structure and mild environment inside alginate micro-beads may affect the metabolic activity of encapsulated cells post-cryopreservation. The effects of high voltages, alginate encapsulation and pre-incubation time on morphology, viability and proliferation of MSCs post-cryopreservation were evaluated. Mesenchymal Stem Cells derived from the Common marmoset monkey Callithrix jacchus (MSC) were encapsulated into 1.5% (w/v) sterile medium viscosity unmodified alginate (Sigma Aldrich, filter-sterilized using 0.8-0.45-0.22mm filter set) with a concentration 1*106cells per ml of alginate using electro-spraying method. Final alginate micro-beads were obtained with less then 300 mu m in diameter under the next process parameters: applied voltages 15, 20 and 25kV, spraying distance 10cm, and alginate flow rate 10ml/h. As a negative control to high voltages, the air flow encapsulation was run in parallel. Micro-beads (0.5ml) containing MSCs (0.5*106cells) were either immediately frozen after encapsulation (0h) or cultured overnight prior to cryopreservation (24h). Cryopreservation was conducted with 1 degree C/min cooling rate down to -80 degree C with 10% Me2SO (v/v) as a cryoprotective agent. After 24h of storage at low temperatures micro-beads were thawed at 37 degree C with further removing of alginate using 55mM sodium citrate for 2min with gentle shaking. Then MSCs were either seeded for MTT test at 104cells/well immediately after thawing (protocol from manufacturer) or cultured for 5days followed by MTT assay. Membrane integrity of encapsulated cells before cryopreservation and after thawing was evaluated by Trypan Blue exclusion method. Metabolic activity and proliferation efficiency of MSCs were evaluated using MTT Nonradioactive Proliferation Assay (CellTiter 96, Promega, USA). The MTT data were normalized on respective control groups. The one-way ANOVA was run for statistical analysis of obtained results. MSCs can be encapsulated into alginate micro-beads with desired concentration and without significant changes in viability and metabolic activity post-encapsulation. MSCs showed normal morphology, attached and proliferated well after thawing. The incubation of MSCs inside alginate micro-beads prior to cryopreservation resulted in lower proliferation rate as compared to immediately frozen (18 plus or minus 6% and 45 plus or minus 8% in respect to native control) and at the same rate as frozen control. The same behavior was observed for re-passage efficiency of encapsulated and frozen MSCs. However, immediately frozen cells after encapsulation recovered at the same rate as native control, indicating an effectiveness of cell cryopreservation inside alginate micro-beads. This study shows an importance of cell cryopreservation inside unmodified alginate directly after encapsulation. Due to toxic effect of Me2SO, cryopreservation of MSCs inside alginate 3D structures using other less toxic CPAs will be conducted. Source of funding: This work is supported by funding from the Cluster of Excellence REBIRTH (DFG EXC 62/1). Conflict of interest: None declared. gryshkovmp.uni-hannover.de

Gu, H., et al. (2016). "Reproducible magnetic carbon nanocomposites derived from polystyrene with superior tetrabromobisphenol A adsorption performance." Journal of materials chemistry. A, Materials for energy and sustainability **4**(26): 10174-10185.

Easily reproducible magnetic carbon nanoadsorbents (MPSNs) derived from polystyrene (PS) by direct calcination of functionalized PS with an iron salt are employed for effective tetrabromobisphenol A (TBBPA) adsorption. Batch adsorption tests indicate that MPSNs exhibited high adsorption affinity to aqueous TBBPA with a maximum adsorption capacity of 117.00 mg g super(-1). The TBBPA adsorption kinetics of MPSNs are found to obey the pseudo-second-order behavior with a calculated room temperature initial adsorption rate of 42.871 mg g super(-1) min super(-1) for the solution with an initial TBBPA concentration of 4.0 mg L super(-1) and pH value of 8.0. Monolayer adsorption of the Langmuir isotherm model is well fitted rather than the multilayer adsorption of the Freundlich isotherm model. The calculated thermodynamic parameters suggest that the TBBPA adsorption on MPSNs is spontaneous and exothermic. The optimal pH value for TBBPA adsorption on MPSNs is around 8.0 with an MPSNs dose of 30.0 mg L super(-1) and contact time of 30 min under sonication at 298 K. The TBBPA adsorption performance of MPSNs is strongly influenced by the presence of humic acid. The prepared MPSN retains around 85.5% of TBBPA adsorption capacity after 5 cycles and exhibits good reusability. The explored adsorption mechanism by Raman and Fourier transform infrared (FT-IR) spectroscopy suggests that the C-O-Fe bond in the MPSN is responsible for the superior TBBPA adsorption performance. This work provides promising magnetic adsorbents for TBBPA wastewater treatment as well as a new strategy to recycle and reuse polymer plastic waste.

Gu, J., et al. (2013). "Adsorption and Recognition Performance of Lead Ion-imprinted Micro-beads." Journal of Tongji University. Natural Science **41**(10): 1507-1512.

As to the problem of the heavy metal pollution in the water environment and the wastewater treatment, a lead ion-imprinted micro-beads, with two functional monomers 1, 12-dodecanediol-o,o'- diphenyl- phosphonic acid(DDDPA) and 4- vinylpyridine, were synthesized. Its adsorption and recognition performance were investigated. The lead ion-imprinted micro-beads were efficient for lead ions removal from the aqueous solutions in a broad pH range (pH> 5). In the presence of competitive ions Zn super(2+), Co super(2+), Ni super(2+), it shows a high selectivity for lead ions. The selectivity coefficient of Pb super(2+)/Zn super(2+), Pb super(2+)/Co super(2+) and Pb super(2+)/Ni super(2+)are 86.6, 53.0 and 46.5, respectively. Meanwhile it shows a certain adsorption capacity for Cr super(3+) and Cu super(2+), the selectivity coefficient of Pb super(2+)/Cr super(2+) and Pb super(2+)/ Cu super(2+)are 20.8 and 9.5, respectively. The desorption experiments indicate that the lower concentration of nitric acid has almost 100% removal efficiency for the low quantity of lead ions. After the recycle of adsorption-desorption experiment, the lead ion-imprinted polymer still shows a high adsorption capacity of 90.9 mg.g super(-1).

Gu, L., et al. (2014). "Development and Customization of a Color-Coded Microbeads-Based Assay for Drug Resistance in HIV-1 Reverse Transcriptase: e109823." PLoS ONE **9**(10).

Background Drug resistance (DR) of HIV-1 can be examined genotypically or phenotypically. Although sequencing is the gold standard of the genotypic resistance testing (GRT), high-throughput GRT targeted to the codons responsible for DR may be more appropriate for epidemiological studies and public health research. Methods We used a Japanese database to design and synthesize sequence-specific oligonucleotide probes (SSOP) for the detection of wild-type sequences and 6 DR mutations in the clade B HIV-1 reverse transcriptase region. We coupled SSOP to microbeads of the Luminex 100 xMAP system and developed a GRT based on the polymerase chain reaction (PCR)-SSOP-Luminex method. Results Sixteen oligoprobes for discriminating DR mutations from wild-type sequences at 6 loci were designed and synthesized, and their sensitivity and specificity were confirmed using isogenic plasmids. The PCR-SSOP-Luminex DR assay was then compared to direct sequencing using 74 plasma specimens from treatment-naive patients or those on failing treatment. In the majority of specimens, the results of the PCR-SSOP-Luminex DR assay were concordant with sequencing results: 62/74 (83.8%) for M41, 43/74 (58.1%) for K65, 70/74 (94.6%) for K70, 55/73 (75.3%) for K103, 63/73 (86.3%) for M184 and 68/73 (93.2%) for T215. There were a number of specimens without any positive signals, especially for K65. The nucleotide position of A2723G, A2747G and C2750T were frequent polymorphisms for the wild-type amino acids K65, K66 and D67, respectively, and 14 specimens had the D67N mutation encoded by G2748A. We synthesized 14 additional oligoprobes for K65, and the sensitivity for K65 loci improved from 43/74 (58.1%) to 68/74 (91.9%). Conclusions We developed a rapid high-throughput assay for clade B HIV-1 DR mutations, which could be customized by synthesizing oligoprobes suitable for the circulating viruses. The assay could be a useful tool especially for public health research in both resource-rich and resource-limited settings.

Gu, L., et al. (2014). "Development and customization of a color-coded microbeads-based assay for drug resistance in HIV-1 reverse transcriptase." PLoS ONE [Electronic Resource] **9**(10): e109823.

BACKGROUND: Drug resistance (DR) of HIV-1 can be examined genotypically or phenotypically. Although sequencing is the gold standard of the genotypic resistance testing (GRT), high-throughput GRT targeted to the codons responsible for DR may be more appropriate for epidemiological studies and public health research.

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CONCLUSIONS: We developed a rapid high-throughput assay for clade B HIV-1 DR mutations, which could be customized by synthesizing oligoprobes suitable for the circulating viruses. The assay could be a useful tool especially for public health research in both resource-rich and resource-limited settings.

Gu, Z., et al. (2019). "Solid-phase PCR based on thermostable, encoded magnetic microspheres for simple, highly sensitive and multiplexed nucleic acid detection." Sensors and Actuators, B: Chemical **298**.
Multiplexed detection of nucleic acids is important for pathogen identification and disease diagnosis. Though real-time quantitative PCR allows for simultaneous amplification of different genes in a single test, the interferences between various primers inevitably cause difficulty in assay design, and pose limitation on multiplexing degree. Conventional solid-phase PCR (SP-PCR) on plenary microarrays can assess more targets than real-time quantitative PCR. However, they are suffering from low reaction efficiency, high background noise, and requiring special equipment and expertise for reliable analysis. Here, we addressed the challenges by performing multiplex PCR on thermostable, tailor-made host-guest encoded magnetic microspheres (Beads based PCR, BB-PCR), which were constructed by coupling magnetic host microspheres with fluorescent guest nanoparticles. As proof of concept, a 3-plex barcoded microbeads with high thermostability and low non-specific fluorescence absorption were selected as model BB-PCR carriers to amplify and detect three gene targets in Salmonella Enteritidis. After BB-PCR reaction, the barcoding and reporting signals were easily identified through flow cytometry. Attributed to the effective interactions between reagents and microspheres during PCR reaction, this method showed high sensitivity of 10 copies/reaction, which was comparable to that of liquid PCR. Thus, BB-PCR developed here allowed for simple, rapid, highly sensitive and high throughput detection of nucleic acid targets, which paves the way for routine multiplexed molecular diagnostics in clinical laboratories. 2019 Elsevier B.V.

Guan, X., et al. (2010). "Rapid detection of pathogens using antibody-coated microbeads with bioluminescence in microfluidic chips." Biomedical Microdevices **12**(4): 683-691.
Detection of pathogens was demonstrated in a polydimethylsiloxane (PDMS)/glass microfluidic chip with which microbead-based immunoseparation platform and the bioluminescence technology were integrated. Escherichia coli (E. coli) O157:H7 was used as the model bacteria. The microchamber in microfluidic chip was filled with glass beads coated with antibodies which could capture specific organism, and the capture efficiency of the chip for the bacteria was

about 91.75% approximately 95.62%. Then the concentration of bacteria was determined by detecting adenosine triphosphate (ATP) employing bioluminescence reaction of firefly luciferin-lucifera-ATP on chip. The method allowed reliable detection of E. coli O157:H7 concentrations from 3.2 x 10(1) cfu/microL to 3.2 x 10(5) cfu/microL within 20 min. This research demonstrated excellent reproducibility, stability, and specificity, and could accurately detect the pathogenic bacteria in food samples. The microfluidic chip and the equipments used in this method are easy to miniaturize, thus the method has great potential to be developed to a portable device for rapid detection of pathogens.

Guernier-Cambert, V., et al. (2019). "Diversity of Mycobacterium tuberculosis in the Middle Fly District of Western Province, Papua New Guinea: microbead-based spoligotyping using DNA from Ziehl-Neelsen-stained microscopy preparations." Scientific Reports **9**(1): 15549.

Tuberculosis remains the world's leading cause of death from an infectious agent, and is a serious health problem in Papua New Guinea (PNG) with an estimated 36,000 new cases each year. This study describes the genetic diversity of Mycobacterium tuberculosis among tuberculosis patients in the Balimo/Bamu region in the Middle Fly District of Western Province in PNG, and investigates rifampicin resistance-associated mutations. Archived Ziehl-Neelsen-stained sputum smears were used to conduct microbead-based spoligotyping and assess genotypic resistance. Among the 162 samples included, 80 (49.4%) generated spoligotyping patterns (n = 23), belonging predominantly to the L2 Lineage (44%) and the L4 Lineage (30%). This is consistent with what has been found in other PNG regions geographically distant from Middle Fly District of Western Province, but is different from neighbouring South-East Asian countries. Rifampicin resistance was identified in 7.8% of the successfully sequenced samples, with all resistant samples belonging to the L2/Beijing Lineage. A high prevalence of mixed L2/L4 profiles was suggestive of polyclonal infection in the region, although this would need to be confirmed. The method described here could be a game-changer in resource-limited countries where large numbers of archived smear slides could be used for retrospective (and prospective) studies of M. tuberculosis genetic epidemiology.

Guerranti, C., et al. (2019). "Microplastics in cosmetics: Environmental issues and needs for global bans." Environmental Toxicology & Pharmacology **68**: 75-79.

Despite the microbeads from cosmetic products do not contribute with high percentages to the microplastic pollution, they can pose a threat to the environment, being discharged into the water bodies and just partially blocked by the wastewater treatment plants. As environmental associations have been fighting for the abolition of microplastics in PCCPs, in many countries measures have been taken and bans are already operational or in process. Some cosmetic companies have voluntarily renounced the use of microbeads and some voluntary certifications of PCCPs prohibit their use. PCCPs recently analysed can contain levels of microbeads reaching 50,391 per g and can contribute with every single use to the introduction of 229,000 microbeads into the domestic sewage. Given the spread and danger of these pollutants, the problem is global and unthinkable to be solved by banning microplastic-containing products only in some countries, thus a general ban would be necessary.

Gug, J., et al. (2015). "Processing and properties of a solid energy fuel from municipal solid waste (MSW) and recycled plastics." Waste Management **35**: 283-292.

Diversion of waste streams such as plastics, woods, papers and other solid trash from municipal landfills and extraction of useful materials from landfills is an area of increasing interest especially in densely populated areas. One promising technology for recycling municipal solid

waste (MSW) is to burn the high-energy-content components in standard coal power plant. This research aims to reform wastes into briquettes that are compatible with typical coal combustion processes. In order to comply with the standards of coal-fired power plants, the feedstock must be mechanically robust, free of hazardous contaminants, and moisture resistant, while retaining high fuel value. This study aims to investigate the effects of processing conditions and added recyclable plastics on the properties of MSW solid fuels. A well-sorted waste stream high in paper and fiber content was combined with controlled levels of recyclable plastics PE, PP, PET and PS and formed into briquettes using a compression molding technique. The effect of added plastics and moisture content on binding attraction and energy efficiency were investigated. The stability of the briquettes to moisture exposure, the fuel composition by proximate analysis, briquette mechanical strength, and burning efficiency were evaluated. It was found that high processing temperature ensures better properties of the product addition of milled mixed plastic waste leads to better encapsulation as well as to greater calorific value. Also some moisture removal (but not complete) improves the compacting process and results in higher heating value. Analysis of the post-processing water uptake and compressive strength showed a correlation between density and stability to both mechanical stress and humid environment. Proximate analysis indicated heating values comparable to coal. The results showed that mechanical and moisture uptake stability were improved when the moisture and air contents were optimized. Moreover, the briquette sample composition was similar to biomass fuels but had significant advantages due to addition of waste plastics that have high energy content compared to other waste types. Addition of PP and HDPE presented better benefits than addition of PET due to lower softening temperature and lower oxygen content. It should be noted that while harmful emissions such as dioxins, furans and mercury can result from burning plastics, WTE facilities have been able to control these emissions to meet US EPA standards. This research provides a drop-in coal replacement that reduces demand on landfill space and replaces a significant fraction of fossil-derived fuel with a renewable alternative.

Guilhermino, L., et al. (2018). "Uptake and effects of the antimicrobial florfenicol, microplastics and their mixtures on freshwater exotic invasive bivalve Corbicula fluminea." Science of the Total Environment **622**(623): 1131-1142.

Microplastics and antimicrobials are widely spread environmental contaminants and more research on their toxicity is needed. The uptake and effects of the antimicrobial florfenicol, microplastics, and their mixtures on Corbicula fluminea were investigated. Bivalves were exposed for 96 h to florfenicol (1.8 and 7.1 mg/l), microplastics (0.2 and 0.7 mg/l), or mixtures of the two substances. After 96 h, all bivalves exposed to antimicrobial treatments had florfenicol in their body (e.g. 2+or-1 micro g/g). Microplastics were found in the gut, lumen of the digestive gland, connective tissue, hemolymphatic sinuses, and gills surface of animals. Florfenicol caused a significant inhibition of cholinesterase (ChE) activity (~ 32%). Animals exposed to 0.2 mg/l of microplastics showed ChE activity inhibition (31%), and no other significant alterations. Mixtures caused feeding inhibition (57-83%), significant ChE inhibition (44-57%) and of isocitrate dehydrogenase activity, and increased anti-oxidant enzymes activity and lipid peroxidation levels. Overall, the results indicate that C. fluminea take up florfenicol and microplastics from the water and accumulated or at least retained it in their body for some time; both florfenicol (low ppm range) and microplastics (ppb range) were toxic to C. fluminea, with mixtures containing florfenicol and microplastics being more toxic. Thus, the risk of exposure and toxic effects of florfenicol to C. fluminea and other bivalves, and its predators increase in ecosystems contaminated with the antimicrobial and microplastics, as well as to humans consuming contaminated species from these ecosystems.

Guillard, V., et al. (2018). "The Next Generation of Sustainable Food Packaging to Preserve Our Environment in a Circular Economy Context." Frontiers in Nutrition **5**: 121.

Packaging is an essential element of response to address key challenges of sustainable food consumption on the international scene, which is clearly about minimizing the environmental footprint of packed food. An innovative sustainable packaging aims to address food waste and loss reduction by preserving food quality, as well as food safety issues by preventing food-borne diseases and food chemical contamination. Moreover, it must address the long-term crucial issue of environmentally persistent plastic waste accumulation as well as the saving of oil and food material resources. This paper reviews the major challenges that food packaging must tackle in the near future in order to enter the virtuous loop of circular bio-economy. Some solutions are proposed to address pressing international stakes in terms of food and plastic waste reduction and end-of-life issues of persistent materials. Among potential solutions, production of microbial biodegradable polymers from agro-food waste residues seems a promising route to create an innovative, more resilient, and productive waste-based food packaging economy by decoupling the food packaging industry from fossil feed stocks and permitting nutrients to return to the soil. To respond to the lack of tools and approach to properly design and adapt food packaging to food needs, mathematical simulation, based on modeling of mass transfer and reactions into food/packaging systems are promising tools. The next generation of such modeling and tools should help the food packaging sector to validate usage benefit of new packaging solutions and chose, in a fair and transparent way, the best packaging solution to contribute to the overall decrease of food losses and persistent plastic accumulation.

Guillot-Delost, M., et al. (2008). "Clinical-grade preparation of human natural regulatory T-cells encoding the thymidine kinase suicide gene as a safety gene." Journal of Gene Medicine **10**(8): 834-846.

BACKGROUND: Human CD4+CD25+FOXP3+ natural regulatory T-cells (nTreg) have a great therapeutic potential for the induction of tolerance in allo-transplanted patients or for the control of severe auto-immune diseases. However, clinical-grade production of nTreg remains difficult to achieve because of the absence of a truly specific surface marker and of their low frequency that implies a need for their ex vivo expansion. Furthermore, safety issues should be taken into consideration due to the risk of either uncontrolled nTreg-induced immunosuppression or uncontrolled proliferation of autoreactive contaminating T-cells particularly in an auto-immune context.

METHODS: We compared different clinical-grade conditions for immuno-magnetic selection and ex vivo expansion of nTreg. For safety, expanded cells were genetically modified with retroviral vectors co-expressing human CD90 and HSV1 thymidine kinase. The CD90 surface marker and thymidine kinase allow for selection and elimination of transduced cells by ganciclovir, respectively.

RESULTS: We showed that (i) nTreg could be enriched in a one step using CD25 microbeads, were functionally suppressive and mainly FOXP3+; (ii) using anti-CD28- and anti-CD3-coated beads, interleukin-2 and rapamycin, nTreg were expanded 150-200-fold after 3 weeks. Under these clinical-grade conditions, they remained suppressive, and no major alteration of the TCR repertoire was observed; (iii) after efficient retroviral transduction and CD90 selection, nTreg maintained their suppressive activity; (iv) transduced nTreg could be eliminated by ganciclovir upon activation.

CONCLUSIONS: The efficient procedure reported here for the preparation of nTreg, whose safety has been ensured, is now applicable for further clinical trials.

Guimaraes, A. M. d. S. (2013). The genome of Mycoplasma suis and its metabolism, pathogenesis and evolution.

Mycoplasma suis is an uncultivable, red blood cell (RBC) pathogen of pigs that causes hemolytic anemia or chronic, subclinical infections. In the studies reported herein, the genome of this organism was completely sequenced, analyzed and compared to other Mollicutes; and M.suis-specific molecular and serologic assays were developed to detect infected pigs. Accordingly, the first study describes the development of a highly sensitive and specific quantitative TaqMan registered PCR (qPCR) assay that provided further insights into the blood bacterial load during acute and chronic disease. The assay was validated using samples from 80 sows and 3-6 months old pigs, a M. suis-infected, splenectomized pig (acute disease model; pig #1), and a naturally infected, non-splenectomized pig (chronic disease model, pig #2). The prevalence among field pigs was found to be 43.7% (35/80), with quantification values ranging from 6.93 x 10 super(3) to 4.02 x 10 super(9) organisms/mL of blood. An average of 4.86 x 10 super(11) organisms/mL of blood at peaks of bacteremia in pig #1 and 2.75 x 10 super(8) organisms/mL of blood in pig #2 were detected throughout the study. The difference in these values explains our ability to visualize organisms attached to the RBCs on blood smears of acutely infected pigs at peaks of bacteremia, but not in chronically infected pigs. The second study describes the whole genome sequencing and analyses of M. suis. It was observed that a great proportion of M. suis genes encodes for hypothetical proteins (61.3%), most of which are grouped into paralogous gene families (PGFs) (42.8%). We believe that some of these families are linked to antigenic variation, as observed in other mycoplasmas and blood-borne pathogens. We then used the predicted proteome to design a complete metabolic map of M. suis, which indicates metabolic reduction and evidence of adaption to the blood environment. The analysis of this map also suggests essential nutrients that may be needed in future attempts to cultivate M. suis in vitro. Interestingly, toxin orthologs were not identified. Thus, we propose that M. suis may cause disease by scavenging and competing for host nutrients, leading to decreased life-span of RBCs. The third study describes the identification of M. suis antigens and development of a microbead immunoassay (MIA) using Luminex registered technology. A total of 6 antigens, including 4 proteins from PGFs, were identified; three of these proteins (GrpE, GAPN and one PGF protein) were used to develop the MIA. The MIA is more sensitive than the indirect hemagglutination (IHA) assay. We also observed a great number of qPCR-negative, MIA-positive animals when testing field samples, which suggests the possibility of infection clearance and/or low blood bacterial load that falls below the detection limit of our qPCR. The fourth study describes the comparative genomics and phylogenomics of the eight hemoplasmas sequenced to date. It was concluded that the hemoplasmas have highly dynamic genomes. This is supported by evidence of substantial gene gain and/or loss throughout evolution, loss of gene synteny, positional shuffling of genes from PGFs, and detection of horizontal gene transfer (HGT). They experienced metabolic reduction when compared to other Mollicutes, but PGFs are likely maintained and fixed within the bacterial population through positive selection. The hemoplasmas are using HGT as means of adapting to the blood environment by acquiring genes related to its metabolism. And finally, our phylogenetic analyses shows that hemoplasmas are not part of the pneumoniae group, as previously thought, and are the most divergent clade within the Mollicutes class. The fifth and final study briefly highlights possible mechanisms of antigenic variation of immunogenic PGFs. Phase variation through slipped-strand mispairing of homopolymeric guanine tracts and homologous DNA recombination are the suggested mechanisms employed by two of these PGFs. The studies reported herein greatly expanded our knowledge of the metabolism, pathogen sis and evolution of M. suis. These results will likely serve as basis for further research related to in vitro cultivation systems, M. suis interaction with

RBCs, mechanisms of immune system evasion and diagnostics.

Guimaraes, A. M. S., et al. (2014). "Identification of Mycoplasma suis antigens and development of a multiplex microbead immunoassay." Journal of Veterinary Diagnostic Investigation **26**(2): 203-212.

The aims of the current study were to identify Mycoplasma suis antigens and develop a multiplex microbead immunoassay (MIA). A M. suis-expression library was screened for immunogens using sera from infected pigs. Based on bioinformatics, putative antigens were identified within positive inserts; gene fragments were expressed and purified as polyhistidine fusion proteins, and immunoreactivity was confirmed by Western blot. Selected antigens were used to develop a MIA. Sera from noninfected and infected pigs were used to set the median fluorescent intensity (MFI) cutoffs and as positive controls, respectively. Assay specificity was tested using sera from pigs seropositive for other pathogens (2 different pigs seropositive for each pathogen). Samples from 51 field pigs and 2 pigs during the course of acute (pig 1) and chronic (pig 2) infections were tested using MIA, indirect hemagglutination assay (IHA), and quantitative polymerase chain reaction (qPCR). Sixteen reactive plaques (52 genes) were detected. A heat-shock protein (GrpE), a nicotinamide adenine dinucleotide-dependent glyceraldehyde 3-phosphate dehydrogenase (GAPN), and 4 proteins from paralogous gene families (PGFs) were identified as antigens by Western blot. While GrpE, GAPN, and 1 PGF protein were strong antigens, the others were not suitable as MIA targets. A MIA using GrpE, GAPN, and the strongly reactive PGF protein was developed. Cross-reactivity with sera from pigs infected with Mycoplasma hyopneumoniae, Porcine circovirus-2, Porcine parvovirus, Porcine reproductive and respiratory syndrome virus, and Porcine respiratory coronavirus with this MIA was not observed. Pig 2 was consistently positive by MIA and qPCR, whereas pig 1, initially negative, seroconverted before becoming qPCR positive. Only 2 samples (from pig 1) were IHA positive. Five (9.8%) field samples were qPCR positive and 40 (78.43%) were positive for all 3 MIA antigens; however, all were IHA negative. In summary, the MIA is specific and more sensitive than qPCR and IHA, providing simultaneous evaluation of antibody response to M. suis antigens.

Guller, A. E., et al. (2015). "Cytotoxicity and non-specific cellular uptake of bare and surface-modified upconversion nanoparticles in human skin cells." Nano Research **8**(5): 1546-1562.

The cytotoxicity and non-specific cellular uptake of the most popular composition of upconversion nanoparticle (UCNP), NaYF^sub 4^:Yb^sup 3+^:Er^sup 3+^, is reported using normal human skin cells, including dermal fibroblasts and immortalized human epidermal linear keratinocytes (HaCaT). A new hydrophilization reaction of as-synthesized UCNPs based on tetramethylammonium hydroxide (TMAH) enabled evaluation of the intrinsic cytotoxicity of bare UCNPs. The cytotoxicity effects of the UCNP surface-coating and polystyrene host were investigated over the concentration range 62.5-125 [mu]g/mL with 24-h incubation, using a MTT test and optical microscopy. The fibroblast viability was not compromised by UCNPs, whereas the viability of keratinocytes varied from 52% ± 4% to 100% ± 10% than the control group, depending on the surface modification. Bare UCNPs reduced the keratinocyte viability to 76% ± 3%, while exhibiting profound non-specific cellular uptake. Hydrophilic poly(D,L-lactide)- and poly(maleic anhydride-alt-1-octadecene)-coated UCNPs were found to be least cytotoxic among the polymer-coated UCNPs, and were readily internalized by human skin cells. Polystyrene microbeads impregnated with UCNPs remained nontoxic. Surprisingly, no correlation was found between UCNP cytotoxicity and the internalization level in cells, although the latter ranged broadly from 0.03% to 59%, benchmarked against 100% uptake level of TMAH-UCNPs. [Figure not available: see fulltext.]

Gundel, D., et al. (2011). "In vitro effects of Aspergillus fumigatus on human invariant natural killer T Cells." International Journal of Medical Microbiology **1)**: 48-49.

Objectives: Invariant human Natural Killer T Cells (iNKT-Cells) are innate immune effector cells. They are characterized by their expression of both, T-and NK cell markers and therefore they are a connecting link between innate and adaptive immunity. These cells are further defined by their TCell receptor, consisting of a specific, invariant alpha-chain and a beta-chain derived from a limited repertoire. They strongly react upon stimulation with lipid antigens presented in the context of the MHC-like molecule CD1d on dendritic cells (DCs) and thus they can be expanded in vitro by stimulation with their prototypic agonist alpha-galactosylceramide (alpha-GalCer). A protective role of iNKT cells in autoimmune diseases and cancer immunity, as well as their action against different pathogens is well documented. However, little is known about their direct interaction with fungi, especially with Aspergillus fumigatus. A. fumigatus, an omnipresent mold, is the most prevalent cause of a highly devastating opportunistic infection, affecting mainly immunocompromised patients. Method(s): In order to expand human iNKT cells (iNKT⁺CD3⁺), PBMCs were treated with alpha-GalCer and rhIL-2 for 15-20 days. After expansion, purity of the iNKT+CD3+ fraction was >90%. To further purify this fraction, a positive selection with CD3 microbeads was performed. After that the purity increased above 95%. iNKT cells were cocultured with different morphologies of A. fumigatus, resting conidia and germlings. Gene induction was evaluated by microarray analysis (Affymetrix U219) and the protein release by using multiplex ELISA assays (BioRad Bio-Plex). Additionally, the induction of IFN-gamma, a major Th1 cytokine, was analyzed by flow cytometry. Finally, XTT assays were used to examine the toxic effects of iNKT cells on A. fumigatus. Result(s): Stimulating iNKT cells with different A. fumigatus morphologies, we observed a time-and morphotype-dependent induction of INF-gamma, with germlings to be shown more immunogenic than conidia. Furthermore, challenging iNKT cells with A. fumigatus germlings at an MOI=1 for 6h, we found that iNKT cells caused a significant fungal damage. We could also observe defined patterns of gene induction, especially regarding cytokine and chemokine gene expression profiles. By multiplex ELISA assays gene expression patterns could be confirmed. Conclusion(s): We found that there is a specific interaction of iNKT cells with A. fumigatus revealed, leading to defined cytokine induction and a fungicidal effect. INF-gamma, a cytokine, which has a known protective role against IA, is produced by iNKT cells when confronted with A. fumigatus.

Gundogdu, S. (2018). "Contamination of table salts from Turkey with microplastics." Food Additives & Contaminants. Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment **35**(5): 1006-1014.

Microplastics (MPs) pollution has become a problem that affects all aquatic, atmospheric and terrestial environments in the world. In this study, we looked into whether MPs in seas and lakes reach consumers through table salt. For this purpose, we obtained 16 brands of table salts from the Turkish market and determined their MPs content with microscopic and Raman spectroscopic examination. According to our results, the MP particle content was 16-84 item/kg in sea salt, 8-102 item/kg in lake salt and 9-16 item/kg in rock salt. The most common plastic polymers were polyethylene (22.9%) and polypropylene (19.2%). When the amounts of MPs and the amount of salt consumed by Turkish consumers per year are considered together, if they consume sea salt, lake salt or rock salt, they consume 249-302, 203-247 or 64-78 items per year, respectively. This is the first time this concerning level of MPs content in table salts in the Turkish market has been reported.

Gündogdu, S. (2018). "Contamination of table salts from Turkey with microplastics: Part A. Chemistry, Analysis, Control, Exposure & Risk Assessment Part A. Chemistry, Analysis, Control, Exposure & Risk Assessment." Food Additives and Contaminants **35**(5): 1006-1014.

Microplastics (MPs) pollution has become a problem that affects all aquatic, atmospheric and terrestial environments in the world. In this study, we looked into whether MPs in seas and lakes reach consumers through table salt. For this purpose, we obtained 16 brands of table salts from the Turkish market and determined their MPs content with microscopic and Raman spectroscopic examination. According to our results, the MP particle content was 16-84 item/kg in sea salt, 8-102 item/kg in lake salt and 9-16 item/kg in rock salt. The most common plastic polymers were polyethylene (22.9%) and polypropylene (19.2%). When the amounts of MPs and the amount of salt consumed by Turkish consumers per year are considered together, if they consume sea salt, lake salt or rock salt, they consume 249-302, 203-247 or 64-78 items per year, respectively. This is the first time this concerning level of MPs content in table salts in the Turkish market has been reported.

Gundogdu, S. and C. Cevik (2019). "Mediterranean dirty edge: High level of meso and macroplastics pollution on the Turkish coast." Environmental Pollution **255**(Pt 3): 113351.

It has become apparent that the coastal zones of aquatic environments are significantly affected by plastics pollution. The accumulation of marine plastic litter on beaches is an important problem due to their significant environmental impacts. In this study, 13 coastal areas in Iskenderun Bay (NE Levantine coast of Turkey) were sampled in May 2018 to investigate meso and macroplastic (0.5-123.4cm) pollution. A total of 1424 meso and macroplastic items in five categories (filament, film, foam, fragments, and pellets) were collected. The average meso and macroplastic concentration was 12.2+/-3.5 pcs m⁻² (12.3+/-3.5gm⁻²) and the mean size for all stations was 3.7+/-0.16cm. The highest meso and macroplastic concentration was found in the Dortyol location (46.2+/-7.6 pcs m⁻²) and the lowest concentration was found in the Y. Lagun location (2.3+/-0.2 pcs m⁻²). Plastics were separated into 14 different groups based on their origins. The most dominant type was hard plastics (broken, fragmented, and deformed) with 59.8% and greenhouse coverage films with 11%. Our results shows that regardless their source plastics fluxes at beaches from various pathways.

Gündoğdu, S., et al. (2018). "Microplastics in municipal wastewater treatment plants in Turkey: a comparison of the influent and secondary effluent concentrations." Environmental Monitoring & Assessment **190**(11): 1-1.

Wastewater treatment plants are one of the primary pathways through which microplastics enter aquatic environments. In this study, we have determined the microplastic concentrations of the influent and secondary effluent water of two wastewater treatment plants in Turkey. For this purpose, we have taken samples of the influent and effluent water of Seyhan and Yüreğir wastewater treatment facilities for 6 days in August 2017 and determined their microplastics' content both visually and using μ-Raman spectroscopy. The results showed that the influent of the wastewater treatment contained 1 million-6.5 million particles per day, while the effluent contained 220,000-1.5 million particles per day. The removal rate of microplastics was found to be between 73 and 79%. In total, seven different types of polymers were detected. The most frequently observed polymer type was polyester. [ABSTRACT FROM AUTHOR]

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Guo, C., et al. (2010). "Prokaryotic expression and RNase activity analysis of rice XIOsPR10." China Biotechnology **30**(7): 39-42.

It has been regarded that PR10s played an important role in systemic acquired resistance (SAR). Furthermore, many PR10 proteins have been reported to exhibit RNase activity and predicted to be responsible for its antibiotic activity. So the Prokaryotic Expression Vector pET28a-XIOsPR10 was constructed and transferred to BL21(DE3). The recombinant protein XIOsPR10 was obtained by Prokaryotic expression and purification of magnetic microbeads, and showed the RNase activity.

Guo, G. H., et al. (2008). "In vivo anti-tumor effect of hybrid vaccine of dendritic cells and esophageal carcinoma cells on esophageal carcinoma cell line 109 in mice with severe combined immune deficiency." World Journal of Gastroenterology **14**(8): 1167-1174.

AIM: To develop a fusion vaccine of esophageal carcinoma cells and dendritic cells (DC) and observe its protective and therapeutic effect against esophageal carcinoma cell line 109 (EC109).

METHODS: The fusion vaccine was produced by fusing traditional polyethyleneglycol (PEG), inducing cytokine, sorting CD34+ magnetic microbead marker and magnetic cell system (MACS). The liver, spleen and lung were pathologically tested after injection of the fusion vaccine. To study the therapeutic and protective effect of the fusion vaccine against tumor EC109, mice were divided immune group and therapeutic group. The immune group was divided into P, E, D and ED subgroups, immunized by phosphate buffered solution (PBS), inactivated EC109, DC and the fusion vaccine respectively, and attacked by EC109 cells. The tumor size, weight, latent period and mouse survival period were recorded and statistically analyzed. The therapeutic group was divided into four subgroups: P, inactivated EC109, D and ED subgroups, which were attacked by EC109 and then treated with PBS, inactivated EC109, DC, and EC109-DC respectively. Pathology and flow cytometry were also used to study the therapeutic effect of the fusion vaccine against EC109 cells.

RESULTS: Flow cytometry showed that the expression of folate receptor (FR), EC109 (C), DCs (D) in human nasopharyngeal carcinoma cell line (HNE1) (B) was 78.21%, 89.50%, and 0.18%, respectively. The fusion cells (C) were highly expressed. No tumor was found in the spleen, lung and liver after injection of the fusion vaccine. Human IgG was tested in peripheral blood lymphocytes (PBL). In the immune group, the latent period was longer in EC109-DC subgroup than in other subgroups, while the tumor size and weight were also smaller than those in ED subgroup. In the therapeutic group, the tumor size and weight were smaller in ED subgroup than in P, inactivated EC109 and DC subgroups.

CONCLUSION: Fusion cells are highly expressed not only in FR but also in CD80. The fusion vaccine has a distinctive protective effect against tumor EC109 and can inhibit the growth of tumor in mice, and its immune protection against tumor attack is more significant.

Guo, H., et al. (2019). "The leaching of additive-derived flame retardants (FRs) from plastics in avian digestive fluids: The significant risk of highly lipophilic FRs." Journal of Environmental Sciences (Elsevier) **85**: 200-207.

The exposure to plastic debris and associated pollutants for wildlife is of urgent concern, but little attention has been paid on the transfer of plastic additives from plastic debris to organisms. In the present study, the leaching of incorporated flame retardants (FRs), including polybrominated diphenyl ethers (PBDEs), alternative brominated FRs (AFRs), and phosphate flame retardants (PFRs), from different sizes of recycled acrylonitrile-butadiene-styrene (ABS) polymer were investigated in avian digestive fluids. The impact of co-ingested sediment on the leaching of additive-derived FRs in digestive fluids was also explored. In the recycled ABS, BDE 209 (715 μg/g) and 1, 2-bis(2,4,6-tribromophenoxy) ethane (BTBPE, 1766 μg/g) had the highest concentrations among all target FRs. The leaching proportions of FRs were higher in finer sizes of ABS. The leaching proportions of FRs from recycled ABS increased with elevated log K OW of FRs. In the tests with coexisted ABS and sediment, hexa- to deca-BDEs, BTBPE, and decabromodiphenyl ethane (DBDPE) migrated from ABS to sediment, which resulted in the less bioaccessible fractions of these FRs in gut fluids. More lipophilic chemicals tended to be adsorbed by sediment from ABS. The results suggest the migration of additive-derived FRs from plastics to other indigestible materials in digestive fluids. The findings in this study provide insights into the transfer of additive-derived FRs from plastics to birds, and indicate the significant contribution of FR-incorporated plastics to bioaccumulation of highly lipophilic FRs. Unlabelled Image [ABSTRACT FROM AUTHOR]

Guo, L., et al. (2018). "A sensitive and innovative detection method for rapid C-reactive proteins analysis based on a micro-fluxgate sensor system." PLoS ONE **13**(3).

A sensitive and innovative assay system based on a micro-MEMS-fluxgate sensor and immunomagnetic beads-labels was developed for the rapid analysis of C-reactive proteins (CRP). The fluxgate sensor presented in this study was fabricated through standard micro-electro-mechanical system technology. A multi-loop magnetic core made of Fe-based amorphous ribbon was employed as the sensing element, and 3-D solenoid copper coils were used to control the sensing core. Antibody-conjugated immunomagnetic microbeads were strategically utilized as signal tags to label the CRP via the specific conjugation of CRP to polyclonal CRP antibodies. Separate Au film substrates were applied as immunoplatforms to immobilize CRP-beads labels through classical sandwich assays. Detection and quantification of the CRP at different concentrations were implemented by detecting the stray field of CRP labeled magnetic beads using the newly-developed micro-fluxgate sensor. The resulting system exhibited the required sensitivity, stability, reproducibility, and selectivity. A detection limit as low as 0.002 μg/mL CRP with a linearity range from 0.002 μg/mL to 10 μg/mL was achieved, and this suggested that the proposed biosystem possesses high sensitivity. In addition to the extremely low detection limit, the proposed method can be easily manipulated and possesses a quick response time. The response time of our sensor was less than 5 s, and the entire detection period for CRP analysis can be completed in less than 30 min using the current method. Given the detection performance and other advantages such as miniaturization, excellent stability and specificity, the proposed biosensor can be considered as a potential candidate for the rapid analysis of CRP, especially for point-of-care platforms.

Guo, X., et al. (2019). "Sorption of sulfamethoxazole onto six types of microplastics." Chemosphere **228**: 300-308.

Microplastics and sulfamethoxazole (SMX) are ubiquitous in aquatic environment. In this study,

we investigated the sorption of SMX onto six types of microplastics (polyamide (PA), polyethylene (PE), polyethylene terephthalate (PET), polystyrene (PS), polyvinyl chloride (PVC) and polypropylene (PP)). The sorption rate and mass transfer steps of SMX was studied by using the phenomenological kinetics models. The effect of pH and salinity on SMX sorption was examined. The results showed that the sorption of SMX onto microplastics reached equilibrium within 16 h. The external mass transfer was the slowest sorption step. The linear and Freundlich isotherms fitted well the sorption equilibrium data. PA had the highest sorption capacity (2.36 mg g−1 at SMX concentrations of 12 mg L−1), with high distribution coefficient (K d) value (284 L kg−1). The K d values of PE, PS, PET, PVC, and PP ranged from 22.2 to 30.9 L kg−1. The sorption capacity of SMX decreased with increase of pH and salinity in the solution. • Microplastics and sulfamethoxazole are ubiquitous in aquatic environments. • Sorption of SMX onto six types of microplastics was investigated. • The sorption rate of SMX was studied using phenomenological kinetics models. • The effect of pH and salinity on the sorption of SMX was examined. [ABSTRACT FROM AUTHOR]

Guo, X., et al. (2019). "Sorption of sulfamethazine onto different types of microplastics: A combined experimental and molecular dynamics simulation study." Marine Pollution Bulletin **145**: 547-554.

Microplastics are becoming a global concern due to their potential to accumulate pollutants in aquatic environments. In this paper, sulfamethazine (SMT) sorption onto six types of microplastics, including polyamide (PA), polyethylene (PE), polyethylene terephthalate (PET), polypropylene (PP), polystyrene (PS), and polyvinyl chloride (PVC) was investigated by experimental and molecular dynamics simulation methods. The experimental results indicated that SMX sorption reached equilibrium within 16h. The kinetics of SMT sorption by PA, PVC, PE, and PP could be fitted by pseudo first-order model, while SMT sorption by PA and PET could be described by pseudo second-order model. The partition coefficient K_d values were 38.7, 23.5, 21.0, 22.6, 18.6 and 15.1L.kg⁻¹ for PA, PE, PS, PET, PVC and PP, respectively. SMT sorption onto microplastics decreased when pH and salinity increased. The molecular dynamics simulation results indicated that the main mechanisms involved in sorption are electrostatic and Van der Waals interaction.

Guo, X., et al. (2018). "Sorption properties of tylosin on four different microplastics." Chemosphere **209**: 240-245.

After oxidation, abrasion and crushing, microplastics (MPs) can enter the aqueous environment and may adsorb surrounding organic pollutants, altering its migration and spatial distribution. Therefore, an investigation of the sorption properties and mechanism of organic pollutant on MPs can offer a theoretical basis for scientific evaluation of their ecological risks. Using tylosin (TYL) as a model pollutant, the sorption performance of MPs was examined via a series of batch equilibrium experiments which resulted the sorptive removal of TYL on MPs reached equilibrium at 36h, and the sorption ability of TYL on the MPs followed the order of PE (polyethylene)<PP (polypropylene)<PS (polystyrene)<PVC (polyvinyl chloride). The pseudo-second-order model well fit for the sorption kinetics data, and the adsorption isotherms could be better described by Freundlich equation rather than Langmuir model. Additionally, the initial solution pH and ionic

strength played important roles across the adsorption. The sorption procedure of TYL on MPs was dominated by electrostatic interaction, surface complexation and hydrophobic interaction.

Guo, X. and J. Wang (2019). "The chemical behaviors of microplastics in marine environment: A review." Marine Pollution Bulletin **142**: 1-14.

Microplastics are widely existed in marine and coastal environments, which aroused global concern in recent years. This review mainly summarized the interactions of organic pollutants and metals with microplastics based on environmental monitoring results and laboratory results reported by literatures. Firstly, the type, properties, and distribution of microplastics in the environment were briefly reviewed. Secondly, the property changes of microplastics after degradation were discussed. Thirdly, the concentrations of pollutants on microplastics in global environments were summarized. Then the effect of the factors (e.g. types and properties of microplastics, types of pollutants, and environmental conditions) on the sorption behaviors of microplastics were discussed in detail. Finally, the influences of microplastics on marine organisms were briefly evaluated.

Guo, Y., et al. (2019). "Effects of microplastics on growth, phenanthrene stress, and lipid accumulation in a diatom, Phaeodactylum tricornutum." Environmental Pollution: 113628.

Most laboratory studies have focused on the effects of nanoplastics instead of plastics at the micrometer scale, which are the major microplastics (MPs) discarded in marine environments. Knowledge on the potential effects of micrometer scale plastics on marine microalgae remains limited. It remains unknown whether the micrometer scale plastics also affect microalgal growth, lipid accumulation and resistance to organic contaminants? In addition, the role of polymer-size on the potential hazardous effects of MPs on microalgae is unknown. In the present study, cell populations of a marine diatom, Phaeodactylum tricornutum, were treated with micrometer scale polyethylene (PEMP, 150 mum) and unplasticized polyvinyl chloride (uPVCMP, 250 mum) powders in the laboratory. Growth was assessed using a hemacytometer and neutral lipid concentrations were evaluated using the Nile Red staining method under short-term (four days) and long-term (nine days) exposure. The effects of combined PEMP and phenanthrene (Phe), and uPVCMP and Phe exposures over four days on growth were investigated. Importance scores and SHapley Additive exPlanations (SHAP) values were calculated to assess the contributions of seven factors in exposure systems to the hazardous effects of MPs on microalgae using a machine-learning prediction based on 165 data sets. Both MP types did not influence algal growth and lipid accumulation but minimized algal inhibition by the action of Phe at four days. In addition, lipid accumulation was induced at nine days. Both importance scores and SHAP values indicated that MP polymer-size was the key factor influencing MP toxicity in microalgae. In conclusion, MPs had adverse effects only in chronic tests and the potential adsorption of MPs could have led to the lower levels of toxicity in a combined MP-Phe exposure system. Compared to nanoplastics, MPs in the hundred-micrometer range do not significantly affect growth and their adsorption would not be influenced by size. Therefore, MP size is the most critical factor that should be considered in future laboratory tests and eco-toxicological risk assessments for microalgae.

Guo, Z., et al. (2017). "The optimal dose of arsenic trioxide induced opposite efficacy in autophagy between K562 cells and their initiating cells to eradicate human myelogenous leukemia." Journal of Ethnopharmacology **196**: 29-38.

ETHNOPHARMACOLOGICAL RELEVANCE: Arsenic trioxide (As2O3), a main component of arsenolite which is a common traditional Chinese medicine (TCM) wildly used as a therapeutic

agent for more than 2400 years in china, has been accepted as a standard treatment for the patients with acute promyelocytic leukemia (APL) based on the principle in TCM of "using a poison to fight against other poisons or malignancy illnesses". However, it remains unknown that which mechanism is actually responsible for the therapeutic effects against these blood malignancies.

AIM OF THE STUDY: The purpose of this study was to explore the actual mechanism that ATO exerts its effects in K562 cells and their initiating cells (K562s).

MATERIALS AND METHODS: K562s cells were separated and enriched for CD34+/CD38- cells using magnetic microbeads. Cell proliferation was determined by incorporation of BrdU. Cell apoptosis was evaluated by Annexin-V binding and PI uptake. Autophagy was estimated by acridine orange and immunofluorescence staining of LC3-B and p62. MC colonic formation was used to examine cell self-renew. ROS generation inside living cells was measured by DCFH-DA. Cell differentiation was assessed by the benzidine staining. The SA-beta-gal assay was used to detect cell senescence. Protein expression was examined by western blotting and immunohistochemical staining.

RESULTS: K562s cells were stronger in self-renew and resistance to ATO cytotoxicity and starvation-induced apoptosis than K562 cells. Unexpectedly, we found that ATO at a dose of 0.5muM which had no effect on cell proliferation resulted in maximum suppression on self-renew in both cells and maximum starvation-induced apoptosis in K562s cells but minimum starvation-induced apoptosis in K562 cells. Next, we found that ATO no more than 0.5muM selectively induced K562s cell differentiation indicated by benzidine staining, gamma-globin and CD235a expression. More importantly, we found that ATO no more than 0.5muM led to opposite efficacy in autophagy between K562 and K562s cells, and the opposite autophagy could induced late-phase senescence in both cells. Finally, we used the optimal dose of ATO to eradicate leukemia cells and obtained a satisfied therapeutic outcomes in vivo.

CONCLUSIONS: Our results suggest that the used dose of ATO may determine the fate of cell differentiation senescence or malignant transformation, and the optimal dose of ATO induced opposite efficacy in autophagy between K562 cells and their initiating cells and ultimately leads both cells to late-phase senescence.

Guo, Z., et al. (2015). "Differentiating endothelial cells from human induced pluripotent stem cells." Journal of Investigative Dermatology **1)**: S73.

Induced pluripotent stem cells (iPSCs) can provide an unlimited number of cells for cell therapy, disease modeling and drug development. Realization of the potential of iPSCs depends on the capacity to efficiently generate cell lineages specific for different applications. Previously published protocols of differentiating endothelial cells (ECs) from iPSCs often require a purification step by FACS or magnetic microbeads to isolate EC-like cells from a heterogeneous population containing cells such as pericytes, and the functionality of iPSC-derived ECs has not been widely utilized to construct vascularized 3D skin equivalents. Here, we aimed to improve differentiation efficiency of iPSCs into ECs for vascularization of 3D skin constructs. Integration-free iPSCs were generated from human fibroblasts by introduction of an episomal vector-based system. Endothelial cells (ECs) were differentiated by manipulation of the transforming growth factor beta (TGF-beta) signaling pathways. Specifically, treatment with TGF-beta2 for 6 days in the presence of retinoic acid differentiated iPSCs into endothelial cells. Subsequent inhibition of TGF-beta with SB431542 prevented the epithelial to mesenchymal transition, and maintained the identity of ECs. Proliferative CD31-positive endothelial cells (ECs) were obtained with high purity without the need for FACS or magnetic microbeads-based purification. These iPSC derived ECs formed vascular structures on Matrigel and in collagen gels,

demonstrating their functionality. We have incorporated these ECs into 3D vascularized skin constructs to advance the application of these cells for wound healing.

Gupta, P. (2017). "Management of plastic waste: a step towards clean environment." International Journal of Renewable Energy Technology **8**(3-4): 387-392.

Plastic pollution may be defined as the accumulation of plastic products in the environment that may affect human life as well as wildlife. Plastics waste contributes a major proportion to the total municipal solid waste. Plastic is composed of various chemical elements and it does not degrade naturally even after its usage. It is properties such as durability, light weight and low cost, which makes it so useful also makes it problematic when it comes to its end of life phase. Mismanagement of plastics waste may pose environmental hazards such as when littered it may interfere with the natural beauty of the city and it may also result in choked drains, may cause air pollution when burnt with garbage containing plastics, interferes in waste processing facilities when garbage is mixed with plastics. Therefore plastic waste management techniques are required for proper management of plastic waste in a way which is environment friendly and may help in the proper utilisation of plastic material. The solution to tackle this problem lies in following 3R namely reduce, reuse and recycle. Waste plastics can be recycled and used in several ways including construction of roads.

Gupta, S., et al. (2013). "Ex vivo expanded human regulatory t cells are potent suppressors but may be short-lived." American Journal of Transplantation **5)**: 229.

Infusion of host derived ex vivo expanded regulatory T cells (eTregs) is an attractive therapeutic strategy for promotion of transplant tolerance. We report herein that human eTregs cultivated for in vivo therapy abundantly express the death molecules T-cell Immunoglobulin and Mucin domain-3 protein (TIM-3) and program death 1(PD-1), are highly potent yet fragile. We studied the functional and phenotypic features of sorted peripheral CD4+CD25hiCD127lo Tregs expanded in the presence of anti-CD3 and anti-CD28 coated micro beads and IL-2 for 14 days. Notably, >95% of eTregs generated using protocols under investigation for Treg cellular therapy are TIM-3+ of which ~60% co-expressed PD-1, both molecules known to contribute to effector T cell apoptosis, exhaustion or dysfunction. Contrastingly, only ~10% of nTregs in peripheral blood express TIM-3. Compared to their nTregs, expanded TIM-3+ Tregs are more potent suppressors of in vitro Teff proliferation and robustly express CD25, CTLA-4, CD39, CD45RO, IL-10, but are programmed for apoptotic cell death. Exposure to the TIM-3 ligand galectin-9 in a dose and time dependent manner or absence of a continuous proliferative micro environment led to eTreg death; though these cells could be rescued by TCR stimulation and/or IL-2. Thus these studies indicate that the highly potent eTregs are terminally differentiated Tregs expressing death molecules TIM-3 and PD-1 and may be short lived in vivo. As use of eTregs is a promising therapeutic strategy our findings provide further insight into novel properties and fate of expanded human Tregs instructive for advancement of Treg cellular therapeutic approaches.

Gupta, S. S., et al. (2016). "Preparation and optimization of floating microbeads of ciprofloxacin HCL." Research Journal of Pharmacy and Technology **9**(7): 848-852.

The objective of this work is to generate a gastro retentive sustained release dosage form of a water soluble drug, Ciprofloxacin, from a fully aqueous environment avoiding the utilize of any organic solvent. A new emulsion gelation system is used to arrange emulsion gel beads by sodium alginate as the polymer. The gel beads containing is set up by gently mixing or homogenizing oil and water phase containing sodium alginate which is then extruded in to calcium chloride solution. The effects of factors like concentration of oil, curing time, and drug:

polymer ratio, alginate: pectin proportion and therapeutic agent on drug entrapment efficiency, floating lag time, and morphology and drug release are study. Minimizing the curing time of beads leaded to enhanced drug entrapment efficiency. The use of sodium alginate and combinations of sodium alginate and pectin are used to study the effect on the sustaining property of the formed beads. It is found that sodium alginate was not sufficient to uphold the drug release at gastric pH. Instead of it, suitable amalgamation of alginate and pectin could afford the sustain release of drug. The results confirm that these beads can entrap even a water soluble drug as Ciprofloxacin in sufficient amount and also can successfully distribute the drug in stomach for a extend duration of time.

Gurevich, O., et al. (2002). "Fibrin Microbeads for Isolating and Growing Bone Marrow-Derived Progenitor Cells Capable of Forming Bone Tissue." Tissue Engineering **8**(4): 661-673.

It has been demonstrated that bone marrow (BM)-derived pluripotent stem cells can be incorporated into muscle, bone, nerve, lung, stomach, intestine, and skin. Fibrin-based biodegradable microbeads (FMB) were developed for culturing, in suspension, a high density of cells, mostly of mesenchymal origin. In the current study, FMB were used to isolate and expand mesenchymal progenitor cells from BM of mice and rats. Cells from BM isolated on FMB (FMB-BM cells) were visualized by fluorescent confocal microscopy and quantified by a modified MTS colorimetric assay. Downloading the BM cells from FMB onto plastic induced their differentiation into islets of cells with osteogenic phenotype that secreted mineralized extracellular matrix. This was augmented by inducers of osteogenesis, such as ascorbic acid, beta -glycerophosphate, and dexamethasone, or osteoblast-growth peptides (OGP). Implanting FMB-BM cells under the kidney capsule in mouse tested the osteogenic potential of these cells in vivo. Thirty days after implantation, bone structures with typical BM elements were seen in 8/53 kidneys in 6-Gy-irradiated mice and in 1/10 kidneys in nonirradiated recipients; bone formation was verified by soft x-ray imaging and elemental analysis that showed elevated Ca and Fe in the implant region. FMB-BM cells--downloaded onto plastic flasks, cultured for 2 weeks, mechanically harvested and then implanted--induced 100% bone formation in both irradiated (6/6) and nonirradiated (3/3) mice. Histology revealed well-organized bone structures under the kidney capsule, including osteoblasts and typical elements of BM. Our findings demonstrate that FMB are capable of isolating and expanding progenitor cells from BM for osteogenesis and possibly for regenerating other mesenchymal tissues.

Gusmão, F., et al. (2016). "In situ ingestion of microfibres by meiofauna from sandy beaches." Environmental Pollution **216**: 584-590.

Microfibres are widespread contaminants in marine environments across the globe. Detecting in situ ingestion of microfibres by small marine organisms is necessary to understand their potential accumulation in marine food webs and their role in marine pollution. We have examined the gut contents of meiofauna from six sandy beaches in the Atlantic Ocean and the Mediterranean. Out of twenty taxonomic groups, three species of the common sandy beach annelid Saccocirrus displayed in situ ingestion of microfibres in all sites. Laboratory observations showed that species of Saccocirrus are able to egest microfibres with no obvious physical injury. We suggest that their non-selective microphagous suspension-feeding behaviour makes Saccocirrus more prone to ingest microfibres. Although microfibres are rapidly egested with no apparent harm, there is still the potential for trophic transfer into marine food webs through predation of Saccocirrus . [ABSTRACT FROM AUTHOR]

Gutierrez, C., et al. (2013). "KRAS mutational status analysis of peripheral blood isolated circulating tumor cells in metastatic colorectal patients." Oncology Letters **6**(5): 1343-1345.

The present study describes an optimized method for isolating peripheral blood circulating tumor cells (CTCs) and performing KRAS mutation analysis. The approach combines isolation of peripheral blood mononuclear cells and immunomagnetic labeling with CD45 and CD326 human microbeads with KRAS analysis performed with a Therascreen KRAS kit by quantitative PCR. KRAS mutations were detected in the CTCs of patients with metastatic colorectal cancer (mCRC). CTCs may represent an alternative to invasive procedures and their analysis may be representative of the current disease status of the patient. This proposed analysis may be performed in a daily clinical practice.

Gutman, D. (2018). "Q&A: UN's Jordi Pon describes region's waste-management challenges." EcoAmericas **20**(12): 12.

In an interview, UN's Jordi Pon describes Latin America and Caribbean region's waste-management challenges. On what were the UN Environment report's main findings, he said one is that while waste management in the region has improved in recent years, a third [of waste] is still sent to open-air dumps with no type of treatment or control. That's the worst option, given the impacts on the environment and health. It [involves] 145,000 [metric] tons per day, of which 17,000 are plastic waste. Meanwhile, we still have a long way to go in the reuse of waste, since in the region an average of barely 10% is recycled and reused. We are wasting 90% of what we generate. Another significant fact is that half of the waste is organic. Adequate management is more expensive if we only consider the direct cost, but if one quantifies pollution's environmental and health costs, the equation changes.

Gutow, L., et al. (2019). "Gastropod pedal mucus retains microplastics and promotes the uptake of particles by marine periwinkles." Environmental Pollution **246**: 688-696.

The rapid dissemination of microplastics in many habitats of the oceans has raised concerns about the consequences for marine biota and ecosystems. Many adverse effects of microplastics on marine invertebrates are consequences of ingestion. Accordingly, the identification of mechanisms that facilitate the uptake of microplastics is essential for the evaluation of possible implications for marine organisms and food webs. Gastropods produce mucus for locomotion. Gastropod pedal mucus naturally retains formerly suspended micro-organisms, such as bacteria, microalgae, and seaweed spores. The retained organisms are consumed by gastropods that forage on pedal mucus. Here, we investigated the potential of gastropod pedal mucus to retain suspended microplastic particles and make them available for ingestion by periwinkles that forage on the contaminated mucus. In laboratory experiments, mucus of the periwinkles Littorina littorea and Littorina obtusata efficiently retained microplastics. Retention of microplastics varied between mucus from conspecifics of different size but not between mucus from either species. The density of microplastics in mucus trails increased concomitantly with the experimental particle concentration but was independent of incubation time. Aging of mucus and, particularly, desiccation affected the retention of microplastics. Periwinkles ingested microplastics when foraging on the contaminated mucus. Our results reveal a functional link between biogenic accumulation of microplastics and their

trophic transfer by marine benthic herbivores into marine food webs.

Gutow, L., et al. (2016). "Experimental Evaluation of Seaweeds as a Vector for Microplastics into Marine Food Webs." Environmental Science & Technology **50**(2): 915-923.

The ingestion of microplastics has been shown for a great variety of marine organisms. However, benthic marine mesoherbivores such as the common periwinkle Littorina littorea have been largely disregarded in studies about the effects of microplastics on the marine biota, probably because the pathway for microplastics to this functional group of organisms was not obvious. In laboratory experiments we showed that the seaweed Fucus vesiculosus retains suspended microplastics on its surface. The numbers of microplastics that adhered to the algae correlated with the concentrations of suspended particles in the water. In choice feeding assays L. littorea did not distinguish between algae with adherent microplastics and clean algae without microplastics, indicating that the snails do not recognize solid nonfood particles in the submillimeter size range as deleterious. In periwinkles that were feeding on contaminated algae, microplastics were found in die stomach and in the gut. However, no microplastics were found in the midgut gland, which is the principle digestive organ of gastropods. Microplastics in the fecal pellets of the periwinkles indicate diat the particles do not accumulate rapidly inside the animals but are mostly released with the feces. Our results provide the first evidence that seaweeds may represent an efficient pathway for microplastics from the water to marine benthic herbivores. [ABSTRACT FROM AUTHOR]

Guttentag, R. M. (2006). "Plastics recycling, chapter 2: Whose bag is it?" Resource Recycling **25**(3): 51-54.

The article reports on the 10th anniversary of Recycling in Cyberspace, which made significant effort to reduce plastic shopping bag (PSB) waste. Canada's MyPlasticbags.ca site sponsored by the Environment and Plastics Council in Mississauga, Ontario, provides information about where PSBs can be recycled through municipal and retail operations. Planet Ark web sites, an Australian environmental organization that started in 1991, provided information on communities that have decided to become PSB-free communities. In Ireland, Irish government in March 2002, imposed a 15-cent-per-bag tax on all single use PSBs paid by the consumer at the point of sale. The basic purpose of this tax is to use a pricing system as a way to affect consumer preferences regarding shopping bags.

Gutzman, Y., et al. (2006). "Bead injection for biomolecular assays: Affinity chromatography enhanced by bead injection spectroscopy." Analyst **131**(7): 809-815.

Selective capture of target biomolecules by ligands immobilized on a solid support is a cornerstone of two seemingly unrelated techniques: micro-Affinity Chromatography (microAC) and micro-Bead Injection Spectroscopy (microBIS). This work shows, for the first time, how these techniques can be carried out using the same instrument and how the data obtained this way complement each other, yielding complete information on retention and elution of target biomolecules. Biomolecular association and dissociation were investigated by microAC and microBIS, using computer-controlled programmable flow and the same instrument for

automated bead transport, packing of a micro-column, assay of the analyte, and bead disposal. The absorbance of the analyte was monitored within the fiber optic flow cell configured either for monitoring directly on the beads or post-column after elution. The separation, binding, and elution of immunoglobulins (human IgG, rabbit IgG, and horse IgG) on protein G-coated Sepharose beads were studied as model systems. The limit of detection of the microAC technique was determined to be 5 ng microL(-1) IgG, and that of the microBIS technique was 50 ng microL(-1) IgG.

Guven, H., et al. (2003). "Expansion of natural killer (NK) and natural killer-like T (NKT)-cell populations derived from patients with B-chronic lymphocytic leukemia (B-CLL): a potential source for cellular immunotherapy." Leukemia **17**(10): 1973-1980.

B-cell chronic lymphocytic leukemia (B-CLL) is the most common leukemia in the Western world. It is currently an incurable disease, making new treatment options such as immunotherapy desirable. Monoclonal antibodies (Mabs) to surface antigens of the tumor cell is one option. Administration of cytotoxic cells such as natural killer (NK) and natural killer-like T (NKT) cells expanded in vitro might be a useful treatment modality alone or in combination with MAbs. A limiting step in the development of successful cellular immunotherapy has been the availability of appropriate cytotoxic cells. Here, we report the feasibility of expanding populations of the human killer cells, CD3-CD56+ NK and CD3+CD56+ NKT cells, from peripheral blood mononuclear cells (PBMCs) of B-CLL patients. The influence of tumor B cells on the in vitro expansion of killer cells was assessed by depleting B cells from PBMCs by microbead separation before culture. The 21-day cultures from both B-cell- and non-B-cell-depleted PBMC showed a marked expansion of NK cells, and also of T cells, among which almost half had the NKT phenotype. Depletion of B cells before culture did not change the expansion rates of NK and NKT cells significantly. In patients with progressive B-CLL, NK cell expansion capacity was improved after fludarabine treatment when compared to samples obtained before treatment. Repeated samples of PBMCs from individual untreated patients with both indolent and progressive disease cultured under identical conditions gave similar NK cell expansion rates. Expanded killer cell populations had cytotoxic function against the NK-sensitive target K562 cell line and expressed high levels of Granzyme B. From our studies, we conclude that NK cells as well as NKT cells from the peripheral blood of B-CLL patients can be expanded, and that these cells have cytotoxic capacity.

Guven, O., et al. (2018). "Microplastic does not magnify the acute effect of PAH pyrene on predatory performance of a tropical fish (Lates calcarifer)." Aquatic Toxicology **198**: 287-293.

Microplastic (MP) leads to widespread pollution in the marine ecosystem. In addition to the physical hazard posed by ingestion of microplastic particles, concern is also on their potential as vector for transport of hydrophobic contaminants. We experimentally studied the single and interactive effects of microplastic and pyrene, a polycyclic aromatic hydrocarbon, on the swimming behaviour and predatory performance of juvenile barramundi (Lates calcarifer). Juveniles (18+ days post hatch) were exposed to MPs, or pyrene (100 nM), or combination of both, and feeding rate and foraging activity (swimming) were analysed. Exposure to MPs alone did not significantly influence feeding performance of the juveniles, while a dose-effect series of pyrene showed strong effect on fish behaviour when concentrations were above 100 nM. In the test of combined MP and pyrene exposure, we observed no effect on feeding while swimming speed decreased significantly. Thus, our results confirm that short-time exposure to pyrene impacts the performance of fish juveniles, while additional exposure to microplastic at the given conditions influenced their activity only and not their feeding rate. Further studies of the combined effects of microplastics and pollutants on tropical fish behaviour are encouraged.

Guven, O., et al. (2017). "Microplastic litter composition of the Turkish territorial waters of the Mediterranean Sea, and its occurrence in the gastrointestinal tract of fish." Environmental Pollution **223**: 286-294.

Microplastic pollution of marine environment is receiving increased publicity over the last few years. The present survey is, according to our knowledge, the survey with the largest sample size analyzed, to date. In total, 1337 specimens of fish were examined for the presence of plastic microlitter representing 28 species and 14 families. In addition, samples of seawater and sediment were also analyzed for the quantification of microplastic in the same region. Samples of water/sediment were collected from 18 locations along the Mediterranean coast of Turkey. 94% of all collected plastic microlitter from the sea was in the size range between 0.1 and 2.5 mm, while the occurrence of other sizes was rare. The quantity of microplastic particles in surface water samples ranged from 16 339 to 520 213 per km². Fish were collected from 10 locations from which 8 were either shared with or situated in the proximity of water/sediment sampling locations. A total of 1822 microplastic particles were extracted from stomach and intestines of fish. Majority of ingested particles were represented by fibers (70%) and hard plastic (20.8%), while the share of other groups: nylon (2.7%), rubber (0.8%) and miscellaneous plastic (5.5%) were low. The blue color of plastic was the most dominant color. 34% of all examined fish had microplastic in the stomach. On average, fish which had microplastic contained 1.80 particles per stomach. 41% of all fish had microplastic in the intestines with an average of 1.81 particles per fish. 771 specimens contained microplastic in either stomach and/or intestines representing 58% of the total sample with an average of 2.36 particles per fish. Microplastic was found in all species/families that had sample size of at least 2 individuals. The number of particles present in either stomach or intestines ranged between 1 and 35. Ingested microplastic had an average diameter +/-SD of 656 +/- 803 mum, however particles as small as 9 mum were detected. The trophic level of fish species had no influence whatsoever on the amount of ingested microplastic. Pelagic fish ingested more microplastic than demersal species. In general, fish that ingested higher number of microplastic particles originated from the sites that also had a higher particle count in the seawater and sediment. Copyright © 2017 Elsevier Ltd

Guzzetti, E., et al. (2018). "Microplastic in marine organism: Environmental and toxicological effects." Environmental Toxicology & Pharmacology **64**: 164-171.

Microplastics are tiny ubiquitous plastic particles present in marine environments. They are not an individual entity, but constitute a cocktail of polymers and additives that can absorb substances from the surrounding environment, including living substances, nutrients and marine pollutants. Given their small size (< 5 μm), microplastics can be ingested by a wide range of marine organisms with the potential to cause harms. Microplastics are a growing threat for marine biota and ecosystem. For organisms, the risks associated with microplastic ingestion are not only due to the material itself, but also to its ability to absorb and concentrate environmental contaminants in seawater and subsequently transfer them through food chains. Moreover, microplastics could influence ecological processes. Recently, plastic debris are recognized as emerging pollutants and represent a great risk for marine biodiversity worldwide. Here, we summarize the main effects of plastics and microplastics on some marine organisms and ecosystem. [ABSTRACT FROM AUTHOR]

Gwada, B., et al. (2019). "Composition of plastic waste discarded by households and its management approaches." Global Journal of Environmental Science and Management **5**(1): 83-94.
Among the emerging environmental issues within Sub-Saharan Africa is the haphazard disposal of plastic waste, some of which end up downstream in the marine environment leading to negative effects. Notably there have been cases of humpback whales getting entangled in 'ghost' fishing nets, and endangered turtles ingesting plastic wastes in Watamu beach in Kenya. The aim of the current study was to assess the composition and management of plastic waste discarded by households in Watamu ward. Stratified random sampling was used to collect data from households in four sub-locations within Watamu ward. Data were analysed using descriptive and inferential statistics (the Freeman-Halton extension of the Fisher's Exact test). The composition of plastics usually discarded as waste by households in order of dominance were low density polyethylene, polyethylene terephthalate, high density polyethylene and polypropylene (FH=37.959, p=0.000). From the results, only 0.7% of respondents recycled their plastic waste. The most preferred disposal method of household plastic waste was open dumpsites (61.4%) followed by burning (12.9%) and discards (6.4%). Majority of respondents (93.6%), re-use some plastic containers for food, water, and oil storage. There was a significant difference in terms of how the respondents re-used their plastic waste in the four sub-locations (FH=36.437, p=0.005). In conclusion, the current plastic waste disposal methods at Watamu are not environmentally friendly and recycling is still at a smaller scale despite its potential to generate income and clean the environment, and promote ecosystem services and human wellbeing.

Gyekye, L. (2009). "Viridor fined on plastics." Materials Recycling Week **193**(19): 7-7.
The article reports on the £75,000 fine imposed by Maidstone Crown Court to Viridor Resource Management for the illegal shipping of mixed plastic waste to Dubai, United Arab Emirates (UAE). The court ruled that the company has violated the Transfrontier Shipment of Waste Regulations and the environmental policy of the UAE Federal Environment Agency. The court also ordered the company to pay £35,000.

H, M. T., et al. (2012). "Haploidentical stem cell transplantation with CD3/CD19 depleted grafts in paediatric patients with aplastic anaemias and haemoglobinopathies." Bone Marrow Transplantation **1)**: S382-S383.
We investigated a cohort of 13 pediatric patients with non-malignant diseases transplanted with T- and B-cell depleted peripheral stem cell grafts from haploidentical donors between 2004 and 2011. 5 patients had myelodyslastic syndrome with refractory cytopenia (MDS-RC), 5 had severe aplastic anemias (SAA) and 3 patients had hemoglobinopathies. 3 out of 13 patients received a 2nd SCT after rejecting the graft from matched related or unrelated donors. Median age was 8.3 years. Standard conditioning regimen consisted of Fludarabin (4x40 mg/m2), Thiotepa (1x10 mg/kg), Melphalan (2x70 mg/m2) and OKT3. Since 2009, patients received upfront additional total lymphoid irradiation (TLI, n=3) to prevent graft rejection. In the current protocol, OKT3 will be substituted by ATG. Graft manipulation was carried out by direct depletion using antiCD3/19 coated magnetic microbeads. A median number of 15.6x106 CD34+ Progenitorcells and 53x103 T-cells/kg body weight (BW) were transfused. Pharmacological Graft vs.Host Disease (GvHD)

prophylaxis was carried out with Mycofenolate until day 60, if residual T-cells in the graft exceeded 25000/kg BW. Primary engraftment occurred in all patients. 5/10 patients with non irradiation regimen rejected the haplo graft and needed reconditioning with Fludarabine (3x40 mg/m2), Thiotepa (1x5 mg/kg), ATG, OKT3, 7 Gy TLI and a second stem cell donation from a different parental donor. Thus, final engraftment was achieved in 13/13 patients. None of the patients rejected the second graft. None of the patients receiving upfront preventive TLI rejected the first graft. Median time to reach 500/mul neutrophiles was 9 days (9-14). Independence from platelet substitution was reached after 11 days (8-16). 7/13 patients (54%) had no signs of GvHD or GvHD grade I, 5 patients (38%) had GvHD grade II, 1 patient developed grade III (8%). TRM at day+100 and after 1 year was 0% and 15%, respectively. Event free survival (EFS) at 3 years was 85%. Conclusion(s): Haploidentical SCT with T-cell depleted grafts is a therapeutic option for non-malignant diseases if no matched donor is available. TRM was low, even if retransplantation was necessary. Fast recoveries of neutrophiles and platelets were achieved. Rejection could be avoided by adding TLI to the initial conditionig regimen. If a non-irradiation regimen is used, possible graft failures can be rescued by reconditioning with TLI and a second stem cell donation from a different parental donor.

Ha, J. and M. K. Yeo (2018). "The environmental effects of microplastics on aquatic ecosystems." Molecular and Cellular Toxicology **14**(4): 353-359.

Purpose of review: Contamination of aquatic ecosystems by plastics under 5 mm in size, which are classified as microplastics (MPs), is becoming increasingly serious, and research on the ecotoxicity of MPs is needed. In this study, we aimed to present solutions to the problem of MPs through a review of the current state of research on the definition of MPs, usage, leakage, toxicity, and domestic and overseas circulation of plastics. Recent findings: Long-term exposure to MPs results in ecotoxicity. MPs not only deliver chemical substances within organisms, but also act as mediators for chemicals or other contaminants in aquatic environments. Co-exposure to MPs and chemical contaminants has been reported to increase toxicity in several organisms. Copyright © 2018, The Korean Society of Toxicogenomics and Toxicoproteomics and Springer Nature B.V.

Ha, N., et al. (2011). "An autotransporter protein from Orientia tsutsugamushi mediates adherence to nonphagocytic host cells." Infection and Immunity **79**(4): 1718-1727.

Orientia tsutsugamushi, the causative agent of scrub typhus, is an obligate intracellular pathogen whose mechanism of cellular adhesion and invasion is poorly characterized. Bioinformatic analyses of two O. tsutsugamushi genomes revealed the presence of a group of genes that encode autotransporter proteins. In this study, we identified 10 autotransporter gene products and categorized them into five groups of orthologs (ScaA to ScaE) based on their sequence similarities. Sequence homology was highest between members of ScaC group, suggesting the functional conservation of bacterium-host interactions. ScaC was actively expressed on the surface of O. tsutsugamushi and induced antibody responses in scrub typhus patients. Experiments using microbeads conjugated to recombinant ScaC or a surrogate Escherichia coli expression system showed that ScaC was sufficient to mediate attachment to, but not invasion of, nonphagocytic mammalian cells. In addition, preincubation of host cells with recombinant ScaC significantly inhibited their interaction with O. tsutsugamushi. Finally, fibronectin was identified as a potential receptor for ScaC by using yeast two-hybrid screening, and this was confirmed using a glutathione S-transferase (GST) pulldown assay. Taken together, these results demonstrate that ScaC is involved in the interaction of O. tsutsugamushi with mammalian host cells and suggest that ScaC may play a critical role in bacterial pathogenesis.

Haag, L. C. (2013). "Range of fire determination from the pseudostippling of skin by shotshell buffer material." American Journal of Forensic Medicine & Pathology **34**(1): 56-62.

The plastic buffer material in certain American shotgun shells emerges from the muzzle with the same velocity as the pellets that it was intended to protect from deformation during the very high accelerative forces associated with the discharge process. These small plastic particles spread out quickly over distance in a predictable, reproducible, and uniform manner as they lose velocity because of air resistance. If these plastic particles strike skin with sufficient velocity and energy, they will produce stipple marks whose distribution and density can be used to establish range of fire. This can be of critical importance in the reconstruction of a shooting involving this type of ammunition.

Haapasalo, M., et al. (1996). "Hyaluronan, a possible ligand mediating Treponema denticola binding to periodontal tissue." Oral Microbiology & Immunology **11**(3): 156-160.

Binding of Treponema denticola ATCC 35405 to glycosaminoglycans, fibrinogen, type I collagen and porcine periodontal ligament epithelial cells was studied using an enzyme-linked immunosorbent assay. T. denticola bound to hyaluronan (hyaluronic acid) and its hexameric fragments. whereas little or no binding was detected to chondroitin-4-sulfate or dermatan sulfate proteoglycan. Binding of T. denticola to hyaluronan gradually increased during the 2-h incubation time. In contrast, binding to fibrinogen and type I collagen was more rapid, peaking within 5 min. T. denticola also bound to microbeads coated with hyaluronan and formed visible aggregates in solution. Pretreatment of the bacteria with hyaluronan or fibrinogen inhibited binding to hyaluronan. Gelatin, bovine serum albumin, chondroitin-4-sulfate, chondroitin-6-sulfate, heparin, dermatan sulfate, glucuronic acid, N-acetylglucosamine and N-acetyl-galactosamine did not inhibit binding. Binding was also inhibited by heating T. denticola and by pretreatment of the spirochetes with sodium periodate, phenylmethylsulfonyl fluoride, and p-chloromercurybenzoic acid. All these treatments also inhibited the chymotrypsin-like activity of T. denticola. Hyaluronan strongly inhibited binding of T. denticola to epithelial cells, whereas the other glycosaminoglycans and N-acetyl-glucosamine did not. The results show that T. denticola binds to hyaluronan, possibly by a mechanism involving the chymotrypsin-like surface protein of T. denticola.

Haave, M., et al. (2019). "Different stories told by small and large microplastics in sediment - first report of microplastic concentrations in an urban recipient in Norway." Marine Pollution Bulletin **141**: 501-513.

Microplastics (MP) in sediments from discharge sites for wastewater and deposition sites in deep regions in an urban fjord in Norway were extracted by density separation in a Microplastic Sediment Separator with ZnCl₂. Particles (>11mum) were identified using FTIR. Twenty different polymer types were identified, at concentrations from 12,000 to 200,000 particles kg⁻¹ dw. Over 95% of the MP were smaller than 100mum. High deposition of small MP agreed with known areas for organic deposition. Polyurethane acrylate resins dominated the small MP while polyamide fibers dominated the larger MP. Particles >500mum showed different maximum concentrations and spatial distribution from the smaller particles. This study is the first to report concentration ranges of identified plastic particles from a Norwegian fjord, down to sizes below the limit of visual identification. The results provides a baseline for future comparison, and point at relevant sizes for environmental risk assessments.

Habib, R. Z., et al. (2019). "Analysis of microbeads in cosmetic products in the United Arab Emirates." Environmental Pollution **258**: 113831.

The microparticle content of 37 common facial and body scrubs commercially available in the United Arab Emirates was analyzed. The chemical composition, ash content, physical characteristics, loading, particle size and shape of the microparticles were determined. Only 11 out of 37 products were found to have microplastic content. Many of the remaining products exhibited microparticles composed of microcrystalline cellulose and crushed walnut shells. Differential scanning calorimetry showed that microplastic products had softening points as low as 84 degreeC. Plastic microbeads of 2 products were found to fuse at 100 degreeC. The fusion altered the flotation characteristics of the microbeads of one product. Heat treatment of the product at 100 degreeC in the presence of silica gel led to entrainment of the silica and partial fragmentation of the beads upon cooling. This may be understood as one mechanism of fragmentation of a microplastic with a low softening point in the presence of hard soil particles under temperature cycling.

Habtour, E., et al. (2016). Damage precursor index (DPI) methodology for aviation structures. 8th European Workshop on Structural Health Monitoring, EWSHM 2016, July 5, 2016 - July 8, 2016, Bilbao, Spain, NDT.net.

In this study, a Damage Precursor Index (DPI) methodology is proposed to track the evolution of fatigue damage precursors immediately after establishing the dynamic behavior of a structure. The DPI is used to measure the change in the state of fatigue damage precursors in structures exposed to vibration loads. The DPI is based on estimating the nonlinear dynamic parameters in isotropic materials prior to crack formation. The model accounts for the incubation and evolution of localized material microplasticity. Structural compliance due to the presence of the micro-plasticity is observed experimentally. The change in the dynamic response as a result of damage precursors is used to update the global dynamic parameters, which are used to calculate a corresponding DPI. The fatigue damage precursors are verified through series of macro/micromechanical characterizations of isotropic structures under vibration loads. The application of the DPI methodology to structural health monitoring systems may considerably improve health awareness in complex systems due to the addition of sensitivity to damage precursors.

Hached, F., et al. (2014). "Mesenchymal stromal cells encapsulation in innovative biomaterials: Application to osteoarthritis treatment." Osteoarthritis and Cartilage **1)**: S444.

Osteoarthritis (OA) is a very common disease affecting a growing part of aging population. It is a degenerative joint disease accompanied by degradation of the articular cartilage and variable degrees of synovium inflammation. Mesenchymal Stromal Cells (MSC) have generated significant medical consideration since they secrete immuno-modulatory and anti-inflammatory factors. Unfortunately, the intra-articular injection of MSC suffers some major limitations including: (i) a massive cell death upon injection in the articular space making difficult to detect the injected cells for a sustained time; (ii) a risk of cell leak outside the articular space due to the propensity of MSC to migrate. Purpose(s): The present project is devoted to the development of a therapeutic strategy for OA, based on the exploitation of the immunomodulatory properties of MSC. To overcome the limitations of the crude intraarticular injections (cell death and leakage of MSC), we propose to entrap bioactive MSC prior to their injection within cytoprotective and permeable microcapsules made of innovative biomaterials. Materials: Alginate and silylated hydroxypropyl methylcellulose (Si- HPMC) were chosen as biocompatible biomaterials able to support the viability and bioactivity of encapsulated MSC. MSC were isolated from human adipose tissue (hADSC: human adipose tissue stromal cells). We selected a dropwise method in $CaCl_2$ solution to obtain alginate capsules. To produce SI-HPMC microcapsules, we developedwater in oil (w/o) emulsion protocol with or without surfactant. To assess pore size of microcapsules, the diffusion of FITC-dextran molecules (sizes ranging from 20 to 2000 KDa) through alginate and Si-HPMC microcapsules were followed by confocal microscopy. For MSC encapsulation, a hADSC suspension of 2.106 cells/ml was added either to the alginate solution or to the Si-HPMC solution (without surfactant). The microbeads were then collected by filtration, washed with HEPES buffer and seeded in culture medium. Culture medium was changed every 2 days after cell encapsulation. hADSC viability after encapsulation in alginate and Si- HPMC was followed for a period of 24 h to 2 months using a Live/Dead Viability/Cytotoxicity kit. Result(s): By dropwise method, we obtained alginate capsules with an average size of 1,1 +/-0,2 mm. Preliminary results have shown that their pore size was between 10 nm and 21 nm. With Si-HPMC, we managed to develop a suitable microencapsulation method by varying operating parameters such as surfactant, temperature or rotating speed. In optimal conditions, we obtained Si-HPMC microbeads with a size of 50,3 +/-4,9 mum (when a surfactant was used) and 1 +/-0,9 mm (without surfactant). Their pore size was ranging from 10 nm to 21 nm. Then we encapsulated hADSC in both polymers.We detected a high rate of viable encapsulated cells in 1 mm alginate capsules (about 93% of viability at 2 months post-encapsulation). In addition, we observed a lower rate of viable encapsulated hADSC in 1 mm Si-HPMC capsules (less than 50% of viability at 48 h post-encapsulation). Conclusion(s): Alginate and Si-HPMC appear as suitable biomaterials for producing permeable microcapsules. Dropwise and emulsion methods allow us to obtain capsules with different sizes. Our data strongly suggest that capsule porosity is appropriate to maintain cell viability (diffusion of nutrients and oxygen) and biological functions. Further experiments are now under investigation to determine whether hADSC encapsulated in permeable biomaterials may be a relevant strategy to prevent cartilage degradation and inflammation in OA.

Hackstein, H., et al. (2011). "Human mesenchymal stem cells can promote phenotypic maturation of human plasmacytoid dendritic cells via Tolllike receptor 7/8." Transfusion Medicine and Hemotherapy **1)**: 20.

Background: Human mesenchymal stem cells (hMSC) represent important multipotent cells hitherto believed to exert primarily immunosuppressive effects on human dendritic cells. We show here that this view is incomplete by providing evidence that hMSC can efficiently promote phenotypic maturation of purified plasmacytoid dendritic cells (pDC). Method(s): hMSC were generated from bone marrow employing standard procedures and human BDCA-4+ pDC precursors were microbead-sorted according from human buffy coat samples. Cocultures of purified pDC and hMSCs were stimulated through different toll-like receptor (TLR) ligands and pDC activation was analyzed by flow cytometry and ELISA. Result(s): Triggering of hMSC pDC cocultures through TLR4 (LPS) or TLR9 (CpG ODN) did not affect upregulation of T cell costimulatory m,olecule expression CD40, CD80, CD86 and HLA-DR on pDCs. In contrast TLR7/8 activation of hMSC pDC cocultures resulted in marked upregulation of CD80 and CD86 surface expression on pDC when compared to pDC-only controls. Moreover, pDC maturation by hMSC was dose-dependent and a hMSC-pDC ration of 1:10 was already sufficient to increase pDC CD80 and CD86 surface expression (mean fluorescence intensity; MFI) by >75% and 190%, respectively. Increasing the hMSC concentration to 20% resulted in further stimulation of pDC CD80 and CD86 MFI after TLR7/8 activation by 331% and 669%, again compared to pDC-only controls. Furthermore, whereas presence of hMSC resulted in moderate reduction of TLR9-triggered interferon-alpha production by pDC, it was not inhibited after TLR7/8-mediated stimulation. Conclusion(s): These data indicate that hMSC are not per se immunosuppressive. The results identify TLR7/8 as a candidate pathway circumventing the immunoregulatory function of hMSC. Given the fact that TLR7/8 activation plays a critical role in the development of autoimmune diseases such as lupus erythematodes and during viral infection, our results may add to the understanding of basic principles of autoimmunity.

Hadzic, R., et al. (2005). "The CD19 molecule is crucial for MID-dependent activation of tonsillar B cells from children." Scandinavian Journal of Immunology **61**(2): 165-172.

The Moraxella immunoglobulin (Ig) D-binding protein (MID) induces a strong proliferative response in human peripheral blood IgD+ B cells from adults isolated by positive selection using anti-CD19-conjugated microbeads. Here, we show that tonsillar B cells from children isolated with positive selection are unable to respond to MID stimulation. The proliferative response was very low or absent at various concentrations of MID tested and at different time points analysed, whereas the MID response of tonsillar B cells from adults isolated with positive selection was considerably higher. Tonsillar B cells from children isolated with positive selection responded to formalin-fixed preparations of Moraxella catarrhalis and Staphylococcus aureus Cowan strain I. In comparison to cells isolated with positive selection, a much higher proliferative response was recorded in tonsillar B cells from children isolated with negative selection, indicating that occupation of the CD19 molecule (i.e. positive selection) inhibited the response. Indeed, the addition of anti-CD19 monoclonal antibodies (MoAb) to MID-activated tonsillar B cells from children isolated with negative selection strongly inhibited the proliferative response. In contrast, anti-CD21 MoAb at the same concentration did only show a minor inhibition on the MID-induced response. Pre-incubation of tonsillar B cells isolated from children with anti-CD19 or anti-CD21 MoAb did not affect the binding of biotin-conjugated MID as analysed by flow cytometry. These results suggest that MID-activated tonsillar B cells from children have a strong requirement for signalling through the CD19 molecule. Future experiments will further reveal the importance of CD19 and possibly other molecules for optimal activation of tonsillar B cells isolated from both children and adults.

Haegerbaeumer, A., et al. (2019). "Impacts of Micro- and Nano-Sized Plastic Particles on Benthic Invertebrates: A Literature Review and Gap Analysis." Frontiers in Environmental Science.

As documented by the numerous publications that have appeared in recent years, plastic pollution of the environment and the effects on the respective ecosystems are currently one of the most intensely discussed issues in environmental science and in society at large. Of special concern are the effects of micro- and nano-sized plastics. A key issue in understanding the fate and potential effects of micro- and nano-sized plastics is their dynamic nature, as the size, shape, and charge of the particles change over time. Moreover, due to various biological processes, such as the aggregation of organic material and/or bacteria (“biofouling”), the density of plastic particles that settle in the sediments of aquatic ecosystems may be several orders of magnitudes higher than that in the surrounding waters. Consequently, the risk posed by plastic pollution to benthic fauna is considerably high. Nonetheless, the vast majority of studies examining the effects of microplastics have focused on pelagic organisms so far. We therefore conducted a comprehensive literature review to examine the impact of micro- and nano-sized plastics on benthic invertebrates, including the physical and chemical effects of leaching and the interactions of plastic particles with contaminants. Overall, 330 papers were reviewed for their fulfilment of different criteria (e.g. test species, plastic material, particle shape, particle size, exposure concentration, exposure route, assay type, assay duration), with 49 publications finally included in our survey. A comprehensive gap-analysis on the effects of plastic particles on benthic invertebrates, revealed a wide variety of effects triggered by micro- and/or nano-sized plastics but also distinct differences regarding the plastic materials tested,

the size fractions applied, the shape of the respective particles and the exposure routes tested. Our review concludes with a discussion of the important research gaps concerning freshwater ecosystems and recommendations for future areas of research.

Hafezi-Moghadam, A., et al. (2001). "L-selectin shedding regulates leukocyte recruitment." Journal of Experimental Medicine **193**(7): 863-872.

The physiologic role of L-selectin shedding is unknown. Here, we investigate the effect of L-selectin shedding on firm adhesion and transmigration. In a tumor necrosis factor alpha-induced model of inflammation, inhibition of L-selectin shedding significantly increased firm adhesion and transmigration by a lymphocyte function-associated antigen (LFA)-1 and intercellular adhesion molecule (ICAM)-1-dependent mechanism. We examined the quality of leukocyte rolling and L-selectin-mediated signaling. Blockade of L-selectin shedding significantly reduced the "jerkiness" of leukocyte rolling, defined as the variability of velocity over time. A low level of jerkiness was also observed in the rolling of microbeads conjugated with L-selectin, a model system lacking the mechanism for L-selectin shedding. Inhibition of L-selectin shedding potentiated activation of LFA-1 and Mac-1 induced by L-selectin cross-linking as shown by activation epitope expression and binding of ICAM-1-conjugated beads. We conclude that inhibition of L-selectin shedding increases leukocyte adhesion and transmigration by (a) increasing leukocyte exposure to the inflamed endothelium by decreasing jerkiness and (b) promoting leukocyte activation by outside-in signaling. These observations help to resolve the apparent discrepancy between the minor contribution of L-selectin to rolling and the significant leukocyte recruitment defect in L-selectin knockout mice.

Haghi, B. N. and M. Banaee (2017). "Effects of micro-plastic particles on paraquat toxicity to common carp (Cyprinus carpio): biochemical changes." International Journal of Environmental Science and Technology **14**(3): 521-530.

In this study, we investigated the possible effects of paraquat and micro-plastics on blood biochemical parameters in common carp (Cyprinus carpio). We exposed C. carpio for 21 days to sublethal concentrations of paraquat (0.2 and 0.4 mg L⁻¹) and micro-plastics (1 and 2 mg L⁻¹), alone or in combination. Blood biochemical analysis indicated that exposure to 0.4 mg L⁻¹ paraquat and mixture of paraquat and micro-plastics was followed by an increase in aspartate aminotransferase (AST), alkaline phosphatase (ALP), and creatine phosphokinase (CPK) activities and glucose levels. The activity of ALP and CPK showed a significant increase in fish treated with 2 mg L⁻¹ micro-plastics. No significant changes were observed in glucose level, AST, ALT, and LDH activities in fish exposed to micro-plastics. Exposure to paraquat and/or micro-plastics resulted in a significant decrease in total protein, globulin, cholesterol, and triglyceride levels and gamma -glutamyl transferase activity. When fish were exposed to paraquat or paraquat and micro-plastics, alanine aminotransferase (ALT) and lactate dehydrogenase (LDH) activities increased significantly compared to the control group. Treating fishes with a mixture of paraquat and 2 mg L⁻¹ micro-plastics caused a significant increase in albumin levels. However, a significant decrease in the albumin level was observed after exposure to paraquat or micro-plastics. Creatinine levels increased after exposure to paraquat and/or micro-plastics. The results indicate that increased doses of micro-plastics in water significantly increased toxic effects of paraquat in fish. Finally, these data support the hypothesis that changes in blood biochemical parameters were induced by exposure to paraquat and/or micro-plastics.

Hahladakis, J. N. and E. Iacovidou (2019). "An overview of the challenges and trade-offs in closing the

loop of post-consumer plastic waste (PCPW): Focus on recycling." Journal of Hazardous Materials **380**: 120887.

Recycling of post-consumer plastic waste (PCPW) is increasingly promoted as the means to achieving circular economy (CE). It converts plastic waste into a secondary material that can be fed back into the system, for use in the same or new components and products, with similar or lower functionality; hence "closing the loop". Up until today, research on examining the environmental impacts, economic implications and technicalities of plastic waste recycling deals with one particular aspect, or stage on the plastic value chain, lacking coherence and structure. To move this research forward, understanding the challenges and trade-offs in scaling up plastic waste recycling is necessary. Here, we bring together existing literature on the multi-faceted aspects of closing the plastic loop, critically debating on the multi-stakeholder endeavours of promoting circularity in the plastics value chain. We present an overview of how the design, production, collection and sorting of PCPW present challenges for plastic waste recycling, which in turn result to a number of trade-offs. We explain that the evaluation of the multi-dimensional implications of trade-offs arising from the PCPW recycling, is essential in measuring the long-term sustainability of resource recovery from waste systems. This work scrutinises the sustainability of closing the plastic waste loops and sets a future research agenda.

Hahn, A., et al. (2019). "Using FTIRS as pre-screening method for detection of microplastic in bulk sediment samples." Science of the Total Environment **689**: 341-346.

We present calibration models for the detection of two types of plastic (LDPE, PET) in sediments, developed from analysis of synthetic sediment mixtures and application of Fourier transform infrared spectroscopy (FTIRS) and partial least squares regression (PLSR) modeling. Synthetic sediment mixtures were produced using ground plastic particles mixed with various different sediment matrixes yielding LDPE and PET contents ranging from 0 to 5wt%. The resulting PLSR calibration models between the FTIRS spectral information and the defined plastic concentration of the synthetic sediment mixtures show strong cross-validated correlations (R²_{CV}=0.73 and 0.72) as well as low root-mean square errors of cross-validation (RMSE_{CV}=0.72 and 0.61; 14.4% and 12.2% when expressed as % of gradient). Application of the calibration to natural sediments shows that the method can be used to detect the presence of microplastics in sediment. The results are only semi-quantitative and semi-qualitative, and the method is suitable mainly for samples with very high microplastic concentrations (>1%). However the major advantage of this procedure is the time and cost efficiency. For studies with large amounts of samples (e.g. monitoring applications) we recommend this method as a pre-screening tool for selecting samples with plastic content for further analysis.

Hahn, Y. K., et al. (2007). "Magnetophoretic immunoassay of allergen-specific IgE in an enhanced magnetic field gradient." Analytical Chemistry **79**(6): 2214-2220.

We demonstrate a novel magnetophoretic immunoassay of allergen-specific immunoglobulin E (IgE) based on the magnetophoretic deflection velocity of a microbead that is proportional to the associated magnetic nanoparticles under enhanced magnetic field gradient in a microchannel. In this detection scheme, two types of house dust mites, Dermatophagoides farinae (D. farinae) and Dermatophagoides pteronyssinus (D. pteronyssinus), were used as the model allergens. Polystyrene microbeads were conjugated with each of the mite extracts followed by incubation with serum samples. The resulting mixture was then reacted with magnetic nanoparticle-conjugated anti-human IgE for detection of allergen-specific IgE by using sandwich immuno-reactions. A ferromagnetic microstructure combined with a permanent

magnet was employed to increase the magnetic field gradient (approximately 10(4) T/m) in a microfluidic device. The magnetophoretic velocities of microbeads were measured in a microchannel under applied magnetic field, and the averaged velocity was well correlated with the concentration of allergen-specific IgE in serum. From the analysis of pooled sera obtained from 44 patients, the detection limits of the allergen-specific human IgEs for D. farinae and D. pteronyssinus were determined to be 565 (0.045 IU/mL) and 268 fM (0.021 IU/mL), respectively. These values are 1 order of magnitude lower than those by a conventional CAP system. For evaluation of reproducibility and accuracy, unknown sera were subjected to a blind test by using the developed assay system, and they were compared with the CAP system. As a result, coefficient of variance was less than 10%, and the developed method enabled a fast assay with a tiny amount of serum (approximately 10 microL).

Hahn, Y. K., et al. (2006). Magnetophoretic immunoassay for allergen-specific immunoglobulin E (IgE) in patient samples. Micro Total Analysis Systems - Proceedings of MicroTAS 2006 Conference: 10th International Conference on Miniaturized Systems for Chemistry and Life Sciences.

This paper reports a novel magnetophoretic immunoassay using a microbead conjugated with superparamagnetic nanoparticles under the enhanced magnetic field gradient. A ferromagnetic microstructure connected with a permanent magnet is used to increase the magnetic field gradient (∼104 T m -1) and successfully applied to detect allergen-specific IgEs samples obtained from 44 patients' serum in a hospital. The detectable ranges of human IgEs are 10.68 ng mL-1 to 151 pg mL-1 (Dermatophagoides pteronyssinus) and 19.47 ng mL-1 to 104 pg mL-1 (Dermatophagoides farinae). © 2006 Society for Chemistry and Micro-Nano Systems.

Haider, T. P., et al. (2019). "Plastics of the Future? The Impact of Biodegradable Polymers on the Environment and on Society." Angewandte Chemie. International Ed. in English **58**(1): 50-62.

In recent years the littering of plastics and the problems related to their persistence in the environment have become a major focus in both research and the news. Biodegradable polymers like poly(lactic acid) are seen as a suitable alternative to commodity plastics. However, poly(lactic acid) is basically non-degradable in seawater. Similarly, the degradation rate of other biodegradable polymers also crucially depends on the environments they end up in, such as soil or marine water, or when used in biomedical devices. In this Minireview, we show that biodegradation tests carried out in artificial environments lack transferability to real conditions and, therefore, highlight the necessity of environmentally authentic and relevant field-testing conditions. In addition, we focus on ecotoxicological implications of biodegradable polymers. We also consider the social aspects and ask how biodegradable polymers influence consumer behavior and municipal waste management. Taken together, this study is intended as a contribution towards evaluating the potential of biodegradable polymers as alternative materials to commodity plastics.

Halden, R. U. (2010). "Plastics and health risks." Annual Review of Public Health **31**: 179-194.

By 2010, the worldwide annual production of plastics will surpass 300 million tons. Plastics are indispensable materials in modern society, and many products manufactured from plastics are a boon to public health (e.g., disposable syringes, intravenous bags). However, plastics also pose health risks. Of principal concern are endocrine-disrupting properties, as triggered for example by bisphenol A and di-(2-ethylhexyl) phthalate (DEHP). Opinions on the safety of plastics vary widely, and despite more than five decades of research, scientific consensus on product safety is still elusive. This literature review summarizes information from more than 120 peer-reviewed publications on health effects of plastics and plasticizers in lab animals and humans. It examines problematic exposures of susceptible populations and also briefly summarizes adverse environmental impacts from plastic pollution. Ongoing efforts to steer human society toward resource conservation and sustainable consumption are discussed, including the concept of the 5 Rs--i.e., reduce, reuse, recycle, rethink, restrain--for minimizing pre- and postnatal exposures to potentially harmful components of plastics. [References: 129]

Halden, R. U. (2015). "Epistemology of contaminants of emerging concern and literature meta-analysis." Journal of Hazardous Materials **282**: 2-9.

A meta-analysis was conducted to inform the epistemology, or theory of knowledge, of contaminants of emerging concern (CECs). The CEC terminology acknowledges the existence of harmful environmental agents whose identities, occurrences, hazards, and effects are not sufficiently understood. Here, data on publishing activity were analyzed for 12 CECs, revealing a common pattern of emergence, suitable for identifying past years of peak concern and forecasting future ones: dichlorodiphenyltrichloroethane (DDT; 1972, 2008), trichloroacetic acid (TCAA; 1972, 2009), nitrosodimethylamine (1984), methyl tert-butyl ether (2001), trichloroethylene (2005), perchlorate (2006), 1,4-dioxane (2009), prions (2009), triclocarban (2010), triclosan (2012), nanomaterials (by 2016), and microplastics (2022 +/- 4). CECs were found to emerge from obscurity to the height of concern in 14.1 +/- 3.6 years, and subside to a new baseline level of concern in 14.5 +/- 4.5 years. CECs can emerge more than once (e.g., TCAA, DDT) and the multifactorial process of emergence may be driven by inception of novel scientific methods (e.g., ion chromatography, mass spectrometry and nanometrology), scientific paradigm shifts (discovery of infectious proteins), and the development, marketing and mass consumption of novel products (antimicrobial personal care products, microplastics and nanomaterials). Publishing activity and U.S. regulatory actions were correlated for several CECs investigated.

Hale, R. C. (2018). "Are the Risks from Microplastics Truly Trivial?" Environmental Science and Technology **52**(3): 931.

Hall, N. M., et al. (2015). "Microplastic ingestion by scleractinian corals." Marine Biology **162**(3): 725-732.

We report for the first time the ingestion of microplastics by scleractinian corals, and the presence of microplastics in coral reef waters adjacent to inshore reefs on Australia's Great Barrier Reef (GRE, 18°31'S 146°23'E). Analysis of samples from sub-surface plankton tows conducted in close proximity to inshore reefs on the central GBR revealed microplastics, similar to those used in marine paints and fishing floats, were present in low concentrations at all water sampling locations. Experimental feeding trials revealed that corals mistake microplastics for prey and can consume up to ~50 [mu]g plastic cm^sup -2^ h^sup -1^, rates similar to their consumption of plankton and Artemia nauplii in experimental feeding assays. Ingested microplastics were found wrapped in mesenterial tissue within the coral gut cavity, suggesting that ingestion of high concentrations of microplastic debris could potentially impair the health of corals.

Halldorsdottir, A. M., et al. (2009). "Comparison of two platforms for HLA antibody screening in apheresis platelet donors." Transfusion **3)**: 191A-192A.

Background: HLA (Human Leukocyte Antigen) antibodies are implicated in TRALI (Transfusion-related Acute Lung Injury), the leading cause of transfusion- related fatalities. Donor screening may reduce TRALI risk. More data is needed on the frequency of HLA

alloimmunization as well as the performance of various detection techniques. This study compares two different assays at a hospital-based donor center; 1) the Dynachip, an automated assay combining ELISA with microarray technology and 2) the LABScreen Single Antigen (SA), a microbead-flow assay. Method(s): Samples from 149 apheresis platelet donors, 96 females and 53 males, who answered questions regarding pregnancy and transfusion history were tested for HLA Class I and II antibodies using two platforms. 1) DynaChipTM HLA Antibody Analysis System (Invitrogen, CA) and 2) LABScreen (SA) assay (One Lambda) for the Luminex instrument. Several thresholds were tested for both methods. In the Dynachip assay reactions are scored based on signal strength (to ?) and percent reactive antibody (PRA). Detection rate was compared for PRA > 2% vs > 5% and for reaction strength +?vs +?. The LABScreen interpretation was based on the normalized background (NBG) ratio, comparing NBG > ?10, 20, 30, 40 and 50. Donor pregnancy and transfusion history was compared to the presence of HLA antibodies. Result(s): Only 7 of 149 (5%) donors had been transfused (5 females and 2 males), whereas 65 of 96 (68%) females had been pregnant. The prevalence of Class I and/or Class II antibodies in the Dynachip and LABScreen assays using different cutoffs is displayed in the table. The prevalence of Class I and/or Class II antibodies ranged widely depending on the threshold used; the range was 16% to 59% for the LABScreen and 14% to 67% for the Dynachip. Positive pregnancy history correlated with HLA alloimmunization but this correlation was stronger in the LABScreen compared to the Dynachip assay (table). LABScreen was negative for both transfused males and one transfused nonpregnant female, but one transfused non-pregnant female reacted in the Dynachip assay. The concordance between the two methods ranged from 59% for the least stringent (NBG > ?10 and +/2%) to 84% using the most stringent criteria (NBG > ?50 and +?/5%). Conclusion(s): The prevalence of HLA antibodies in donors depends on the choice of assay and the thresholds used. The concordance between the LABScreen SA and Dynachip HLA antibody assays was poor at low thresholds. The correlation with pregnancy history was stronger in the LABScreen than in the Dynachip assay.

Halle, A. T., et al. (2017). "Nanoplastic in the North Atlantic Subtropical Gyre." Environmental Science & Technology **51**(23): 13689-13697.

Plastics can be found in all ecosystems across the globe. This type of environmental pollution is important, even if its impact is not fully understood. The presence of small plastic particles at the micro- and nanoscales is of growing concern, but nanoplastic has not yet been observed in natural samples. In this study, we examined four size fractions (meso-, large micro-, small micro-, and nanoplastics) of debris collected in the North Atlantic subtropical gyre. To obtain the nanoplastic portion, we isolated the colloidal fraction of seawater. After ultrafiltration, the occurrence of nanoscale particles was demonstrated using dynamic light scattering experiments. The chemical fingerprint of the colloids was obtained by pyrolysis coupled with gas chromatography-mass spectrometry. We demonstrated that the signal was anthropogenic and attributed to a combination of plastics. The polymer composition varied among the size classes. At the micro- and nanoscales, polyvinyl chloride, polyethylene terephthalate, polystyrene and polyethylene were observed. We also observed changes in the pyrolytic signals of polyethylene with decreasing debris size, which could be related to the structural modification of this plastic as a consequence of weathering. [ABSTRACT FROM AUTHOR]

full abstract. (Copyright applies to all Abstracts.)

Halle, L. L., et al. (2020). "Ecotoxicology of micronized tire rubber: Past, present and future considerations." Science of the Total Environment **706 (no pagination)**(135694).

Micronized tire rubber has recently come into focus as black particles that are found in microplastic (MP) samples worldwide. These particles have been found in all environmental compartments with the most likely source being the abrasion of car tires on road surfaces. Thus, it is well founded that tires are a source of MPs and that tire abrasion is a primary source of anthropogenic particulates. Currently, the impact of tires has been viewed through the lens of particulate pollution together with MPs, but this is a relatively new direction for this topic. Previously ecotoxicological research into the environmental consequences of tires has primarily been related to the leached chemicals from tire particulates. This paper aims to (i) highlight similarities and differences of micronized rubber particles with the existing suite of polymer contaminants termed as 'microplastics' or 'plastic debris', (ii) survey the existing literature on environmental presence, fate, and interaction of micronized rubber particles with biota, and lastly (iii) present future research needs that require consideration in order to move this research area forward. Existing knowledge gaps that require attention include; determining the environmental presence and fate of micronized rubber within different environmental compartments, understanding the interaction of rubber particles with biota, particularly as potential impacts have so far been attributed solely to the leachate, and evaluating whether standard ecotoxicological protocols need to be adapted for particulate contaminants in general and specifically to suit rubber particulates and leachate. Copyright © 2019 Elsevier B.V.

Halstead, J. E., et al. (2018). "Assessment tools for microplastics and natural fibres ingested by fish in an urbanised estuary." Environmental Pollution **234**: 552-561.

Microplastics and fibres occur in high concentrations along urban coastlines, but the occurrence of microplastic ingestion by fishes in these areas requires further investigation. Herein, the ingestion of debris (i.e., synthetic and natural fibres and synthetic fragments of various polymer types) by three benthic-foraging fish species Acanthopagrus australis (yellowfin bream), Mugil cephalus (sea mullet) and Gerres subfasciatus (silverbiddy) in Sydney Harbour, Australia has been quantified and chemically speciated by vibrational spectroscopy to identify the polymer type. Ingested debris were quantified using gut content analysis, and identified using attenuated total reflectance Fourier transform infrared (ATR-FTIR) and Raman microspectroscopies in combination with principal component analysis (PCA). The occurrence of debris ingestion at the time of sampling ranged from 21 to 64% for the three species, and the debris number ranged from 0.2 to 4.6 items per fish for the different species, with ~53% of debris being microplastic. There was a significant difference in the amount of debris ingested among species; however, there was no difference among species when debris counts were standardised to fish weight or gut content weight, indicating that these species ingest a similar concentration of debris relative to their ingestion rate of other material. ATR-FTIR microspectroscopy successfully identified 72% of debris. Raman spectroscopy contributed an additional 1% of successful identification. In addition, PCA was used to non-subjectively classify the ATR-FTIR spectra resulting in the identification of an additional 9% of the debris. The most common microplastics found were polyester (PET), acrylic-polyester blend, and rayon (semi-synthetic) fibres. The potential of using Raman microspectroscopy for debris identification was investigated and provided additional information about the nature of the debris as well as the presence of specific dyes (and hence potential toxicity).

Halverson, G. R. (2010). "The relative hemolytic index (RHI): A new mathematical model to predict the outcome of an incompatible blood transfusion." Transfusion **2)**: 38A.

Background: Bioassays to predict blood transfusion outcome where there is serologic incompatibility have included ⁵¹Cr-labeled survival studies, monocyte monolayer assay (MMA), antibody dependant cell-mediated cytotoxicity (ADCC) and in vivo crossmatch. These tests are costly, take time, and the results can be unclear. Introduced here is a new mathematical model, the Relative Hemolytic Index (RHI), which is intended to replace these bioassays for predicting blood transfusion outcome. Method(s): The RHI includes tests to measure total IgG concentration or titer, isotype, C1q binding capacity and Fcgamma receptor (FcgammaR) affinity. The IgG titer was determined by hemagglutination. Microbeads analyzed by flow cytometric analysis determined the isotype and the FcgammaR affinity. C1q binding was done by Elisa. Antibodies in higher concentration received a higher score than those of lower concentration. Sera that were mostly IgG1 or IgG3 scored higher than IgG2 or IgG4. IgM antibodies received a high score. Serum with high C1q binding capacity scored higher than those with low binding capacity. Antibodies with an affinity for FcgammaRI or FcgammaRIIIa scored higher than those to FcgammaRIIa. The RHI is the sum of the scores obtained. The samples were also tested by MMA to compare results obtained with the RHI. Result(s): Two human monoclonal (Mab) anti-Ds were used as controls in all four RHI assays. Based upon the results obtained with the controls, the cutoff for a significant RHI was set at 30. Assay results, scores and RHI for the Mab anti-D and three representative serum samples are shown in Table 1. The anti-D Mabs scored a high RHI at 39 and 47 respectively, and this is in agreement with a significant monocyte index (MI) of 30.5% and 44% respectively for RBC adherance and engulfment in the MMA. Of three representative serum samples, the anti-D+C and the warm/cold mixed autoantibody had significant RHI values of 57 and 46 respectively, while the anti-c serum sample did not with a score of 27. The MMA results also confirm those sera with a significant RHI scored an MI that is well above the >5% significance limit cutoff at 47.5% and 12.2% respectively. Conclusion(s): Current methods for predicting transfusion outcomes in the setting of blood incompatibility to serum antibodies are time consuming and costly, and are not immediately available for the critically ill patient requiring blood. The advantages of the RHI are that the tests can be multiplexed and run simultaneously, and can be completed within 6 hours. The RHI will not only save time and money, it will also allow for better patient care and for safer transfusions where the question of compatibility does not have a ready answer.

Halvorsen, E. H., et al. (2011). "Interleukin-15 Induces Interleukin-17 Production by Synovial T Cell Lines from Patients with Rheumatoid Arthritis." Scandinavian Journal of Immunology **73**(3): 243-249.

IL-17-producing T cells (Th17 cells) are believed to contribute to local inflammation and joint damage in rheumatoid arthritis (RA). Limited data exist on Th17 cells located within the inflamed synovial tissue (ST) of patients with RA. Here, we aimed to generate polyclonal T cell lines (TCLs) from the RA ST and assess their cytokine production, including the effects of exogenous IL-15 on IL-17 production in vitro. For five patients with RA, polyclonal TCLs were established from ST obtained by joint surgery. Synovial TCLs were expanded and stimulated by anti-CD3/CD28 microbeads and exogenous cytokines. Cytokine production was assessed by culture supernatant analyses and intracellular flow cytometry, and TCLs were sorted based on their surface expression of CCR6. In addition to IL-17, we detected IL-6, IL-10, IFN-gamma and TNF-alpha in the synovial TCL culture supernatants. Exogenous IL-15 increased the production of IL-17 as well as the other cytokines except IFN-gamma. For IL-17, this effect was more pronounced after prolonged culture times. Intracellular flow cytometry confirmed the presence of IL-17⁺ and IL-17⁺IFN-gamma⁺ CD4⁺ T cells in the TCLs. IL-17⁺ and IL-17⁺IFN-gamma⁺ T cells were enriched in the CD4⁺CCR6⁺ population. In conclusion, Th17 cells can be detected after polyclonal expansion and stimulation of RA synovial TCLs generated by joint surgery. The Th17 cells from the RA ST were enriched in the CD4⁺CCR6⁺ population, and they were sensitive to exogenous IL-15. Th17 cells present within the synovial compartment may contribute to the RA pathogenesis and local joint damage. © 2011 The Authors. Scandinavian Journal of Immunology © 2011 Blackwell Publishing Ltd.

Ham, A. S. W. (2006). Vascular drug targeting: Engineered poly(ethylene glycol) microparticle surfaces modulate receptor-specific adhesion.

In vascular disease, the expression of selectins on the endothelium signal areas of inflammation that can be used as a target drug delivery. To create a selectin targeting vehicle, microbeads were first conjugated with the monoclonal antibody HuEP5C7.g2 (HuEP), which has specificity to E- and P-selectin. While the HuEP microparticle targeting performance was not as comparatively stable as P-selectin Glycoprotein Ligand-1 microbeads, HuEP is an alternative to expensive glycoproteins which support targeting and rolling on selectin surfaces at near physiological flow conditions. To improve microparticle receptor-specific targeting, engineering a targeting moiety on the extremities of grafted tethers has been shown to increase effective tethering and to improve adhesion robustness. Therefore, microparticle surfaces were grafted with two types of poly(ethylene glycol) (PEG) tethers, a short PEG chain (MW 3400 Da), and a long PEG chains (MW 10000 Da). Under in vitro flow conditions, there was an increase in microbead avidity resulting in a 4.5-fold improvement in the tethering frequency and a 7-fold increase in the microparticle adhesion bond lifetime as the length of the PEG linker was increased. The data suggest that long PEG tethers improve targeting avidity by increasing ligand availability and lowering the dissociative forces on the adhesion bonds. PEG, as an engineered surface to modulate receptor-specific adhesion, additionally is used as a permeable repulsive barrier. The response of PEG layers under compressive forces to prevent the accessibility of buried ligand on microbeads showed that long PEG tethers provided a 2-fold increase in shielding efficiency over short PEG tethers at similar densities and pressures. Additionally, applying pressure to the PEG layer decreases the contact time necessary to achieve significant binding by 14-fold in PEG super(2000) and 17-fold in PEG super(10000) when compared to gravity mediated contact. The surface engineering of the particles with PEG largely prevented adhesion where it strongly regulates the accessibility of shielded ligands under applied pressure. The use of PEG linkers to engineer the surfaces of targeting microbeads as a mimetic of leukocyte microvilli in targeted drug delivery demonstrates the potential to use molecular polymer length and surface density to modulate the apparent adhesion kinetics of receptor-specific interactions.

Hamed, F., et al. (2020). "Shaking Table Study on PET Strips-Sand Mixtures Using Laminar Box Modelling." Geotechnical and Geological Engineering **38**(1): 683-694.

Daily increase in plastic waste amounts is a serious environmental problem and it is among the major challenges worldwide. Reusing this waste material can be therefore an appropriate solution to overcome this problem. Besides, recycling plastic waste as reinforcing material has become a cheap and viable alternative for soil improvement schemes. In the current study, PET plastic waste strips (water bottles) were randomly mixed with sandy soil to improve the soil strength parameters. Due to the lack of comprehensive seismic studies on soils reinforced with PET strips, a series of 1-g shaking table tests was performed to evaluate the dynamic properties of the sand-PET mixtures with different PET contents (0%, 0.5%, 0.75% and 1% by the sand

weight) and aspect ratios (1 and 5). Effect of various parameters, including excitation amplitude, PET strip content and PET strip aspect ratio on response of the mixtures were elaborated. It was found that addition of the PET strips to the sand, could reduce the soil brittleness under low overburden pressures. Therefore, at the inclusion ranges used in this study, increase of the PET strips content or aspect ratio, caused an increase in the damping ratio and decrease in the shear modulus values compared to the plain sand model. Opposite trends of PET strips inclusion contribution were reported under the influence of high overburden pressures through carrying out some cyclic large-scale direct shear tests.

Hamed, M., et al. (2019). "Assessment the effect of exposure to microplastics in Nile Tilapia (Oreochromis niloticus) early juvenile: I. blood biomarkers." Chemosphere **228**: 345-350.

There is a scarcity of knowledge about the impacts of microplastics (MPs) on the early juvenile stage of freshwater fish. The current study aims to inspect the exposure and post-exposure recovery of microplastics (MPs) on accumulation and blood biomarkers of Nile Tilapia (Oreochromis niloticus) early juvenile. Four groups of fishes were used; the first group was the control group, the second group was exposed to (1 mg/L of MPs), the third group was exposed to (10 mg/L of MPs), and the fourth group was exposed to (100 mg/L of MPs) for 15 days and 15 days of recovery. The results showed that significantly higher numbers of microplastics were observed in microplastics-exposed groups compared to control group. Biochemical parameters (creatinine, uric acid, AST, ALT, ALP, glucose, cholesterol, total protein, albumin, globulin, and A/G ratio) showed significant increment after exposure to microplastics for 15 days compared to control group in dose dependent manner. The hematological indices (RBC's count, Hb, Ht, MCHC, Platelets, WBC's count, and monocytes) showed a significant decline after exposure to microplastics for 15 days compared to control group, while MCV and MCH showed a significant increase after exposure to microplastics for 15 days. After the recovery period, microplastics accumulations, hemato-biochemical alterations were still detected in microplastics exposed groups compared to the control group except for WBC's count and MCV which return to normal levels. MPs caused anemia and perturbations in hemato-biochemical parameters which may cause mortality of tilapia early juvenile and should be considered in a program for monitoring hazard materials in the ecosystem.

Hämer, J., et al. (2014). "Fate of Microplastics in the Marine Isopod Idotea emarginata." Environmental Science & Technology **48**(22): 13451-13458.

Plastic pollution is an emerging global threat for marine wildlife. Many species of birds, reptiles, and fishes are directly impaired by plastics as they can get entangled in ropes and drown or they can ingest plastic fragments which, in turn, may clog their stomachs and guts. Microplastics of less than 1 mm can be ingested by small invertebrates, but their fate in the digestive organs and their effects on the animals are yet not well understood. We embedded fluorescent microplastics in artificial agarose-based food and offered the food to marine isopods, Idotea emarginata. The isopods did not distinguish between food with and food without microplastics. Upon ingestion, the microplastics were present in the stomach and in the gut but not in the tubules of the midgut gland which is the principal organ of enzyme-secretion and nutrient resorption. The feces contained the same concentration of microplastics as the food which indicates that no accumulation of microplastics happens during the gut passage. Long-term bioassays of 6 weeks showed no distinct effects of continuous microplastic consumption on mortality, growth, and intermolt duration. I. emarginata are able to prevent intrusion of particles even smaller than 1 µm into the midgut gland which is facilitated by the complex structure of the stomach including a fine filter system. It separates the midgut gland tubules

from the stomach and allows only the passage of fluids and chyme. Our results indicate that microplastics, as administered in the experiments, do not clog the digestive organs of isopods and do not have adverse effects on their life history parameters. [ABSTRACT FROM AUTHOR]

Hamlin, H. J., et al. (2015). "Migration of nonylphenol from food-grade plastic is toxic to the coral reef fish species Pseudochromis fridmani." Chemosphere **139**: 223-228.

Nonylphenol (NP) is a non-ionic surfactant used extensively in industrial applications, personal care products, and many plastics. We exposed marine orchid dottybacks (Pseudochromis fridmani) for 48 h to either glass, Teflon, or two bags labeled as FDA food-grade polyethylene (PE1 and PE2) from different manufacturers. The PE2 bags leached high levels of NP into the contact water, which were taken up by the fish, and decreased short and long-term survival. Concentrations of NP that leached from the bags were consistent with 96 h LC₅₀ values determined in this study, indicating NP is the likely toxic agent. Despite being similarly labeled, the NP concentrations that leached from the bags and the resultant toxicity to the fish varied dramatically between manufacturers. This study highlights that some plastics, labeled as food-safe, can be highly toxic to aquatic animals, and could pose a greater threat to humans than previously realized. This study also highlights risks for aquatic animals exposed to increasing quantities of plastic waste.

Hammami, M. B. A., et al. (2017). "Survey on awareness and attitudes of secondary school students regarding plastic pollution: implications for environmental education and public health in Sharjah city, UAE." Environmental Science & Pollution Research **24**(25): 20626-20633.

Since the industrial revolution in the 1800s, plastic pollution is becoming a global reality. This study aims to assess knowledge and attitude about plastic pollution among secondary school students in Sharjah city, United Arab Emirates. A cross-sectional study was conducted among 400 students in 6 different secondary schools in Sharjah city. Self-administered questionnaires were distributed through probability stratified random sampling method between February and April 2016. Majority of the population understands how harmful plastic wastes are to the environment (85.5%). However, the students' mean knowledge score was 53%, with females ($P < 0.01$), grades 11 and 12 ($P = 0.024$), and students whose mothers were more educated ($P = 0.014$) being more knowledgeable and inclined towards pro-environmental behavior. Yet, all students showed tendency to be involved in the fighting against this dilemma. Strategies which address deficiencies, provide incentives for change, and assure governmental support along with environmental education are needed to bridge the information gap and enhance opportunities to adopt pro-environmental behaviors.

Hammer, J., et al. (2012). "Plastics in the marine environment: the dark side of a modern gift." Reviews of Environmental Contamination & Toxicology **220**: 1-44.

Plastics are cheap, strong, and durable and offer considerable benefits to humanity. They potentially can enhance the benefits that both medical and scientific technology will bestow to humankind. However, it has now been several decades since the use of plastics exploded, and we have evidence that our current approach to production, use, transport and disposal of plastic materials has caused, and is still causing serious effects on wildlife, and is not sustainable. Because of frequent inappropriate waste management practices, or irresponsible human behavior, large masses of plastic items have been released into the environment, and thereby have entered the world's oceans. Moreover, this process continues, and in some places is even increasing. Most plastic debris that now exists in the marine environment originated from ocean-based sources such as the fishing industry. Plastics accumulate in coastal areas, at the ocean surface and on the seabed. Because 70% of all plastics are known to eventually sink, it is suspected that ever increasing amounts of plastic items are accumulating in seabed sediments. Plastics do not biodegrade, although, under the influence of solar UV radiations, plastics do degrade and fragment into small particles, termed microplastics. Our oceans eventually serve as a sink for these small plastic particles and in one estimate, it is thought that 200,000 microplastics per km(2) of the ocean's surface commonly exist. The impact of plastic debris has been studied since the beginning of the 1960's. To date, more than 267 species in the marine environment are known to have been affected by plastic entanglement or ingestion. Marine mammals are among those species that are most affected by entanglement in plastic debris. By contrast, marine birds suffer the most from ingestion of plastics. Organisms can also be seriously absorbed by floating plastic debris, or the contaminants may derive from plastic additives that are leached to the environment. Recent studies emphasize the important role of microplastics as they are easily ingestible by small organisms, such as plankton species, and form a pathway for contaminants to enter the food web. Contaminants leached from plastics tend to bioaccumulate in those organisms that absorb them, and chemical concentrations are often higher at higher trophic levels. This causes a threat to the basis of every food web and can have serious and far-reaching effects, even on nonmarine species such as polar bears and humans, who consume marine-grown food. Therefore, resolving the plastic debris problem is important to human kind for two reasons: we are both creator, and victim of the plastic pollution problem. Solutions to the plastic debris problem can only be achieved through a combination of actions. Such actions include the following: Legislation against marine pollution by plastics must be enforced, recycling must be accentuated, alternatives (biodegradable) to current plastic products must be found, and clean-up of debris must proceed, if the marine plastic pollution problem is to eventually be resolved. Governments cannot accomplish this task on their own, and will need help and initiative from the public. Moreover, resolving this long-standing problem will require time, money, and energy from many individuals now living and those of future generations, if a safer and cleaner marine environment is to be achieved.

Hammer, S., et al. (2016). "Plastic debris in great skua (Stercorarius skua) pellets corresponds to seabird prey species." Marine Pollution Bulletin **103**(1/2): 206-210.

Plastic is a common item in marine environments. Studies assessing seabird ingestion of plastics have focused on species that ingest plastics mistaken for prey items. Few studies have examined a scavenger and predatory species that are likely to ingest plastics indirectly through their prey items, such as the great skua (Stercorarius skua). We examined 1034 regurgitated pellets from a great skua colony in the Faroe Islands for plastics and found approximately 6% contained plastics. Pellets containing remains of Northern fulmars (Fulmarus glacialis) had the highest prevalence of plastic. Our findings support previous work showing that Northern fulmars have higher loads of plastics than other sympatric species. This study demonstrates that marine plastic debris is transferred from surface feeding seabird species to predatory great skuas. Examination of plastic ingestion in species that do not ingest plastics directly can provide insights into how plastic particles transfer vertically within the food web.

Hammill, T. B. and R. L. Crawford (1997). "Bacterial microencapsulation with three algal polysaccharides." Canadian Journal of Microbiology **43**(11): 1091-1095.

Methods for encapsulating pollutant-degrading bacteria into microbeads of carrageenan type I, carrageenan type II, and guar gum are described. Cell suspensions in solutions of encapsulating agents were passed through a low-pressure nozzle into an aqueous medium. The resultant aerosols polymerized to form microbeads that ranged in diameter from 2-70 mum. Pentachlorophenol degradation experiments with an encapsulated Sphingomonas sp. showed degradation rates similar to those seen using free cells. These results describe three additional matrices for the microencapsulation of bacteria that have potential for use in bioremediation processes.

Hammond, D. (1992). "Fast oligosaccharide separations identify fruit juice adulteration." Laboratory Equipment Digest **30**(8): 11-12.

Adulteration of orange juice with beet medium invert sugar (whose main sugars are in similar concentration ratio) may be detected via analysis for oligosaccharides present in invert syrups but not in natural juices. Sub-ppm levels of such oligosaccharides are detected in slightly more than 30 min, compared with 2 h for the standard GC method, using a Dionex DX-300 ion chromatograph having a column of Microbeads (sub-micron particles of a polymer having many anion-exchange sites at the surface) followed by HPAE-PAD (high-pH anion exchange pulsed amperometric detection).

Han, B., et al. (2009). "Ex vivo expansion and hematopoietic reconstitution ability of isolated CD34+CD59+ cells from patients with paroxysmal nocturnal hemoglobinuria." Haematologica **1)**: S31.

Paroxysmal nocturnal hemoglobinuria (PNH) is a clonal hematopoietic stem cell disorder characterized by intravascular hemolysis, venous thrombosis, and bone marrow (BM) failure. Until now, allogeneic(allo) hematopoietic stem cell transplantation is still the only way to cure PNH. Eculizumab, although very promising, is not the eradication of the disease because of raising the possibility of severe intravascular hemolysis if therapy is interrupted. Here we isolated the residual bone marrow normal progenitor cells (marked by CD34 + CD59 +) from PNH patients, tried to find a way of effectively expanding the progenitors cells ex vivo. Object. To expand CD34 + CD59 + cells isolated from patients with PNH and observed the long term hemaotopoietic reconstruction ability both ex vivo and in vivo. Method. CD34 + CD59 + cells from 13 patients with PNH and CD34 + cells from 11 normal controls were isolated from the bone marrow mononucleated cells first with immunomagnetic microbead and then by autoclone flow cytometry sorting. The sorted cells were then cultivated under different conditions for two weeks to find out the optimal expansion. The long term hematopoietic supporting ability was evaluated by long-term culture in semi-solid medium ex vitro and long-term engraftment in irradiated immunodeficient mice in vivo. Results. CD34 + CD59 + cells from patients with PNH can be expanded effectively in vitro, and the biggest expansion of CD34 + CD59 + cells was 23.49+/-3.52 fold on the 7th day. The best combination of hematopietic factors for in vitro expansion was SCF+IL-3+IL-6+FL+Tpo+Epo, and the most suitable time for harvesting was on day 7. Although the CD34 + CD59 + PNH cells have impaired ex vivo proliferation and survival compared with normal CD34 + cells, they remain strong colony-forming capacity in long-term culture. The peripheral blood cell count in lethally irradiated mice transplanted with expanded CD34 + CD59 + PNH cells recovered on day 90, which was compatible with those transplanted with normal CD34 cells (p>0.05). The survival rate and human CD45 xpression in different organs was similar between mice ransplanted ith CD34 D59 NH cells and those with normal CD34 ells p>0.05). On secondary ransplantation, the

peripheral blood cell count eturned to almost normal on day 30 in mice transplanted ither with NH cells or with normal control cells. Lower CD45 percentage was found in secondary transplantation but no difference between mice transplanted with different cells. Conclusion. Isolated CD34 CD59+cells from patients with PNH can be effectively expanded ex vivo and can sup-port hematopoiesis both in vitro and in vivo in the long term. These data provide a new potential way of managing PNH with auto-PBSCT.

Han, K. Y., et al. (2018). "SIDR: simultaneous isolation and parallel sequencing of genomic DNA and total RNA from single cells." Genome Research **28**(1): 75-87.

Simultaneous sequencing of the genome and transcriptome at the single-cell level is a powerful tool for characterizing genomic and transcriptomic variation and revealing correlative relationships. However, it remains technically challenging to analyze both the genome and transcriptome in the same cell. Here, we report a novel method for simultaneous isolation of genomic DNA and total RNA (SIDR) from single cells, achieving high recovery rates with minimal cross-contamination, as is crucial for accurate description and integration of the single-cell genome and transcriptome. For reliable and efficient separation of genomic DNA and total RNA from single cells, the method uses hypotonic lysis to preserve nuclear lamina integrity and subsequently captures the cell lysate using antibody-conjugated magnetic microbeads. Evaluating the performance of this method using real-time PCR demonstrated that it efficiently recovered genomic DNA and total RNA. Thorough data quality assessments showed that DNA and RNA simultaneously fractionated by the SIDR method were suitable for genome and transcriptome sequencing analysis at the single-cell level. The integration of single-cell genome and transcriptome sequencing by SIDR (SIDR-seq) showed that genetic alterations, such as copy-number and single-nucleotide variations, were more accurately captured by single-cell SIDR-seq compared with conventional single-cell RNA-seq, although copy-number variations positively correlated with the corresponding gene expression levels. These results suggest that SIDR-seq is potentially a powerful tool to reveal genetic heterogeneity and phenotypic information inferred from gene expression patterns at the single-cell level.

Han, L., et al. (2012). "Increased expression and function of P-glycoprotein in peripheral blood CD56+ cells is associated with the chemoresistance of non-small-cell lung cancer." Cancer Chemotherapy & Pharmacology **70**(3): 365-372.

PURPOSE: Chemoresistance is common among non-small-cell lung cancer (NSCLC), P-glycoprotein (P-gp), encoded by the human multi-drug-resistant MDR1 gene, and multidrug-resistance protein 1 (MRP1) might be major contributors. The aim of the present study was to develop an effective method to investigate the expression and function of P-gp in the peripheral CD56+ cells in order to clarify their correlation with the chemoresistance in NSCLC.

METHODS: Using microbead technology and a RT-qPCR methodology, we evaluated the expression levels of P-gp and MRP1 in the purified CD56+ cells in the chemoresistance and chemo-naive NSCLC patients compared with that in the healthy volunteers. Flow cytometric analysis was used to investigate the changes of P-gp function in the CD56+ cells between the three cohorts.

RESULTS: The MDR1 gene expression was elevated markedly (twofold-tenfold), and P-gp function was increased in the chemoresistance cohort compared with the chemo-naive and the healthy cohorts; whereas there was only about two times averagely elevated for the MRP1 gene expression. No statistical significance ($p > 0.05$) was seen with respect to the expression of MDR1 and MRP1, the function of P-gp between the chemo-naive and the healthy cohorts.

CONCLUSIONS: P-gp in peripheral CD56+ cells demonstrated possible clinical relevance as predictive biomarkers for the identification of chemoresistance in NSCLC, while MRP1 may not play a significant role in the drug resistance in NSCLC. The potential applications for this finding are provided evidence to screen the potential P-gp reversors and to diagnose and manage the chemoresistance in NSCLC patients.

Han, X., et al. (2019). "An optimized density-based approach for extracting microplastics from soil and sediment samples." Environmental Pollution **254**(Pt A): 113009.

Microplastic pollution in the environment has received growing attention worldwide. A major impediment for accurate measurements of microplastics in environmental matrixes is to extract the particles. The most commonly-used method for separation from soil or sediment is flotation in dense liquid based on the relatively low density of plastic particles. This study provides an improved and optimized process for extraction of microplastic particles by modifying the floatation technique and floatation solution. Microplastics in soils and sediments are extracted by adding 200g dry soil or sediment sample to 1.3L mix of the saturated NaCl and NaI solutions in a volume ratio of 1:1 and aerating for 40s then filtering the supernatant. The accuracy and precision of the new approach is validated by recovery experiments using soil and sediment samples spiked with six common microplastic compounds: polyethylene (PE), polyethylene terephthalate (PET), polypropylene (PP), polyvinyl chloride (PVC), polystyrene (PS) and expanded polystyrene (EPS), and comparison with the previous method. The optimized approach is further compared with the previous approach using the real soil and sediment samples.

Han, Y., et al. (2015). "Clinical significance of circulating microparticles in phmyeloproliferative neoplasms (MPN)." Haematologica **1)**: 536.

Background: Microparticles (MPs) are small membrane vesicles that are classified a as follow: platelet-derived MPs (PMPs), endothelial MPs (EMPs), red blood cell MPs (RMPs) and tissue factor MPs (TF+MPs) based on their origins. Philadelphia chromosome-negative myeloproliferative neoplasms (Ph-MPN) are disorders characterized by abnormal hematopoiesis, thrombosis and JAK2V617F mutation. Although MPs are considered as biomarkers reflecting procoagulant state in cancer patients, whether they exist in the patients with Ph-MPN remains unclear. Aim(s): Our objective in this study was to measure the variation of the four types of MPs in the patients with MPN and to Figure out their correlations with JAK2V617F mutation and some clinical complications, especially thrombosis and splenomegaly. Method(s): Ninty-two patients with MPN were enrolled in this study, including 60 essential thrombocythemia (ET), 20 polycythaemia vera (PV), and 12 primary myelofibrosis (PMF). 30 healthy volunteers were selected as normal controls. Venous blood wasanticoagulated with sodium citrate (1:9). Plasma samples were measured by flow cytometry for RMPs, PMPs, TF+MPs and EMPs with phycoerythrin (PE)-conjugated monoclonal antibodies CD235a, CD61, CD142, and CD62E, respectively. Forward scatter was set in scale using fluorescent microspheres of 0.8mum and standard fluorescent microbeads (0~0.8mum) in diameter were used to set the microparticle gate. Data were presented as mean and standard deviation. Meanwhile, genomic DNA was extracted from mononuclear cells and amplified by allele specific polymerase chain reaction (PCR). Result(s): (1) Levels of RMPs, PMPs, EMPs and TF+MPs in patients with Ph- MPN was(135.2+/-291.60)/mul, (960.7+/-1539.1)/mul, (808.8+/-1244.5)/mul and (103.2+/-303.6)/mulrespectively; they were all significantly higher than control group (P<0.05). Moreover, levels of all four types of MPs in PMF group demonstrate significantly higher than PV group (P<0.05), and RMPs in PMF group was significantly higher than ET group (P<0.05).(2) Ph-MPN patients with thrombosis complication showed higher levels of all four types of MPs

than those without thrombosis complication(P<0.01). (3) Ph-MPN patients with splenomegaly showed higher levels of all four types of MPs than those without splenomegaly (P<0.01). (4) All four types of MPs in the JAK2V617F mutation group were higher than the group in which those patients without mutation (P<0.05). Summary and Conclusion(s): Ph-MPN patients reveals higher levels of all four types of MPs than normal controls, especially in patients complicated with thrombosis or splenomegaly. MPs in PMF patients possess more obvious increase than PV and ET groups. Patients with JAK2V617F mutation showed higher levels of the four types of MPs than that without JAK2V617F mutation. Consequently, MPs play an crucial role in the pathogenesis of Ph-MPN, and the MPs released may promote the formation of thrombosis.

Han, Y., et al. (2013). "Clinical significance of circulating microparticles in Ph-myeloproliferative neoplasms (MPN)." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Background Microparticles (MPs) are small membrane vesicles that are classified as red blood cell MPs (RMPs), platelet-derived MPs (PMPs), tissue factor MPs (TF+MPs) and endothelial MPs (EMPs) based on their origins. Philadelphia chromosome-negative myeloproliferative neoplasms (Ph-MPN) are disorders characterized by abnormal hematopoiesis, thrombosis, JAK2V617F mutation. Although MPs are considered as biomarkers reflecting procoagulant state in cancer patients, their involvement in the patients with Ph-MPN remains unclear. Our objective in this study was to measure the alterations of the four MPs types in the patients with MPN and to evaluate their correlations with JAK2V617F mutation and some clinical complications, especially for thrombosis and splenomegaly. Methods Sixty-seven patients with MPN were enrolled in this study, including 12 polycythaemia vera (PV), 49 essential thrombocythemia (ET) and 6 primary myelofibrosis (PMF). 30 healthy donors were selected as normal controls. Venous blood was anticoagulated with sodium citrate (1:9). Using flow cytometry, plasma samples were measured for RMPs, PMPs, TF+MPs and EMPs with phycoerythrin (PE)-conjugated monoclonal antibodies CD235a, CD61, CD142, and CD62E, respectively. Forward scatter was set in scale using fluorescent microspheres of 0.8mum and standard fluorescent microbeads (0-0.8mum) in diameter were used to set the microparticle gate. Data were expressed as median (M) and interquartile range (IQR). Meanwhile, genomic DNA was extracted from mononuclear cells and amplified by allele specific polymerase chain reaction (PCR). Results (1) Patients with MPN showed significantly higher plasma levels for all four MPs compared with healthy donors (P<0.05), namely 49.0/mul (15.8-109.5/mul) vs 21.0/mul (13.8-32.6/mul) for RMPs, 181.2/mul(75.8-1111.6/mul) vs 74.9/mul (55.5-115.4/mul) for PMPs, 48.1/mul (13.1-72.4/mul) vs 31.0/mul (14.9-47.6/mul) for TF+MPs and 310.2/mul (128.6-1130.5/mul) vs 155.9/mul (100.3-227.6/mul) for EMPs. (2) Among different subtypes of MPN, PMPs were higher in patients with PMF than patients with PV and ET (P<0.05), but there was no significant difference between PV and ET group. No obvious difference was found in RMPs, TF+MPs and EMPs among different subtypes of MPN patients. (3) MPN patients with JAK2V617F mutation (n=34) were found to have higher plasma levels of TF+MPs and RMPs than those without mutation (P<0.05) and this difference was not found for PMPs and EMPs. (4) MPN patients with various thrombotic complications (n=10) showed higher levels of all four types of MPs than those without thrombotic complications (n=31) (P<0.05). Elevated MP levels were also found in patients with splenomegaly (n=19) compared to those without splenomegaly (n=14) (P<0.05). Conclusion Higher levels of MPs were observed in MPN patients compared with healthy controls, especially in patients complicated with thrombosis and splenomegaly, which reflects a prothrombotic state. Moreover, significantly increased TF+MPs and RMPs were found in MPN patients with JAK2V617F mutatioin.

Han, Y. P., et al. (2017). "Cationic polystyrene resolves nonalcoholic steatohepatitis (NASH), obesity,and metabolic disorders in an animal model by promoting eubiosis of gut microbiota and decreasing endotoxemia." Gastroenterology **152 (5 Supplement 1)**: S1014.

Background and Aims: A pandemic of metabolic diseases, consisting of type-2 diabetes, non-alcoholic fatty liver diseases (NAFLD) and obesity is occurring world-wide. Efforts to investigate the underlying mechanism and to explore low cost but effective treatments are needed. Our previous work found that vitamin D signaling through its receptor (VDR) in the ileum maintains gut microbiota in eubiosis through up-regulating Paneth cell specific alpha-defensins and tight junction proteins. Mice fed a vitamin-D-deficient-high-fat diet (VDD+HFD) develop gut dysbiosis, endotoxemia, systemic inflammation, insulin resistance, fatty liver and central obesity. Our current study was aimed at determining if the cationic polystyrene resin cholestyramine could be used to sequester negatively charged endotoxin in addition to bile acids in the gut to reverse the effects we observed with VDD+HFD. Method(s): The mice receiving VDD+HFD were treated by oral gavage of cationic cholestyramine or control uncharged polystyrene microbeads for 10-12 weeks. In another experiment, fecal bacteria derived from the cholestyramine- or control-treated mice were transplanted into mice receiving VDD+HFD to determine if the effects observed with cholestyramine were mediated through rebalancing of gut microbiome and reduction of gut produced endotoxin. Result(s): Cholestyramine, but not the control polystyrene microbeads, was able to sequester gut bacterial endotoxin, leading to reduction of plasma endotoxin levels, resolving hepatic and systemic inflammation, and improving the metabolic disorders. Moreover, gut dysbiosis, being characterized by increased phylum Firmicutes and decreased phylum Bacteroidetes and Akkermansia muciniphila, spp was resolved by the cholestyramine treatment showing large increases of Akkermansia muciniphila. Fecal bacteria transplant from cholestyramine treatment but not from the control polystyrene prevented the metabolic disorders of the recipients. Conclusion(s): These results demonstrate a potential beneficial role of cholestyramine in treating the metabolic disorders due to VDD+HFD by inhibiting endotoxemia and promoting gut eubiosis.

Han, Z., et al. (2011). "Generation of antigen-specific regulatory T cells from human umbilical cord blood." Diabetes **1)**: A122.

Regulatory T cells (Tregs) are considered vital to the maintenance of selftolerance and prevention of autoimmune disease. While proven effective for preventing type 1 diabetes (T1D) in murine models of the disease, analogous methods involving transfer of antigen-specific Tregs to prevent and/or reverse the disorder in humans have been hindered by the paucity of naive Tregs that can be effectively isolated and expanded from peripheral blood (PB). Due to their less mature state and enhanced proliferative capacity, naive Tregs isolated from umbilical cord blood (UCB) may provide a superior source in adoptive cellular immunotherapy. Using a lentiviral gene delivery system, we expressed an antigen-specific T cell receptor (TCR) recognizing glutamic acid decarboxylase (GAD)(555-567) in the context of HLA-DR4 on FACS-isolated UCB naive Tregs (CD4+CD127-/loCD25+CD45RA+ T cells). Expression of GFP, a downstream reporter, indicated a 55-60% transduction efficiency using this system. In addition, a 140-fold ex-vivo expansion of transduced Tregs was achieved upon stimulation with alphaCD3/alphaCD28-coated microbeads and IL-2 over a 14-day period. Treg phenotype and stable TCR expression were analyzed and confirmed by flow cytometry using FoxP3/ Helios and GFP/TCR Vbeta5.1 staining, respectively. GFP expression and TCR Vbeta5.1 staining of ex-vivo expanded Tregs indicated stable integration and expression of the antigen-specific TCR introduced by our lentiviral gene delivery system. Our findings indicate that naive Tregs isolated from UCB can be engineered to express antigen-specific TCRs and carry the capacity for ex-vivo expansion. While further studies to determine the activities and functions of these cells are required, our investigation provides a novel approach for TCR-specific gene therapy and carries important implications for the development of therapeutic interventions aimed to restore antigenspecific immune tolerance in patients with T1D. These studies were funded by the JDRF Collaborative Center for Cell Therapy to J.A.B., Cord Blood Center to M.A.A., and Transitional Award to T.M.B.

Hanachi, P., et al. (2019). "Abundance and properties of microplastics found in commercial fish meal and cultured common carp (<i>Cyprinus carpio</i>)." Environmental science and pollution research international **26**(23): 23777-23787.

Microplastics (MPs) are environmental contaminants that are of increasing global concern. This study investigated the presence of MPs in four varieties of marine-derived commercial fish meal, followed by identification of their polymer composition using Fourier transform infrared (FTIR) spectroscopy. Exposure experiments were conducted on cultured common carp (Cyprinus carpio) by feeding four varieties of commercially available fish meal to determine relationships between abundance and properties of MPs found both in meal and in those transferred to cultured common carp. Mean particle sizes were 452 ± 161 μm (± SD). Fragments were the predominant shape of MP found in fish meal (67%) and C. carpio gastrointestinal tract and gills (65%), and polypropylene and polystyrene were the most present plastic polymers found in fish meal (45% and 24%, respectively) and C. carpio (37% and 33%, respectively). Positive relationships were found between MP levels in fish meal and C. carpio. This study highlights that marine-derived fish meal may be a source of MPs which can be transferred to cultured fish, thus posing a concern for aquaculture.

Hanada, M., et al. (2009). "Growth inhibition and apoptosis induction by tumor necrosis factor-alpha in satellite cells of human urethral rhabdosphincter." Journal of Urology **1)**: 79-80.

INTRODUCTION AND OBJECTIVE: Human urethral rhabdospincter (HUR) cells is reported to decrease with aging due to apoptosis. This reduction of HUR cells may be a cause of urinary incontinence in the elderly, but the mechanism is not clear. There are some reports that Tumor Necrosis Factor-alpha (TNF-alpha) induces apoptosis in murine skeletal muscles and that serum concentration of TNF-alpha increases with aging. This study was performed to clarify whether TNF-alpha induces growth inhibition and/or apoptosis of HUR satellite cells. METHOD(S): HUR satellite cells were cultured from specimens of HUR tissues obtained from patients who underwent radical prostatectomy, and they were selected by magnetic affinity cell sorting using anti-CD56 antibody-conjugated microbeads. Selectively cultured HUR satellite cells were transfected with SV40 T antigen and used for the following experiments. Cell growth was examined by cell proliferation assay, and apoptosis induction was confirmed by flowcytometry, double staining with Annexin V-FITC and propidium iodide and Western blot analysis. The expressions of TNF receptors were confirmed by reverse transcriptase-PCR (RT-PCR) and Western blot analysis. Finally, we examined whether TNF-alpha antagonists (Infliximab and Etanercept) prevent the effects of TNF-alpha on HUR satellite cells. RESULT(S): Proliferation of HUR satellite cells was inhibited by TNF-alpha in dose dependent manner. Some of the HUR satellite cells treated with TNF-alpha were stained with Annexin V-FITC but not with propidium iodide, suggesting the induction of early phase apoptosis. Flowcytometry analysis revealed the increase of sub-G1 fraction in TNF-alpha treated HUR satellite cells and a tendency of the decreased G2/M fraction. The activation of caspase-8, -3 and cleavage of PARP were observed by Western blot analysis. The expressions of both mRNA and protein of TNF receptors were confirmed by RT-PCR and Western blot analysis, respectively. The phosphorylation of

IkappaBalpha was increased two to five minutes after the treatment of TNF-alpha, and quickly returned to the basal level within 10 minutes. Pretreatment of TNF-alpha antagonists prevented TNF-alpha induced growth inhibition, the increase of sub G1 fraction and the phosphorylation of IkappaBalpha. CONCLUSION(S): TNF-alpha induces growth inhibition and apoptosis of HUR satellite cells through activation of TNF receptor. Anti-TNF-alpha therapy may be useful for the treatment and/or prevention of urinary incontinence in the elderly.

Hanau, D., et al. (2012). "The appearance of exclusively anti-HLA-dqalpha1 antibodies following organ transplantation is not deleterious." Tissue Antigens **79 (6)**: 522.

The occurrence, following organ transplantation, of antibodies targeting HLA Class II molecules is associated with an increased risk of acute or chronic rejection. These anti-Class II antibodies are found to target HLA-DQ molecules more frequently than HLA-DR molecules because both the alpha and beta chains of HLA-DQ are polymorphic and bear immunogenic epitopes. Thus, these anti-HLA-DQ antibodies are considered to be anticonformational, recognizing conformations generated by combinations of DQalpha-DQbeta heterodimers. The development of the single antigen technique, well suited to screening for anti-HLA Class II antibodies, the enhancement of this technique through use of microbeads carrying DQalpha-DQbeta heterodimers and also the latest improvements in the HLAMatchmaker program (http://www.hlamatchmaker.net) have allowed us to identify 12 cases (among 1154 analyzed) in which, up until now, only anti-DQalpha1 antibodies have appeared. This immunization displays a certain number of particularities: (i) it can occur following kidney, liver, heart or lung transplantation, (ii) it is not cytotoxic (B cell cross match negative) and is not accompanied by any signs of rejection, whereas (iii) the mean fluorescence intensities (MFI) are elevated (varying from 6000 to 13000 depending on the patient) and remain stable for years. Finally, (iv) this immunization targets predominantly the eplet 41GR3, shared by the molecules DQA1*04, DQA1*05 and DQA1*06. Interestingly, in one case this type of immunization appeared "naturally", in the absence of any context of transplantation or transfusion. It targets the eplet 75SL4 (DQA1*05) with an MFI of no more than 3000.

Handgretinger, R., et al. (2011). "Transplantation of TcRalphabeta/CD19 depleted stem cells from haploidentical donors: Robust engraftment and rapid immune reconstitution in children with high risk leukemia." Blood. Conference: 53rd Annual Meeting of the American Society of Hematology, ASH **118**(21).

In haploidentical transplantation with mobilized peripheral blood stem cells (PBSC's), in vitro T-cell depletion of the graft is an effective method to prevent or completely avoid Graft-versus-Host Disease (GvHD). In order to increase the T-cell depletion efficacy of PBSC's while maintaining the anti-tumor and anti-infectious properties of the graft, we have investigated a new T-cell depletion method which removes alphabeta+ T-lymphocytes via a biotinylated anti-TcRalphabeta antibody followed by an anti-biotin antibody conjugated to magnetic microbeads while retaining gammadelta+ T-lymphocytes, Natural killer (NK) cells and other cells in the graft. In addition, CD19+ B-lymphocytes were concomitantly depleted for the prevention of posttransplant EBV-associated lymphoproliferative disease. The alphabeta+ T-cells and CD19+ B cells were then removed using the CliniMACS system. So far, 23 patients have been treated in two centers, namely Tubingen and Rome. Graft manipulation resulted in a consistent efficiency of alphabeta+ T-lymphocyte removal at the two centers. The overall depletion of alphabeta+ T-cells was 4.5 log (range 3.8-5.0) and 4.3 log (range 3.7-5.0) in Tubingen and Rome, respectively, with a median number of transplanted alphabeta+ T-cells of 14 x 10³/kg. The recovery of CD34+ stem cells was 72% and 89% in the two centers, and

the median number of infused CD34+ stem cells was 11.9 x10⁶/kg (range 7.5-30 x 10⁶/kg) and 13.3 x10⁶/kg (range 8.3-19.8 x 10⁶/kg), respectively. Patients were given 107 x 10⁶/kg (range 35-186 x10⁶/kg) and 123 x 10⁶/kg (range 51-202 x10⁶/kg) CD56+ NK cells in Tubingen and Rome, respectively. The median number of infused gammadelta+ T-lymphocytes was 11.9 x10⁶/kg (range 7.5-30.2 x 10⁶/kg) and 10.3 x10⁶/kg (range 6.5-25.1 x 10⁶/kg) respectively. The 10 patients transplanted in Tubingen had advanced/refractory leukemias (ALL, n=5; AML, n=5; active disease, n=6; 2nd transplantation, n=2; CR2, n=2). For this poor-prognosis patients, a reduced-intensity conditioning regimen (melphalan, thiotepa, fludarabin or clofarabin and OKT-3 or ATG) was used. No further post-transplant GvHD prophylaxis was given. All 10 patients engrafted. The median time to reach neutrophil (PMN) and platelet (PLT) recovery was 9 (range 8-12) and 15 days (range 6-28) respectively. All patients reached complete donor chimerism and showed a very rapid immune reconstitution with 350 (range 21-824) CD3+ T cells/mul, 66 (12-177) CD3+4+/mul and 599 (227-1390) CD56+ NK cells/mul at day +28 posttransplant. Three patients had no signs of acute GvHD, 5 patients had GvHD grade I and 2 patients had skin GvHD grade II. Only 1 patient experienced a transient grade 3 GvHD of the skin which required only topical treatment. No patient experienced chronic GvHD. Three patients relapsed after transplantation, 7 patients are in remission for 5 months (range 3-12). There was no transplant-related death sofar. The second cohort given transplantation in Rome comprised 13 patients with ALL (9), AML (3) and NHL (1). All children but 1 had relapsed/refractory disease. In particular, 11 patients were transplanted in CR and 2 with active disease. Conditioning regimen was myeloablative and consisted of fractionated TBI, Thiotepa, fludarabine and ATG (8 mg/Kg). No further post-transplant GvHD prophylaxis was given. All patients engrafted, the median time to reach PMN and PLT recovery being 11 (range 7-13) and 12 (range 10-16) days, respectively. Only 2 patients had skin grade I acute GvHD. No patient experienced chronic GvHD. With a median follow-up of 4 months (range 1-9) 10 patients are alive and disease-free; 2 patients relapsed (1 died) and 1 had fatal lung aspergillosis. In both cohorts, gammadelta+ T cells started to expand faster than alphabeta+ T cells in the early post-transplant period, whereas at day +100, alphabeta+ T-cells were predominant. In addition to a rapid reconstitution of alp abeta+ T-lymphocytes, Vbeta spectratyping revealed a broad T-cell receptor repertoire early after transplantation. Altogether, these data indicate that transplantation of TcR alphabeta+/CD19 depleted cells from a haploidentical donor results in sustained engraftment, rapid immune reconstitution and low incidence of both acute and chronic GvHD. The anti-leukemic efficacy of this approach in comparison to other methods of T-cell depletion needs to be evaluated with a longer patient follow-up.

Hani, C. (2018). "Effect of varying compression ratio and blend percentage on performance of single cylinder diesel engine operating with blends of plastic pyrolysis oil and diesel." International Journal for Research in Applied Science and Engineering Technology **6**(4): 3883-3890.

Polluting emissions are a major problem faced by operation of diesel engines. Various alternatives have been researched to address this issue. Of all alternatives, use of plastic pyrolysis oil provides additional benefit of plastic waste disposal issue. Paper presents results obtained by operating single cylinder diesel engine with blend of plastic pyrolysis oil (0%, 15% and 30%) and diesel at varying compression ratio (16, 17 and 18). Results of brake thermal efficiency, mechanical efficiency and fuel consumption are presented.

Hankett, J. M., et al. (2016). "Low-Volatility Model Demonstrates Humidity Affects Environmental Toxin

Deposition on Plastics at a Molecular Level." Environmental Science & Technology **50**(3): 1304-1312.

Despite the ever-increasing prevalence of plastic debris and endocrine disrupting toxins in aquatic ecosystems, few studies describe their interactions in freshwater environments. We present a model system to investigate the deposition/desorption behaviors of low-volatility lake ecosystem toxins on microplastics in situ and in real time. Molecular interactions of gas-phase nonylphenols (NPs) with the surfaces of two common plastics, poly(styrene) and poly(ethylene terephthalate), were studied using quartz crystal microbalance and sum frequency generation vibrational spectroscopy. NP point sources were generated under two model environments: plastic on land and plastic on a freshwater surface. We found the headspace above calm water provides an excellent environment for NP deposition and demonstrate significant NP deposition on plastic within minutes at relevant concentrations. Further, NP deposits and orders differently on both plastics under humid versus dry environments. We attributed the unique deposition behaviors to surface energy changes from increased water content during the humid deposition. Lastly, nanograms of NP remained on microplastic surfaces hours after initial NP introduction and agitating conditions, illustrating feasibility for plastic-bound NPs to interact with biota and surrounding matter. Our model studies reveal important interactions between low-volatility environmental toxins and microplastics and hold potential to correlate the environmental fate of endocrine disrupting toxins in the Great Lakes with molecular behaviors. [ABSTRACT FROM AUTHOR]

Hankins, C., et al. (2018). "Scleractinian coral microplastic ingestion: Potential calcification effects, size limits, and retention." Marine Pollution Bulletin **135**: 587-593.

The impact that microplastics (<5 mm) have on scleractinian coral is largely unknown. This study investigated calcification effects, size limits, and retention times of microbeads and microfibers in two Caribbean species, Montastraea cavernosa and Orbicella faveolata, in a series of three experiments. No calcification effects were seen in the two-day exposure to a microbead concentration of 30 mg L⁻¹. M. cavernosa and O. faveolata actively ingested microbeads ranging in size from 425 mum-2.8 mm, however, a 212-250 mum size class did not elicit a feeding response. The majority of microbeads were expelled within 48 h of ingestion. There was no difference in ingestion or retention times of 425-500 mum microbeads versus 3-5 mm long microfibers. M. cavernosa and O. faveolata have the ability to recognize and reject indigestible material, yet, there is still a need to study effects of energetics and microplastic contamination as a result of ingestion and egestion. Copyright © 2018

Hanson, A. M. (2017). "Women's environmental health activism around waste and plastic pollution in the coastal wetlands of Yucatan. (Special Issue: Water, sanitation and hygiene.)." Gender and Development **25**(2): 221-234.

This article focuses on women's grassroots organisations and their role in confronting waste-induced water, health, and development challenges in low-lying tropical coastal areas. As a case study, the article will focus on women's waste management and plastics recycling organisations in Yucatan, Mexico and their role in preventing water-borne diseases and educating the community on the links between garbage and human health. Women educate the community on the links between garbage and human health; challenge exclusionary gender norms by increasing women's participation in community sustainable development, and improve urban conditions in the coastal wetlands. I draw from over 400 surveys with coastal residents and 14 oral histories with coastal women, to underscore the muddy links that connect sanitation to gendered responsibility and the exclusionary spaces of urban development and ecological restoration in the swamps. The information shared through the histories and broad surveys emphasises how gendered roles and expectations are critical variables in shaping social difference, ecological degradation, and human health in low-lying coastal areas and cities.

Hantoro, I., et al. (2019). "Microplastics in coastal areas and seafood: implications for food safety." Food Additives & Contaminants. Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment **36**(5): 674-711.

Microplastics have become ubiquitous in the marine environment. Microplastics have been detected in many coastal environments and species, including commercial seafood. This triggers concern about potential economic impacts and the risks of dietary exposure, especially for coastal communities. However, data regarding the levels of microplastics in coastal seafood and their toxicological effects are still limited. Accordingly, the dietary risk is still poorly explored. This review summarizes and discusses recent scientific findings on (i) the presence of microplastics in coastal waters, (ii) the occurrence of microplastics in coastal seafood and the likelihood of trophic transfer, and (iii) the effects of microplastics on coastal fish and shellfish species. Human toxicity data are also reviewed, but the risks for human health are difficult to determine due to limited data. Based on available worldwide data, the estimation of microplastics intake through seafood consumption shows a huge variation. Additionally, a lack of standardized analytical methods complicates the comparison of results between studies and therefore seriously affects the reliability of risk assessments. It is concluded that more exposure and toxicity data are needed properly to assess human health risks of microplastics in coastal seafood, and the lack of data currently impede the derivation of a risk-based food safety standard. The pros and cons of an interim solution, i.e. setting a provisional action level, are being discussed.

Hantoro, I., et al. (2019). "Microplastics in coastal areas and seafood: implications for food safety: Part A. Chemistry, Analysis, Control, Exposure & Risk Assessment Part A. Chemistry, Analysis, Control, Exposure & Risk Assessment." Food Additives and Contaminants **36**(5): 674-711.

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standard. The pros and cons of an interim solution, i.e. setting a provisional action level, are being discussed.

Hantoro, I., et al. (2019). "Microplastic intake via shellfish consumption and its potential risks to human health." Annals of Nutrition and Metabolism **75 (3)**: 335.

Background/Aims: Microplastic contamination in marine environment and seafood has raised global concern on the human health impact. The possibility of microplastic ingested by human is very likely to occur via consumption of seafood that is eaten whole, such as shellfish. However, the risks of microplastic on human health are still under investigation. The aims of this study was to assess shellfish consumption of Semarang inhabitants and to determine their microplastic intake via shellfish consumption. Method(s): Multistage random sampling method was used to determine the respondents from districts until neighborhood level. In total there were 500 respondents invited to participate in this study. The respondents were classified based on four age groups, i.e. children (0-9 years), adolescent (10-19 years), adults (20-59 years), and elderly people (60->75 years). The daily intake of shellfish of Semarang inhabitants was obtained from FFQ and recall diet. The concentrations of microplastics were obtained from a microscopic technique following a series of alkaline digestion and filtration. To estimate the microplastic intake, the daily intake of shellfish was multiplied by the average concentration of microplastics found in shellfish collected from Semarang.

Hao, X.-d., et al. (2019). "Evolution and Fate of Microplastics in Sewage Treatment." Zhongguo ji Shui pai Shui = China Water & Wastewater(8).

Microplastics (size 5 mm) are produced due to daily discard from both daily life and industry production,in which there are two forms: primary and secondary microplastics. Numbers of microplastics vary a lot due to different testing particle sizes,and there are at least 1 000 to 100 000 n/m~3 in raw sewage, most of which are unbiodegradable. Microplastics were mainly removed by adsorption in the primary treatment facilities; some microplastics could be adsorbed in the secondary treatment process,but the role of the secondary treatment was not great; the membrane interception method in the tertiary treatment (membrane and/or filtration) could effectively remove microplastics. The average removing efficiency of microplastics via both primary and secondary treatment was around 80%,the residue (≤20%) of microplastics in the effluent would enter into the water environment,which was a major source of evolution and accumulation in the hydrosphere. Microplastics in the environment could be taken up by the human beings through drinking water,salt,seafood,etc. For this reason,the sources and hazards of microplastics were reviewed; and detecting methods in water/wastewater were summarized; evolution patterns were analyzed; fate in the environment and preventive measures into both products and the environment were elucidated.

Haque, M. S. (2019). "Sustainable use of plastic brick from waste PET plastic bottle as building block in Rohingya refugee camp: a review." Environmental Science & Pollution Research **26**(36): 36163-36183.

Bangladesh is 10th among the major plastic waste contributor countries of the globe. Throughout the world, plastic waste disposal is a major concern since it is being nonbiodegradable in nature and hazardous, because of its potential harmful effect on human health and to the environment. Various studies have shown that waste PET (polyethylene terephthalate) plastic bottle filled with sand or other inorganic materials can serve as a useful building material where plastic waste management or recycling process is not very effective and particularly, in low-income communities. Plastic brick use in existing Rohingya refugee camp and

newly proposed displacement camp in the coast island-Bhasan Char-as construction material to build new shelters, can be a sustainable use and management of country's plastic waste, and a feasible solution against the shelter issues of Rohingya people. The vulnerability due to heavy wind, monsoon rains, cyclones, and the gaps and lack in funding to build new rigid and safe shelters can be effectively mitigated by using this low-cost, environment-friendly plastic brick as building block in refugee camps.

Hara, J., et al. (2020). "Quantification of microplastic ingestion by the decapod crustacean Nephrops norvegicus from Irish waters." Marine Pollution Bulletin **152**: 110905.

Microplastics are widespread pollutants in the marine environment, yet few studies have assessed the abundance and characteristics of microplastics in commercial species. This study evaluates the presence of ingested microplastics in the gastrointestinal tract of Nephrops norvegicus (n = 150), collected from five Irish prawn grounds. The efficiency of three digesting solutions was assessed. The most efficient digestion was the KOH (10%) solution incubated at 40 degreeC for a 48 h period. An average of 1.75 +/- 2.01 items per individual was ingested by c. 69% of N. norvegicus examined. A total of 262 microplastic, predominantly fibres (98%), between 1 and 2 mm were recorded. Although, no spatial pattern was identified, samples from the North Irish Sea recorded highest occurrence of microplastics (~83%). A positive correlation was found between microplastic abundance and prawn carapace condition.

Hardesty, B. D., et al. (2015). "A biochemical approach for identifying plastics exposure in live wildlife." Methods in Ecology and Evolution **6**(1): 92-98.

1. Plastic pollution is a long-standing ubiquitous issue. Global use of plastics is continuing to rise, and there is increasing interest in understanding the prevalence and risk associated with exposure of wildlife to plastics, particularly in the marine environment. 2. In order To facilitate an assessment of ingestion of plastics in seabird populations, we developed a minimally invasive tool that allows for detection of exposure to plastics. 3. Using a simple swabbing technique in which the waxy preen oil is expressed from the uropygial gland of birds, we successfully tested for the presence of three common plasticizers: dimethyl, dibutyl and diethylhexyl phthalate [dimethyl phthalate, dibutyl phthalate and bis(2-ethylhexyl)-phthalate, respectively]. These plasticizers are prevalent in the manufacturing of plastic end-user items which often end up in the marine environment. 4. Using gas chromatography-mass spectrometry and protocols to reduce background contamination, we were confidently able to detect targeted plasticizers at low levels. 5. The method described has broad applicability for detecting plastics exposure in wildlife at individual, population and species levels. Furthermore, the approach can be readily modified as needed to survey for plastics exposure in taxa other than seabirds. 6. Applying the simple, minimally invasive approach we describe here is particularly appealing for detecting plastics exposure at population and species levels, it shows promise for quantification and it has no observed detrimental impacts to wildlife.

Hardesty, B. D., et al. (2019). "Multiple approaches to assessing the risk posed by anthropogenic plastic debris." Marine Pollution Bulletin **141**: 188-193.

Hariram, V., et al. (2017). "Formulation and Characterization of Pyrolytic Oil from Waste Tyre and Waste Plastic: A Comparative Study." Nature Environment and Pollution Technology **16**(4): 1183-1188.

Elimination of solid waste generated by the engineering sector is the need of the present world. In this study, a comparative analysis has been made to formulate a petro-diesel like fuel from the waste tyre (WTPO) and waste plastic (WPPO), which is derived from unusable tyre and

plastic waste materials, by the thermal pyrolytic reaction. A pyrolysis reactor is designed and fabricated to transform the solid waste into the pyrolytic oil through thermal cracking. The characterization of WTPO and WPPO is carried out using the gas chromatography, mass spectrometry, Fourier transform infra-red and elemental analysis. The GC-MS analysis of both WPTO and WPPO indicated the presence of naphtha and limonene compounds at higher concentration levels. The content of sulphur in WTPO is at higher level. The physico-chemical properties are also determined based on IS:1448 and it is found to be comparable with the commercial petro-diesel.

Harl, B., et al. (2013). "Chloride channel blockers suppress formation of engulfment pseudopodia in microglial cells." Cellular Physiology and Biochemistry **31**(2-3): 319-337.

Background/Aims: Phagocytosis depends on the formation of engulfment pseudopodia surrounding the target. We tested in microglia, monocyte-derived cells in the brain, whether a swelling-activated Cl⁻-current (I<inf>Cl,</inf><inf>swell</inf>), required for global cell volume (CV) regulation, also contributes to local expansion and retraction of engulfment pseudopodia. Method(s): We used scanning electron microscopy (SEM) and confocal laser scanning microscopy (CLSM) to visualize and quantify the uptake of polystyrene microbeads (MBs) by microglial cells. Flow cytometry was used for cell volume measurments and I<inf>Cl,</inf><inf>swell</inf> was measured by whole-cell patch clamp. Result(s): We found that exposure of microglial BV-2 cells to MBs in Cl⁻-free extracellular solution attenuated MB uptake and that the Cl⁻-channel blockers DIOA, flufenamic acid, NPPB and DCPIB suppressed the uptake of MBs in BV-2 cells and in primary microglial cells. Microglial cells exposed to MBs in the presence of Cl⁻ channel blockers failed to extend engulfment pseudopodia. We observed that cells containing at least three MBs revealed an about twofold increase in current density of I<inf>Cl, swell</inf> compared to cells without MB. Osmotic challenges to stimulate global CV regulation before exposure to MBs modulated phagocytosis. Pre-conditioning of cells in hypo- or hypertonic medium for 12-16 hours caused a decrease in MB uptake. Conclusion(s): These findings indicate that I<inf>Cl,</inf><inf>swell</inf> contributes to formation of engulfment pseudopodia and participates in engulfment and particle uptake in microglial cells. Copyright © 2013 S. Karger AG, Basel.

Harris, D. A., et al. (2012). "Juvenile-onset systemic lupus erythematosus (JSLE) monocytes and macrophages express raised levels of receptors associated with apoptotic cell clearance." Annals of the Rheumatic Disease. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **71**(SUPPL. 3).

Background Juvenile-onset Systemic Lupus Erythematosus (JSLE) is a chronic, severe, multi-systemic autoimmune disease. Impaired apoptotic cell clearance is implicated as the initial step in the pathogenesis of JSLE, leading to exposure of autoantigens (1). We have investigated the phenotype of the macrophages and their precursors monocytes, important phagocytes whose function is impaired in adult-onset SLE (2), to determine the extent of their involvement in JSLE. This has been assessed by measurement of the gene expression of monocyte and macrophage receptors important in apoptotic cell phagocytosis. CD36 is a member of the Scavenger Receptor Class B receptor group, considered especially important in the recognition of apoptosing neutrophils (3). MER is a tyrosine kinase receptor important in the internalisation of apoptotic cells (4). CR3 is a complement receptor whose principle action is through recognition of C3bi, a complement component that attaches to apoptotic cells (5). Objectives To investigate for evidence of phagocytosis dysregulation in JSLE by determining if ineffective macrophage and monocyte function is associated with abnormal expression of phagocytic receptors. Methods Monocytes were separated using CD14 MicroBeads (MACS Miltenyi Biotec) from processed whole blood, cultured in medium (RPMI + 10% FCS + 1% PenStrep + M-CSF) over 6 days into macrophages, and RNA extracted. The RNA was assessed for quantity and quality using NanoDrop, converted to cDNA and RT-qPCR performed using SYBR Green with primers for CD36, MERKT, and CR3; with expression compared against beta2M as reference gene. Statistical analyses were performed using IBM SPSS v19 (Mann-Whitney U). We compared the relative expression ratios between JSLE patients and healthy controls (HCs; median [IQR]). Results In monocytes, CD36 expression was significantly increased in JSLE (n=6): (0.96 [0.68-1.34]) vs HCs (n=6): (0.53 [0.39-0.70]), (p=0.03), with a trend towards greater expression of MERKT: (0.47 [0.30-0.74]) vs (0.30 [0.19-0.44]), (p=0.20). Conversely, CR3 was more highly expressed in HC monocytes: (0.65 [0.49-0.96]) vs (0.77 [0.71-1.32]), although not significantly (p=0.15). Relative expression ratios for macrophages showed similar trends, with increased expression of CD36 and MERKT in JSLE (n=2 to date) approaching statistical significance compared with HCs (n=9): CD36 (1.86 [N/A]) vs (1.14 [0.35-2.23]), (p=0.06); MERKT: (2.14 [N/A]) vs (1.14 [0.78-1.73]), (p=0.10), but no difference in CR3 expression: (0.98 [N/A]) vs (1.40 [0.35-2.23]), (p=0.64). Conclusions Our preliminary findings indicate that there are features that distinguish JSLE from HC monocytes and macrophages, reflected in the observed increased expression of receptors associated with apoptotic cell clearance. Work is on-going to consolidate these data with increased sample size and investigations of other markers of phagocytosis, correlated with macrophage phagocytic function.

Harris, M., et al. (2017). "Magnetic stimuli-responsive chitosan-based drug delivery biocomposite for multiple triggered release." International Journal of Biological Macromolecules **Part B. 104**: 1407-1414.

Stimuli-responsive biomaterials offer a unique advantage over traditional local drug delivery systems in that the drug elution rate can be controllably increased to combat developing symptomology or maintain high local elution levels for disease treatment. In this study, superparamagnetic Fe<inf>3</inf>O<inf>4</inf> nanoparticles and the antibiotic vancomycin were loaded into chitosan microbeads cross-linked with varying lengths of polyethylene glycol dimethacrylate. Beads were characterized using degradation, biocompatibility, and elution studies with successive magnetic stimulations at multiple field strengths and frequencies. Thirty-minute magnetic stimulation induced a temporary increase in daily elution rate of up to 45% that was dependent on field strength, field frequency and cross-linker length. Beads degraded by up to 70% after 3 days in accelerated lysozyme degradation tests, but continued to elute antibiotic for up to 8 days. No cytotoxic effects were observed in vitro compared to controls. These promising preliminary results indicate clinical potential for use in stimuli-controlled drug delivery. Copyright © 2017 Elsevier B.V.

Harrison, J. P., et al. (2012). "The applicability of reflectance micro-Fourier-transform infrared spectroscopy for the detection of synthetic microplastics in marine sediments." Science of the Total Environment **416**: 455-463.

Synthetic microplastics (=5-mm fragments) are globally distributed contaminants within coastal sediments that may transport organic pollutants and additives into food webs. Although micro-Fourier-transform infrared (micro-FT-IR) spectroscopy represents an ideal method for detecting microplastics in sediments, this technique lacks a standardized operating protocol. Herein, an optimized method for the micro-FT-IR analysis of microplastics in vacuum-filtered sediment retentates was developed. Reflectance micro-FT-IR analyses of polyethylene (PE) were compared with attenuated total reflectance FT-IR (ATR-FT-IR) measurements. Molecular mapping as a precursor to the imaging of microplastics was explored in the presence and absence of 150- micro m PE fragments, added to sediment at concentrations of 10, 100, 500 and 1000 ppm. Subsequently, polymer spectra were assessed across plastic-spiked sediments from fifteen offshore sites. While all spectra obtained of evenly shaped plastics were typical to PE, reflectance micro-FT-IR measurements of irregularly shaped materials must account for refractive error. Additionally, we provide the first evidence that mapping successfully detects microplastics without their visual selection for characterization, despite this technique relying on spectra from small and spatially separated locations. Flotation of microplastics from sediments only enabled a fragment recovery rate of 61 (+or-31 S.D.) %. However, mapping 3-mm² areas (within 47-mm filters) detected PE at spiking concentrations of 100 ppm and above, displaying 69 (+or-12 S.D.) % of the fragments in these locations. Additionally, mapping detected a potential PE fragment in a non-spiked retentate. These data have important implications for research into the imaging of microplastics. Specifically, the sensitivity and spatial resolution of the present protocol may be improved by visualizing the entire filter with high-throughput detection techniques (e.g., focal plane array-based imaging). Additionally, since micro-FT-IR analyses depend on methods of sample collection, our results emphasize the urgency of developing efficient and reproducible techniques to separate microplastics from sediments.

Harshita, N., et al. (2011). "Studies on biodegradation of LDPE film in the presence of potential bacterial consortia enriched soil." Biologija **57**(4): 141-147.

Low density polyethylene (LDPE) is an important commodity plastic and has a wide applicability in the modern era. In virtue of their wide applicability, the generation of the huge plastic waste became a conundrum for environment and public health. Consequently, the present study was conducted for the microbial degradation of LDPE film in natural conditions using mixture of potential polymer degrading consortia. For this purpose, the talc based formulation of bacterial consortia was inoculated into soil with LDPE film for the period of three months. Fourier transform infrared spectroscopy (FT-IR) in combination with SEM revealed that the consortia incurred significant surfacial degradation of LDPE film, introduction of hydroxyl (-OH) functionality and significant shifts in fingerprint region, respectively. The potential of the consortia towards degradation of LDPE has further been ascertained through change in bulk structural characteristics using differential scanning calorimetry (DSC). Moreover, the comparative in situ biodegradation study of LDPE film in laboratory and natural conditions indicates that environmental factors like sun-light, temperature and rainfall may enhance the rate of biodegradation of the polymer in nature.

Hart, D. N. J., et al. (2015). "Functional studies on the C-type lectin receptor CD302 present on dendritic cells and macrophages." Blood **126 (23)**: 2198.

Introduction: C-type lectin receptors (CLR) play an important role in the immune system by recognising molecular patterns expressed by exogenous and endogenous threats. They have been shown to capture and internalise antigens and to mediate other important immune cell functions. DEC205 and CLEC9A are being actively investigated as targets for clinical therapeutic cancer vaccines. We discovered CD302 as a new CLR expressed on human dendritic cells (DC), monocytes and macrophages (J Immunol 2007;179:6052). Our initial studies suggested the molecule could play a role in cell adhesion or migration due to its co-localisation with migratory structures on macrophages. Our study set out to investigate the potential immunological function of CD302 using mouse models and to define its wider tissue expression in man. Method(s): We generated CD302 knockout (KO) mice lacking exon 1 of its gene, abrogating transcription, for functional studies. We characterised the transcriptional expression of CD302 in mouse immune cells using real-time PCR. We developed monoclonal mAb to mCD302. Human studies utilized the anti-CD302 mAbs, MMRI-20 & 21 in flow cytometry and confocal microscopy studies of human immune cell populations. Result(s): CD302 was primarily expressed in mouse liver, lungs, lymph nodes (LN) and spleen. In spleen, macrophages, granulocytes and dendritic cells (DC) expressed CD302. Analysis of LN DC subsets revealed 2.5-fold higher CD302 mRNA expression in migratory compared to resident DC populations. Enumeration of various immune populations in lymphoid organs by flow cytometry uncovered a modest deficiency in migratory DC number and proportion within LN of CD302 KO mice compared to wild-type (WT) mice. In vitro studies showed CD302 KO and WT DC had an equivalent capacity to be activated by various stimuli, prime T cells and migrate towards the lymphoid-homing chemokines CCL19/CCL21. CD302 KO migratory DC exhibited a reduced in vivo migratory capacity to LN after FITC skin-painting. However, CD302 KO macrophages migrated similarly to WT macrophages in vivo in response to thioglycollate. In man, CD302 was present in high density in liver and peripheral blood monocytes and myeloid but not plasmacytoid DC. Current studies are aimed at clarifying its distribution on tissue DC and macrophage subsets. Anti-CD302 coated microbeads were taken up by human monocyte derived macrophages and anti-CD302 mAb was also internalized by DC. Confocal studies showed that CD302 co-localized with F-actin structures at the near basal surface such as filopodia and lamellipodia and podosomes of human macrophages and EGFP tagged CD302 expressed in COS-1 cells associated with F-actin. Conclusion(s): Our data suggests that CD302 may play a specialist role in DC and macrophage membrane functions. This appears to relate to its ability to associate with F-actin and may contribute to the membrane interactions required for DC to migrate towards the draining LN.

Harte, P., et al. (2019). "Adaptation and improvement of an elemental mapping method for lithium ion battery electrodes and separators by means of laser ablation-inductively coupled plasma-mass spectrometry." Analytical & Bioanalytical Chemistry **411**(3): 581-589.

In this study, laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) was applied to previously aged carbonaceous anodes from lithium ion batteries (LIBs). The electrodes were treated by cyclic aging in a lithium ion cell set-up with LiNi_{0.5}Mn_{1,5}O₄ (LNMO) cathodes and hard carbon (HC)/mesocarbon microbead (MCMB) anodes. An inhomogeneous transition metal deposition pattern could be induced by replacing the spacer in a standard coin cell set-up with a washer. The inhomogeneity pattern matched the dimension of the washer depicted by the hole in the center. These transition metal (TM) patterns were used to optimize higher lateral scanning speeds and frequencies on the spatial resolution of the mapping experiments using LA-ICP-MS. Higher scanning speeds had an observable influence on the resolution of the obtained image and an overall saving of 60% with regard to time and gas consumption could be achieved. Additionally, the optimized method was applied to the cathode and separator in order to visualize the distribution and deposition pattern, respectively.

Hartmann, N. B., et al. (2019). "Are We Speaking the Same Language? Recommendations for a Definition and Categorization Framework for Plastic Debris." Environmental Science & Technology **53**(3): 1039-1047.

The accumulation of plastic litter in natural environments is a global issue. Concerns over potential negative impacts on the economy, wildlife, and human health provide strong incentives for improving the sustainable use of plastics. Despite the many voices raised on the issue, we lack a consensus on how to define and categorize plastic debris. This is evident for

microplastics, where inconsistent size classes are used and where the materials to be included are under debate. While this is inherent in an emerging research field, an ambiguous terminology results in confusion and miscommunication that may compromise progress in research and mitigation measures. Therefore, we need to be explicit on what exactly we consider plastic debris. Thus, we critically discuss the advantages and disadvantages of a unified terminology, propose a definition and categorization framework, and highlight areas of uncertainty. Going beyond size classes, our framework includes physicochemical properties (polymer composition, solid state, solubility) as defining criteria and size, shape, color, and origin as classifiers for categorization. Acknowledging the rapid evolution of our knowledge on plastic pollution, our framework will promote consensus building within the scientific and regulatory community based on a solid scientific foundation.

Hartmann, N. B., et al. (2017). "Microplastics as vectors for environmental contaminants: Exploring sorption, desorption, and transfer to biota." Integrated Environmental Assessment & Management **13**(3): 488-493.

The occurrence and effects of microplastics (MPs) in the aquatic environment are receiving increasing attention. In addition to their possible direct adverse effects on biota, the potential role of MPs as vectors for hydrophobic organic chemicals (HOCs), compared to natural pathways, is a topic of much debate. It is evident, however, that temporal and spatial variations of MP occurrence do (and will) occur. To further improve the estimations of the role of MPs as vectors for HOC transfer into biota under varying MP concentrations and environmental conditions, it is important to identify and understand the governing processes. Here, we explore HOC sorption to and desorption from MPs and the underlying principles for their interactions. We discuss intrinsic and extrinsic parameters influencing these processes and focus on the importance of the exposure route for diffusive mass transfer. Also, we outline research needed to fill knowledge gaps and improve model-based calculations of MP-facilitated HOC transfer in the environment. Integr Environ Assess Manag 2017;13:488-493. © 2017 SETAC.

Hashide, R., et al. (2012). "Insulin-containing layer-by-layer films deposited on poly(lactic acid) microbeads for pH-controlled release of insulin." Colloids & Surfaces B: Biointerfaces **89**: 242-247.

Layer-by-layer (LbL) thin films containing insulin were deposited on the surface of biodegradable poly(lactic acid) (PLA) microbeads and the pH-triggered release of insulin was studied. The LbL films were successfully prepared by the alternate deposition of insulin and poly(vinyl sulfate) (PVS) or dextran sulfate (DS) at pH 4.0 through the electrostatic force of attraction between positively charged insulin and polyanions. The loading of insulin on the microbeads was dependent on the number of insulin layers and the type of polyanions used; higher insulin loading was observed for thicker films and when PVS was used as the polyanion. Insulin was released from the microbeads when they were exposed to neutral solution (pH 7.4) due to a loss of electrostatic attraction between the insulin and polyanions in the films, which in turn was caused by the charge reversal of insulin from positive to negative in the neutral medium. The pH threshold for insulin release was found to be pH 5.0-6.0. The released insulin retained its original secondary structure as evidenced by circular dichroism spectra. The insulin loaded on the microbeads was satisfactorily stable even in the presence of a digestive enzyme (pepsin) at pH 1.5. These results suggest a potential future use for insulin-loaded microbeads in the oral delivery of insulin.

Hashimoto-Okada, M., et al. (2009). "The CD70-CD27 interaction during the stimulation with dendritic cells promotes naive CD4⁺ T cells to develop into T cells producing a broad array of

immunostimulatory cytokines in humans." International Immunology **21**(8): 891-904.

CD70 expressed on dendritic cells (DCs) has been shown to play a critical role in inducing effective CD8⁺ T cell responses and a T<inf>h</inf>1 response in mice. However, it has not been extensively examined whether human primary DCs express CD70 and whether the CD70-CD27 interaction promotes naive CD4⁺ T cells to acquire the ability to produce effector cytokines during the DC-T cell interaction in humans. Here, we show that human myeloid dendritic cells (mDCs) and plasmacytoid dendritic cells stimulated with CD40 ligand together with pro-inflammatory cytokines or Toll-like receptor ligands express CD70. Thymic stromal lymphopoietin plus prostaglandin E<inf>2</inf> also induced CD70 on mDCs. Naive CD4⁺ T cells stimulated with DCs but not with anti-CD3/CD28 microbeads expressed CD70. Stimulation with CD70 together with anti-CD3/CD28 microbeads imparted the ability to produce T<inf>h</inf>1 (IFN-gamma), T<inf>h</inf>2 (IL-4, IL-5, IL-13) cytokines, IL-2 and tumor necrosis factor-alpha to naive CD4⁺ T cells. The production of IFN-gamma was associated with the induction of T-bet. Naive CD4⁺ T cells stimulated with mDCs acquired an enhanced ability to produce a broad array of immunostimulatory cytokines in a CD70-dependent manner. These data suggest that human CD70 expressed on mDCs and activated T cells transmits a 'basal level' signal, rather than a 'polarizing' signal, to naive CD4⁺ T cells, in that CD70 promotes the development of CD4⁺ T cells that produce a variety of effector cytokines including both T<inf>h</inf>1 and T<inf>h</inf>2 types, thus contributing to the enhancement of a broad spectrum of immune responses. © The Japanese Society for Immunology. 2009. All rights reserved.

Hashizume, H., et al. (2010). "In vitro propagation and dynamics of T cells from skin biopsies by methods using interleukins-2 and -4 or anti-CD3/CD28 antibody-coated microbeads." Acta Dermato-Venereologica **90**(5): 468-473.

In order to explore the mechanisms of inflammatory skin disorders, we established two methods of expanding skin-derived lymphocytes, one using high levels of interleukin (IL)-2 and IL-4 (method A) and the other using low levels of cytokines and anti-CD3/CD28 microbeads (method B). Both methods provide advantages for functional studies. With either of these two, we could obtain more than 10(7) cells/ from a 3 mm skin biopsy in 21 days from 23 out of 26 biopsies of various skin diseases. The relevance of these cells was confirmed by shifted T-cell receptor beta chain variable region (TCR-Vbeta) repertoire and antigen-dependent proliferation in antigen-driven skin disorders. The propagation of skin-resident lymphocytes, seen especially in method A, seems to be mediated by a functional defect of regulatory T cells residing in skin sequentially expanding under the conditions of our methods.

Hasnain, J. and J. Nazia (2015). "Utilization of mustard oil for the production of polyhydroxyalkanoates by Pseudomonas aeruginosa." Journal of Microbiology, Biotechnology and Food Sciences **4**(5): 412-414.

With the unnecessary use of plastics and cumulative pressure being placed on capacities available for plastic waste disposal, the need for biodegradable plastics and biodegradation of plastic wastes has assumed increasing importance in the last few years. Bioplastic production from mustard oil was considered relatively cheap, easily available, included in vegetable oil and don't having much volatile characteristics. Total of 67 bacterial strains were isolated and purified from different regions of the Pakistan, and were checked for Polyhydroxyalkanoates (PHA) production by Sudan black and Nile blue staining. Quantitative analysis for biodegradable plastic produced by different bacterial species was performed by Modified surfactant hypochlorite method. High PHA production was detected in 35 strains belonging to different genera including

Pseudomonas, Staphylococcus, Escherichia and Enterobacter. Fermentation and PHA production was done in batch culture. The PHA production of P. aeruginosa by mustered oil cultivation was studied under six experimental conditions, such as air flow rates, pH, Temperature, optical density, substrates concentration and cell dry weight. PHA production of Pseudomonas species were subsequently authenticated at molecular level by PCR amplifications and sequence analysis. PHA polymerase 1 (PhaC1) and PHA polymerase 2 (PhaC2) from Pseudomonas aeruginosa were amplified, sequenced and submitted to gene bank.

Hassan, A. B. and P. R. Cook (1993). "Visualization of replication sites in unfixed human cells." Journal of Cell Science **105**(Pt 2): 541-550.

Sites of DNA replication in nuclei are focally concentrated, suggesting that an underlying structure organizes the activity of many polymerases. As fixation could induce aggregation into foci, we examined the distribution of replication sites in unfixed nuclei. HeLa cells were encapsulated in agarose microbeads, permeabilized in a 'physiological' buffer, their DNA polymerizing activity characterized, and replication sites directly labelled by incubation with fluorochrome-dUTP conjugates. Using conventional and digital fluorescence microscopy, 80-250 foci were seen in these unfixed cells. These foci are unlikely to be formed by the aggregation of separate polymerases as most replication activity found in vivo is retained throughout these procedures. Although commonly used fixation methods collapsed or dispersed their periphery, the central core was very stable. Foci remained when approximately 90% chromatin was removed, suggesting they were attached to an underlying structure.

Hassan, A. R. H. A. A., et al. (2015). "Highly sensitive and rapid determination of Escherichia coli O157: H7 in minced beef and water using electrocatalytic gold nanoparticle tags." Biosensors and Bioelectronics **67**: 511-515.

A simple, highly sensitive and specific immunosensing assay for rapid detection and quantification of Escherichia coli O157:H7 in meat and water samples based on the electrocatalytic properties of gold nanoparticles (AuNPs) towards hydrogen evolution reaction and superparamagnetic microbeads (MBs) as pre-concentration/purification platforms without the need of broth enrichment is developed for the first time. Minced beef and water samples inoculated with different concentrations of E. coli O157:H7 have been tested using anti-E. coli O157-magnetic beads conjugate (MBs-pECAb) as a capture platform and sandwiching afterwards with AuNPs modified with secondary antibodies (AuNPs-sECAb) and detected using chronoamperometric measurement with screen-printed carbon electrodes (SPCEs). Detection limits (LOD) of 148, 457 and 309CFU/mL were obtained in buffer solution, minced beef and tap water samples respectively, with a broad detection range of 10²-10⁵CFU/mL in all cases. Recoveries percentages after spiking of 5 different samples of both minced beef and tap water with 10³ and 10⁴CFU/mL were 94.7 and 90.4 (in beef) and 91.3 and 94.8% (in water), respectively. Specificity, reproducibility and comparison with a commercial lateral flow kit in terms of LOD and detection range were also studied showing clear advantages of the electrochemical method performance. The successful application of this AuNPs based technology in minced beef and tap water indicates the possibility of its using in various food items and other water resources. Copyright © 2014 Elsevier B.V.

Hassani Bafrani, H., et al. (2015). "Magnetic activated cell sorting and its application for selection of human non apoptotic spermatozoa in ART." Iranian Journal of Reproductive Medicine **1)**: 60.

Introduction: Hydrogen peroxide has been implemented in literature to induce a significant

increase in caspase. Activation of caspase 9 triggers a cascade of caspase activation, including caspase 3, which promotes cellular apoptosis. Magnetic cell sorting (MACS) using annexin V-conjugated microbeads eliminates apoptotic spermatozoa with annexin V-positive. Material(s) and Method(s): A total of 20 semen samples were obtained from male partners of couples for analysis. One aliquot (0.5ml) of the sperm suspension was subjected to MACS. Motility and concentration was checked, and a sample taken for tunnel before and after MACS. The remaining sperm suspension was divided into 6 tubes (2x control, 2x peroxide, 2x peroxide/ melatonin). DNA fragmentation was evaluated using the TUNEL assay (Roche, Indianapolis, IN, USA) (14), with some modifications. Data were analyzed using Graph Pad Instat Ver. 3.10. Result(s): Results of the TUNEL assay in pretreatments of human spermatozoa with 100uM peroxidase for 24 hrs revealed that the percentage of sperm with fragmented DNA was significantly lower on the sored sperm after sorting MACS (p<0.001 vs. control). Following the pretreated human spermatozoa with peroxidase for 24 hr, percentage of sperm motility and progressive motility were significantly reduced (p<0.001 vs. control). Pretreatments of human spermatozoa for 24 hr revealed that the percentage of sperm motility and progressive motility were significantly reduced by 100 muM peroxidase and peroxidase with MACS, versus zero hour in control group (p<0.001). Conclusion(s): The sperm was treated with 100 muM peroxidase sorting using MACS retain appropriate spermatozoa and select sperm good quality. The use of MACS will select only sperm with intact this result in high percentage motility and progressive motility.

Hassanipour, F. (2009). A particulate-flow heat exchanger inspired by gas diffusion in lung capillaries.
In this study, a new cooling concept using encapsulated phase-change particles flowing with water in a parallel-plate mini-channel is presented. This novel concept is inspired by the gas exchange process in alveolar capillaries, where red blood cells (RBCs) flow with blood plasma, yielding very high gas transfer efficiency. Another important characteristic of alveolar capillary blood flow, which is related to the high efficiency of the lungs, is the snug fitting of the RBCs into the capillaries. Hence, preliminary results of experimental tests using particles with diameter similar to the flow channel spacing flowing with water through a heated parallel-plate channel test module are presented and analyzed in Chapter 3. The particles are octadecane paraffin (C sub(18)H sub(38)), a phase-change material, encapsulated in a thin melamine shell. The temperature distribution along the heated surface of the channel is measured for various water flow rates, with and without particles, and with different numbers of particles. Results are reported in terms of the channel heated surface average temperature and the average heat transfer coefficient. This study also considers modeling and simulation of the particulate enhanced convection in Chapter 4. The effect of flow velocity and particle concentration on the local heat transfer of the flow is also investigated. Time-dependent moving-mesh models, incorporating both melting and solidification, are utilized for simulating a single particle flow. Particulate flow using particles with phase-change material (PCM) in the cooling fluid enhances the convective energy transport by the fluid mainly in two ways: (1) by "storing energy" in latent heat form; and, (2) by "mixing" the flow field. The high energy storage density and small temperature variation during the heat transfer process provided by the encapsulated phase-change material has made the first role particularly interesting in recent years to many investigators. The objective of Chapter 5 is to determine, latent heat and of the mixing effects on the convection enhancement. To obtain the latent heat effect, the tests are repeated with ABS (Acrylonitrile-Butadiene-Styrene) plastic particles with no latent heat capacity (in the current test operating temperature range). We measured the temperature distribution along the heated surface of the channel for various heat fluxes, and velocities, with octadecane (C

sub(18)H sub(38)) paraffin and ABS plastic particles. The results have been also compared with clear water coolant flow.

Hastings, W., et al. (2016). "An in vitro approach to study T cell exhaustion." Cancer Research. Conference: 107th Annual Meeting of the American Association for Cancer Research, AACR **76**(14 Supplement).

Immune checkpoint inhibition is now a validated modality in the treatment of multiple cancers. In vitro immune cell assays are a key tool in the study of pharmacological agents for immune modulation. Assays often involve isolating lymphocytes from human peripheral blood followed by a T cell stimulus such as anti- CD3, staph enterotoxin B, or allogeneic APCs. While this approach is useful to probe the events of immune stimulation, it likely reflects a primary or secondary immune activation, rather than a state of exhaustion. As intra-tumoral T cells are thought to be exhausted by chronic/repeated exposure to self- antigen, we sought to define experimental conditions that would reflect this state in vitro. We reasoned that repeated stimulation of T cells using anti-CD3/anti-CD28 coated microbeads would induce an exhausted phenotype. We found that, using PBMC from normal healthy donors, frequent and repeated stimuli resulted in a loss of T cells' ability to produce IL-2, TNFa, and IFNg as measured by intracellular cytokine staining. Interestingly, only one restimulation was necessary to confer this phenotype, as repeated stimuli over a longer time course did not result in further suppression. We also found that repeat stimulation conferred a surface marker phenotype suggestive of exhausted cells. Finally, we used cell death inhibitors z-7AAD-cmk and EGTA and found no effect on cytokine loss, supporting the hypothesis that cells are exhausted and not deleted by activation induced cell death. Thus we have defined experimental conditions that possibly reflect an exhausted T cell phenotype in vitro. This may be useful for the pharmacological evaluation of different therapeutic agents for their immune modulatory activities in cancer.

Haworth Ii, K. R. (1989). PLASTIC SOLUTIONS. **36:** 6-6.

Comments on an article about plastic pollution in the February 1989 issue of the periodical "Organic Gardening".

Hayashi, T., et al. (2015). Vascular network formation for a long-term spheroid culture by co-culturing endothelial cells and fibroblasts. Proceedings of the IEEE International Conference on Micro Electro Mechanical Systems (MEMS).

In this paper, we present a poly-dimethylsiloxane (PDMS) microfluidic device to create a vascular network for a long-term spheroid culture, of which network and spheroid are consist of human umbilical vein endothelial cells (HUVEC) and normal human lung fibroblasts (LF), respectively. Following device design, fabrication, and fundamental evaluation of HUVEC sprouting conditions, we visualized that HUVEC networks were successfully formed by the co-culture with LFs and reached a LF-based spheroid. Moreover, perfusability of the network was evaluated by injecting fluorescent microbeads. This platform will be applicable for long-term tissue cultures to understand morphogenesis and modeling of blood vessel functions. © 2015 IEEE.

Hays, H. and G. Cormons (1974). "Plastic particles found in tern pellets, on coastal beaches and at factory sites." Marine Pollution Bulletin **5**(3): 44-46.

Small polystyrene particles, evidently of industrial origin, now appear as a contaminant of the sea in several parts of the world. They have been discovered in pellets of indigestible food regurgitated by gulls and terms, so are clearly entering the food chain at some point. In this

study, the authors surveyed the coast along Long Island Sound for possible sources of the plastic found in the area. It was found that the polystyrene particles were being discharged from several factories into the Sound. So far as is known at present, they are harmless but it would be as well to exercise caution in releasing plastic to the environment. To determine their effect, if any, on living things, more study is needed.

Haza, A. C., et al. (2019). "Wind-Based Estimations of Ocean Surface Currents From Massive Clusters of Drifters in the Gulf of Mexico." Journal of Geophysical Research. Oceans **124**(8): 5844-5869.
During the Lagrangian submesoscale experiment (LASER), 1,000 drifters were launched to sample the surface ocean flow in the northern Gulf of Mexico. Due to half a dozen strong winter storms, about 40% of the drifters lost their drogue. This unintended situation facilitated documentation of both near-surface (5 cm) and deeper (60 cm) flows. These depths are relevant to transport of oil spills, as well as marine debris, such as microplastics, a rapidly growing environmental problem. Here, we improve the surface Lagrangian current prediction by combining a state-of-the-art ocean forecast model with wind and wave data. The ocean surface velocities are obtained from the Navy Coordinate Ocean Model at 1-km horizontal resolution, while the wind and wave fields are from the Unified Wave INterface Coupled Model coupled atmosphere-wave-ocean model. Two Lagrangian parameterizations are tested: one is based on Ekman dynamics, and the other directly on the surface winds. LASER data set is then used to assess the performance of these formulations, as a function of wind/wave conditions, as well as geographic region. It is found that incorporation of wind and wave data into the ocean circulation model can lead to major prediction improvement, by reducing the average 2-day separation from the modeled and real LASER trajectories by a factor ranging from 1.4 to 4.9. This is a significant improvement for applications, where a rapid deployment of assets is needed, such as oil spill response, or other tracking problems. Key Points: The surface wind contributes significantly to the upper 60 cm transport in the Gulf of MexicoThe transport in the upper 5 cm differs from the upper 60 cm, due to the wave contribution [ABSTRACT FROM AUTHOR]
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Hazel, B. G. (1996). "WASTE - THE POLITICS AND PHILOSOPHIES." Recycling Textile & Plastic Waste: 161-164.
The article focuses on the philosophies and theories regarding waste disposal of textile industry in the present age. Comparing the modern age with the past ages, it is considered not sustainable both economically and environmentally. In terms of recycling, the industry has two ways, first recycling within the processing chain and recycling post-consumer waste. However, one should remember that it is not the textile industry's sole responsibility for consumer waste from textiles. The protection of the environment is an issue for producer, consumer, legislator and regulator alike and can only be effectively addressed if all participants understand all its aspect and act accordingly.

He, B., et al. (2020). "Abundance, distribution patterns, and identification of microplastics in Brisbane River sediments, Australia." Science of the Total Environment **700 (no pagination)**(134467).
Plastic pollutants in aquatic ecosystems have received wide attention and research endeavours

since early 1970s. However, in comparison to marine environments, the occurrence of microplastics in a tidal river system remains largely unknown, especially in river sediments. Sediment samples taken from twenty-two sampling points along Brisbane River over the four different seasons revealed relatively high concentrations of microplastics in river sediments, with abundance ranging from 0.18 to 129.20 mg kg⁻¹, or 10 to 520 items kg⁻¹. Unfortunately, varied methods and units used for reporting do not allow the accurate comparison between related studies. The spatial distributions of microplastics hotspots indicated that microplastics abundance is distance-dominated caused by flow velocities. Lower and higher concentrations of microplastics abundance mostly occurred in dry and wet seasons, respectively. Significant temporal variations of microplastics concentrations was observed in residential and commercial areas. Polyethylene (PE), polyamide (PA) and polypropylene (PP), were the three main polymer types found in the Brisbane River sediments. Other polymer types such as polyethylene terephthalate (PET) were also detected. The majority of the detected microplastic particles were found to be <3 mm. This study reveals the abundance, spatial and temporal distribution patterns, and characteristics of microplastic pollutants in Brisbane River sediments, and provides systematic data for further research on microplastics in estuarine environments worldwide. Copyright © 2019 Elsevier B.V.

He, D., et al. (2018). "Microplastics in soils: Analytical methods, pollution characteristics and ecological risks." TrAC - Trends in Analytical Chemistry **109**: 163-172.

Microplastics are emerging persistent contaminants of increasing concern. Although microplastics have been extensively detected in aquatic environments, their occurrence in soil ecosystems remains largely unexplored. This review focused on recent progress in analytical methods, pollution characteristics and ecological effects of microplastics in soils. In spite of the presence of microplastics in soils, no standardized methods are available for the quantification. Uniform protocols including microplastic extraction and identification are urgently needed to develop. In soil environments, main sources of microplastics include mulching film, sludge, wastewater irrigation and atmospheric deposition. The fate of microplastics is closely related to soil physio-chemistry and biota. Existing evidence shows that microplastics can influence soil biota at different trophic levels, and even threaten human health through food chains. Therefore, further research is needed to fully reveal the fate and ecological risks of microplastics in soils; and necessary action is required to control microplastic pollution in terrestrial ecosystems. Copyright © 2018 Elsevier B.V.

He, J., et al. (2014). "A novel microbead-based microfluidic device for rapid bacterial identification and antibiotic susceptibility testing." European Journal of Clinical Microbiology & Infectious Diseases **33**(12): 2223-2230.

Effective treatment of infectious diseases depends on the ability to rapidly identify the infecting bacteria and the use of sensitive antibiotics. The currently used identification assays usually take more than 72 h to perform and have a low sensitivity. Herein, we present a microbead-based microfluidic platform that is highly sensitive and rapid for bacterial detection and antibiotic sensitivity testing. The platform includes four units, one of which is used for bacterial identification and the other three are used for susceptibility testing. Our results showed that Escherichia coli O157 at a cell density range of 10(1)-10(5) CFU/muL could be detected within 30 min. Additionally, the effects of three antibiotics on E. coli O157 were evaluated within 4-8 h. Overall, this integrated microbead-based microdevice provides a sensitive, rapid, reliable, and highly effective platform for the identification of bacteria, as well as antibiotic sensitivity testing.

He, J., et al. (2018). "Strong and oriented conjugation of nanobodies onto magnetosomes for the development of a rapid immunomagnetic assay for the environmental detection of tetrabromobisphenol-A. (Special Issue: Fading lemonade challenge/Where are modern flow techniques heading to?/Current trends in supercritical fluid chromatography/Instrumental analysis of microplastics.)." Analytical and bioanalytical chemistry **410**(25): 6633-6642.

Variable domain of heavy chain antibody (nanobody, Nb) derived from camelids is an efficient reagent in monitoring environmental contaminants. Oriented conjugates of Nbs and bacterial magnetic particles (BMPs) provide new tools for the high-throughput immunoassay techniques. An anti-tetrabromobisphenol-A (TBBPA) Nb genetically integrated with an extra cysteine residue at the C terminus was immobilized onto BMPs enclosed within the protein membrane, using a heterobifunctional reagent N-succinimidyl-3-(2-pyridyldithiol) propionate, to form a solid BMP-Nb complex. A rapid and sensitive enzyme-linked immunosorbent assay (ELISA) based on the combination of BMP-Nb and T5-horseradish peroxidase was developed for the analysis of TBBPA, with a total assay time of 30 min and a half-maximum signal inhibition concentration (IC₅₀) of 1.04 ng/mL in PBS (pH 10, 10% methanol and 0.137 moL/L NaCl). This assay can even be performed in 100% methanol, with an IC₅₀ value of 44.3 ng/mL. This assay showed quantitative recoveries of TBBPA from spiked canal water (114-124%) and sediment (109-113%) samples at 1.0-10 ng/mL (or ng/g (dw)). TBBPA residues determined by this assay in real canal water samples were below the limit of detection (LOD) and in real sediments were between <LOD and 23.4 ng/g (dw). The BMP-Nb-based ELISA shows promising application in environmental monitoring.

He, K., et al. (2018). "Adapting to new policy environment - past pattern and future trend in us-sino waste plastic trade flow." International Journal of Sustainable Development & World Ecology **25**(8): 702-711.

Plastics are one of the most used materials in human activities, where consumer consumption and industrial production together has imposed vast rise in demand for this material in last century. While plastic is ideally derived from crude oil as a primary source from manufacturers' perspective, varying crude oil prices are driving manufacturers economically to seek for alternative sources for plastics production. Waste plastic recovered from obsolete consumer products thus becomes an economic substitution for virgin plastics, which is further intensified with the possibility of international waste plastic trading. This study focuses on waste plastic trade between the US and mainland China by performing a correlation analysis of trade data. It is suggested in this study that although waste plastics are traded from the US to mainland China in general, as many of us believes, the route is gradually shifting in the past years. With tightening Chinese customs regulations, waste plastic from the US now tends to take a transit in a third destination (Hong Kong SAR for instance) for preliminary treatment to bypass Chinese customs inspection. Such phenomenon is worth noting, as a complication in waste plastic trading route hinders waste plastic transboundary movement monitoring. Furthermore, it will have adverse consequent consumer, industrial, and environmental impacts. It is thus necessary for national competent authorities to strengthen cooperative study and communication capacity in the future as a response to the changing waste plastic trade pattern. [ABSTRACT FROM AUTHOR] material for the full abstract. (Copyright applies to all Abstracts.)

He, L., et al. (2018). "Toxic effects of micro-plastics on zebrafish embryos." Agricultural Biotechnology **7**(5): 112-115.

The large plastic produced by human production and life is degraded into micro-plastics in the environment. Micro-plastics are harmful to organisms and the environment. In order to determine the hazards of micro-plastic pollution, zebrafish embryos were used as the tested organism, and 0.6-1.0 micro m polystyrene micro-plastic was used to carry out embryo exposure experiment. The toxic effects of polystyrene plastic particles on zebrafish embryos were investigated comprehensively, and the toxicity was evaluated. The results of this study showed that 0.6-1.0 micro m polystyrene micro-plastic had certain toxicity on zebrafish embryos, and it had a lethal effect when the concentration reached 250 mg/L; 25 mg/L 0.6-1.0 micro m polystyrene particles can cause cyrtosis and pericardial edema of zebrafish embryos and oilier non-lethal toxic effects; and 250 and 1 000 mg/L exposure concentration can slow down heart rate. A hazard evaluation index system of polystyrene particles to zebrafish embryos was established, and it is determined that the exposure to 250 mg/L or lower concentration of polystyrene particles has slight hazard.

He, P., et al. (2019). "Municipal solid waste (MSW) landfill: A source of microplastics? -Evidence of microplastics in landfill leachate." Water Research **159**: 38-45.

Although landfill is suspected to be releasing microplastics to the environment, there is few empirical researches carried out. To clarify suspicions of landfills as potential sources of microplastics, twelve leachate samples from four active and two closed municipal solid waste landfills were investigated. Microplastics were found in all the landfill leachate samples. In total, seventeen different types of plastics were identified in the leachate samples with calculated concentration ranging from 0.42 to 24.58 items/L. Polyethylene and polypropylene were the predominant polymer types. 99.36% microplastics were derived from the fragmentation of plastic waste buried in landfills. The size of 77.48% microplastics was between 100 and 1000mum. The study shows that the generation, accumulation and release of microplastic in landfills is a long-term process. The results of our study provide preliminary evidence and validate that landfill isn't the final sink of plastics, but a potential source of microplastics.

He, X., et al. (2019). "A value-added insight of reusing microplastic waste: Carrier particle in fluidized bed bioreactor for simultaneous carbon and nitrogen removal from septic wastewater." Biochemical Engineering Journal **151 (no pagination)**(107300).

Turning microplastic litter into reusable products is a resource-saving and eco-friendly strategy of disposing of plastic pollution. This work realized a value-added insight of reusing microplastic waste by processing the recycled microplastic items with clay waste into composite particle (CP). Furthermore, the systematic evaluation of CP particle was carried out in a Liquid-solid fluidized bed bioreactor (LSFBBR-CP) treating septic sewage with low COD to nitrogen ratio (C/N <=3). The commercial inorganic particle, bioceramsite (BC), was tested in the LSFBBR-BC for comparison. During the 257-day stepwise operation, two LSFBBRs constantly achieved effluent of TCOD <45 mg L⁻¹ and low observed sludge yield (Y<inf>obs</inf> <=0.067 g VSS g⁻¹ COD). Comparatively, the lower fluidization velocity for the CP particles (u<inf>l</inf>, 0.67-1.20 cm s⁻¹) not only contributed to high biomass attachment (17.2 mg VSS g⁻¹ CP particles) but also favored nitrifiers (Nitrosomonas, Nitrosospira, Nitrobacter and Nitrospira) enrichment. Additionally, the LSFBBR-CP outperformed the LSFBBR-BC in energy conservation by consuming 41.1-47.4% less energy for fluidization, due

to the lower u<inf>l</inf>. Contrary to BC particles' attrition regarding to particle size decrease and surface chemicals loss, the CP particles exhibited superiority in physio-chemical stability. Those comparative advantages confirmed that the CP could be a promising alternative for BC as a carrier particle in LSFBBR, suggesting that turning microplastic litter into reusable carrier particle for FBBRs is feasible. Copyright © 2019 Elsevier B.V.

He, Y., et al. (2017). "Comparison of different kits for Illumina RNA-seq library preparation." Genomics and Applied Biology **36**(11): 4607-4615.

RNA-seq was the transcriptome analysis technology that depended on deep sequencing. It was widely used on mainstream platform Illumina of next generation sequencing. In terms of the RNA-seq library construction for the Illumina platform, there were many types of method to support. However, there were differences among these methods on the operation steps and costs. In this study, three methods which were the preparation of TruSeq RNA library, NEBNext RNA library and RNA Kapa library were tested respectively. The lengths of these three libraries were focused on 300 bp-1 000 bp, KAPA RNA library had highest concentration. The preparation method only needed a magnetic microbeads purification, had easier operation, lower cost, and lower initial amount that required for construction. And it was suitable for large scale construction experiments.

Hebel, K., et al. (2012). "CD4⁺ T cells from human neonates are intrinsically poised towards a TH2 phenotype that can be modulated by co-stimulation." Immunology **1)**: 181.

Purpose/Objective: Interleukin 4 (IL-4) is the primary cytokine supporting the development of atopic diseases. As suggestive evidence points towards a bias of CD4 T cells of neonates and infants to become TH2 cells, we determined the capacity of TH cells of neonates and infants to do so. Material(s) and Method(s): Lymphocytes, CD4⁺CD45RA⁺, or CD4⁺CD45RA⁺CD31⁺ T cells were stimulated with anti-CD3 and anti-CD28 coated microbeads and analysed using Bio-Plex and flow cytometry. Fluorescent microscopy was used to determine subcellular localisation of IL-4. CD31-expressing cells were enriched by magneticcell sorting (MACS). Real-time-PCR was used for quantification of expression of specific mRNAs. ELIspot was performed to determine cytokine secretion of individual T lymphocytes. Result(s): In adenoids, we discovered a so far hardly appreciated TH subpopulation expressing an IL-4 splice variant which is not secreted. By fluorescent microscopy the non-secreted IL-4 was shown to accumulate in defined subcellular structures and not in undefined regions as has been reported before. Having a closer look at the subpopulation during ontogeny, naive CD4⁺ T cells from cord blood*but not from adults - with and without anti-CD3 T cell activation had a strong bias to express the non-secreted Interleukin-4 (IL-4) variant in CD45RA⁺ T cells at high frequencies that downmodulated the surface molecule CD31. Accordingly, only the CD31) subfraction of CD4⁺ T cells gained the ability to secrete IL-4. However, when the primary T-cell-triggering stimulus was enhanced by costimulation with anti-CD28, CD4⁺ T cells started to loose the intracellular IL-4, a phenomenon that was enforced by exogenous addition of IL-1beta, IL-12, or IL-6, but inhibited by TGFb reflecting the plasticity of neonatal TH cells. Conclusion(s): Neonatal T-cells show an intrinsic capacity to run a TH differentiation program. Interestingly for therapy, the final differentiation process can still be manipulated by costimulation. It is of great interest for immunpathologies driven by a TH2 response such as allergies that the secretion of this intrinsically induced, functional IL-4 additionally depends on the activation stimulus and the exogenous cytokine milieu and thus, can be manipulated.

Hebert, A., et al. (2003). "Analysis of intra-hepatic peptide-specific cell recruitment in mice immunised with Plasmodium falciparum antigens." Journal of Immunological Methods **275**(1/2): 123-132.

The liver stage of Plasmodium spp. now appears as a relevant target of immune effectors triggered by the so-called "anti-sporozoite" vaccine. Since the monitoring of immune responses at the systemic level may not faithfully reflect the local protective mechanisms, the aim of the present work was to set up a model to study the local intra-hepatic cellular responses and to compare these with the peripheral immune responses. This was achieved by intra-portal delivery of epitopic peptides, i.e. peptides containing B and T cell epitopes, which were coated onto the surface of polystyrene microbeads. The peptide-coated beads presumably mimic the hepatic schizont, and when distinct peptides are administered separately, this method of delivery allows us to decipher the immune responses resulting in mice immunised with recombinant proteins spanning several such epitopes. Using the P. falciparum liver stage antigen-3 (LSA3) molecule, which can induce protection against a sporozoite challenge, our results show that 25- micro m microbeads could easily access the liver parenchyma by intra-portal injection and were distributed evenly in the liver. Also, LSA3-derived synthetic peptides coated onto microbeads initiated specific cell recruitment within 6 h. Depending on the LSA3 peptide used, the infiltrates induced differed in size, with the strongest cell recruitment obtained using nonrepeat II peptide (NR2)-coated microbeads with a mean leukocyte number of 79 per granuloma. Immunohistological studies of liver sections revealed that, irrespective of the delivered peptide, cells infiltrating the liver towards microbeads were mainly CD3⁺ T lymphocytes, both CD4⁺ (70 to 80%) and CD8⁺ (20 to 30%) subtypes, macrophages and dendritic cells. Cells infiltrating the granuloma had features of activated cells, with evidence of VLA-4 cell-surface expression, and production of IFN- gamma and IL-4. Analysis of the peripheral B and T-cell responses in the same animals revealed that, whereas the local responses were directed mainly towards NR2 and repeat peptides (RE), the peripheral T-cell response to these peptides was weak and infrequent, although antibody production was high.

Hebisch, R. and G. Linsel (2012). "Workers' exposure to hazardous substances and biological agents in recycling enterprises." Gefahrstoffe Reinhaltung der Luft **72**(4): 163-169.

Recycling and waste management is performed in about 5,300 enterprises by about 150,000 employees in Germany. The Federal Institute for Occupational Safety and Health (BAuA) has performed a comprehensive investigation program in different recycling enterprises during the last decade. In detail, workers' exposures have been measured when recycling electronic waste, end-of life vehicles, plastics waste, textile, and paper and paperboard. During all these processes workers are exposed to airborne particles. Additionally, when recycling electronic waste and end-of life vehicles a significant exposure to heavy metals and organic solvents was found, respectively. Furthermore, for plastics, textiles, and paper and paperboard recycling exposure to biological agents may reach considerable concentrations. The results of the workplace measurements were used to establish recommendations for good practice to protect workers in recycling enterprises.

Hecht, A., et al. (2014). "Fractal dimension of microbead assemblies used for protein detection." Chemphyschem **15**(16): 3444-3446.

We use fractal analysis to calculate the protein concentration in a rotating magnetic assembly of microbeads of size 1 mum, which has optimized parameters of sedimentation, binding sites and magnetic volume. We utilize the original Forrest-Witten method, but due to the relatively small number of bead particles, which is of the order of 500, we use a large number of origins and also a large number of algorithm iterations. We find a value of the fractal dimension in the range

1.70-1.90, as a function of the thrombin concentration, which plays the role of binding the microbeads together. This is in good agreement with previous results from magnetorotation studies. The calculation of the fractal dimension using multiple points of reference can be used for any assembly with a relatively small number of particles.

Heddagaard, F. E. and P. Moller (2019). "Hazard assessment of small-size plastic particles: is the conceptual framework of particle toxicology useful?" Food & Chemical Toxicology **136**: 111106.

Humans are exposed to plastic particles, but there are no studies on environmental plastics in cell cultures or animals. The toxicological understanding arises from model particles like polystyrene, polyethylene or non-plastic particles like food-grade titanium dioxide. The majority of studies on polystyrene particles show toxicological effects on measures of oxidative stress, inflammation, mitochondrial dysfunction, lysosomal dysfunction and apoptosis. The toxic effects in cell cultures mainly occur at high concentrations. Polyethylene particles seem to generate inflammatory reactions, whereas other toxicological effects have not been assessed. There are very few studies on effects of polystyrene particles in animal models and these have not demonstrated overt indices of toxicity. Studies in animals are the likely way for hazard assessment of micro- or nanoplastics. However, co-culture systems that mimic the complex architecture of mammalian tissues can cost-efficiently determine the hazards of micro- and nanoplastics. Future studies should include low doses of micro- and nanoplastic particles, which are more relevant in the assessment of health risk than the extrapolation of effects from high doses to realistic doses. Based on studies on model particles, environmental exposure to micro- and nanoplastic particles may be a hazard to human health.

Hedman, B., et al. (2006). "Emission of PCDD/F, PCB, and HCB from combustion of firewood and pellets in residential stoves and boilers." Environmental Science & Technology **40**(16): 4968-4975.

To assess potential emissions of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), polychlorinated biphenyls (PCBs), and hexachlorobenzene (HCB) from residential combustion of biofuels, experiments were performed in which various types of pellets and firewood were combusted in four types of stoves and boilers, with both full and reduced rates of air supply. Intermittent combustion of wood pellets resulted in emissions of 11 ng-(WHO-TEQ)/kg combusted fuel (dry weight). A modern, environmentally certified boiler yielded somewhat lower emissions of PCCD/F and PCB than a wood stove. Both gave <0.1 ng(WHO-TEQ)/m3n (1.3-6.5 ng(WHO-TEQ)/kg) and considerably lower emissions than an old boiler (7.0-13 ng(WHO-TEQ)/kg). No positive effect on emissions could be observed in full air combustion (simulating the use of a heat storage tank) compared to combustion with reduced air. Two of the wood combustion experiments included paper and plastic waste fuels. Chlorine-containing plastic waste gave rise to high emissions: ca. 310 ng(WHO-TEQ)/ kg over the whole combustion cycle. The homologue profiles of PCDD/Fs show characteristic differences between ashes and flue gas from combustions with different levels of air supply. These differences do not, however, seem to have any correlation to the relative amount of toxic congeners.

Heeb, N. V., et al. (2010). "Thermally-induced transformation of hexabromocyclo dodecanes and isobutoxypenta bromocyclododecanes in flame-proofed polystyrene materials." Chemosphere **80**(7): 701-708.

Abstract: Polystyrenes (PS) are produced in quantities exceeding 10Mty−1. They are used for insulation and packaging materials, often in flame-proofed forms with hexabromocyclododecanes (HBCDs) added as flame retardants. Polystyrenes are also constituents of plastic debris found in the aquatic environment. HBCDs are now considered as persistent, bioaccumulative, and toxic compounds. Lately, we reported that isobutoxypenta bromocyclododecanes (iBPBCDs), a formerly unknown class of polybrominated compounds, are also present in flame-proofed polystyrenes. It is therefore likely that iBPBCDs are released along with HBCDs from these materials. Herein, we report on changes of the HBCD- and iBPBCD-patterns when exposing expanded (EPS) and extruded (XPS) polystyrenes at temperatures of 140–160°C. Substantial transformation reactions were observed in EPS, which was rich in γ-HBCDs and δ-, η-, and θ-iBPBCDs at the beginning, but changed to materials rich in α-HBCDs and α-, β-, ε-, and ξ-iBPBCDs. Patterns of untreated XPS already resembled those of the thermally treated EPS. Upon thermal exposure, some further enrichment of α-HBCDs and α-, β-, ε-, and ξ-iBPBCDs was also noticed for the XPS samples, indicating similar transformation mechanisms. Comparable apparent first-order transformation rate constants (k trans) of −0.003, −0.008, and −0.020min−1 and −0.004, −0.009, and −0.019 min−1 are found for γ-HBCD- and δ-iBPBCD-conversion at 140, 150, and 160°C, respectively. We conclude that a thermal treatment of flame-proofed polystyrenes alters their HBCD- and iBPBCD-patterns. Thus depending on the proportions of EPS and XPS materials reaching the environment, more of the lipophilic (late-eluting) or of the more polar (early-eluting) HBCD- and iBPBCD-stereoisomers will be released. Several properties such as partitioning coefficients, degradation rates, and bioaccumulation factors are stereoisomer-specific. Therefore, the environmental fate of individual HBCDs and iBPBCDs is expected to vary, the specific stereoisomer pattern in polystyrenes at a potential source is another important aspect to consider. [Copyright &y& Elsevier]

Heegaard, N. H. (1999). "Microscale characterization of the structure-activity relationship of a heparin-binding glycopeptide using affinity capillary electrophoresis and immobilized enzymes." Journal of Chromatography. A **853**(1-2): 189-195.

A heparin-binding glycopeptide (T3) from human serum amyloid P component was characterized by taking advantage of two important features of capillary electrophoresis: the low sample consumption and the possibility of doing on-line binding studies. Incubations with neuraminidase and proteolytic enzymes were carried out with enzymes immobilized on paramagnetic microbeads. Affinity capillary electrophoresis subsequently was used to characterize T3 and its fragments with respect to heparin binding. We find that an intact glycan moiety makes the C-terminal part of T3 relatively resistant to chymotryptic clevage. This protection is lost upon desialylation. Also, the C-terminus of T3 is involved in heparin binding while the N-terminal part of the molecule has no appreciable binding activity. The micromethods presented here make it feasible to perform structure-function studies even on the small amounts of analytes that are typically available when working with glycopeptides from natural sources.

Heemskerk, B., et al. (2010). "Microbead-assisted retroviral transduction for clinical application." Human Gene Therapy **21**(10): 1335-1342.

Retroviral transduction is the most commonly used strategy to obtain long-term expression of therapeutic genes. To efficiently transduce mammalian cells, a recombinant fibronectin molecule, RetroNectin, is generally used to juxtapose viral particles and cells, and thereby enhance viral uptake. Although this strategy has become widely adopted, in particular for the genetic modification of hematopoietic cells, several limitations apply. For example, it requires the use of culture systems that allow protein coating, something that is not possible for many of the closed cell culture systems that are used in clinical trials. Furthermore, efficient transduction is obtained only when culture systems can be exposed to centrifugation, an approach termed spin transduction. Here, we describe a novel and more potent strategy for the transduction of T cells that can be applied on a clinical scale. We show that RetroNectin can efficiently be coated onto epoxy-modified paramagnetic beads. After a blocking step, these beads can subsequently bind retroviral particles from viral supernatants, rendering such supernatants largely devoid of functional viral particles. Addition of these virus-loaded beads to activated T cells results in efficient retroviral infection. Importantly, transduction does not require the use of culture systems that are compatible with protein coating, nor is it dependent on centrifugation of either the viral supernatant or the cells. Finally, cell growth, phenotype, and function of spin-transduced versus bead-transduced cells are comparable. Viral coating of microbeads should facilitate the production of genetically modified cells, in particular for use in clinical trials.

Hegaret, H., et al. (2003). "Flow cytometric analysis of haemocytes from eastern oysters, Crassostrea virginica, subjected to a sudden temperature elevation: II. Haemocyte functions: aggregation, viability, phagocytosis, and respiratory burst." Journal of Experimental Marine Biology and Ecology **293**(2): 249-365.

The capability of an oyster to respond to environmental stresses, such as periodically high summer temperatures, as well as disease or parasite infections, depends, in large measure, upon the viability and functional capability of haemocytes. Eastern oysters (Crassostrea virginica) were subjected to a sudden increase in temperature from 20 to 28 degrees C for 1 week, and several haemocyte functions were determined before and after the temperature elevation using the flow cytometer. Previously, we described the characterization of different haemocyte types using new and modified flow cytometric methods. In this report, we provide detailed protocols for flow cytometric methods to: (1) determine haemocyte aggregation using paired samples with or without an antiaggregant solution; (2) assess haemocyte viability using propidium iodide (PI); (3) quantify haemocyte phagocytosis with fluorescent microbeads; and (4) measure the respiratory burst response of individual haemocytes using 2',7'-dichlorofluorescein diacetate (DCFH-DA) and zymosan to activate the release of reactive oxygen species (ROS). The temperature increase caused no significant change in haemocyte aggregation, although there was a trend of increasing aggregation in granulocytes and small granulocytes, but a slight decrease in hyalinocyte aggregation. Phagocytosis of all haemocyte types decreased after the temperature increase. Significantly higher percentages of dead haemocytes in all haemocyte types (attributable to a large increase in mortality of hyalinocytes, the most numerous cells) were found after the temperature increase, suggesting generally less capable immune function. Numbers of dead small granulocytes and granulocytes tended to decrease, but this was not statistically significant. Effects of temperature elevation upon respiratory burst were not statistically significant; however, a trend of increased ROS production after temperature elevation was consistent for all haemocyte types. Granulocytes, hyalinocytes, and small granulocytes showed increased production of ROS in the presence of zymosan; granulocytes showed the highest induced fluorescence.

Hegazy, S., et al. (2015). "Novel IMB-ELISA Assay for Rapid Diagnosis of Human Toxoplasmosis Using

SAG1 Antigen." Japanese Journal of Infectious Diseases **68**(6): 474-480.

Nanotechnology is important for medical diagnosis. Various nanoparticles have presented tremendous potential for diagnosing disease markers, pre-cancerous cells, fragment of viruses, specific proteins, antibodies, and other disease indicators. In general, nanoparticles are smaller than 1,000 nm and produced from different materials in different shapes such as spheres, rods, wires, and tubes. Our study aimed to develop a novel antigen-capture immunoassay based on IgG polyclonal antibody-coated magnetic microbead nanoparticles for the rapid detection of circulating surface antigen 1 of Toxoplasma gondii in human serum samples. Sandwich ELISA elicited a sensitivity of 92%, a specificity of 92.7%, a positive predictive value (PPV) of 92%, and a negative predictive value (NPV) of 92.7%. Immunomagnetic bead-ELISA showed sensitivity (98%), specificity (96.4%), PPV (96%), and NPV (98.1%) higher than that of sandwich ELISA. It is obvious that the use of magnetic microbead nanoparticles offers the potential advantage of improving the diagnostic testing of toxoplasmosis.

Hegbert, B. A., et al. (1991). Post-consumer mixed plastics recycling: Characterization, collection, costs and markets, NTIS, SPRINGFIELD, VA (USA).

Recycling of plastic discards is one method of reducing municipal solid waste. Because of its heterogeneous nature and the amount of contaminants present, separation of post-consumer mixed plastic waste is the most difficult. The purpose of the report is to identify the compositions of plastics in municipal solid waste (MSW) and in recycling programs, the post-consumer plastics contributions to recycling programs, the cost of plastics collection and some of the end uses for reprocessed post-consumer plastics. Attention is given to curbside collection of recyclables because of its high recovery rate (60-90%) in comparison to other recycling methods (10-30%).

Hegde, S. S., et al. (2013). "Transmyocardial therapeutic-delivery using real-time MRI guidance." Journal of Cardiovascular Magnetic Resonance **1)**: 213-214.

Background: Catheter-based transmyocardial injection offers a minimally invasive method to deliver therapeutics to the heart. It is typically performed under X-ray fluoroscopic guidance, which suffers from poor demarcation of myocardial boundaries and an inability to assess myocardial viability. MRI-guided intramyocardial delivery of therapeutics at 3T offers the potential for more precise targeting of these therapies with superior tissue contrast. Our group has been actively involved with (Figure presented) microencapsulated stem cell therapy to improve cell retention and prevent stem cell rejection. However, conventional microencapsulated stem cell products are too large to be administered transmyocardially. We demonstrate here intramyocardial injection of a prototype single stem cell therapeutic into the myocardium of a normal swine using real-time MR guidance and a custom active injection catheter. Method(s): Prototype alginate microbeads (50 mum diameter) impregnated with iron oxide (MyeOne) were produced using a custom microfluidic device. A custom MR- trackable, steerable intramyocardial injection catheter (10F diameter, 135 cm long, MRI Interventions, Inc.) with four built-in tracking coils (Figure 1a) was visualized on the Interactive Front End (IFE) navigation software (Siemens Corporate Research) in conjunction with a real-time tip-tracking sequence (BEAT-IRTTT, Pan.L et.al, ISMRM 2011, pp. 195). The catheter and the real-time interface were tested in a phantom, ex vivo pig heart, and an in vivo swine study at 3T (Siemens TimTrio). For the in vivo study, a breath-hold, multi-slice cine TrueFISP short-axis stack was obtained, which was segmented and converted to a 3D model (Figure 1b) for an overlay within IFE (Figure 1c). The catheter was navigated using real-time model guidance to target injection sites (Figure 1d). After ensuring correct needle placement, iron oxideimpregnated alginate

microbeads (0.02 ml/injection) were injected into the myocardium during a FLASH real-time acquisition (Figure 1e). Delivery success was confirmed using a breath hold, multi-slice 2D FLASH sequence (Figure 1f,g). Relevant imaging parameters are in the figure caption. Result(s): Left ventricular catheterization and guidance to four target sites in the myocardium was achieved. Confirmation of microbead delivery on FLASH images was possible but difficult due to the small volume and low iron concentration delivered. Follow-up imaging at one week postdelivery was unable to visualize the iron oxide-labeled therapeutic. No adverse events from transmyocardial delivery were observed. Conclusion(s): A real-time interface with active catheter tip tracking enabled successful 3T MRI-guided transmyocardial delivery of a prototype therapeutic to the in vivo heart.

Hegedus, E., et al. (2008). "Heteroduplex analysis using flow cytometric microbead assays to detect deletions, insertions, and single-strand lesions." Cytometry Part A: The Journal of the International Society for Analytical Cytology **73**(3): 238-245.

We explore the possibilities offered by flow cytometric microbead analysis to develop high throughput methods for the detection of deletions/insertions and single-strand DNA lesions. The products of PCR reactions derived from reference and test samples are denatured and reannealed, then exposed to enzymatic or chemical treatments distinguishing homoduplices from heteroduplices. The biotin- and dye labeled reaction products are immobilized on microbeads and the homo- and heteroduplices are assessed in separate fluorescence channels, by flow cytometry. Using a model system based on the mixed lineage leukemia gene breakpoint cluster region, we demonstrate that deletions and insertions in genomic DNA can be detected, using S1 nuclease and chemical cleavage to distinguish hetero- from homoduplices, or a restriction enzyme cleaving only the homoduplices. Single-strand discontinuities can also be detected, by combining nick-translation, using labeled nucleotide, and flow cytometric microbead analysis. The methodical approaches demonstrated are applicable in a versatile manner in basic cell and molecular biological research and also promise direct application for high throughput screening of genetic diseases and lesions, including insertions or deletions of short sequence elements and single-strand lesions formed at hypersensitive sites in response to apoptotic stimuli.

Hei, L., et al. (2007). "Fixing heavy metals in sludge and reducing pollution to soil using heavy metal stabilizers." Transactions of the Chinese Society of Agricultural Engineering **23**(8): 205-209.

Heavy metal stabilizers were added to sludge in used plastic containers, through artificial watering or naturally rain falling, the fertilizer components flowed out with leaching water and fertilized plants but the heavy metals retained in the sludge in the container. The leaching and pot experiments with Laetuca satiuali and Ipomoea aquatica showed that the positive effects of the mixture of the sludge and K₂SO₄ on plant production and reduction of heavy metal contents in plants were significant. Metals-bound sludge could be collected easily after treatment to prevent the secondary pollution, provided that the heavy metals were fixed within the container and significantly reduced the leaching of heavy metals to soil. This equipment meets the requirements of safe agricultural utilization of the sludge. Besides, this method permits the plastic waste recycled and realized with a low cost.

Heidbreder, L. M., et al. (2019). "Tackling the plastic problem: A review on perceptions, behaviors, and interventions." Science of the Total Environment **668**: 1077-1093.

The excessive production and consumption of plastic has serious consequences on the environment and human health. The reduction of plastic has therefore become a major global

challenge. As technical solutions might be insufficient to curb the problem, a perspective highlighting the impact of human behavior is needed. The current literature review provides an overview of the existing social-scientific literature on plastic, ranging from risk awareness, consumers' preferences, and predictors of usage behavior to political and psychological intervention strategies. By reviewing the literature, we aim to identify potential factors for future interventions to reduce plastic consumption. The 187 studies reviewed show that people much appreciate and routinely use plastic, despite a pronounced awareness of the associated problems. Habits, norms, and situational factors seem to be especially predictive for plastic consumption behavior. Both political and psychological interventions are potentially effective, although long-term effects are often uncertain. The review closes with implications for behavior-based solutions and future research, which should combine interdisciplinary approaches and take into account cultural differences.

Heidenreich, F. and T. Jovin (1996). "Synthesis of anti-acetylcholine receptor antibodies by CD5- B cells from peripheral blood of myasthenia gravis patients." Journal of Neurology **243**(1): 57-62.

An increased frequency of CD5+ B cells (or, according to a new nomenclature, B1 cells) has been detected in the peripheral blood of a proportion of patients with myasthenia gravis (MG), as in some other autoimmune diseases. To elucidate the pathogenic significance of this B-cell subset in myasthenia gravis, mononuclear cells from the peripheral blood of six MG patients were separated into T and B lymphocytes by a magnetic cell separation procedure employing superparamagnetic microbeads (MACS). Subsequently, the B-cell fraction was depleted of CD5+ B cells in a second separation. The resulting purified CD5- B-cell fraction was cultured alone or with the addition of autologous T cells. Anti-acetylcholine receptor (AChR) synthesis by CD5- B cells in cultures with T cells was significantly increased by pokeweed mitogen (176 +/- 130 fmol/ml per week/2 x 10(5) B cells) compared with unfractionated cells (75 +/- 101) or CD5- B cells alone (19 +/- 4). These results demonstrate that in MG anti-AChR are synthesized, at least in part, by CD5- B cells which are dependent on T cells. Although this does not exclude the existence of AChR-specific CD5+ B cells, it provides evidence against a pivotal role of this B-cell subset in anti-AChR synthesis.

Height, A. (2006). "Minister's recycling bags are filled with the wrong waste." Materials Recycling Week **188**(18): 7-7.

The article reports on the allegation that Local Environment Minister Ben Bradshaw has disposed his non-recyclable wastes in a recycling bin in Great Britain. The periodical "Mail on Sunday" revealed that the recycling bin contains information on the kind of garbage that should be placed on it. It has been discovered that the general rubbish sack of the minister composes of non-recyclable materials including waxed paper from a mint, foil-covered chewing gum, and chocolate wrappers. Bradshaw reacted on the issue by acknowledging the efforts of the newspaper in stressing the significance of recycling.

Height, A. (2007). "PIM process is able to fuse commingled plastics." Materials Recycling Week **189**(1): 6-6.

The article reports on the success of Environmental Polymer Technologies (EPT) in developing a process to fuse commingled plastics in Wales. After five years of development, EPT has discovered the use of powder impression molding (PIM) process to mix commingled plastic waste that can be turned into a range of quality products. Sorting ad washing are needed to attain a high-value recycled plastic product. But PIM fuses the material together than fully melting it. The final product consists of three sections, a core layer covered on either side by an outer layer, and the layer's properties can be tailor-made to suit the final product.

Heindler, F. M., et al. (2017). "Toxic effects of polyethylene terephthalate microparticles and Di(2-ethylhexyl)phthalate on the calanoid copepod, Parvocalanus crassirostris." Ecotoxicology and Environmental Safety **141**: 298-305.

Large amounts of plastic end up in the oceans every year where they fragment into microplastics over time. During this process, microplastics and their associated plasticizers become available for ingestion by different organisms. This study assessed the effects of microplastics (Polyethylene terephthalate; PET) and one plasticizer (Di(2-ethylhexyl)phthalate; DEHP) on mortality, productivity, population sizes and gene expression of the calanoid copepod Parvocalanus crassirostris. Copepods were exposed to DEHP for 48 h to assess toxicity. Adults were very healthy following chemical exposure (up to 5120 micro g L-1), whereas nauplii were severely affected at very low concentrations (48 h LC50 value of 1.04 ng L-1). Adults exposed to sub-lethal concentrations of DEHP (0.1-0.3 micro g L-1) or microplastics (10,000-80,000 particles mL-1) exhibited substantial reductions in egg production. Populations were exposed to either microplastics or DEHP for 6 days with 18 days of recovery or for 24 days. Populations exposed to microplastics for 24 days significantly depleted in population size (60+or-4.1%, p<0.001) relative to controls, whilst populations exposed for only 6 days (with 18 days of recovery) experienced less severe depletions (75+or-6.0% of control, p<0.05). Populations exposed to DEHP, however, exhibited no recovery and both treatments (6 and 24 days) yielded the same average population size at the termination of the experiment (59+or-4.9% and 59+or-3.4% compared to control; p<0.001). These results suggest that DEHP may induce reproductive disorders that can be inherited by subsequent generations. Histone 3 (H3) was significantly (p<0.05) upregulated in both plastic and DEHP treatments after 6 days of exposure, but not after 18 days of recovery. Hsp70-like expression showed to be unresponsive to either DEHP or microplastic exposure. Clearly, microplastics and plasticizers pose a serious threat to zooplankton and potentially to higher trophic levels.

Heinemann, L. and E. Krisiunas (2019). "Diabetes Technology and Waste: A Complex Problem Piling Up!" Journal of Diabetes Science and Technology **13**(5): 815-816.

Heinrich, P. and T. Braunbeck (2019). "Bioavailability of microplastic-bound pollutants in vitro: The role of adsorbate lipophilicity and surfactants." Comparative biochemistry and physiology. Toxicology & pharmacology : CBP **221**: 59-67.

The potential role of microplastic particles (MPs) as vectors for lipophilic organic pollutants enhancing their uptake by organisms has repeatedly been discussed in the scientific community. Likewise, several studies indicate an important role of surfactants in pollutant-transfer from MP to organisms. Employing polyethylene particles, the bioavailability of three MP-bound inducers of 7-ethoxyresorufin-O-deethylase (EROD) with variable lipophilicity was quantitatively compared via EROD activity in RTL-W1 cells. In addition, non-cytotoxic surfactant concentrations of Pluronic F-127, rhamnolipids, sodium deoxycholate and sodium dodecyl sulfate (SDS) supplemented to the medium were tested for their effects on pollutant desorption from MPs as well as on cellular EROD induction. Bioavailability of MP-bound pollutants was negatively correlated with lipophilicity, and all surfactants were found to modulate the cellular response towards inducers by unidentified mechanisms. After experimental correction for effects on the cellular response, all surfactants except SDS moderately increased desorption of inducer from MPs. Results on the impact of lipophilicity agree with previously published thermodynamic models, indicating that appreciable pollutant desorption from MPs may only occur for substances with comparatively low lipophilicity, the accumulation of which on MPs is negligible in the environment. However, the role of surfactants should be considered further with respect to potential effects on sorption of pollutants to and from MPs.

Heinrich, P. and T. Braunbeck (2019). "Microplastic testing in vitro: Realistic loading of pollutants, surfactant-free solid surface-dosing and bioanalytical detection using a sensitivity-optimized EROD assay." Toxicology in Vitro **54**: 194-201.

Microplastic particles (MPs) are emerging contaminants in aquatic environments, which are assumed to play a role as vectors for lipophilic pollutants, as the particles bear a potential for the accumulation of lipophilic contaminants from the water phase on the MPs' surface and subsequent release in contact with organisms. In an attempt to allow the bioanalytical detection and quantitatively estimate bioavailability of MP-bound pollutants under realistic conditions in vitro, a protocol was developed for water-based loading of lipophilic substances to MPs using a solid-phase extraction (SPE) approach and subsequent detection of the substances in a sensitivity-enhanced 7-ethoxyresorufin-O-deethylase (EROD) assay with RTL-W1 cells. Exemplarily, particles were loaded with benzo[k]fluoranthene (BkF), which was shown to bind to MPs with high affinity. Spiked particles were added to the surface of the culture medium, where they released low, but consistent amounts of BkF, which were quantified by EROD induction. Additionally, a geometrical model was developed for the estimation of numbers, surface areas and masses of MPs interacting with medium. The approach presented allows the experimental in vitro examination of the postulated function of MP as a pollutant vector in a highly sensitive animal-experimentation-free test system. Copyright © 2018 Elsevier Ltd

Heinrich, P. and T. Braunbeck (2020). "Microplastic particles reduce EROD-induction specifically by highly lipophilic compounds in RTL-W1 cells." Ecotoxicology & Environmental Safety **189**: 110041.

Microplastic particles (MPs) from lipophilic polymers have been shown to efficiently accumulate hydrophobic organic contaminants (HOCs) in aquatic environments. MPs have, therefore, frequently been discussed as vectors for contaminants, enhancing HOC uptake by various organisms after ingestion followed by pollutant release; however, integrative models of sorption argue against this mechanism and even predict cleansing of pollutants from biological systems under particular circumstances. In order to experimentally investigate such a depuration mechanism, RTL-W1 cells were dosed with three 7-ethoxyresorufin-O-deethylase (EROD) inducers of distinct lipophilicity via the medium before adding both native and hexane-purified polyethylene MPs (20-25 mum) to the medium surface. EROD activity was significantly reduced in the presence of MP, the extent of which correlated with the inducers' lipophilicity (K_{OW}) and thus affinity to MP. For hexane-purged MPs and TCDD (K_{OW} = 6.8), MPs reduce the bioavailability by up to 79%; the effect was marginally weaker with benzo[k]fluoranthene (K_{OW} = 6.11) and almost absent with beta-Naphthoflavone (K_{OW} = 4.68). Compared to hexane-purged MPs, native particles possessed slightly less detoxification potential. These experimental results corroborate theoretically predicted mechanisms of detoxification via MPs. Yet, it is unclear if, under corresponding conditions in the environment, MPs can compete with organismal tissues for highly lipophilic compounds and, if so, to which degree they may act as a sink reducing the amount of bioavailable pollutants in situ. However, the present results suggest that in scenarios where pollutant-free MPs interact with organisms that accumulated HOCs via other routes of uptake, qualitatively the presence of such a mechanism is likely.

Heinzl, M. W., et al. (2015). "Detection of granulocyte-reactive antibodies: a comparison of different

methods." Vox Sanguinis **108**(3): 287-293.
BACKGROUND AND OBJECTIVES: Granulocyte-reactive antibodies can cause autoimmune and neonatal immune neutropenias as well as transfusion-related acute lung injury. The classical antibody-detection methods granulocyte aggregation test (GAT), granulocyte immunofluorescence test (GIFT) and monoclonal antibody-specific immobilization of granulocyte antigens (MAIGA) are time-consuming and technically challenging. In recent years, flow cytometric white blood cell immunofluorescence test (Flow-WIFT) and the microbeads assay LabScreen Multi have emerged and are still subject of evaluation. These serological tests were compared on a screening and specification level.
MATERIALS AND METHODS: For screening, the combination of GAT/GIFT was compared to Flow-WIFT testing 333 samples. Positive samples were further analysed with MAIGA and LabScreen Multi.
RESULTS: Granulocyte aggregation test/GIFT detected 77 positive samples, Flow-WIFT found 108 granulocyte-reactive samples. Six Samples were only positive in GAT/GIFT, and 37 samples were only positive in Flow-WIFT (kappa = 0.682). Antibody specification with MAIGA and the microbeads assay confirmed granulocyte-reactivity in 83 cases with 70 matching results (kappa = 0.742). However, out of six detected human neutrophil antigen (HNA) reactivities only two specificities matched in both assays.
CONCLUSION: Flow-WIFT may be a valuable addition to GIFT for granulocyte-reactive antibody screening. MAIGA remains the most reliable laboratory method for antibody specification.

Helbig, P. and C. D. Pitt (2018). "Sodium polytungstate as gravity separating fluid for polymeric blasting media evaluation." Analytical Methods **10**(25): 3039-3042.
Quality assessment of Plastic Blast Media (PBM) in order to determine heavy and light particulate contamination has been carried out traditionally using gravity separation in a medium prepared using 1,1,2-trifluorotrichloroethane (TFTCE) as high density compound. Environmental concerns require the assessment of viable alternatives to ozone depleting substances like TFTCE. Sodium polytungstate (SPT) can be used to increase the density of aqueous solutions, and has been used successfully in gravity separation of minerals and rocks. Some research was carried out into the literature regarding separating microplastics – a granular contaminant in water courses that is similar to PBM-revealing that it had been carried out using concentrated solutions of metal salts. Comparison of the results obtained from the TFTCE method with results obtained from a method using SPT revealed that there is no loss of analytical accuracy by changing to the SPT method.

Helcoski, R., et al. (2020). "Wetland soil microplastics are negatively related to vegetation cover and stem density." Environmental Pollution **256**: 113391.
Microplastics are a complex group of ubiquitous environmental contaminants of emerging concern. These particles degrade slowly, release plasticizers, and can be transferred between trophic levels. In aquatic systems, they have been identified suspended in the water column, along shorelines, and within sediment. However, the abundance and distribution of microplastics in vegetated wetlands, which are transitional ecosystems between terrestrial and aquatic environments, are poorly understood. Here we describe the spatial distribution of soil microplastics in habitats of varying vegetation density in an urban tidal wetland. Samples were wet-sieved, organic matter was oxidized using hydrogen peroxide, and microplastics separated under a dissecting microscope, counted, and weighed. A fraction (n=175) were analyzed via FTIR for validation. Positive microplastics identification was 81%-93%. Dominant polymers were polystyrene (29%) and polyethylene and synthetic rubber (both 8%). Average microplastic number to a 5-cm depth (23,200+/-2,500m⁻² or 1,270+/-150kg⁻¹)

varied between habitat types, where mudflat, channel edge, and drift line habitats all had significantly more total microplastics than the interior of dense stands of vegetation, suggesting that emergent wetland plants are a highly effective filter of microplastics. Microfibers were about eight times as abundant as microfragments, and fibers and fragments differed in their distribution patterns, with microfibers most abundant in vegetation-free mudflats and microfragments in vegetated channel edges. Our results demonstrate that vegetated wetlands are important locations for microplastic accumulation and that wetland vegetation and hydrodynamics affect spatial distribution of microplastics between habitats.

Hemmig, E., et al. (2020). "Transposing Lateral Flow Immunoassays to Capillary-Driven Microfluidics Using Self-Coalescence Modules and Capillary-Assembled Receptor Carriers." Analytical Chemistry **92**(1): 940-946.

Point-of-care (POC) immunodiagnostic tests play a crucial role in enabling rapid and correct diagnosis of diseases in prehospital care, emergency, and remote settings. In this work, we present a silicon-based, capillary-driven microfluidic chip integrating two microfluidic modules for the implementation of highly miniaturized immunoassays. Specifically, we apply state-of-the-art microfluidic technology to demonstrate a one-step immunoassay for the detection of the cardiac marker troponin I in human serum using sample volumes of ~1 muL and with a limit of detection (LOD) of ~4 ng mL⁻¹ within 25 min. The microfluidic modules discussed here broadly map functionalities found in standard lateral flow assays. We implement a self-coalescence module (SCM) for the controlled reconstitution and delivery of inkjet-spotted and dried detection antibodies (dAbs). This allows for homogeneous dissolution of 1.3 ng of fluorescently labeled dAbs in 416 nL of the sample used for the assay. We also show how to immobilize receptors inside closed microfluidic devices in <30 s using bead lane modules inside which microbeads functionalized with capture antibodies (cAbs) are self-assembled. The resulting bead lane module, with a volume of ~3 x 10⁻⁵ mm³, is positioned across the flow path and holds ~300 5 mum-diameter microbeads. Altogether, these capillary-driven elements allow for the manipulation of samples and reagents with an unprecedented precision and control, paving the way for the next generation of POC immunodiagnostics.

Hendrickson, E., et al. (2018). "Microplastic Abundance and Composition in Western Lake Superior As Determined via Microscopy, Pyr-GC/MS, and FTIR." Environmental Science & Technology **52**(4): 1787-1796.

While plastic pollution in marine and freshwater systems is an active area of research, there is not yet an in-depth understanding of the distributions, chemical compositions, and fates of plastics in aquatic environments. In this study, the magnitude, distribution, and common polymers of microplastic pollution in surface waters in western Lake Superior are determined. Analytical methodology, including estimates of ambient contamination during sample collection and processing, are described and employed. Microscopy, pyrolysis-gas chromatography/mass spectrometry (Pyr-GC/MS), and Fourier transform infrared spectroscopy (FTIR) were used to quantify and identify microplastic particles. In surface waters, fibers were the most frequently observed morphology, and, based upon PyGC/MS analysis, polyvinyl chloride was the most frequently observed polymer, followed by polypropylene and polyethylene. The most common polymer identified by FTIR was polyethylene. Despite the low human population in Lake Superior's watershed, microplastic particles (particularly fibers, fragments, and films) were identified in western-lake surface waters at levels comparable to average values reported in studies within Lake Michigan, the North Atlantic Ocean, and the South Pacific Ocean. This study

provides insight into the magnitude of microplastic pollution in western Lake Superior, and describes in detail methodology to improve future microplastics studies in aquatic systems.

Hengstmann, E., et al. (2018). "Microplastic in beach sediments of the Isle of Rugen (Baltic Sea) - Implementing a novel glass elutriation column." Marine Pollution Bulletin **126**: 263-274.

To extent the understanding on microplastics in the marine environment we performed a case study at four beaches on the Isle of Rugen considering abundance and spatial distribution of microplastics in beach sediments. For the analysis, density separation via a glass elutriation column was implemented. In advance, efficiencies were tested for two polymers, being not buoyant in water. Recovery rates of 80% for PET and 72% for PVC particles in sandy samples were achieved. A median abundance of 88.10 (Q₁=55.01/Q₃=114.72) microplastic particles per kg dry sediment or 2862.56 (Q₁=1787.34/Q₃=3727.28) particles per m² was found at the beaches on Rugen. Fibers were more abundant than fragments at all beaches. In this study, no statistically significant differences but only tendencies were determined between the beaches with different exposition and anthropogenic activity as well as for distribution patterns which showed that microplastic fragments accumulate in topographic depressions, similar to macrolitter items.

Heng-Xiang, L., et al. (2016). "Effects of Toxic Leachate from Commercial Plastics on Larval Survival and Settlement of the Barnacle Amphibalanus amphitrite." Environmental Science & Technology **50**(2): 924-931.

Plastic pollution represents a major and growing global problem. It is well-known that plastics are a source of chemical contaminants to the aquatic environment and provide novel habitats for marine organisms. The present study quantified the impacts of plastic leachates from the seven categories of recyclable plastics on larval survival and settlement of barnacle Amphibalanus (=Balanus) amphitrite. Leachates from plastics significantly increased barnacle nauplii mortality at the highest tested concentrations (0.10 and 0.50 m^2/L). Hydrophobidty (measured as surface energy) was positively correlated with mortality indicating that plastic surface chemistry may be an important factor in the effects of plastics on sessile organisms. Plastic leachates significandy inhibited barnacle cyprids setdement on glass at all tested concentrations. Setdement on plastic surfaces was significandy inhibited after 24 and 48 h, but settlement was not significantly inhibited compared to the controls for some plastics after 72--96 h. In 24 h exposure to seawater, we found larval toxicity and inhibition of setdement with all seven categories of recyclable commercial plastics. Chemical analysis revealed a complex mixture of substances released in plastic leachates. Leaching of toxic compounds from all plastics should be considered when assessing the risks of plastic pollution. [ABSTRACT FROM AUTHOR]

Henriksen, J. S., et al. (1995). "Tachykinins induce secretion of prolactin from perifused rat anterior pituitary cells by interactions with two different binding sites." Journal of Receptor and Signal Transduction Research **15**(1/4): 529-541.

Substance P and the 2 other mammalian tachykinins, neurokinin A and B, are accepted as having direct regulating effects at the anterior pituitary level. The effects of substance P (SP) and neurokinin B (NKB), alone and in combination, on prolactin release from cultured anterior pituitary cells grown on collagen-coated micro beads and placed in a perfusion system were examined. Prolactin (Prl) secretion was observed within 25 s after exposure to either secretagogue and reached a maximum within 60-80 s. Furthermore, the prolactin response induced by SP and NKB was dose-dependent. Prl secretion remained constant for up to 4 h when SP or NKB were perifused and then fell gradually towards basal levels. Simultaneous addition of submaximal concentrations of SP and NKB resulted in an additive response compared with the responses of either secretagogue alone. Continuous (8 h) perifusion with SP did not prevent a normal prolactin response by NKB or TRH. These results indicate that the tachykinins, substance P and neurokinin B, release Prl from perifused female rat anterior pituitary cells by interaction with 2 different receptors, possibly the NK1 and NK3 tachykinin receptor subtypes.

Henry, B., et al. (2019). "Microfibres from apparel and home textiles: Prospects for including microplastics in environmental sustainability assessment." Science of the Total Environment **652**: 483-494.

Textiles release fibres to the environment during production, use, and at end-of-life disposal. Approximately two-thirds of all textile items are now synthetic, dominated by petroleum-based organic polymers such as polyester, polyamide and acrylic. Plastic microfibres (<5mm) and nanofibres (<100nm) have been identified in ecosystems in all regions of the globe and have been estimated to comprise up to 35% of primary microplastics in marine environments, a major proportion of microplastics on coastal shorelines and to persist for decades in soils treated with sludge from waste water treatment plants. In this paper we present a critical review of factors affecting the release from fabrics of microfibres, and of the risks for impacts on ecological systems and potentially on human health. This review is used as a basis for exploring the potential to include a metric for microplastic pollution in tools that have been developed to quantify the environmental performance of apparel and home textiles. We conclude that the simple metric of mass or number of microfibres released combined with data on their persistence in the environment, could provide a useful interim mid-point indicator in sustainability assessment tools to support monitoring and mitigation strategies for microplastic pollution. Identified priority research areas include: (1) Standardised analytical methods for textile microfibres and nanofibres; (2) Ecotoxicological studies using environmentally realistic concentrations; (3) Studies tracking the fate of microplastics in complex food webs; and (4) Refined indicators for microfibre impacts in apparel and home textile sustainability assessment tools.

Henry, N., et al. (2017). "Pullulan microbeads/Si-HPMC hydrogel injectable system for the sustained delivery of GDF-5 and TGF-beta1: new insight into intervertebral disc regenerative medicine." Drug Delivery **24**(1): 999-1010.

Discogenic low back pain is considered a major health concern and no etiological treatments are today available to tackle this disease. To clinically address this issue at early stages, there is a rising interest in the stimulation of local cells by in situ injection of growth factors targeting intervertebral disc (IVD) degenerative process. Despite encouraging safety and tolerability results in clinic, growth factors efficacy may be further improved. To this end, the use of a delivery system allowing a sustained release, while protecting growth factors from degradation appears of particular interest. We propose herein the design of a new injectable biphasic system, based on the association of pullulan microbeads (PMBs) into a cellulose-based hydrogel (Si-HPMC), for the TGF-beta1 and GDF-5 growth factors sustained delivery. We present for the first time the design and mechanical characterization of both the PMBs and the called biphasic system (PMBs/Si-HPMC). Their loading and release capacities were also studied and we were able to demonstrate a sustained release of both growth factors, for up to 28 days. Noteworthy, the growth factors biological activity on human cells was maintained. Altogether, these data suggest that this PMBs/Si-HPMC biphasic system may be a promising candidate for the development of an innovative bioactive delivery system for IVD regenerative medicine.

Henry, T. B., et al. (2011). "Aqueous fullerene aggregates (nC60) generate minimal reactive oxygen species and are of low toxicity in fish: a revision of previous reports." Current Opinion in Biotechnology **22**(4): 533-537.

This review aims to clarify inconsistencies in previous reports regarding the potential for aqueous aggregates of fullerenes (nC60) to generate reactive oxygen species (ROS) and cause toxicity in fish.

Henschler, R., et al. (2016). "Ex vivo expansion induces substantial alterations in cell size and cytoskeletal proteins in T lymphocytes and mesenchymal stromal cells (MSCS)." Vox Sanguinis **111 (Supplement 1)**: 287.

Background: Immune cells used as cellular therapeutics in many cases undergo ex vivo expansion protocols. This includes the selection and clonal amplification of antigen-specific T cells, the generation of chimeric antigen receptor-transduced (CAR) T cells, or the generation of therapeutic MSCs. Recent data have indicated that during ex vivo expansion, MSCs or immune cells succumb to impairments in migration or antigen recognition that may affect their therapeutic potential. So far, the impact of culture expansion on proteins which are crucial for these functionalities such as actin-binding proteins are not known. Method(s): Transcription and protein content of the following actin-binding proteins or modifiers cofilin and profilin, alpha-actinin, filamin A, and the proteins linking actin and integrin signalling complexes, paxillin, vinculin and talin were analyzed. Transcription was quantified by qRT-PCR. Protein levels were quantified by flow cytometry of permeabilized cells using fluorescence-labelled antibodies pre-titrated to exceed the concentration of the analyzed antigens. Cell size was determined by flow cytometry using calibrated microbeads. Result(s): Analysis of cell size indicated that during anti-CD3/antiCD28-induced ex vivo expansion in RPMI/10% FCS 30U/ml Interleukin-2, immune-magnetically isolated murine CD3+ T lymphocytes increased in cell diameter from 7 to 14 mm and from approximately 179 to 1436 mm3 cell volume during a culture period of 7 days. In contrast, protein levels of all seven actin binding molecules remained constant on a per cell basis. Transcript mRNA levels of all seven actin-binding molecules, relative to the housekeeping gene GAPDH, were reduced between 5 and 50 fold. Expanded MSCs displayed still higher cell diamaters and >10 fold cell volumes than expanded T lymphocytes, but on a cell basis a further reduced mRNA expression levels of the investigated actin binding molecules compared to expanded T lymphocytes. Conclusion(s): Ex vivo expansion can induce substantial increases in size and intracellular volume of T lymphocytes and MSCs. In parallel, functionally relevant actinbinding proteins such as profilin, cofilin, alpha actinin, filamin A, paxillin, vinculin and talin do not undergo any parallel increase, and their transcription is strongly reduced. Our findings indicate that cell culture skews proteins with key functions in the migration and function of T lymphocytes and MSCs.

Hensher, M. (2020). "Incorporating environmental impacts into the economic evaluation of health care

systems: Perspectives from ecological economics." Resources, Conservation and Recycling **154**.
Health care is responsible for a range of negative environmental impacts, including greenhouse gas emissions, air pollution, plastics waste, and pharmaceutical pollution of ecosystems through excretion and inappropriate disposal. Evidence on the scale of these impacts has been growing in high-income countries. To date, there has been only limited discussion of how environmental impacts might be incorporated into economic evaluations of health care programs, including health technology assessment. This paper considers why and how this aim might be achieved, using perspectives from both mainstream and ecological economics. There are strong arguments for using economic evaluation to internalise the negative environmental externalities currently being generated by health care, as well as precautionary arguments for health systems to better understand their exposure to their environmental impacts. The paper tests the feasibility of incorporating the costs of greenhouse gas emissions within costing for economic evaluation, and concludes that the use of shadow prices to achieve this aim is feasible. It suggests that this cost-based approach is preferable to more convoluted attempts to incorporate environmental impacts in the outcome component of health economic evaluations. The interaction between overuse, antimicrobial resistance and environmental harms of health care is identified as an area that would benefit from investigation using innovative economic methods. © 2019 Elsevier B.V.

Henson, M. S., et al. (2011). "Immunotherapy with autologous tumour antigen-coated microbeads (large multivalent immunogen), IL-2 and GM-CSF in dogs with spontaneous B-cell lymphoma." Veterinary and Comparative Oncology **9**(2): 95-105.
Cytotoxic T-lymphocyte responses to subcellular antigens are enhanced when antigens are presented on cell-sized silica microbeads called large multivalent immunogens (LMIs). LMIs prepared with tumour cell membrane fragments have induced partial remissions in humans with melanoma and renal cell carcinoma. The purpose of this phase I study was to evaluate the safety of LMIs, prepared with autologous lymphoma cell membranes, along with subcutaneous interleukin 2 (IL-2) and granulocyte-macrophage colony stimulating factor (GM-CSF) in dogs with untreated B-cell lymphoma. After lymph node excision and induction chemotherapy, five dogs were vaccinated with three weekly doses of LMI alone; five with LMI and subcutaneous IL-2 and five with LMI, IL-2 and GM-CSF. No significant toxicity was noted, treatment did not adversely affect disease-free interval and half of the dogs showed measurable delayed-type hypersensitivity reactions to intradermal challenge with LMI, suggesting specific cell-mediated immunity.

Heo, J. (2005). Characterization and applications of microfluidic devices based on immobilized biomaterials.
Microfluidic biosensors and bioreactors based on immobilized biomaterials are described in this dissertation. Photocrosslinkable hydrogel or polymeric microbeads were used as a supporting matrix for immobilizing E.coli or enzymes in a microfluidic device. This dissertation covers a microfluidic bioreactor based on hydrogel-entrapped E.coli, a microfluidic biosensor based on an array of hydrogel-entrapped enzymes, and a microfluidic bioreactor based on microbead-immobilized enzymes. Hydrogel micropatches containing E.coli were fabricated within a microfluidic channel by in-situ photopolymerization. The cells were viable in the hydrogel micropatch and their membranes could be porated by lysating agents. Entrapment of viable cells within hydrogels, followed by lysis, could provide a convenient means for preparing biocatalysts without the need for enzyme extraction and purification. Our results suggested that hydrogel-entrapped cells, immobilized within microfluidic channels, can act as sensors for small

molecules and as bioreactors for carrying out reactions. A microfluidic biosensor based on an array of hydrogel-entrapped enzymes could be used to simultaneously detect different concentrations of the same analyte or multiple analyte in real time. The concentration of an enzyme inhibitor could be quantified using the same basic approach. Isolations of the microchannels within different microfluidic channels could eliminate the possibility of cross talk between enzymes. Finally, we characterized microfluidic bioreactors packed with microbead-immobilized enzymes that can carry out sequential, two-step enzyme-catalyzed reactions under flow conditions. The overall efficiency of the reactors depended on the spatial relationship of the two enzymes immobilized on the beads. Digital simulations confirmed the experimental results.

Her, Z., et al. (2017). "Severity of Plasma Leakage Is Associated With High Levels of Interferon gamma-Inducible Protein 10, Hepatocyte Growth Factor, Matrix Metalloproteinase 2 (MMP-2), and MMP-9 During Dengue Virus Infection." Journal of Infectious Diseases **215**(1): 42-51.

BACKGROUND: Dengue virus infection typically causes mild dengue fever, but, in severe cases, life-threatening dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) occur. The pathophysiological hallmark of DHF and DSS is plasma leakage that leads to enhanced vascular permeability, likely due to a cytokine storm.

METHODS: Ninety patients with dengue during 2010-2012 in Singapore were prospectively recruited and stratified according to their disease phase, primary and secondary infection status, and disease severity, measured by plasma leakage. Clinical parameters were recorded throughout the disease progression. The levels of various immune mediators were quantified using comprehensive multiplex microbead-based immunoassays for 46 immune mediators.

RESULTS: Associations between clinical parameters and immune mediators were analyzed using various statistical methods. Potential immune markers, including interleukin 1 receptor antagonist, interferon gamma-inducible protein 10, hepatocyte growth factor, soluble p75 tumor necrosis factor alpha receptor, vascular cell adhesion molecule 1, and matrix metalloproteinase 2, were significantly associated with significant plasma leakage. Secondary dengue virus infections were also shown to influence disease outcome in terms of disease severity.

CONCLUSIONS: This study identified several key markers for exacerbated dengue pathogenesis, notably plasma leakage. This will allow a better understanding of the molecular mechanisms of DHF and DSS in patients with dengue.

Herber, M., et al. (2012). "Sensitive detection and analysis of plasma cells by seven-color phenotyping with combined intracellular solid phase staining on the macsquant analyzer." Cytometry Part B - Clinical Cytometry **82B (6)**: 413.

With the identification of phenotypic markers for plasma cells more than a decade ago, the discriminationand enumeration of malignant and normal plasma cells inmultiple myeloma patients has become feasible. Meanwhile,flow cytometry is well established as a valuable tool fordiagnosis, prognosis and minimal residual disease (MRD)assessment. Since there is no single marker which allowsdifferentiation between normal and malignant plasma cells,multicolor panels with at least four markers are recommendedfor immunophenotypical analysis. Furthermore, ithas been shown in various studies that additional markersimprove the discrimination of malignant plasma cells.Therefore, we propose a seven-color antibody combinationfor plasma cell phenotyping in Multiple Myeloma patients,including clonality assessment using the following antibodies:CD138-PE, CD38-FITC, CD56-APC, CD19-PE-Vio770,CD45-APC-Vio770, Anti Igkappa-PerCP, Anti Iglambda-VioBlue.Usage of optimized staining cocktails is particularly usefulin MRD assessment via multiparameter flow

cytometry, whichhas gained increasing clinical importance as being the mostrelevant prognostic factor. However, detection of rare malignantplasma cells is restricted by the total number of cellsacquired during a single MRD measurement. In general, thereproducible limit of sensitivity for MRD by flow cytometry is0.01%, which requires acquisition of at least 10⁶ total cells inorder to count 100 neoplastic cells. Magnetic pre-enrichmentallows rapid processing of larger total cell numbers, therebydramatically increasing the sensitivity of subsequent flowanalysis. The MACSQuant Analyzer integrates magnetic preenrichmentand flow cytometric analysis in a single automatedworkflow. This involves the autolabeling function for surfacestaining of the patient sample followed by automated magneticpre-enrichment of CD138-positive plasma cells via theMACSQuant Enrichment Unit. In addition, the EnrichmentUnit serves as solid phase for automated intracellular stainingof retained MicroBead-labeled plasma cells. The major advantageof solid phase intracellular staining of kappa/lambda light chains,besides minimizing manual handling, is the reduction of cellloss as repeated centrifugation steps are omitted.In summary, combining seven-color plasma cell phenotypingwith the MACSQuant Analyzer and WholeBloodCD138 MicroBeads provides a convenient automated workflowfor sensitive detection and characterization of neoplasticplasma cells in bone marrow and peripheral blood frommyeloma patients.

Herbort, A. F., et al. (2018). "Alkoxy-silyl Induced Agglomeration: A New Approach for the Sustainable Removal of Microplastic from Aquatic Systems." Journal of Polymers & the Environment **26**(11): 4258-4270.

The substance class of inert organic-chemical stressors (IOCS) describes organic-chemical (macro-) molecules, which demonstrate a high level of persistence upon entry in the ecosystem, and whose degradation is limited. These synthetically produced organic-chemical macromolecules, which are often derived from the polymerization of different monomers, are, in the form of plastics, indispensable in the everyday world. They enter the environmental compartments and cause great damage due to primary (industry, cosmetic, washing of textile), and secondary (degradation) entry. If these particles get into aquatic systems, this has fatal consequences for the ecosystem such as the death of marine animals, or bioaccumulation. Wastewater treatment plants are reaching their limits and require innovative ideas for the sustainable removal of microplastic. This article examines a new approach to the removal of polymers from aquatic systems (lab scale) by using sol-gel induced agglomeration reactions to form larger particle agglomerates. These enlarged agglomerates can be separated much more easily from the wastewater, since they float on the water surface. Separation systems, e.g. sand trap can easily be used. A further advantage is that the agglomeration can be carried out completely independently of the type, size, and amount of the trace substance concentration as well as of the external influences (pH value, temperature, pressure). Thus, this new type of particle separation can not only be used in sewage treatment plants, but can also be transferred to decentralized systems (e.g. implementation in industrial processes).Graphical Abstract: <graphic></graphic> [ABSTRACT FROM AUTHOR]

Herbort, A. F., et al. (2018). "A new approach for the agglomeration and subsequent removal of

polyethylene, polypropylene, and mixtures of both from freshwater systems - a case study." Environmental Science and Pollution Research **25**(15): 15226-15234.

Based on a new concept for the sustainable removal of microplastics from freshwater systems, a case study for a pH-induced agglomeration and subsequent removal of polyethylene and polypropylene particles from water is presented. The two-step-based process includes firstly a localization and secondly an aggregation of microplastic particles (250-350 micro M) in a physicochemical process. The research describes a strong increase in the particle size independent of pH of the aquatic milieu induced by the addition of trichlorosilane-substituted Si derivatives. The resulting Si-based microplastic aggregates (particle size after aggregation is 2-3 cm) could be easily removed by use of, e.g., sand traps. Due to the effect that microplastic particles form agglomeration products under every kind of process conditions (e.g., various pH, various polymer concentrations), the study shows a high potential for the sustainable removal of particles from wastewater.

Hermabessiere, L., et al. (2019). "Microplastic contamination and pollutant levels in mussels and cockles collected along the channel coasts." Environmental Pollution **250**: 807-819.

Nowadays, environmental pollution by microplastics (<5mm; MP) is a major issue. MP are contaminating marine organisms consumed by humans. This work studied MP contamination in two bivalve species of commercial interest: blue mussel (Mytilus edulis) and common cockle (Cerastoderma edule) sampled on the Channel coastlines (France). In parallel, 13 plastic additives and 27 hydrophobic organic compounds (HOC) were quantified in bivalves flesh using SBSE-TD-GS-MS/MS to explore a possible relationship between their concentrations and MP contamination levels. MP were extracted using a 10% potassium hydroxide digestion method then identified by mu-Raman spectroscopy. The proportion of contaminated bivalves by MP ranged from 34 to 58%. Blue mussels and common cockles exhibited 0.76+/-0.40 and 2.46+/-1.16 MP/individual and between 0.15+/-0.06 and 0.74+/-0.35MP/g of tissue wet weight. Some HOC and plastic additives were detected in bivalves. However, no significant Pearson or Spearman correlation was found between MP loads and plastic additives or HOC concentrations in bivalve tissues for the two species.

Hermsen, E., et al. (2018). "Quality Criteria for the Analysis of Microplastic in Biota Samples: A Critical Review." Environmental Science & Technology **52**(18): 10230-10240.

Data on ingestion of microplastics by marine biota are quintessential for monitoring and risk assessment of microplastics in the environment. Current studies, however, portray a wide spread in results on the occurrence of microplastic ingestion, highlighting a lack of comparability of results, which might be attributed to a lack of standardization of methods. We critically review and evaluate recent microplastic ingestion studies in aquatic biota, propose a quality assessment method for such studies, and apply the assessment method to the reviewed studies. The quality assessment method uses ten criteria: sampling method and strategy, sample size, sample processing and storage, laboratory preparation, clean air conditions, negative controls, positive controls, target component, sample (pre)treatment, and polymer identification. The results of this quality assessment show a dire need for stricter quality assurance in microplastic ingestion studies. On average, studies score 8.0 out of 20 points for "completeness of information" and 0 for "reliability". Alongside the assessment method, a standardized protocol for detecting microplastic in biota samples incorporating these criteria is provided.

Hermsen, E., et al. (2017). "Detection of low numbers of microplastics in North Sea fish using strict quality assurance criteria." Marine Pollution Bulletin **122**(1-2): 253-258.

We investigated 400 individual fish of four North Sea species: Atlantic Herring, Sprat, Common Dab, and Whiting on ingestion of >20mum microplastic. Strict quality assurance criteria were followed in order to control contamination during the study. Two plastic particles were found in only 1 (a Sprat) out of 400 individuals (0.25%, with a 95% confidence interval of 0.09-1.1%). The particles were identified to consist of polymethylmethacrylate (PMMA) through FTIR spectroscopy. No contamination occurred during the study, showing the method applied to be suitable for microplastic ingestion studies in biota. We discuss the low particle count for North Sea fish with those in other studies and suggest a relation between reported particle count and degree of quality assurance applied. Microplastic ingestion by fish may be less common than thought initially, with low incidence shown in this study, and other studies adhering to strict quality assurance criteria.

Hernandez, J., et al. (2018). "Contractility in human induced pluripotent stem cell derived cardiomyocytes is highly dependent on stochastic variability in myofilament development." Circulation. Conference **138**(Supplement 1).

Introduction: Modeling heart diseases using cardiomyocytes derived from human induced pluripotent stem cells (HIPSC-CMS) enables direct study of cellular and molecular mechanisms. However, the variable phenotypes of individual cells has limited the reproducibility of contractile measurements. We hypothesized that variability in myofibrillar development in HIPSC-CMS influences the contractile kinetics and could be controlled for by visualizing and quantifying myofilaments in vitro. Methods and Results: Control hiPSCs were differentiated into cardiomyocytes (HIPSC-CMS) and purified. HIPSC-CMS were replated at day ~25 onto 8.7 kPa polyacrylamide gels containing fluorescent microbeads and micropatterned with fibronectin in 7:1 aspect ratio rectangles (1750 um²). Single iPSC-CMs grew into the rectangular shapes and exhibited spontaneous contractions by day 2 of replating. HIPSC-CMS were stained with live-cell actin dye and imaged on day 5-7 for fluorescent bead displacements and actin videos depicting myofilaments. Traction force analysis of bead displacements was performed to calculate whole-cell force vs. time curves at 33 msec temporal resolution. Myofilament area was measured by thresholding a binary mask on the actin live cell images. Myofilament number varied markedly among individual iPSC-CMs. iPSC-CMs with few myofilaments (myofilament area/cell area <30%) developed low force (<400 uN per cell) and were not included in subsequent analyses. Among cells with myofilament area >30%, the mean traction force was 1368+/-357 uN and the myofilament area demonstrated a linear correlation with maximum force (R²=0.19, runs test p=0.8) with slope of 0.8+/-0.2 uN/um² (p=0.002 vs zero slope). Maximum contraction velocity strongly correlated with maximum force (R²=0.31, runs test p=0.4) with slope of 3.9+/-0.9 sec⁻¹ (p<0.0001 vs zero slope), as did maximum relaxation velocity (R²=0.27, runs test p=0.6, slope 4.1+1.0 sec⁻¹, p=0.0003 vs zero slope). Similar results were observed in two control cell lines and with two different purification methods. Conclusion(s): Variability in myofilament development is a critical determinant of contractile force and kinetics in individual iPSC-CMs that should be accounted for in iPSC-CM contractile experiments.

Hernandez, L. M., et al. (2019). "Plastic Teabags Release Billions of Microparticles and Nanoparticles into Tea." Environmental Science & Technology **53**(21): 12300-12310.

The increasing presence of micro- and nano-sized plastics in the environment and food chain is of growing concern. Although mindful consumers are promoting the reduction of single-use plastics, some manufacturers are creating new plastic packaging to replace traditional paper uses, such as plastic teabags. The objective of this study was to determine whether plastic

teabags could release microplastics and/or nanoplastics during a typical steeping process. We show that steeping a single plastic teabag at brewing temperature (95 degreeC) releases approximately 11.6 billion microplastics and 3.1 billion nanoplastics into a single cup of the beverage. The composition of the released particles is matched to the original teabags (nylon and polyethylene terephthalate) using Fourier-transform infrared spectroscopy (FTIR) and X-ray photoelectron spectroscopy (XPS). The levels of nylon and polyethylene terephthalate particles released from the teabag packaging are several orders of magnitude higher than plastic loads previously reported in other foods. An initial acute invertebrate toxicity assessment shows that exposure to only the particles released from the teabags caused dose-dependent behavioral and developmental effects.

Hernandez-Gonzalez, A., et al. (2018). "Microplastics in the stomach contents of common dolphin (Delphinus delphis) stranded on the Galician coasts (NW Spain, 2005-2010)." Marine Pollution Bulletin **137**: 526-532.

Plastic debris is currently recognised as one of the major global threats to marine life. However, few data exist on the presence and abundance of microplastics (plastics <5 mm in size) in marine mammals. This is the first record of the presence of microplastics in the digestive tracts of marine mammals from the Iberian Peninsula. This study made use of 35 samples of common dolphin stomach contents. Microplastics were identified in all the samples analysed, an average of 12 items per stomach although abundance varied widely from one stomach to another. Most plastic items were small fibres although some fragments and a bead were also found. Excluding the smallest fibres as possible airborne contamination, the estimated occurrence of microplastics could drop to as low as 94%. Although factors affecting accumulation of microplastics and their effect on common dolphins are unknown, the fact that all stomachs analysed contained microplastics is a cause for concern.

Hernandez-Milian, G., et al. (2019). "Microplastics in grey seal (Halichoerus grypus) intestines: are they associated with parasite aggregations?" Marine Pollution Bulletin **146**: 349-354.

Between 2012 and 2015, 13 grey seals were recovered from trammel nets targeting monkfish and rays off the south coast of Ireland. Incidence and distribution of microplastics were investigated along the intestines of bycaught seals. No macrodebris items were found, whereas microplastics were detected in all seals. A total of 363 microplastics items were identified (85% fibers, 14% fragments, 1% films). Estimation of microplastic ingestion based on prey ingestion (245 particles) was lower than the observed data. Acantocephala parasites (n=1543) were found in 12 seals, with an average of 74.5+or-67.7 parasites per seal. Distribution of microplastics varied between seals, although microplastics tended to accumulate in areas where more parasites were aggregated; however, there was no significant relationship between the number of parasites and microplastics was found. Seals recovered from nets appear to be a good source to monitor the incidence of microplastic pollution within the coastal food webs.

Hernandez-Molina, G., et al. (2012). "Regulatory B cells in primary sjogren's syndrome." Arthritis and Rheumatism **10)**: S225.

Background/Purpose: B cells have traditionally been considered as positive regulators of humoral immune response, however their negative regulatory role has recently being recognized. Objective. To characterize the phenotypes of regulatory B cells in peripheral blood of primary Sjogren syndrome (pSS) patients and compare their presence according to the clinical and/or serologic activity disease status. Method(s): We included 50 pSS patients according to the AECG classification criteria, all of them were evaluated by a rheumatologist. We defined

clinical activity as the presence of parotid enlargement or any extraglandular manifestation assessed by the SDAI or the ESSDAI indexes (except fatigue, fever or arthralgias). We defined serologic activity as IgG immunoglobulin >16 g or low C3, C4 or serum viscosity >1.9 cp. Twelve healthy age matched subjects were used as controls. PBMCs were isolated by centrifugation over a Lymphoprep gradient. CD19-mAb-coated microbeads were used to purify B cells by positive selection. We used the following mAbs: anti-CD38-PECy5, anti-CD38-PE, anti-CD24-FITC, anti-IgA-PE, anti-IgDPE, anti-IgG-PECy5, anti-IgM-APC, anti-CD5-APC, anti-CD10-APC, anti-CD20-APC, anti-CD27-APC, anti-CXCR4-APC and anti-CXCR7-Cy5. Cells immunofluorescent staining was analyzed by a FACScalibur flow cytometer. The relative % of the subtypes of Il-10 cells producers was calculated on basis of the total positive selection of the phenotype CD19+/ CD38^{bright}/CD24^{bright}. We used One way ANOVA analysis (post-hoc analysis Dunn method) with the Sigma Stat 11.2 software. Result(s): Patients were predominantly females, mean age 53+/-12 years and median disease duration of 9.7 years. Seventeen patients (34%) were clinical active (parotid enlargement, vasculitis, arthritis, leucopenia, lymphopenia, pneumonitis or optic neuritis). Patients with or without clinical activity were similar in age, disease duration but received more frequently prednisone and azathioprine. Twenty-seven (54%) patients had serologic activity regardless their clinical status. IL-10⁺ B cells represented the 0.55% of the total pSS B cell population and was higher in clinical inactive patients(0.63%), whereas controls had a lower prevalence (0.22%, p<0.05). We found a statistically significant increment in the following subtypes of Bregs cells: CD19⁺/CD38^{bright}/IgA⁺/IL10⁺ cells (pSS 79%, clinical inactive 80% vs. control 66%), CD19⁺/CD24^{bright}/CD38^{bright}/CD5⁺/IL10⁺ (clinical inactive 24% vs. control 14%), CD10⁺/IL10⁺ (pSS 23%, clinical inactive 26% vs. control 15%). IgD⁺ cells and CD27-/IL10⁺ cells were increased in all the groups regardless their clinical activity when compared vs. controls. The phenotypes CD19⁺/CD24^{bright}/CD38^{bright}IL10⁺/CD20⁺, CD27⁺, CXCR4⁺ and CXCR7⁺ were similar among groups. We did not find a difference when we analyzed by serologic activity. Conclusion(s): Most of the studied Bregs phenotypes were increased in pSS patients, particularly in those without clinical activity. The presence of these cells emphasizes the importance of the immunobiology of B cells in pSS.

Herndon, B., et al. (2013). "Urease and Helicobacter spp. antigens in pulmonary granuloma." Journal of Comparative Pathology **148**(2-3): 266-277.

Pulmonary sarcoidosis, a human disease of unknown cause, has no animal model. Sarcoidosis patients have serum antibodies specific for Helicobacter pylori and its surface enzyme urease. H. pylori do not survive in the high-oxygen pulmonary atmosphere, but urease may access the lung by oesophageal reflux. A model was established in rats to study gastro-oesophageal reflux of urease into the airways. Pathology in tissues from human sarcoidosis patients was compared with that in the rat model. Changes observed in the rat model included prominent peribronchial lymphocytic infiltration, which is seen occasionally in human sarcoidosis. Granulomas, pathognomonic for human sarcoidosis, occurred occasionally in the lungs of rats given urease protein intratracheally, but were widespread when urease was coupled to microbeads and administered intravenously. Biomarkers associated with human sarcoidosis (interleukin1-beta and platelet-activating factor) were up-regulated acutely in the rat model. Further investigations with this model may provide significant insights into the origin and pathogenesis of pulmonary

diseases in man and other species that carry gastric Helicobacter spp. and its associated enzyme.

Herrera, A., et al. (2018). "Microplastic and tar pollution on three Canary Islands beaches: An annual study." Marine Pollution Bulletin **129**(2): 494-502.

Marine debris accumulation was analyzed from three exposed beaches of the Canary Islands (Lambra, Famara and Las Canteras). Large microplastics (1-5mm), mesoplastics (5-25mm) and tar pollution were assessed twice a month for a year. There was great spatial and temporal variability in the Canary Island coastal pollution. Seasonal patterns differed at each location, marine debris concentration depended mainly of local-scale wind and wave conditions. The most polluted beach was Lambra, a remote beach infrequently visited. The types of debris found were mainly preproduction resin pellets, plastic fragments and tar, evidencing that pollution was not of local origin, but it cames from the open sea. The levels of pollution were similar to those of highly industrialized and contaminated regions. This study corroborates that the Canary Islands are an area of accumulation of microplastics and tar rafted from the North Atlantic Ocean by the southward flowing Canary Current.

Herrera, A., et al. (2019). "Microplastic ingestion by Atlantic chub mackerel (Scomber colias) in the Canary Islands coast." Marine Pollution Bulletin **139**: 127-135.

In recent years, due to the increasing concerns about their negative impact on wildlife and possible toxicity to living organisms (including humans), microplastics have become the subject of intense investigations. In the ocean, microplastics can be easily ingested by numerous marine organisms because of their small size (<5 mm). The Northwest African upwelling system is an important fishery area, and the present study is the first one in the region to reveal the presence of microplastic particles in the digestive tract of Atlantic chub mackerel (Scomber colias). From the 120 examined fish gastrointestinal tracts, 78.3% contained some type of microplastics, 74.2% contained fibres, 17.5% plastic fragments, and 16.7% paint. More studies are needed on fish, but S. colias is a candidate for being a good indicator of microplastic contamination in the region. Copyright © 2018 Elsevier Ltd

Hervás, M., et al. (2012). "Electrochemical immunosensing on board microfluidic chip platforms." TrAC - Trends in Analytical Chemistry **31**: 109-128.

Microfluidic devices as immunosensing platforms have had a great deal of attention in recent years, becoming an emergent technology in biomedical, pharmaceutical, environmental and food analysis. Combination of the remarkable features of microfluidic platforms with those of immunoassays produces a promising tool for selective, sensitive, automatic and point-of-care testing in real applications.In this article, we review and discuss different aspects of microfluidic material substrate, fluid handling, multiplexing, and, mainly, surface-modification and immunoreagent-immobilization strategies since 2005. Although different detection modes can be used in this kind of microfluidic immunosensing platform, the special features of electrochemistry have greatly expanded this technique, and electrochemical detection is common to the articles that we review. Finally, we comment on the future outlook for microfluidic immunosensing. © 2011 Elsevier Ltd.

Herzke, D., et al. (2016). "Negligible impact of ingested microplastics on tissue concentrations of persistent organic pollutants in northern fulmars off coastal Norway." Environmental Science & Technology **50**(4): 1924-1933.

The northern fulmar (Fulmarus glacialis) is defined as an indicator species of plastic pollution by the Oslo-Paris Convention for the North-East Atlantic, but few data exist for fulmars from

Norway. Moreover, the relationship between uptake of plastic and pollutants in seabirds is poorly understood. We analyzed samples of fulmars from Norwegian waters and compared the POP concentrations in their liver and muscle tissue with the corresponding concentrations in the loads of ingested plastic in their stomachs, grouped as "no", "medium" (0.01-0.21 g; 1-14 pieces of plastic), or "high" (0.11-0.59 g; 15-106 pieces of plastic). POP concentrations in the plastic did not differ significantly between the high and medium plastic ingestion group for sumPCBs, sumDDTs, and sumPBDEs. By combining correlations among POP concentrations, differences in tissue concentrations of POPs between plastic ingestion subgroups, fugacity calculations, and bioaccumulation modeling, we showed that plastic is more likely to act as a passive sampler than as a vector of POPs, thus reflecting the POP profiles of simultaneously ingested prey.

Herzke, D., et al. (2019). "Correction to Negligible Impact of ingested microplastics on tissue concentrations of persistent organic pollutants in Northern Fulmars of coastal Norway." Environmental Science & Technology **53**(24): 14769.

Hesler, M., et al. (2019). "Multi-endpoint toxicological assessment of polystyrene nano- and microparticles in different biological models in vitro." Toxicology in Vitro **61**: 104610.

Nanoplastics (NP) and microplastics (MP) accumulate in our environment as a consequence of the massive consumption of plastics. Huge knowledge-gaps exist regarding uptake and fate of plastic particles in micro- and nano-dimensions in humans as well as on their impact on human health. This study investigated the transport and effects of 50nm and 0.5mum COOH-modified polystyrene (PS) particles, as representatives for NP and MP, in different biological models in vitro. Acute toxicity and potential translocation of the particles were studied at the human intestinal and placental barrier using advanced in vitro co-culture models. Furthermore, embryotoxicity and genotoxicity were investigated as highly sensitive endpoints. Polystyrene was not acutely toxic in both sizes (nano- and microparticles). No transport across the intestinal and placental barrier but a cellular uptake and intracellular accumulation of PS nano- and microparticles were determined. The particles were identified as weak embryotoxic and non-genotoxic. In contrast to single-organ studies, this multi-endpoint study is providing a data-set with the exact same type of particles to compare organ-specific outcomes. Our study clearly shows the need to investigate other types of plastics as well as towards long-term or chronic effects of plastic particles in different biological models in vitro.

Hess, R. D., et al. (1995). "Quantitative cytofluorimetric determination of cell membrane-associated large tumor antigen on SV40-transformed cells." Cytometry **20**(1): 81-85.

The aim of this study was to quantitate the number of cell membrane-located SV40 large tumor antigen (large T) molecules of SV40-transformed cell lines by cytofluorimetric analysis. Five different SV40-transformed cell lines were labelled by either a biotin- or a fluorescein-conjugated monoclonal antibody, PAb1605, which is specific for the large T carboxyterminus. The conjugated-antibody fluorescence signals of the stained large T molecules of transformed cells were measured via cytofluorimetry. Comparison of the fluorescence signals of calibrated beads bearing a known number of fluorescein molecules to the signals of conjugated PAb1605 antibodies bound on microbeads to a defined number of IgG binding sites made it possible to determine the number of antibody-accessible large T molecules per SV40-transformed cell. The numbers (x10(-4)) found per cell were 1.0 (ELONA, hamster), 3.0 (VLM, mouse), 3.5 (mKSA, mouse), 11 (C57SV, mouse), and 5.5 (SV80, human), respectively. Thus, the technique described allows a precise quantitation of surface-exposed, antibody-accessible viral antigen expression.

Hester-Reilly, H. J. and N. C. Shapley (2007). "Imaging contrast effects in alginate microbeads containing trapped emulsion droplets." Journal of Magnetic Resonance **188**(1): 168-175.

This study focuses on spherical microparticles made of cross-linked alginate gel and microcapsules composed of an oil-in-water emulsion where the continuous aqueous phase is cross-linked into an alginate gel matrix. We have investigated the use of these easily manufactured microbeads as contrast agents for the study of the flow properties of fluids using nuclear magnetic resonance imaging.

Heuchan, S. M., et al. (2019). "Development of Fertilizer Coatings from Polyglyoxylate-Polyester Blends Responsive to Root-Driven pH Change." Journal of Agricultural & Food Chemistry **67**(46): 12720-12729.

Many current controlled-release fertilizers (CRFs) are coated with nonbiodegradable polymers that can contribute to microplastic pollution. Here, coatings of self-immolative poly(ethyl glyoxylate) (PEtG) capped with a carbamate and blended with polycaprolactone (PCL) or poly(l-lactic acid) (PLA) were evaluated. They were designed to depolymerize and release fertilizers in the vicinity of plant roots, where the pH is lower than that in the surrounding environment. PEtG/PCL coatings exhibited significant temperature and pH effects, requiring 18 days at pH 5 and 30 degreeC, compared to 77 days at pH 7 and 22 degreeC, to reach 15% mass loss. Plant roots were also effective in triggering coating degradation. Spray-coating and melt-coating were explored, with the latter being more effective in providing pellets that retained urea prior to polymer degradation. Finally, PEtG/PCL-coated pellets promoted plant growth to a similar degree or better than currently available CRFs.

Heyward, S. and T. Williamson (2012). "Use of hepatocyte and kupffer cell co-culture models in assessment of cytochrome p450 metabolism." Drug Metabolism Reviews **1)**: 60.

Primary human hepatocyte cultures have long been the gold standard for assessment of liver metabolism of xenobiotic compounds. In the liver, the response to infection and inflammation by tissue-associated immune cells can alter gene expression, including cytochrome P450 (CYP) enzymes. Kupffer cells are macrophages which are part of the liver sinusoid and mediate many of these responses. Hepatocyte/Kupffer cell co-cultures offer a more comprehensive model to understand the effects of the liver inflammatory response and macrophage modulation of critical drug metabolizing enzymes for better in vivo correlation. Freshly isolated SD rat kupffer cells and hepatocytes were cultured as separate monolayers and in co-cultures at ratios ranging from physiological (1:16) to highly inflamed (1:2). Trypan blue exclusion was used to assess viability of isolated cells. The phagocytic properties of kupffer cells are retained in culture. The specific uptake of 1 mum fluorescently labeled latex microbeads was used to assess purity of the kupffer cells. Cells were cultured for 24 hours prior to initiating experiment. Bacterial endotoxin, lipopolysaccaride (LPS) was used to stimulate production of cytokine by kupffer cells. Kupffer/hepatocyte cocultures, at a ratio of 1:4 respectively, were exposed to increasing concentrations of LPS ranging from 0.1 mug/mL to 10 mug/mL. Samples were taken 24-hour post-LPS exposure and analyzed for levels of the pro-inflammatory cytokine IL-6 using ELISA. Following normal metabolism induction procedures, hepatocyte only cultures and 1:2, 1:4, and 1:8 kupffer/hepatocyte cocultures were exposed to know inducers of CYP1A, CYP2B, and CYP3A for 48 hours prior to substrate incubation and sample collection. Metabolite formation was determined using LCMS to measure enzyme activity and mRNA expression levels were quantified using Taqman Real-Time RT-PCR to measure protein synthesis. MTT was run in parallel to monitor viability of cultures throughout experiment. Specific uptake of 1 micron fluorescently labeled microbeads by freshly isolated kupffer cells showed >90% purity, as

indicated by flow cytometry. Cytokine quantitation using ELISA showed increased production of IL-6 (pg/mL) with increasing kupffer cell content, with the highly inflamed ratio 1:2 producing the highest levels of cytokine. ELISA results also showed a concentration dependent, linear increase in IL-6 production with increasing concentrations of LPS. Cultures were treated with and without LPS for 24 hours followed by induction for 48 hours with dexamethasone, phenabarbital and beta-napaflavone. Induction of CYP1A, 2B, and 3A were assessed by metabolism of protypical substrates and mRNA transcript levels. Both the substrate metabolism activity and mRNA results showed significant reduction in CYP gene induction in cultures of kupffers/hepatocytes at a ratio of 1:4. These data indicate that defined in vitro cultures of kupffer cells and hepatocytes can be obtained and used to better define the impact of immune mediators on liver metabolism.

Hick, P., et al. (2010). "Preparation of fish tissues for optimal detection of betanodavirus." Aquaculture **310**(1/2): 20-26.

Betanodaviruses, the causative agents of viral nervous necrosis (VNN) disease, cause significant production losses in aquaculture worldwide. To improve the detection of betanodavirus, methods of extraction of the virus and its RNA from the tissues of sub-clinically infected barramundi (Lates calcarifer) and Australian bass (Macquaria novemaculeata) were evaluated. Compared to crude manual processing, the yield of betanodavirus was increased by 3.5-fold when tissues were disrupted by micro-bead beating and 2-fold using an optimised manual pestle grinding method ($p<0.01$). Both of these methods produced a tissue homogenate which was compatible with virus isolation in SSN-1 cells. The quantity of betanodavirus detected was at least 5.6 times higher when nucleic acids were purified using an automated magnetic particle method compared to two commonly used silica-adsorption spin column products ($p<0.01$). When used together, tissue disruption by micro-bead beating and nucleic acid purification using a magnetic particle processor was predicted to result in a 15-fold increase in yield of virus from tissues, and increased the speed of sample preparation 10-fold compared to the use of manual tissue grinding and a silica-adsorption spin column. The mechanised and automated methods required less manual handling of samples, which may reduce the potential for false positive and false negative results arising through sample cross contamination, degradation and operator error. High-throughput preparation of tissue samples and detection of betanodavirus with greater sensitivity will enable improved control of VNN in aquaculture.

Hida, K., et al. (2013). "Development of a rapid total nucleic acid extraction method for the isolation of hepatitis A virus from fresh produce." International Journal of Food Microbiology **161**(3): 143-150.

Recently, there have been increasing reports of foodborne illnesses associated with the consumption of fresh produce. Among these, hepatitis A virus (HAV) remains epidemiologically important and has been continually implicated in several outbreaks. We describe a rapid method (<8h) for the isolation and subsequent detection with real-time quantitative PCR (RT-qPCR) of the HAV HM-175 cytopathic strain seeded onto baby spinach and sliced tomatoes using a total RNA extraction method, utilizing a high concentration (4M) guanidine thiocyanate buffer. Consistent detection of HAV genome from both produce items was achieved at an inoculation level of 3x103 PFU/25 g of food, with less consistent detection achieved at 3x102 PFU/25g. Initial studies revealed that a final precipitation of recovered RNA with potassium acetate to reduce carryover of polysaccharides and the addition of polyvinylpyrrolidone to remove polyphenolics in spinach were essential. For tomatoes, virus isolation was achieved with the incorporation of either an elution step with a high pH Tris-glycine-beef extract (TGBE) buffer or with an enzymatic digestion with pectinase. We also describe the development of a protocol for the detection of HAV from tomatoes utilizing a Luminex microbead-based suspension array. The results correlated well with the RT-qPCR assay suggesting the feasibility of the Bioplex as a detection platform for viruses isolated from foods.

Hidalgo, D., et al. (2014). "INTEGRATED AND SUSTAINABLE SYSTEM FOR MULTI-WASTE VALORIZATION." Environmental Engineering & Management Journal (EEMJ) **13**(10): 2467-2475.

The general aim of this paper is to demonstrate the sustainable management of a broad spectrum of wastes (livestock, industrial, agri-food, agricultural and non-recyclable fraction proceeding from waste treatment plants) in an integrated plant. The technological development and practical application of the "Mixed Plant" concept is used to achieve this objective. In order to valorize in a joint form all the above-mentioned categories of waste, two different processes have been integrated. The first one is an anaerobic digestion system for the transformation of biodegradable organic waste into biogas. The second one is a low-temperature pyrolysis (chemical) treatment for the valorization of the non-recyclable plastic waste fraction and other non-organic waste streams. Biogas together with pyrolysis gas fraction (syngas) will be used as fuel in an adapted co-generation engine. So as to close the recycling cycle with a minimum environmental impact, and as an added value, the digestate obtained in the anaerobic reactor will be valorized as a slow-release fertilizer (struvite), the liquid fraction obtained during the pyrolysis gas distillation process will be valorized as second generation biofuels and the solid fraction generated in the pyrolysis process (ashes) will be transformed into carbon pellets (biofuel). The ultimate aim of this model is to reduce costs associated with waste treatment processes, thereby optimizing waste management, not only from the environmental perspective, but also from the financial point of view. [ABSTRACT FROM AUTHOR]

Hidalgo, D., et al. (2019). "A multi-waste management concept as a basis towards a circular economy model." Renewable & Sustainable Energy Reviews **111**: 481-489.

This study proposes the use of a waste management procedure based on the technical development and practical implementation of a "Multi-Waste Plant" concept. A final point of this model is to reduce the costs related to waste treatment processes, thus optimizing its management, from the ecological viewpoint, as well as from the money related perspective. To this end, it is proposed: 1. Treatment, in the same facility, of various types of waste: municipal, industrial, biomass; 2. Energy and mass integration of individual waste treatment processes (anaerobic digestion and pyrolysis) to obtain a single integrated process more economical; 3. Complete recuperation of waste as energy (biogas, syngas and carbon pellets) and slow-release fertilizers (struvite). As a result, stable codigestion of a mix of poultry manure, pig manure, and vegetable waste (40/40/20 w/w) was achieved in a two-phase biodigester with production of biogas (65%CH 4, energy content 6.5kWhm−3) and non-harmful digestate with phytotoxicity less than 25 Equitoxm−3, later transformed in struvite fertilizer with up to 95,4% of nutrients recovery. In parallel, the pyrolysis of a mix of organic fraction, waste biomass, plastic waste and other industrial waste (15/15/50/20 w/w) at 420-450°C produced non-condensable gas (86.2%, LHV 8.5kWhm−3), char (9%) and a liquid phase (4.8%). A Pinch analysis reveals that an energy integration process in the plant will make possible to cover energy needs of the whole facility.

The "Multi-Waste Plant" concept along these lines turns into an unmistakable example of the circular economy model. Image 1 • Different waste streams treated in the same facility: the key of sustainability. • Energy integration leads to an optimization of global consumptions. • Flexibility of waste management is enhanced and process costs are reduced. • The "Multi-Waste Plant" concept is a clear exponent of the circular economy model. [ABSTRACT FROM AUTHOR]
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Hidalgo-Bastida, L. A., et al. (2011). "Lattice-Boltzmann mathematical model of cell attachment in a perfusion bioreactor: Validation using microCT." European Cells and Materials **3)**: 46.
INTRODUCTION : The optimisation of tissue engineering bioreactors is a lengthy and expensive experimental process. Mathematical modelling can reduce cost and time by providing a very close approximation of the operational parameters. Although different models have been used in bioengineering, only the lattice-Boltzmann code allows the simulation of multi-scale systems such as these. Cell attachment and subsequent proliferation and differentiation are determined by the cell (particle) behaviour in a given perfusion environment (flow rate, cell concentration, nutrients availability and waste removal). By using this mathematical tool we aim to optimise a perfusion bioreactor by developing a code that can simulate all these conditions and then conducting experimental work to validate it. METHOD(S): The lattice-Boltzmann model was developed to predict cell adhesion based on surface, perfusion rate (fluid velocity) and initial cell concentration parameters. The simulations were run for straight and bended channels to mimic the pattern of a single cell moving through a porous scaffold. For the validation, protein-coated and uncoated tygon tubing (1.02 mm diameter) was seeded at 0.0003 ml/min with hMSC previously labelled with superparamagnetic particles (CD105 Microbeads, Miltenyi Biotec Ltd, UK) and placed in a "U" holder. Samples were CT imaged at low voltage and high current using a Nikon Custom 320 kV bay. Reconstructed images were cropped into straight sections and 90 degrees section for the validation. RESULT(S): Mathematical modelling of 90 degrees sections revealed that when particles of different sizes are present in the perfusion system, large particles push the small particles to the edges; meanwhile, cells in straight sections always are concentrated in the centre of the channel. Validation data showed that cells seeded onto uncoated tygon tubing did not attach regardless of seeding time. Protein-coated tubing confirmed cell adhesion to the internal walls in the lowers region of the conduit. (Figure presented) Discussion & CONCLUSION(S): The cell attachment simulations produced by the lattice-Boltzmann code provided useful information on cell behaviour and attachment for our perfusion model. CT data of labelled cells showed specific adhesion patterns. Cells accumulated near the bend as suggested in the model, however the main deposition occurred in the bottom section. We hypothesise this was caused by gravity. Our model did not include that component, which would explain why the data did not match the simulation. Current work incorporates gravity to our lattice-Boltzmann model to confirm the influence of this element.

Hidalgo-Ruz, V., et al. (2012). "Microplastics in the marine environment: A review of the methods used for identification and quantification." Environmental Science and Technology **46**(6): 3060-3075.
This review of 68 studies compares the methodologies used for the identification and quantification of microplastics from the marine environment. Three main sampling strategies

were identified: selective, volume-reduced, and bulk sampling. Most sediment samples came from sandy beaches at the high tide line, and most seawater samples were taken at the sea surface using neuston nets. Four steps were distinguished during sample processing: density separation, filtration, sieving, and visual sorting of microplastics. Visual sorting was one of the most commonly used methods for the identification of microplastics (using type, shape, degradation stage, and color as criteria). Chemical and physical characteristics (e.g., specific density) were also used. The most reliable method to identify the chemical composition of microplastics is by infrared spectroscopy. Most studies reported that plastic fragments were polyethylene and polypropylene polymers. Units commonly used for abundance estimates are "items per m²" for sediment and sea surface studies and "items per m³" for water column studies. Mesh size of sieves and filters used during sampling or sample processing influence abundance estimates. Most studies reported two main size ranges of microplastics: (i) 500 mum-5 mm, which are retained by a 500 mum sieve/net, and (ii) 1-500 mum, or fractions thereof that are retained on filters. We recommend that future programs of monitoring continue to distinguish these size fractions, but we suggest standardized sampling procedures which allow the spatiotemporal comparison of microplastic abundance across marine environments. © 2012 American Chemical Society.

Hidayah, N. and Syafrudin (2018). A Review on Landfill Management in the Utilization of Plastic Waste as an Alternative Fuel. Les Ulis, EDP Sciences. **31**.

Wastes from landfills originate from many spheres of life. These are produces as a result of human activities either domestically or industrially. The global plastic production increased over years due to the vast applications of plastics in many sectors. The continuous demand of plastics caused the plastic wastes accumulation in the landfill consumed a lot of spaces that contributed to the environmental. In addition, economic growth and development also increased our demand and dependency on plastics which leads to its accumulation in landfills imposing risk on human health, animals and cause environmental pollution problems such as ground water contamination, sanitary related issues, etc. The management and disposal of plastic waste have become a major concern, especially in developing cities. The idea of waste to energy recovery is one of the promising techniques used for managing the waste of plastic. Hence, this paper aims review at utilizing of plastic as an alternative fuel.

Hidayaturrahman, H. and T. G. Lee (2019). "A study on characteristics of microplastic in wastewater of South Korea: Identification, quantification, and fate of microplastics during treatment process." Marine Pollution Bulletin **146**: 696-702.

This study investigated the removal of microplastics from different treatment stages in three WWTPs and examined the performance of tertiary treatment that was done by coagulation and different technologies such as ozone (WWTP-A), membrane disc-filter (WWTP-B), and rapid sand filtration (WWTP-C). The results showed that the primary and secondary treatment processes effectively remove microplastics from wastewater with efficiencies ranging between 75% and 91.9%. The removal efficiency increased further to >98% after tertiary treatment. Microbeads and fragments were the major types of microplastics found in all wastewater sampling points. Microbeads found in the wastewater samples were classified as primary microplastics, that mainly came from personal care products, whereas secondary microplastics consisted of fragments, fibers, and sheets that were generated mainly due to fragmentation of larger plastics. Microplastics were still found in a high concentration in the final effluent, especially from WWTP-B, which is discharged into the Geumho river.

Hieu, N. M., et al. (2017). "Synthesis of SiO2-Coated Fe3O4 Nanoparticles Using Ultrasound and Its Application in DNA Extraction from Formalin-Fixed, Paraffin-Embedded Human Cancer Tissues." Journal of Electronic Materials **46**(6): 3738-3747.

SiO2-coated Fe3O4 nanoparticles (Fe3O4@SiO2 NPs) were successfully synthesized using ultrasound in order to extract DNA from cancer tissues for application in diagnostics. The core 10.7-nm-diameter Fe3O4 nanoparticles were synthesized by co-precipitation of Fe3+ and Fe2+ as reaction substrates and NH4OH as precipitant, then coated with a thin layer of amorphous silica by a modified Stober method. Further SiO2 coating using alkaline hydrolysis of tetraethyl orthosilicate in ethanol and water mixture was accelerated in the presence of a 37-kHz ultrasound, resulting in the NPs having different sizes of 14.5 nm (version M1), 24.4 nm (version M2), and 34.9 nm (version M3) with saturation magnetization values of 50.2 emu/g, 18.6 emu/g, 10.3 emu/g, respectively. Among the three Fe3O4@SiO2 NPs versions, the M1 NPs allowed extraction of DNAs from 10 mg formalin-fixed and paraffin-embedded (FFPE) tissues of nasopharyngeal carcinoma patients with the highest recovery of about 100–500 ng/µl and good purity (A260/A280: 1.8–1.9). The extracted DNAs could be used as templates for downstream amplification of 252-bp sequencing specifically for the Braf cancer biomarker gene using polymerase chain reaction (PCR), as well as detection of the pathogenic Epstein–Barr virus (EBV) and the human papilloma-virus (HPV) using real-time PCR. DNA extraction recoveries of both EBV and HPV using Fe3O4@SiO2 NPs M1 were significantly better that those using commercialized Fe3O4@SiO2 microbeads, as indicated by lower threshold cycles of all fluorescent signals including fluorescein amidite (FAM) dye representative for EBV infection, hexachlorofluorescein (HEX) dye representative for β-globin (internal control), and SYBR Green dye representative for HPV infection in tested clinical samples from patients with nasopharyngeal carcinoma (NPC). © 2017, The Minerals, Metals & Materials Society.

Higashi, T., et al. (2004). "A novel transfection method for mammalian cells using calcium alginate microbeads." Journal of Bioscience & Bioengineering **97**(3): 191-195.

The direct transfer of genetic materials into mammalian cells is an indispensable technique. We have developed calcium alginate (CA) microbeads which can deliver plasmid DNAs and yeast artificial chromosomes into plant and yeast cells. In this paper, we demonstrate the effective transfection of mammalian cells by CA microbeads immobilizing plasmid DNAs. The transfection was performed using the pEGFP-C1 plasmid containing the cytomegalovirus (CMV) promoter and enhanced green fluorescent protein (EGFP) gene. The transient expression of EGFP was observed 24 h after transfection. The expression efficiency was maximum when the concentration of sodium alginate was 1% and the amount of plasmid DNA was increased to 100 microg. The expression efficiency of our method using CA microbeads is 2-10 times higher than that of the polyethylene glycol (PEG) method. Our results suggest that the CA microbead mediated transfection of mammalian cells effectively delivers genetic materials into mammalian suspension cells.

Higgins, R., et al. (2011). "National registry of ABO and HLA antibody incompatible renal transplantation." American Journal of Transplantation **2)**: 109.

Introduction: Antibody incompatible renal transplantation (AIT) is widely practiced, but the most outcome reports are from single centres. The UK Registry is the first comprehensive national registry for HLA and ABO AIT. Method(s): Data for all UK transplants are already collected. An additional AIT dataset was introduced in 2008, collecting data on transplants since 2001 with ABO incompatibility (ABOi), or donor specific HLA antibodies (HLAi) detectable in the immediate pre-transplant period. Result(s): The Registry is aware of 381 AIT transplants; 213 HLAi, 150

ABOi, and 18 were both HLAi and ABOi. In 2009, of the 972 living donor transplants performed in the UK, 49 (5%) were HLAi, and 64 (7%) were ABOi. Fourteen centres reported HLAi transplants, range per unit 1-76. Pre-treatment complement dependent cytotoxic (CDC) crossmatch (XM) was +ve in 29%. Flow cytometric (FC) XM was +ve but CDC XM -ve in 49%, and 22% had donor specific antibodies (DSA) detectable only by microbead or other solid phase assay. 179 (77%) were from a living donor grafts and 52 (23%) deceased donor. Centres used different combinations of IVIg and CD20 as well as plasmapheresis prior to transplantation. For ABOi, excluding the HLAi and ABOi cases, 146 were planned ABOi in living transplants, 3 were deceased donor transplants in a planned programme of A2 donor into selected B recipients at a single centre. ABO antibodies were removed with plasmapheresis in 76% of cases, antigen-specific absorption in 18%, and 6% had no antibody removal. Three year graft survival (death and graft loss) was 84 (95% CI 69-92)% in ABOi, and 84 (69-92)% in HLAi, compared with 92 (91-93)% for all other living donor transplants, and 84 (83-85)% for all other deceased donor transplants. Discussion. 12% of living donor renal transplants in 2009 were antibody incompatible, and over three quarters of the transplant units in the UK have reported AIT transplants. Overall three year graft survival rates were comparable with the Results: of 'antibody compatible' deceased donor transplantation.

Higgins, R., et al. (2010). "UK registry of antibody incompatible kidney transplantation 2001-2010." Transplantation **1)**: 189.

Introduction. Antibody incompatible renal transplantation (AIT) is now widely practiced, but there remain uncertainties about outcomes. The UK Registry is the first comprehensive national registry for HLA and ABO AIT. Methods. Comprehensive data for all UK transplants are already collected. An additional AIT dataset was introduced in 2008, collecting data on transplants since 2001 with ABO incompatibility (ABOi), or donor specific HLA antibodies (HLAi) detectable in the immediate pre-transplant period. Those with historic positive, current negative DSA were not included. Results. 381 AIT transplants have been performed; 213 HLAi, 150 ABOi (37 full reports to registry awaited), and 18 were both HLAi and ABOi. In 2009, of the 972 living donor transplants performed in the UK, 49 (5%) were HLAi, and 64 (7%) were ABOi. Fourteen centres reported HLAi transplants, number per unit ranging from 1-76. The pre-treatment complement dependent cytotoxic (CDC) crossmatch (XM) (non AHG enhanced) was +ve in 29% of cases. Flow cytometric (FC) XM was +ve but CDC XM -ve in 49%, and 22% had donor specific antibodies (DSA) detectable only by microbead or other solid phase assay. 106 (46%) were first grafts; 94 (41%) were second; 23 (10%) were third and 8 (3%) were fourth grafts. 179 (77%) grafts used kidneys from a living donor while 52 (23%) used kidneys from a deceased donor. Centres used different combinations of IVIg and CD20 as well as plasmapheresis prior to transplantation. For ABOi cases, excluding the HLAi and ABOi cases, 146 were planned ABOi in living transplants, 3 were deceased donor transplants in a planned programme of A2 donor into selected B recipients at a single centre, and there was 1 other O recipient who received an A donor kidney. ABO antibodies were removed with plasmapheresis in 76% of cases, antigen-specific absorption in 18%, and 6% had no antibody removal. Three year graft survival (death and graft loss) was 84 (95% CI 69-92)% in ABOi transplant, and 82 (73-88)% in HLAi transplants, compared with 92 (91-93)% for all other living donor transplants, and 84 (83-85)% for all other deceased donor transplants. Conclusion. 12% of living donor renal transplants performed in the UK in 2009 were antibody incompatible, and over three quarters of the transplant units in the UK have reported AIT transplants to the Registry. Overall three year graft survival rates were comparable with the results of 'antibody compatible' deceased donor transplantation. The dataset will allow further analysis by specificity and level of donor specific HLA antibody transplants, and outcomes

according to blood group mismatch and prior HLA sensitisation in ABOi transplants.

Higgins, R., et al. (2009). "Rises and falls in donor-specific and third-party HLA antibody levels after antibody incompatible transplantation." Transplantation **87**(6): 882-888.

BACKGROUND: After human leukocyte antigen (HLA) antibody-incompatible transplantation, donor specific and third party HLA antibodies may be found, and their levels fall in a donor-specific manner during the first month. However, these changes have not been previously described in detail.

METHODS: Donor-specific HLA antibody (DSA) and third-party HLA antibody (TPA) levels were measured using the microbead method in 44 presensitized patients who had renal transplantation.

RESULTS: DSA+TPA fell in the first 4 days after transplantation, and greater falls in DSA indicated absorption by the graft. This occurred for class I (57.8% fall compared with 20.2% for TPA, P<0.0005), HLA DR (63.0% vs. 24.3%, P<0.0004), and for HLA DP/DQ/DRB3-4 (34% vs. 17.5%, P=0.014). Peak DSA levels occurred at a mean of 13 days posttransplant, and they were higher than pretreatment in 25 (57%) patients and lower in 19 (43%) patients (P=ns). The risk of rejection was associated with peak DSA levels; 15 of 25 (60%) patients with DSA at median fluorescence intensity (MFI) more than 7000U experienced rejection, compared with 4 of 7 (57%) patients with peak DSA MFI 2000 to 7000U, and 2 of 12 (17%) patients with peak DSA MFI less than 2000U (P<0.02). DSA levels subsequently fell in a donor specific manner compared to TPA.

CONCLUSION: DSA levels may change markedly in the first month after antibody incompatible transplantation, and the risk of rejection was associated with higher pretreatment and peak levels.

Higgins, R., et al. (2014). "Refining the prediction of early antibody mediated rejection after antibody incompatible renal transplantation; importance of pregnancy-induced sensitisation." Transplantation **1)**: 103.

Background. Acute antibody mediated rejection (AMR) after HLA antibody incompatible renal transplantation is related to donor specific HLA antibody (DSA) levels. However, pre-treatment DSA levels have a low predictive value for AMR, partly because of rapid changes in DSA levels post-transplant. This study examined changes in DSA according to the primary sensitising event. Methods. Responses to 220 HLA specificities in 64 patients over the first 30 days after transplantation were evaluated using single antigen microbead assays. The primary sensitising event for each specificity was assigned according to the time of appearance of antibody in relation to pregnancy, transfusion or transplantation, taking into account the HLA type of the sensitisor and HLA epitope maps. Results. The greatest increase from pre-treatment to peak DSA level was seen in those stimulated by pregnancy, median (IQR) increase in MFI of 1981 (94-5870) u. The next highest increase was for those sensitised by transplant with repeat HLA epitope mismatch, at 546u (-308u-2698u) (p<0.01). Time to peak level was shorter in the pregnancy group, median 13 (9-19.75) days, compared to 15.5 (11-21) days in the transfusion group and 16 (12-23) days in the transplant group (p<0.01). For specificities with pre-treatment MFI <5000u, peak level of >5,000u occurred in 24/58 (41%) stimulated by pregnancy, compared to 8/119 (7%) in all other specificities (p<0.0001). With pre-treatment total DSA MFI <5000u, AMR occurred after primary sensitisation by pregnancy in 7/9 (78%) patients, compared to 2/5 (40%) for transfusion and 1/7 (14%) for transplantation. Conclusion. After transplantation rises in DSA were greatest, fastest and most likely to be associated with rejection for specificities where pregnancy was the primary sensitising event. In contrast, there were lower rises DSA corresponding to HLA exposure from previous transplants, at both antigen and epitope levels.

Greater insight into the antibody response post-transplantation will enable better risk stratification and cost-effective tailoring of therapy.

Higgins, R., et al. (2011). "Human leukocyte antigen antibody-incompatible renal transplantation: excellent medium-term outcomes with negative cytotoxic crossmatch." Transplantation **92**(8): 900-906.
BACKGROUND: Human leukocyte antigen (HLA) antibody-incompatible renal transplantation has been increasingly performed since 2000 but with few data on the medium-term outcomes.
METHODS: Between 2003 and 2011, 84 patients received renal transplants with a pretreatment donor-specific antibody (DSA) level of more than 500 in a microbead assay. Seventeen patients had positive complement-dependent cytotoxic (CDC) crossmatch (XM), 44 had negative CDC XM and positive flow cytometric XM, and 23 had DSA detectable by microbead only. We also reviewed 28 patients with HLA antibodies but no DSA at transplant. DSAs were removed with plasmapheresis pretransplant, and patients did not routinely receive antithymocyte globulin posttransplant.
RESULTS: Mean follow-up posttransplantation was 39.6 (range 2-91) months. Patient survival after the first year was 93.8%. Death-censored graft survival at 1, 3, and 5 years was 97.5%, 94.2%, and 80.4%, respectively, in all DSA+ve patients, worse at 5 years in the CDC+ve than in the CDC-ve/DSA+ve group at 45.6% and 88.6%, respectively (P<0.03). Five-year graft survival in the DSA-ve group was 82.1%. Rejection occurred in 53.1% of DSA+ve patients in the first year compared with 22% in the DSA-ve patients (P<0.003).
CONCLUSIONS: HLA antibody-incompatible renal transplantation had a high success rate if the CDC XM was negative. Further work is required to predict which CDC+ve XM grafts will be successful and to treat slowly progressive graft damage because of DSA in the first few years after transplantation.

Higgins, R., et al. (2012). "From median fluorescence intensity to microgrammes per millilitre; quantification of hla antibody levels." American Journal of Transplantation **3)**: 310.
Introduction. Recent advances in anti-HLA antibody detection methodologies has provided the clinical laboratory with a valuable tool to rapidly and accurately monitor the changes in antibody levels through the course of a kidney transplant. This is of particular importance in HLA antibody incompatible transplantation (HLAiTx) where daily monitoring of antibody status is often neccessary and clinical intervention can be heavily influenced by these results. However antibody data is given only as units of detectable fluorescence and no insight into the serum concentration of HLA specific antibody can be inferred. We describe a simple method for estimating serum concentration of HLA specific antibody using standard curves derived from human monoclonal HLA specific antibody. Methods. HLA epitope specific monoclonal antibodies of IgG isoform were quantified and 'spiked' into HLA antibody negative AB serum and standard curves for single antigen bead binding were constructed in the dynamic range of 0.1-200ug/ ml. Patient sera with the same single epitope reactivity as determined by inhibition analysis were then analysed using the concentration curve as reference. Results. One transplant waiting list patient demonstrated a 142T epitope specific antibody (HLA-A2,28) at a consistent concentration of between 30-40ug/ml between three-monthly samples. The second patient underwent HLAiTX at our centre and had a pre-treatment serum antibody concentration of 12.8ug/ml which rose to a peak of 185ug/ml at day 17 post-transplant during a period of antibody mediated rejection. The base/peak ratio of absolute concentration was 14.5, compared to base/peak values of microbead MFI of 2984 u and 12000 u, giving a ratio of 4.1. Discussion. This pilot study provides a valuable insight into the concentrations at which anti-HLA antibody is found in the general circulation and the dynamic ranges of antibody concentration

that can be observed during the early post-transplant period in HLAiTx. Knowledge of circulating HLA-specific antibody levels is of fundamental importance if designing more specific antibody reduction strategies.

Higgins, R., et al. (2010). "The histological development of acute antibody-mediated rejection in HLA antibody-incompatible renal transplantation." Nephrology Dialysis Transplantation **25**(4): 1306-1312.
BACKGROUND: The aim of this study was to examine the development of acute antibody-mediated rejection in HLA antibody-incompatible renal transplantation in relation to the Banff 07 histological classification.
METHODS: Renal biopsies were scored using the Banff 07 diagnostic criteria, and paraffin-embedded sections were stained with the pan-leucocyte marker CD45.
RESULTS: Thirty-six patients had 72 renal biopsies. In biopsies performed 30 min after graft reperfusion, the mean number of CD45+ cells per glomerulus was higher than in control grafts ($P < 0.04$) and was associated with the donor-specific antibody (DSA) level at transplantation measured by microbeads ($P < 0.01$), and eight out of nine patients with greater than five CD45+ cells per glomerulus had early post-transplant rejection or oliguria, compared to 11 out of 20 with less than five cells per glomerulus ($P < 0.01$). In the first 10 days post-transplant, although peritubular capillary (PTC) leucocyte margination grade 3 and C4d deposition were specific for rejection, their sensitivities were low. PTC C4d staining was only seen in two out of 11 biopsies taken in the first 5 days after transplant, even in the presence of rejection, but was present in the majority of later biopsies with rejection. In biopsies stained for CD3, CD68 and CD20, it was notable that CD20+ cells were not seen during acute rejection, the infiltrates comprising CD3+ and CD68+ leucocytes.
CONCLUSIONS: Glomerular margination of leucocytes occurred early after transplantation and was associated with DSA level and early graft dysfunction. The Banff 07 PTC margination scoring system was easy to apply, especially when CD45 staining was used, and PTC margination grade 3 was always associated with clinical rejection.

Higgs, R. (1997). "Europe recycling more plastics, APME says." Plastics News **9**(12): 7.
Reports that according to figures released by the Association of Plastics Manufacturers in Europe (APME), recovery of post-consumer plastic waste through recycling or waste-to-energy incineration in Europe improved in 1995. What is cited for the improvement; Comments from Fred Mader, APME's deputy director; Other findings by APME; What the statistics show.

Hiki, K. and F. Nakajima (2015). "Effect of salinity on the toxicity of road dust in an estuarine amphipod Grandidierella japonica." Water Science and Technology **72**(6): 1022-1028.
Urban runoff can reach coastal aquatic environments; however, little is known about the effect of salinity on road runoff toxicity. The objective of this study is to investigate the toxicity of highway road dust over a salinity gradient from 5 to 35 per mil, in an estuarine benthic amphipod, Grandidierella japonica. Road dust toxicity was evaluated by assessing mortality after 10 days of exposure and short-term microbead ingestion activity of the amphipod. For all road dust samples considered, amphipod mortality increased with increasing salinity, whereas no significant difference in mortality was observed among test salinities in the reference river sediment. Ingestion activity during exposure to road dust decreased with increasing salinity. In fact, none of the individuals ingested any microbeads at salinity of 35 per mil. If assumed microbead ingestion is a proxy for feeding activity, high mortality at 35 per mil could be attributed to aquatic exposure and not to dietary exposure. These findings suggest that road dust may have considerable impact on benthic organisms at high salinity levels.

Hildebrand, M., et al. (1992). "Comparison of bioanalytical determinations of Iloprost, a chemically stable PGI<inf>2</inf> mimetic, by conventional radioimmunoassay (RIA) and scintillation proximity assay (SPA)." Eicosanoids **5**(1): 5-8.

The scintillation proximity assay is a novel variant of classical radioimmunoassay. It can be performed as a single tube measurement because the separation of bound and unbound tracer fraction is avoided. In principle, microbeads are coated with anti-species antibodies that can couple with the respective antiserum used for RIA. By means of special cores, light emission takes place if labelled, antiserum-bound tracer is coupled to the anti-species antibody on the fluomicrosphere surface. In the present report, the novel assay was compared to a validated RIA for the bioanalysis of the PGI<inf>2</inf> mimetic, Iloprost. Extraction recovery of Iloprost was ~ 90% at pH <=4. The detection limit of the novel assay was 2-4 pg/sample, corresponding to 10-20 pg/ml plasma (if 0.2 ml plasma was used). Coefficients of variations were 9, 7 and 6% (within-day, n = 5) and 30, 11 and 10% (day-to-day, n = 10) at 50, 100 and 200 pg/ml. RIA and SPA levels of Iloprost measured in human plasma samples (n = 428) were similar. The SPA method exhibits both a similar specificity and detection limit to RIA and will be used for further analyses.

Hildebrandt, L., et al. (2019). "Evaluation of continuous flow centrifugation as an alternative technique to sample microplastic from water bodies." Marine Environmental Research **151**: 104768.

The scientific and public interest regarding environmental pollution with microplastic has considerably increased within the last 15 years. Nevertheless, up to now there is no widely applied standard operation procedure for microplastic sampling, resulting in a lack of inter-study comparability. In addition, many studies on microplastic occurrences do not indicate a sound methodological validation of the applied methods and procedures. This study presents an alternative volume-reduced sampling technique to sample the entire load of suspended particulate matter including microplastic particles in natural waters, based on continuous flow centrifugation. For the lab-scale validation of the proposed instrumental setup, six different microplastic types (PE, PET, PS, PVDC, EPS and PP) were used. The particles covered a size range from 1mum to 1mm and a density range from 0.94gmL⁻¹ to 1.63gmL⁻¹. Recoveries ranged from 95.0%+/-2.3% - 99.1%+/-0.3% for virgin powders and from 96.1%+/-0.6% - 99.4%+/-0.2% (1 SD, n=2 - 3) for microplastic suspended in river water for 40 days. Gravimetric and microscopic analysis of the effluent indicates efficient removal of microplastic from the suspensions. Static light scattering analysis of the microplastic suspensions prior to and after centrifugation confirmed that no change of the particle size distribution has occurred - neither through aggregation nor through size-discrimination during centrifugation. Moreover, the system was tested in the field and used twice to sample suspended particulate matter from the Elbe estuary directly on site. Based on these first lab-scale experiments, continuous flow centrifugation proves a promising technique bearing potential to alleviate drawbacks such as contamination, filter clogging and particle size-discrimination of commonly used volume-reduced microplastic sampling approaches.

Hilder, P. E., et al. (2019). "Retinal adaptations of southern bluefin tuna larvae: implications for culture." Aquaculture **507**: 222-232.

We examined Southern bluefin tuna, Thunnus maccoyii, larvae to identify specific retinal adaptations that would indicate both important parameters for culture and larval ecology in the wild. Plastic resin histology, microspectrophotometry and behavioural feeding responses were used to describe visual development. Thunnus maccoyii larvae reflected the visual morphogenesis template commonly observed in many other marine fish species exhibiting indirect development. First-feeding (3 days post-hatching, [dph], 3.4 mm standard length [SL]) larvae possessed tightly packed single cone photoreceptors. Rods and twin cones were present in the retina in post-flexion larvae (21 dph, 8.39 mm fork length [FL]) with cone mosaic patterns observed in juveniles (30 dph, 21 mm FL). Based on the spacing of adjacent photoreceptors and focal length, first feeding larvae had a maximum theoretical visual acuity of 1.23+or-0.11 degrees that decreased to 0.14+or-0.02 degrees at 30 dph. Thunnus maccoyii displayed high cell density in the ventral retinal region (cones, bipolar and horizontal cells), a low convergence of cone cells to ganglion cells throughout the retina during larval development (1.1+or-0.2 to 1.4+or-0.3 at 3 dph and 30 dph, respectively), and early development of retinal pigment epithelium (RPE) migration. Microspectrophotometry showed twin cone visual pigments maximally sensitive to light in the blue-green part of the visual spectrum (wavelength of maximum absorption [lambda _{max}] of 494 nm, 507 nm and 524 nm), and behavioural experiments showed they fed preferentially at these wavelengths. Increased retinal cone densities in the ventral region indicated a localized region specialized for acute vision for prey and predator detection in the upward direction (dorsal plane) at an early age, representing a possible adaptation to life in deeper oceanic waters. The apparent high acuity and photopic sensitivity observed in T. maccoyii is hypothesised to be associated with the ability to feed in low light conditions. This has important practical considerations in determining lighting regimes for culture of T. maccoyii and possibly for other tuna species.

Hill, D., et al. (2018). "The relative effects of concentration and PH on mucus rheology." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **197**(MeetingAbstracts).

RATIONAL Cystic fibrosis (CF) airway disease is characterized by thickened, sticky mucus with increase viscosity and elasticity. Currently, there are two competing hypotheses as to the underlying cause of abnormal CF l mucus: The first is that dehydration of the airway surface layer (ASL) due to improper chloride secretion and sodium hyper absorption draws water out of the ASL and results in hyper-concentrated mucus; The second is that acidification of the ASL by impaired bicarbonate secretion by Cystic fibrosis transmembrane conductance regulator (CFTR) increases mucus viscosity. This study evaluates the relative contributions of concentration and pH to the rheological properties of mucus to determine the dominate contributor to abnormal CF mucus rheology. METHODS Our study employs two isolated mucin solutions, porcine gastric mucin (PGM) and bovine submaxillary mucin (BSM) at concentrations of 20mg/ml and 50 mg/ml and physiologically relevant pHs of 6, 7, and 8. We additionally studied mucus harvest from human bronchial epithelial (HBE) cell cultures prepare to concentration of 2 and 4% solids, mimicking healthy and pathological mucus, as well as CF sputum. The buffer capacity of each solution was measured by titration 100mM hydrochloric acid. The biophysical properties of each mucin / mucus specimen were measured across length scales that range from the nano to macroscopic by fluorescents recovery after photobleaching (FRAP), thermal microbead rheology (TMR), and macroscopic cone and plate rheology (C&PR) respectively. Finally, mucociliary transport (MCT) rates were measured on HBE cultures at healthy and pathological concentration across the same pH range. RESULTS Mucins and mucus display a concentration dependent buffer capacity, needing more protons added at higher concentration to achieve the same pH changes. TMR showed that concentration effects the diffusion of 1um microsphere a factor of 10 ($p < 0.001$) across all specimen types, while changing pH between 6 and 8 did not significantly affect the motion of tracer particles. Similar results were found in C&PR studies. FRAP studies showed both concentration and pH dependent changes in the nanoscopic rheology of mucus.

Studies on the non-mucin component (small protein) of sputum showed that the majority of FRAP signal arises from small proteins, and not the gel forming mucins. Like rheology, transport was significantly reduced by dehydration, while pH did not have a measureable effect. CONCLUSIONS Concentration affects the biophysical properties of mucus across multiple length scales and model systems, while pH has a limited effect across physiologically relevant scales of 6 - 8.

Hill, D. B., et al. (2016). "Biophysical analysis of pediatric CF bal: Defining biomarkers of the onset of CF airway disease." Pediatric Pulmonology **51 (Supplement 45)**: 239.

The AREST CF project represents a unique opportunity to document the early onset of airways disease in cystic fibrosis. In this ongoing study, bronchoalveolar lavage (BAL) samples are being collected from pediatric patients at regular intervals over the first 6 years of life. The goal of our analysis is to investigate changes in the rheological properties of mucus brought on by CF airway disease. We have previously shown that CF sputum is characterized by significantly increased mucin concentration [1], resulting in modified biophysical properties such as viscoelasticity and osmotic pressure [2, 3]. Due to the dilute nature of BAL samples, determining the native concentration of mucus along the airways from BAL samples has proven impossible. While small flecks of concentrated, viscoelastic mucus are present in the pediatric CF BALs, the samples also contain highly diluted mucus that is rheologically identical to saline. By combining sophisticated microbead rheological measurements of BAL samples with advanced data analytics, we are able to determine a diversity of rheological microenvironments in which tracer particles are sampling. Specifically, we embed 1 micron diameter tracer particles into the sample volume and analyze their diffusive fluctuations. Analytically, we firstly determine which particle tracked paths are consistent with normal saline and exclude those from further analysis. For non-excluded particles, anomalous sub-diffusion parameters of each particle path are calculated [4], reflecting motilities from a range of diluted to pure mucus sample. We compare our results to adult CF and normal BALs, finding that the samples collected from the pediatric AREST participants display a rheology that lies between that of healthy adults and adult CF patients. We additionally compare the results of over 150,000 particle tracks from 64 patients and 12 non-CF pediatric disease patients with traditional clinical biomarkers such as CT scan scoring and cell counts.

Hill, D. B., et al. (2018). "The relative effects of concentration and ph on the biophysical properties of airway mucus and its clearance from the lung." Pediatric Pulmonology **53 (Supplement 2)**: 173.

Background: Currently, there are two competing hypotheses that seek to explain the underlying cause of abnormally viscous CF mucus. The first is that dehydration of the airway surface layer (ASL) as a result of defective CFTR-mediated chloride secretion coupled with sodium hyperabsorption results in a hyper-concentrated mucus layer; the second is that acidification of the ASL resulting from impaired bicarbonate secretion by CFTR increases mucus viscosity. This study evaluated the relative contributions of concentration and pH to the rheological properties of mucus to determine the dominant contributor to abnormal CF mucus rheology and mucus clearance. Method(s): Our study examined the effects of mucus concentration and pH in 1) commercially available mucins, 2) mucus harvested from normal and CF human bronchial epithelium (HBE) cell cultures, and 3) sputum from CF patients. Porcine gastric mucin (PGM) and bovine submaxillary mucin (BSM) was prepared at concentrations of 20 mg/mL and 50 mg/ mL and physiologically relevant pHs of 6, 7, and 8. Normal and CF HBE mucus was prepared at concentrations of 2% and 4% solids, mimicking healthy and pathological CF mucus. The buffer capacity of each solution was measured by titration with 100 mM hydrochloric acid. The

biophysical properties of each mucin/mucus specimen were measured across length scales that range from the nano to macroscopic by fluorescent recovery after photobleaching (FRAP), thermal microbead rheology (TMR), and macroscopic cone and plate rheology (C&PR) respectively. Finally, mucociliary transport (MCT) rates, mucus osmotic pressure, and pericilary layer (PCL) heights were measured on HBE cultures at healthy and pathological concentrations across a range of pHs from 6 to 8. Result(s): Mucins and mucus display a concentration-dependent buffer capacity, needing more protons added at higher mucus concentrations to achieve the same change in pH. TMR showed that concentration affects the diffusion of 1mum microspheres a factor of 10 ($p < 0.001$) across all specimen types while changing pH between 6 and 8 did not significantly affect the motion of tracer particles. Similar results were found in C&PR studies. FRAP studies showed both concentration and pH-dependent changes in the nanoscopic rheology of mucus. However, further studies on the non-mucin component (small protein) of sputum showed that the majority of the FRAP signal arises from small proteins, and not the large gel-forming mucins. Osmotic pressure was increased by mucus dehydration and not by pH. Like rheology, the PCL height and MCT rates were all significantly reduced by dehydration, while pH did not have a measurable effect. Conclusion(s): Concentration affects the biophysical properties of mucus across multiple length scales and model systems, while pH has a negligible effect across physiologically relevant scales of 6 - 8.

Hill, D. B., et al. (2010). "Force generation and dynamics of individual cilia under external loading." Biophysical Journal **98**(1): 57-66.

Motile cilia are unique multimotor systems that display coordination and periodicity while imparting forces to biological fluids. They play important roles in normal physiology, and ciliopathies are implicated in a growing number of human diseases. In this work we measure the response of individual human airway cilia to calibrated forces transmitted via spot-labeled magnetic microbeads. Cilia respond to applied forces by 1), a reduction in beat amplitude (up to an 85% reduction by 160-170 pN of force); 2), a decreased tip velocity proportionate to applied force; and 3), no significant change in beat frequency. Tip velocity reduction occurred in each beat direction, independently of the direction of applied force, indicating that the cilium is "driven" in both directions at all times. By applying a quasistatic force model, we deduce that axoneme stiffness is dominated by the rigidity of the microtubules, and that cilia can exert 62 +/- 18 pN of force at the tip via the generation of 5.6 +/- 1.6 pN/dynein head.

Hill, D. B., et al. (2015). "Defining successful mucus: Marrying biochemistry and biophysics." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **191**(MeetingAbstracts).

Rationale In human airways diseases, including cystic fibrosis (CF) and chronic obstructive pulmonary disease (COPD), host defense is compromised and airways inflammation and infection often result. Mucus clearance and trapping of inhaled pathogens constitute key elements of host defense. Clearance rates are governed by mucus viscous and elastic moduli at physiological driving frequencies, whereas transport of trapped pathogens in mucus layers is governed by diffusivity. There is a clear need for simple and effective clinical biomarkers of airways disease that correlate with these properties. Methods We tested the hypothesis that mucus solids concentration, indexed as weight percent solids (wt%), is such a biomarker. Passive microbead rheology was employed using 1micron diameter embedded tracer particles to determine both diffusive and viscoelastic properties of mucus harvested from human bronchial epithelial (HBE) cultures. The range of concentrations explored in these studies was guided by sputum from healthy (1.5-2.5 wt%) and diseased (COPD, CF; 5 wt%) subjects to represent disease progression and severity. Results Analyses of microbead datasets showed mucus diffusive properties and viscoelastic moduli scale robustly with wt%. Importantly, prominent changes in both biophysical properties arose at 4 wt%, consistent with a gel transition (from a more viscous- dominated solution to a more elastic-dominated gel). These findings have significant implications for: (1) penetration of cilia into the mucus layer and effectiveness of mucus transport; and (2) diffusion vs. immobilization of micro-scale particles relevant to mucus barrier properties. Conclusions These data provide compelling evidence for mucus solids concentration as a baseline clinical biomarker of mucus barrier and clearance functions.

Hill, D. B., et al. (2014). "A biophysical basis for mucus solids concentration as a candidate biomarker for airways disease." PLoS ONE [Electronic Resource] **9**(2): e87681.

In human airways diseases, including cystic fibrosis (CF) and chronic obstructive pulmonary disease (COPD), host defense is compromised and airways inflammation and infection often result. Mucus clearance and trapping of inhaled pathogens constitute key elements of host defense. Clearance rates are governed by mucus viscous and elastic moduli at physiological driving frequencies, whereas transport of trapped pathogens in mucus layers is governed by diffusivity. There is a clear need for simple and effective clinical biomarkers of airways disease that correlate with these properties. We tested the hypothesis that mucus solids concentration, indexed as weight percent solids (wt%), is such a biomarker. Passive microbead rheology was employed to determine both diffusive and viscoelastic properties of mucus harvested from human bronchial epithelial (HBE) cultures. Guided by sputum from healthy (1.5-2.5 wt%) and diseased (COPD, CF; 5 wt%) subjects, mucus samples were generated in vitro to mimic in vivo physiology, including intermediate range wt% to represent disease progression. Analyses of microbead datasets showed mucus diffusive properties and viscoelastic moduli scale robustly with wt%. Importantly, prominent changes in both biophysical properties arose at ~4 wt%, consistent with a gel transition (from a more viscous-dominated solution to a more elastic-dominated gel). These findings have significant implications for: (1) penetration of cilia into the mucus layer and effectiveness of mucus transport; and (2) diffusion vs. immobilization of micro-scale particles relevant to mucus barrier properties. These data provide compelling evidence for mucus solids concentration as a baseline clinical biomarker of mucus barrier and clearance functions.

Hilton, J. P. (2013). Microfluidic Selection and Applications of Aptamers.

BioMEMS technology has the potential to increase the efficiency of conventional biological and medical protocols, by reducing their consumption of time and resources. Through more efficient surface-based chemical reactions and automation of tedious manual processes, orders of magnitude increases in efficiency across a number of metrics can be achieved by shifting conventional medical and biological protocols to the microscale domain. The SELEX process, by which aptamer sequences are selected via isolation from randomized libraries, is a time-consuming and resource-intensive protocol which is being performed with increasing frequency in both academic and private sector laboratories. Conventional approaches using macroscale technology cannot meet the current demand for selection of new aptamer sequences, as they require months of work and liters of expensive reagents. Microscale approaches to the SELEX process have been receiving attention in recent years due to their initial successes in reducing the time and reagents necessary to find aptamers. In particular, microscale "selection" or partitioning of weakly bound sequences from aptamer candidates, and on-chip integration of the protocol have separately been explored as approaches to scaling and improving SELEX. Initial results have shown that this technology can reduce resource requirements for SELEX by at least an order of magnitude. In this dissertation, a new approach to on-chip SELEX is developed which integrates highly efficient microfluidic selection and on-chip integration of the entire protocol. As a result, further reductions in processing time and reagent requirements can be realized. A demonstration of aptamer capabilities is first achieved via the development of a microfluidic aptasensor for cocaine, which utilizes aptamer-coated microbeads and fluorescent detection. Secondly, a technology necessary for on-chip integration of SELEX is developed: a novel bead-based polymerase chain reaction (PCR) protocol which vastly simplifies procedures for the capture and resuspension of ssDNA in solution. This protocol is then integrated on-chip with bead-based partitioning of weakly bound sequences to develop a microchip which performs temperature-specific isolation of aptamer sequences from a randomized library. Finally, this approach is further developed into a microfluidic SELEX chip which is capable of performing multiple rounds of temperature-specific SELEX. The novel bead-based protocol is shown to efficiently isolate target-binding sequences from a random library in a fraction of the time previously reported. As a result, this research provides a schematic for the development of highly efficient, integrated microfluidic SELEX devices. Such devices have the potential to impact a variety of fields including medical diagnostics, drug detection, and aptamer-based therapeutics.

Hintersteiner, I., et al. (2015). "Characterization and quantitation of polyolefin microplastics in personal-care products using high-temperature gel-permeation chromatography." Analytical & Bioanalytical Chemistry **407**(4): 1253-1259.

In recent years, the development of reliable methods for the quantitation of microplastics in different samples, including evaluating the particles' adverse effects in the marine environment, has become a great concern. Because polyolefins are the most prevalent type of polymer in personal-care products containing microplastics, this study presents a novel approach for their quantitation. The method is suitable for aqueous and hydrocarbon-based products, and includes a rapid sample clean-up involving twofold density separation and a subsequent quantitation with high-temperature gel-permeation chromatography. In contrast with previous procedures, both errors caused by weighing after insufficient separation of plastics and matrix and time-consuming visual sorting are avoided. In addition to reliable quantitative results, in this investigation a comprehensive characterization of the polymer particles isolated from the product matrix, covering size, shape, molecular weight distribution and stabilization, is provided.

Hipfner, J. M., et al. (2018). "Two forage fishes as potential conduits for the vertical transfer of microfibres in Northeastern Pacific Ocean food webs." Environmental Pollution **239**: 215-222.

We assessed the potential role played by two vital Northeastern Pacific Ocean forage fishes, the Pacific sand lance (Ammodytes personatus) and Pacific herring (Clupea pallasii), as conduits for the vertical transfer of microfibres in food webs. We quantified the number of microfibres found in the stomachs of 734 sand lance and 205 herring that had been captured by an abundant seabird, the rhinoceros auklet (Cerorhinca monocerata). Sampling took place on six widely-dispersed breeding colonies in British Columbia, Canada, and Washington State, USA, over one to eight years. The North Pacific Ocean is a global hotspot for pollution, yet few sand lance (1.5%) or herring (2.0%) had ingested microfibres. In addition, there was no systematic relationship between the prevalence of microplastics in the fish stomachs vs. in waters around three of our study colonies (measured in an earlier study). Sampling at a single site (Protection Island, WA) in a single year (2016) yielded most (sand lance) or all (herring) of the microfibres recovered over the 30 colony-years of sampling involved in this study, yet no microfibres had been recovered there, in either species, in the previous year. We thus found no evidence that sand lance and herring currently act as major food-web conduits for microfibres along British Columbia's outer coast, nor that the local at-sea density of plastic necessarily determines how much plastic enters marine food webs via zooplanktivores. Extensive urban development around the Salish Sea probably explains the elevated microfibre loads in fishes collected on Protection Island, but we cannot account for the between-year variation. Nonetheless, the existence of such marked interannual variation indicates the importance of measuring year-to-year variation in microfibre pollution both at sea and in marine biota.

Hipfner, J. M., et al. (2017). "Low incidence of plastics in food loads delivered to nestlings by a zooplanktivorous seabird over a 21-year period." Marine Pollution Bulletin **121**(1/2): 320.

We quantified the amount of plastic found in food loads delivered to nestlings in Cassin's Auklet (Ptychoramphus aleuticus), a small, zooplanktivorous seabird, on Triangle Island, British Columbia, in 1996-2016. The density of plastic in surrounding waters is moderately high, yet few food loads contained any plastic (3 of 850), and none more than two pieces. That result accords well with previous observations on the other four North Pacific auklets (Aethia spp.), leading us to conclude that true auklets rarely transfer plastic to nestlings. However, many hatch-year Cassin's Auklets found dead in coastal British Columbia, Washington and Oregon during the mass mortality event of fall and winter 2014-15 had plastic in their ventriculi. We suggest that these plastic particles would have been obtained at sea after fledging, perhaps while the birds transited south through a region of high plastic density off the west coast of Vancouver Island, Washington and Oregon.

Hirakawa, K., et al. (2006). "Electrochemical immunoassay for vitellogenin based on sequential injection using antigen-immobilized magnetic microbeads." Analytical Sciences **22**(1): 81-86.

A rapid and sensitive immunoassay for the determination of vitellogenin (Vg) is described. The method involves a sequential injection analysis (SIA) system equipped with an amperometric detector and a neodymium magnet. Magnetic beads, onto which an antigen (Vg) was immobilized, were used as a solid support in an immunoassay. The introduction, trapping and release of magnetic beads in an immunoreaction cell were controlled by means of the neodymium magnet and by adjusting the flow of the carrier solution. The immunoassay was based on an indirect competitive immunoreaction of an alkaline phosphatase (ALP) labeled anti-Vg monoclonal antibody between the fraction of Vg immobilized on the magnetic beads and Vg in the sample solution. The immobilization of Vg on the beads involved coupling an amino group moiety of Vg with the magnetic beads after activation of a carboxylate moiety on the surface of magnetic beads that had been coated with a polylactate film. The Vg-immobilized magnetic beads were introduced and trapped in the immunoreaction cell equipped with the neodymium magnet; a Vg sample solution containing an ALP labeled anti-Vg antibody at a constant concentration and a p-aminophenyl phosphate (PAPP) solution were sequentially introduced into the immunoreaction cell. The product of the enzyme reaction of PAPP with ALP on the antibody, paminophenol, was transported to an amperometric detector, the applied voltage of which was set at +0.2 V vs. an Ag/AgCl reference electrode. A sigmoid calibration curve was obtained when the logarithm of the concentration of Vg was plotted against the peak current of the amperometric detector using various concentrations of standard Vg sample solutions (0-500 ppb). The time required for the analysis is less than 15 min.

Hirata-Koizumi, M., et al. (2009). "Disappearance of gender-related difference in the toxicity of benzotriazole ultraviolet absorber in juvenile rats." Congenital Anomalies **49**(4): 247-252.

2-(2'-hydroxy-3',5'-di-tert-butylphenyl)benzotriazole (HDBB) is an ultraviolet absorber used in plastic resin products, such as building materials and automobile components. In oral repeated dose toxicity studies using 5- or 6-week-old rats, this chemical induced hepatic histopathological changes, such as hypertrophy accompanied with eosinophilic granular changes and focal necrosis of hepatocytes, and male rats showed nearly 25 times higher susceptibility to the toxic effects than females. Castration at approximately 4 weeks of age markedly reduced the sex-related variation in HDBB toxicity, but some difference, less than five times, remained between male and female castrated rats. Following oral HDBB administration to male and female juvenile rats from postnatal days 4-21, such gender-related difference in toxic susceptibility was not detected; therefore, it is speculated that the determinants of susceptibility to HDBB toxicity are differentiated between sexes after weaning. In young rats given HDBB, there was no gender-related difference in plasma HDBB concentration, and no metabolites were detected in the plasma of either sex. HDBB induced lauric acid 12-hydroxylase activity in the liver and this change was more pronounced in males than in females. These findings indicate that HDBB could show hepatic peroxisome proliferation activity, and the difference in the susceptibility of male and female rats to this effect might lead to marked gender-related differences in toxicity.

Hirayama, T., et al. (2004). "Effects of heat exposure on nutrient digestibility, rumen contraction and hormone secretion of goats." Animal Science Journal **75**(3): 237-243.

The present study investigated the changes in nutrient digestibility, rumen fermentation, behaviour and hormone (growth hormone (GH), insulin and insulin-like growth factor-1 (IGF-1)) secretion of goats (three male goats) in a hot (H, 35+or-1.2 degrees C; relative humidity (RH), 80+or-7.2%; 13 days), thermoneutral (T, 20+or-0.6 degrees C; RH, 80+or-3.4%; 20 days), and in a thermoneutral environment accompanied by the same restricted diet as provided in the hot environment (TR, 20+or-0.6 degrees C; RH, 80+or-3.4%; 20 days). The following results were obtained: rectal temperature and water intake were higher in the H treatment than in the T or TR treatment while hay consumption was lower. Crude protein, neutral detergent fibre and acid detergent fibre digestibility were highest in H treatment. The concentrations of acetic acid and butyric acid in the rumen were also highest in the H treatment. The time spent during eating was also highest in the H treatment, followed in order by T then TR treatment. Ruminating time was lower in H treatment than in T or TR treatment and reposing time was highest in the TR treatment. When eating and ruminating, the amplitude values of the rumen contraction were lowest in the H treatment as was the frequency of rumen contraction. Excretion of plastic particles were faster in T and TR treatments than H treatment. Heat exposure was associated with lowered concentrations of total volatile fatty acids and acetic acid in the plasma. The plasma glucose concentration was highest in the T treatment, followed in order by the TR then H treatment. The H treatment had the lowest plasma GH concentration but with the highest plasma insulin. The IGF-1 concentration was highest in the H treatment, followed in order by T then TR treatment. It is concluded that heat exposure of goats decreased the feed intake and rumen contraction but increased digestibility. However, when goats in a thermoneutral environment received the same restricted feeding as they received in the hot environment, digestibility increased without a change in rumen contraction. Between H and TR treatments, the changes in digestibility are accomplished by coordinate changes in hormone secretion in order to maintain body homeostasis.

Hiskakis, M., et al. (2008). "Agricultural plastic waste mapping in Greece." Acta Horticulturae **801**(Vol 1): 351-358.

A detailed geographical mapping of the agricultural plastic use in Greece was conducted in the framework of a European project focusing in the areas of high concentration. Quantitative data and analysis of the agricultural plastic waste generation by category (films, bags etc), the geographical distribution, the compositional range and physical characteristics of the agricultural plastic waste per use, the temporal distribution of removal, the current agricultural plastic waste management practices and disposal methods available are presented. Reported information on the agricultural plastic use in Greece is sporadic and unreliable. Data from the Ministry of Agriculture and the Statistical Organization of Greece were combined with the information from the services of the prefectures, local agronomists and farmers, site visits and interviews with the sales departments of major producers and importers of agricultural plastics. The temporal distribution of the agricultural plastic waste generation within each zone is important for the logistics of the consolidation operation. The composition and physical characteristics of the agricultural plastic waste streams were mapped by category and by application. These characteristics may delimit some of the disposal options of the streams (i.e. recycling, energy recovery) and guide the consolidation methodology. This work represents the first systematic effort to completely map the agricultural plastic waste generation and consolidation in Greece. The structured information and the reliable data provided in this work are expected to stimulate the design of an optimized waste management system for the agricultural plastic wastes chain in Greece. It is also expected to facilitate the implementation of the labelling scheme to be developed in the framework of the European project Labelagriwaste.

Hitchcock, J. N. and S. M. Mitrovic (2019). "Microplastic pollution in estuaries across a gradient of human impact." Environmental Pollution **247**: 457-466.

Microplastic (MP) pollution is an emerging issue in aquatic sciences. Little comparative information currently exists about the problem in coastal systems exposed to different levels of human impact. Here we report a year-long study on the abundance of MP in the water column of three estuaries on the east-coast of Australia. The estuaries are subject to different scales of human impact; the Clyde estuary has little human modification, the Bega estuary has a small township and single wastewater treatment works discharging to its waters, and the Hunter estuary which has multiple townships, multiple wastewater treatment plants, and heavy industry. MP abundance followed an expected pattern with the lowest abundance in the low-impact Clyde estuary (98 part. m³), moderate levels of MP in the moderately impacted Bega estuary (246 part. m³), and high MP abundance in the highly impacted Hunter estuary (1032 part. m³). The majority of particles were <200mum and fragment-like rather than fiber-like. MP abundance was positively related to maximum antecedent rainfall in the Bega estuary, however there are no clear environmental factors that could explain MP variation in the other systems. MP were generally higher in summer and following freshwater inflow events. On the Hunter estuary MP abundance was at times as high as zooplankton abundance, and within the range of numbers reported in other highly impacted systems globally. The results confirm that higher levels of human impact lead to greater plastic pollution and highlight the need to examine aquatic ecosystems under a range of conditions in order to adequately characterize the extent of MP pollution in rivers and coastal systems.

Hitchings, L. (2014). "Plastic crackdown." New Scientist **222**(2975): 7-7.

The article reports on the ban of cosmetics that contain plastic microbeads that has been implemented in Illinois in an effort to reduce pollution in the state.

Ho, H. O., et al. (1994). "Fibrin-based drug delivery systems. II: The preparation and characterization of

microbeads." Drug Development and Industrial Pharmacy **20**(4): 535-546.
An emulsion method was employed to prepare fibrin beads having different sizes in this study. The oil phase of emulsion system was consisted of mineral oil with various amount of oleic acid as surfactant. Fibrin was converted from fibrinogen with thrombin in Tris buffer solution, then the mixture was emulsified into the oil phase forming droplets. After curing for one hour, 400 ul of glutaraldehyde solution (0.5% v/v) was added to minimize coagulation. The recovery of fibrin beads was simply done by decanting the oil phase and washing the residual with diethyl ether once and then with a mixture of isopropanol and n-hexane (1:3) containing 0.2% w/v Tween 80 twice. As expected, increasing the amount of oleic acid in the oil phase decreased the size of fibrin beads. It is due to the decrease of interfacial tension with increasing oleic acid amount. The presence of macromolecules showed no interference on the formation of fibrin beads except lysozyme. The diffusion characteristics of fibrin beads was evaluated using macromolecules of different molecular weight as model. The size of fibrin beads affected the penetration rate, whereas the effect of molecular weight of macromolecules was inconclusive. An exponential equation was able to approximate the penetration of macromolecules into fibrin beads during the late-time period. The possibility of using fibrin beads as the carrier to deliver protein drugs was appreciated.

Ho, L. T. and P. L. M. Goethals (2019). "Opportunities and challenges for the sustainability of lakes and reservoirs in relation to the Sustainable Development Goals (SDGs)." Water **11**(7).
Emerging global threats, such as biological invasions, climate change, land use intensification, and water depletion, endanger the sustainable future of lakes and reservoirs. To deal with these threats, a multidimensional view on the protection and exploitation of lakes and reservoirs is needed. The holistic approach needs to contain not just the development of economy and society but also take into account the negative impacts of this growth on the environment, from that, the balance between the three dimensions can be sustained to reach a sustainable future. As such, this paper provides a comprehensive review on future opportunities and challenges for the sustainable development of lakes and reservoirs via a critical analysis on their contribution to individual and subsets of the Sustainable Development Goals (SDGs). Currently, lakes and reservoirs are key freshwater resources. They play crucial roles in human societies for drinking water provision, food production (via fisheries, aquaculture, and the irrigation of agricultural lands), recreation, energy provision (via hydropower dams), wastewater treatment, and flood and drought control. Because of the (mostly) recent intensive exploitations, many lakes and reservoirs are severely deteriorated. In recent years, physical (habitat) degradation has become very important while eutrophication remains the main issue for many lakes and ponds worldwide. Besides constant threats from anthropogenic activities, such as urbanization, industry, aquaculture, and watercourse alterations, climate change and emerging contaminants, such as microplastics and antimicrobial resistance, can generate a global problem for the sustainability of lakes and reservoirs. In relation to the SDGs, the actions for achieving the sustainability of lakes and reservoirs have positive links with the SDGs related to environmental dimensions (Goals 6, 13, 14, and 15) as they are mutually reinforcing each other. On the other hand, these actions have direct potential conflicts with the SDGs related to social and economic dimensions (Goals 1, 2, 3 and 8). From these interlinkages, we propose 22 indicators that can be used by decision makers for monitoring and assessing the sustainable development of lakes and reservoirs.

Ho, S., et al. (2006). "Study of recycled polyethylene materials as asphalt modifiers." Canadian Journal of Civil Engineering **33**(8): 968-981.

There has been interest in modifying asphalt with polyethylene materials, which are a major plastic waste substance, especially low-density polyethylene (LDPE). In this study, combinations of three low molecular weight polyethylene (PE) wax materials and three recycled LDPE materials were used as asphalt modifiers. The modified asphalts were studied using the SuperpaveTM MP1 and MP1a specifications, 1% direct tension test (DTT) failure strain criteria, phase separation, and microscopy. When the molecular weight distribution of the polyethylene modifiers was widened, the bending beam rheometer thermal stress curve of the modified asphalt shifted to the low-temperature end, giving a better critical cracking temperature. Not all recycled LDPE are the same. When using recycled LDPE in asphalt modification, we have to consider the LDPE properties, such as molecular weight and molecular weight distribution, which have been found to play important roles in asphalt's low-temperature properties, hot storage stability, and polymer phase distribution. This study showed that LDPE with lower molecular weight and wider molecular weight distribution are more suitable materials for asphalt modification, compared with high molecular weight LDPE with very narrow molecular weight distribution. (English) [ABSTRACT FROM AUTHOR]

Il se développe un intérêt envers la modification de l'asphalte par des polyéthylènes, des déchets de plastiques importants, surtout le polyéthylène à faible densité (LDPE). Dans la présente étude, des combinaisons de trois composés de cire de polyéthylène (PE) de faible poids moléculaire et de trois matériaux en LDPE recyclés ont été utilisées comme agents modificateurs de l'asphalte. Les asphaltes modifiés ont été étudiés selon les spécifications MP1 et MP1a SuperpaveTM, des critères de contrainte de défaillance par essai en traction pure (DTT) de 1 %, la séparation des phases et la microscopie. Lorsque la répartition des poids moléculaires des agents modificateurs du polyéthylène a été élargie, la courbe de contrainte thermique du rhéomètre de flexion de poutre Bending Beam Rheometer de l'asphalte modifié s'est déplacée vers l'extrémité de basse température, donnant une meilleure température critique de fissuration. Les LDPE recyclés ne sont pas tous les mêmes. Lors de l'utilisation de LDPE recyclés dans l'asphalte modifié, nous avons dû tenir compte des propriétés des LDPE telles que le poids moléculaire et la répartition du poids moléculaire, ce qui s'est avéré jouer un rôle important dans les propriétés de l'asphalte à basse température, la stabilité d'entreposage à chaud et la répartition des phases du polymère. La présente étude montre que les LDPE ayant un poids moléculaire plus faible et une répartition plus large du poids moléculaire sont de meilleurs matériaux pour la modification de l'asphalte par rapport aux LDPE de poids moléculaire plus élevé ayant une répartition très étroite du poids moléculaire.Mots clés : superpave, LDPE, polyéthylène, asphalte, recyclé, rhéomètre à flexion de poutre (« bending beam rheometer (BBR) »), essais en traction pure, répartition des poids moléculaires, régalage à basse température.[Traduit par la Rédaction] (French) [ABSTRACT FROM AUTHOR]

Ho, W. K. and K. S. Leung (2019). "Sorption and desorption of organic UV filters onto microplastics in single and multi-solute systems." Environmental Pollution **254**(Pt B): 113066.

Sorption studies of organic pollutants by microplastics (MPs) in single-solute systems are well established in the literature. However, actual aquatic environments always contain a mixture of contaminants. Prediction of the fate and biological effects of MPs-mediated chemical exposure

requires a better understanding of sorption-desorption processes of multiple organic contaminants by MPs. In this study, the altered sorption and desorption behaviors of individual organic UV filters (BP-3 and 4-MBC) in the presence of cosolutes (BP-3, 4-MBC, EHMC and OC) on two types of MPs (LDPE and PS) were examined. In most cases, co-occurrence of other organic UV filters appeared to have an antagonistic effect on the sorption of primary solute, which was consistent with trends found in previous studies. Nevertheless, the sorption uptake of 4-MBC as primary solute on PS was enhanced in the presence of cosolute(s), arising presumably from solute multilayer formation caused by laterally attractive pi-pi interactions between adsorbed cosolute(s) and 4-MBC molecules. Such formation of multilayer sorption in multi-solute systems depends on the solute hydrophobicity and concentration as well as inherent sorptivity of MPs. Our further desorption experiments revealed that the bioaccessibility of primary solute was significantly elevated with cosolutes, even though competitive sorption was observed under the same experimental conditions. These findings supplement the current knowledge on sorption mechanisms and interactions of multiple organic contaminants on MPs, which are critical for a comprehensive environmental risk assessment of both MPs and hazardous anthropogenic contaminants in natural environments.

Hoai, N. T., et al. (2010). "Batch and column separation characteristics of copper-imprinted porous polymer micro-beads synthesized by a direct imprinting method." Journal of Hazardous Materials **173**(1-3): 462-467.

Copper (II) ion-imprinted porous polymethacrylate micro-particles were prepared. Two functional monomers, methacrylic acid and vinyl pyridine, formed a complex with the template copper ion through ionic interactions. The self-assembled copper/monomer complex was polymerized in the presence of an ethylene glycol dimethacrylate cross-linker by a suspension method. After the imprinting sites were provided through removal of the template, the micro-porous particles, of approximate size 200 microm, were obtained for batch and column separation applications. The chemical structure and morphology of the Cu(II)-imprinted micro-porous particles were analyzed using FTIR, SEM, and BET. The adsorption capacity and adsorption kinetics of the imprinted beads for the template Cu(II) ion were significantly affected by particle size, copper ion concentration, pH, and flow rate of the feed solution. The imprinted particles showed high selectivity for the copper ion over other metal ions such as Ni and Zn. The selectivity of the present imprinted polymers for the copper ion was at least 10 times as high as those from commercial sources.

Hoang, T. C. and M. Felix-Kim (2020). "Microplastic consumption and excretion by fathead minnows (Pimephales promelas): Influence of particles size and body shape of fish." Science of the Total Environment **704**: 135433.

The present study characterizes the dependence of microplastic consumption and excretion on particle size and body shape of fathead minnow (Pimephales promelas) over time that has not been studied. Specifically, the study is to answer four important questions: 1) how do P. promelas consume microplastic particles at different size ranges over time? 2) how long does it take for P. promelas to excrete microplastic particles after consumption? 3) do P. promelas reconsume microplastic particles after excretion? 4) are microplastic consumption and excretion by P. promelas dependent on the body shape? To answer these questions, larval P. promelas were exposed to polyethylene microbeads (PMBs) at two different consumable size ranges of 63-75 micro m and 125-150 micro m in moderately hard water. The experiments were designed to allow and to not allow fish to reconsume the particles they excreted.

Hodge, S., et al. (2003). "Alveolar macrophages from subjects with chronic obstructive pulmonary disease are deficient in their ability to phagocytose apoptotic airway epithelial cells." Immunology & Cell Biology **81**(4): 289-296.

Chronic obstructive pulmonary disease is a highly prevalent, complex disease, usually caused by cigarette smoke. It causes serious morbidity and mortality and costs the global community billions of dollars per year. While chronic inflammation, extracellular matrix destruction and increased airway epithelial cell apoptosis are reported in chronic obstructive pulmonary disease, the understanding of the basic pathogenesis of the disease is limited and there are no effective treatments. We hypothesized that the accumulation of apoptotic airway epithelial cells chronic obstructive pulmonary disease in could be due to defective phagocytic clearance by alveolar macrophages. There have been no previous studies of the phagocytic capacity of alveolar macrophages in chronic obstructive pulmonary disease using physiologically relevant apoptotic airway epithelial cells as phagocytic targets. We developed a phagocytosis assay whereby cultured 16HBE airway epithelial cells were induced to apoptosis with ultraviolet radiation and stained with mitotracker green. Alveolar macrophages from bronchoalveolar lavage from eight control and six chronic obstructive pulmonary disease subjects were analysed following 1.5 h incubation with apoptotic airway epithelial cells, then staining with macrophage marker anti CD33. CD33+/mitotracker green + events (i.e., alveolar macrophages which had phagocytosed apoptotic airway epithelial cells) were analysed using flow cytometry. Phagocytosis of polystyrene microbeads was investigated in parallel. A significantly reduced proportion of alveolar macrophages from chronic obstructive pulmonary disease subjects ingested apoptotic airway epithelial cells compared with controls (11.6 +/- 4.1% for chronic obstructive pulmonary disease versus 25.6 +/- 9.2% for control group). Importantly, the deficiency was not observed using polystyrene beads, suggesting that the failure to resolve epithelial damage in chronic obstructive pulmonary disease may result, at least partially, from specific defects in phagocytic ability of alveolar macrophages to ingest apoptotic airway epithelial cells.

Hodgson, D. J., et al. (2018). "Ingestion and fragmentation of plastic carrier bags by the amphipod Orchestia gammarellus: effects of plastic type and fouling load." Marine Pollution Bulletin **127**: 154-159.

Inappropriate disposal of plastic debris has led to the contamination of marine habitats worldwide. This debris can be ingested by organisms; however, the extent to which chewing and gut transit modifies plastic debris is unclear. Detritivores, such as amphipods, ingest and shred natural organic matter and are fundamental to its breakdown. Here we examine ingestion and shredding of plastic carrier bags by Orchestia gammarellus. A laboratory experiment showed these amphipods shredded plastic carrier bags, generating numerous microplastic fragments (average diameter 488.59 micro m). The presence of a biofilm significantly increased the amount of shredding, but plastic type (conventional, degradable and biodegradable) had no effect. Subsequent field observations confirmed similar shredding occurred on the strandline. Rates of shredding will vary according to amphipod density; however, our data indicates that shredding by organisms could substantially accelerate the formation microplastics in the environment.

Hodson, M. E., et al. (2017). "Plastic bag derived-microplastics as a vector for metal exposure in terrestrial invertebrates." Environmental Science & Technology **51**(8): 4714-4721.

Microplastics are widespread contaminants in terrestrial environments but comparatively little is known about interactions between microplastics and common terrestrial contaminants such as zinc (Zn). In adsorption experiments fragmented HDPE bags c. one mm² in size showed similar sorption characteristics to soil. However, when present in combination with soil, concentrations of adsorbed Zn on a per mass basis were over an order of magnitude lower on microplastics. Desorption of the Zn was minimal from both microplastics and soil in synthetic soil solution (0.01 M CaCl₂), but in synthetic earthworm guts desorption was higher from microplastics (40-60%) than soil (2-15%), suggesting microplastics could increase Zn bioavailability. Individual Lumbricus terrestris earthworms exposed for 28 days in mesocosms of 260 g moist soil containing 0.35 wt% of Zn-bearing microplastic (236-4505 mg kg⁻¹) ingested the microplastics, but there was no evidence of Zn accumulation, mortality, or weight change. Digestion of the earthworms showed that they did not retain microplastics in their gut. These findings indicate that microplastics could act as vectors to increase metal exposure in earthworms, but that the associated risk is unlikely to be significant for essential metals such as Zn that are well regulated by metabolic processes.

Hoellein, T. J., et al. (2017). "Longitudinal patterns of microplastic concentration and bacterial assemblages in surface and benthic habitats of an urban river." Freshwater Science **36**(3): 491-507.

Rivers are a major source of microplastic particles (<5 mm) to oceans, but empirical measurements of microplastic movement in freshwater ecosystems are rare. The hard, buoyant surface of microplastic is a novel habitat that selects for unique microbial assemblages in rivers, especially downstream of wastewater treatment plant (WWTP) point sources. We measured microplastic in surface water and benthic habitats 50 m upstream and 50, 305, 1115, and 1900 m downstream of the effluent outfall from a large WWTP in an urban river. We used high-throughput sequencing to measure bacterial assemblages on microplastic from surface and benthic habitats and compared them to bacterial assemblages from seston, water, and sediment. Concentrations of total microplastic and microplastic types (fragment, pellet) in surface water did not change with distance downstream of the WWTP. Thus, microplastic transport showed no net deposition or resuspension. Microplastic concentrations were much higher in the benthic zone than surface water. Benthic deposition appears to be a plastic sink over longer time scales, but subsequent studies are needed to resolve microplastic transport dynamics by particle type, size, and habitat. Composition of microplastic-attached bacterial assemblages differed from that of assemblages in water, seston, and sediment and supports domestic wastewater as a point source of microplastic (e.g., gastrointestinal taxa). Shifts in microplastic assemblages with distance from the WWTP suggest succession toward a 'stream-like' bacterial assemblage. Future studies are required to quantify the metabolic capacity of microplastic-associated bacteria. Estimates of transport distance, microplastic storage, and microbial interactions are critical to include lotic ecosystems in accountings of global plastic budgets.

Hohmann-Jeddi, C. (2019). "Microplastics in drinking water: WHO calls for more research on risks. [German]." Pharmazeutische Zeitung **164**(35): 46.

Holland, E. R., et al. (2016). "Plastics and other anthropogenic debris in freshwater birds from Canada." Science of the Total Environment **571**: 251-258.

Plastics in marine environments are a global environmental issue. Plastic ingestion is associated with a variety of deleterious health effects in marine wildlife, and is a focus of much international research and monitoring. However, little research has focused on ramifications of plastic debris for freshwater organisms, despite marine and freshwater environments often having comparable plastic concentrations. We quantified plastic and other anthropogenic debris in 350 individuals of 17 freshwater and one marine bird species collected across Canada. We determined freshwater birds' anthropogenic debris ingestion rates to be 11.1% across all species studied. This work establishes that plastics and other anthropogenic debris are a genuine concern for management of the health of freshwater ecosystems, and provides a baseline for the prevalence of plastic and other anthropogenic debris ingestion in freshwater birds in Canada, with relevance for many other locations. Copyright © 2016 Elsevier B.V.

Holland, T. (2009). "Market Watch." Materials Recycling Week **194**(14): 35-38.
The article offers information on the materials markets in Great Britain. The world's lightest screwcap wine bottle is expected to be available for Christmas by the lightweight glass project GlassRite, which is led by the Waste and Resources Action Pogramme (WRAP). The WRAP-funded scheme, which subsidised composting bins for local authorities, has ended in September 2009 because many authorities are already doing the action for themselves. The Recoup organization which advocates plastic recycling, released its annual report on plastics packaging collection, exposing that 40% of plastic bottles were collected for recycling in 2008.

Holland, T. (2011). "Party time heralds bumper volumes." Materials Recycling Week **197**(17): 10-10.
The article reports that as of May 2011, recyclers in England are expecting a windfall of extra material to work with. It states that in light of more drinking due to the hot weather, extra banking holidays, as well as celebrations to honor the Royal Wedding, more waste was produced. It is expected therefore, that more aluminum, plastic and glass will be collected for reprocessing, a change from February when waste material becomes scarce. Some claim to have seen an increase in waste by as much as 50%, considered a good sign for the industry.

Holloway, J., et al. (2003). "Assessment of white blood cell phagocytosis as an immunological indicator of methylmercury exposure in birds." Archives of Environmental Contamination and Toxicology **44**(4): 493-501.
White blood cell (WBC) phagocytosis was investigated as a potential immunological indicator of methylmercury (MeHg) exposure in birds. The assay was first assessed using chicken WBCs dosed with MeHg in vitro either in whole blood or as isolated cells and later using blood of wild common loons exposed in vivo to a range of dietary MeHg and having a range of blood-Hg concentrations. Whole blood and isolated WBCs from captive chickens were exposed to a range of MeHg concentrations for 3 h. After MeHg exposure, cells were incubated with fluorescent latex microbeads (diameter=1.75 micro m), fixed, and analyzed for size, complexity, and fluorescent intensity by flow cytometry. MeHg significantly depressed phagocytic activity when added to isolated WBCs at concentrations >0.01 micro g/ml, but not when added to whole blood up to 50 micro g/ml. Similarly, no significant relationship between the concentration of Hg in whole blood and phagocytic capacity of WBCs in free-living loons was observed. Our results suggest that the phagocytosis assay, although rapid and convenient for use in field studies with wildlife species, is not a responsive immunological indicator of MeHg exposure at environmentally realistic concentrations of blood-Hg in wild loons. Assays that measure other immunologic endpoints (e.g., bacterial killing assay, PHA skin test, and mitogen-induced lymphocyte proliferation) should be assessed with respect to their ability to detect MeHg immunotoxicity in wild birds.

Holmes, C. M., et al. (2020). "A National-Scale Framework for Visualizing Riverine Concentrations of Microplastics Released from Municipal Wastewater Treatment Incorporating Generalized Instream Losses." Environmental Toxicology & Chemistry **39**(1): 210-219.
Down-the-drain exposure models provide a valuable tool for estimating environmental exposure to substances which are treated and discharged by municipal wastewater-treatment plants

(WWTPs). Microplastics may enter WWTPs from consumer activities and disposal. An exposure framework was developed using the iSTREEM R model, which estimates spatially explicit concentrations of substances in riverine systems across the United States and portions of Ontario, Canada. One hundred simulations covering a range of WWTP removal and instream loss rates (proxy for net sedimentation) were incorporated into a Web-based visualization tool for user exploration of relative concentrations across simulations. Surface water concentrations specific to user-supplied tonnage were examined via interactive heat maps and cumulative distributions. Exploring the spatial aspect of iSTREEM results showed that modeling 90% WWTP removal and no instream loss resulted in 8.5% of the mass entering WWTPs discharged to marine estuaries (7.4%) or Great Lakes (1.1%) environments, with the remainder of the mass discharged (1.5%) in inland sinks or exiting the United States via rivers. Modeling an example instream loss of k = 0.1 d⁻¹ (i.e., half-life = 7 d), terminal river segments contained 3.3% of influent mass (2.3% marine estuaries, 1.0% Great Lakes). Varying instream loss rates had substantial impacts on the total mass exported. The Web-based tool provided a user-based mechanism to visualize relative freshwater concentrations of microplastics across a large geographic area by varying simplified particle fate assumptions. Environ Toxicol Chem 2019;39:210-219. © 2019 SETAC.

Holmes, C. M., et al. (2020). "A National-Scale Framework for Visualizing Riverine Concentrations of Microplastics Released from Municipal Wastewater Treatment Incorporating Generalized Instream Losses." Environmental Toxicology & Chemistry **39**(1): 210-219.

Down-the-drain exposure models provide a valuable tool for estimating environmental exposure to substances which are treated and discharged by municipal wastewater-treatment plants (WWTPs). Microplastics may enter WWTPs from consumer activities and disposal. An exposure framework was developed using the iSTREEM® model, which estimates spatially explicit concentrations of substances in riverine systems across the United States and portions of Ontario, Canada. One hundred simulations covering a range of WWTP removal and instream loss rates (proxy for net sedimentation) were incorporated into a Web-based visualization tool for user exploration of relative concentrations across simulations. Surface water concentrations specific to user-supplied tonnage were examined via interactive heat maps and cumulative distributions. Exploring the spatial aspect of iSTREEM results showed that modeling 90% WWTP removal and no instream loss resulted in 8.5% of the mass entering WWTPs discharged to marine estuaries (7.4%) or Great Lakes (1.1%) environments, with the remainder of the mass discharged (1.5%) in inland sinks or exiting the United States via rivers. Modeling an example instream loss of k = 0.1 d–1 (i.e., half-life = 7 d), terminal river segments contained 3.3% of influent mass (2.3% marine estuaries, 1.0% Great Lakes). Varying instream loss rates had substantial impacts on the total mass exported. The Web-based tool provided a user-based mechanism to visualize relative freshwater concentrations of microplastics across a large geographic area by varying simplified particle fate assumptions. Environ Toxicol Chem 2019;39:210–219. © 2019 SETAC [ABSTRACT FROM AUTHOR]

Holmes, L. A., et al. (2012). "Adsorption of trace metals to plastic resin pellets in the marine environment." Environmental Pollution **160**(1): 42-48.

Plastic production pellets collected from beaches of south west England contain variable concentrations of trace metals (Cr, Co, Ni, Cu, Zn, Cd and Pb) that, in some cases, exceed concentrations reported for local estuarine sediments. The rates and mechanisms by which metals associate with virgin and beached polyethylene pellets were studied by adding a cocktail of 5 mug L ⁻¹ of trace metals to 10 g L⁻¹ pellet suspensions in filtered seawater. Kinetic profiles were modelled using a pseudo-first-order equation and yielded response times of less than about 100 h and equilibrium partition coefficients of up to about 225 ml g⁻¹ that were consistently higher for beached pellets than virgin pellets. Adsorption isotherms conformed to both the Langmuir and Freundlich equations and adsorption capacities were greater for beached pellets than for virgin pellets. Results suggest that plastics may represent an important vehicle for the transport of metals in the marine environment. © 2011 Elsevier Ltd. All rights reserved.

Holt, N. and S. Sanjay (2016). "Transforming the plasticulture production system through novel bed geometry design." Transactions of the ASABE **59**(3): 993-1003.

Raised-bed plasticulture with drip irrigation is used worldwide for growing high-value crops, especially vegetables. This high-input, intensive system must become more efficient to meet food demands while reducing its environmental footprint. Futuristic tall and narrow compact beds were designed with an aim to improve the plasticulture system by increasing or maintaining yield while decreasing system input requirements. Using a whole-systems approach, compact geometries were evaluated on an example crop, eggplant (L.), in the ecologically sensitive but highly productive sub-tropical Everglades region of Florida. Two compact beds, 61 cm (width) x25 cm (height) and 45 cm x 30 cm, were evaluated against a conventional short and wide bed, 91 cm x 15 cm. The conventional bed used two drip tapes for irrigation and fertigation. The compact beds needed only one tape but produced equivalent yields as the conventional bed. Irrigation, nitrogen, and phosphorus application rates were respectively reduced by 50%, 14%, and 19% in the compact beds. Water and nutrient productivities with the compact beds increased by at least $43 per 10 kL irrigation, $6 per kg nitrogen, and $8 per kg phosphorus applied, representing respective gains of 92%, 11%, and 8% over the conventional bed. Productivity increases highlight how compact beds can make plasticulture more efficient. Shifting to compact beds also brings non-water co-benefits, including reductions in the system's production costs by $560 to $670 ha⁻¹, carbon footprint by 5% to 10% (reduced fumigant and plastic usage), agricultural plastic waste, and potential detrimental impacts from changed climate. Compact beds provide flood and disease protection by decreasing impervious (mulched) surface area and having extra bed height above the ground. Use of compact beds at the study farm would decrease rainfall intensity in the row middles by 34% and increase the farm's soil water storage capacity by 52% (1.4 cm). Increased storage and infiltration of rainfall will decrease flooding frequency and runoff volume, thereby reducing peak flows in downstream environments. Compact beds also have an added economic benefit for farmers who pay to lease land, as production can be increased through a higher plant population density without changing total mulched surface area. A cultural shift to taller and narrower compact beds makes plasticulture more sustainable as water, nutrient, cost, and energy inputs are reduced without sacrificing yields. Compact beds provide the impetus to transform plasticulture to a futuristic, further-optimized system that is more automated (e.g., chemigation), less labor intensive, and better adapted to climate change for continued economic and environmental viability.

Holt, N., et al. (2017). "Transforming the food-water-energy-land-economic nexus of plasticulture production through compact bed geometries. (Special Section: The challenge of understanding the water-food nexus complexity.)." Advances in Water Resources **110**: 515-527.

Raised-bed plasticulture, an intensive production system used around the world for growing high-value crops (e.g., fresh market vegetables), faces a water-food nexus that is actually a food-water-energy-land-economic nexus. Plasticulture represents a multibillion dollar facet of the United States crop production value annually and must become more efficient to be able to produce more on less land, reduce water demands, decrease impacts on surrounding environments, and be economically-competitive. Taller and narrower futuristic beds were designed with the goal of making plasticulture more sustainable by reducing input requirements and associated wastes (e.g., water, nutrients, pesticides, costs, plastics, energy), facilitating usage of modern technologies (e.g., drip-based fumigation), improving adaptability to a changing climate (e.g., flood protection), and increasing yield per unit area. Compact low-input beds were analyzed against conventional beds for the plasticulture production of tomato (Solanum lycopersicum), an economically-important crop, using a systems approach involving field measurements, vadose-zone modeling (HYDRUS), and production analysis. Three compact bed geometries, 61 cm (width) x25 cm (height), 45 cm x30 cm, 41 cm x30 cm, were designed and evaluated against a conventional 76 cm x20 cm bed. A two-season field study was conducted for tomato in the ecologically-sensitive and productive Everglades region of Florida. Compact beds did not statistically impact yield and were found to reduce: (1) production costs by $150-$450/ha; (2) leaching losses by up to 5% (1 cm/ha water, 0.33 kg/ha total nitrogen, 0.05 kg/ha total phosphorus); (3) fumigant by up to 47% (48 kg/ha); (4) plasticulture's carbon footprint by up to 10% (1711 kg CO₂-eq/ha) and plastic waste stream by up to 13% (27 kg/ha); (5) flood risks and disease pressure by increasing field's soil water storage capacity by up to 33% (~1 cm); and (6) field runoff by 0.48-1.40 cm (51-76%) based on HYDRUS model simulations of 10-year, 2-h storm events in other major tomato production regions of California and Virginia. Re-designing the bed geometries in plasticulture production systems to be more compact is an example of win-win production optimization not only for traditional farms in rural areas but also for urban and peri-urban farms which are located closer to city centers. Compact beds could enable more plants per unit area, thus requiring less land area for the same production. Needing less area facilitates urban and peri-urban farming where land values can be high. Urban and peri-urban farming has several benefits, including reductions in transportation energy as production is closer to market and the ability for city wastewater to be reused for irrigation instead of freshwater withdrawals. Compact beds allow plasticulture to have smaller water, chemical, energy, carbon, waste, and economic footprints without impacting production. Improving agricultural systems in this way could enhance economic and environmental viability, which is essential for a sustainable food-water-energy-land-economic nexus.

Holt, N., et al. (2017). "Transforming the food-water-energy-land-economic nexus of plasticulture production through compact bed geometries." Advances in Water Resources **110**: 515.

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Homsy, A., et al. (2007). "Magnetohydrodynamic pumping in nuclear magnetic resonance environments." Sensors and Actuators B: Chemical **123**(1): 636-646.

We present a DC magnetohydrodynamic (MHD) pump as component of a nuclear magnetic resonance (NMR) microfluidic chip. This is the first time that MHD pumping in an NMR environment was observed and demonstrated. This chip generates a maximum flow rate of 1.5kLmin super(-) super(1) (2.8mms super(-) super(1) in the microchannel) for an applied voltage of 19V with only 38mW of power consumption in a 7T superconductive magnet. We developed a simple method of flow rate measurement inside the bulky NMR magnet by monitoring the displacement of a liquid-liquid interface of two immiscible liquids in an off-chip capillary. We compared and validated this flow measurement technique with another established technique for microfluidics based on the displacement of microbeads. This allowed us to characterize and compare the flow rate generated by the micropump on top of a permanent magnet (B sub(1)=0.33T) with the superconductive magnet (B sub(0)=7.05T). We observed a 21-fold increase in flow rate corresponding to the ratio of the magnetic field intensities (B sub(0)/B sub(1)=21) in accordance with the theoretical flow dependence on the magnetic field intensity. The final aim is to integrate MHD pumps together with planar coils in a microfluidic system for NMR analysis. The high performance of MHD pumps at relatively low flow rates is seen as an asset for NMR and MRI applications.

Homsy, E., et al. (2019). "Characterization of microparticle Gasdermin-D in patients in the medical intensive care unit." American Journal of Respiratory and Critical Care Medicine. Conference **199**(9).

Rationale: The inflammasome is a multimeric complex that is responsible for the activation of protein mediators of inflammation. Gasdermin-D (GSDM-D) is a protein with membrane pore forming properties that assists with intercellular transference of the inflammasome by microparticle vectors. In vitro studies have shown that activated caspase-1 cleaves inactive p52 GSDM-D into its active p30 subunit which then encapsulates both proteins into microparticles. These microparticles are then able to induce pyroptosis in healthy cells¹. We therefore hypothesized that GSDM-D plays an important role in sepsis and ARDS among other inflammatory conditions, and sought to better characterize GSDM-D in the much more complicated clinical setting. Method(s): Thirty seven patients were enrolled. Day 1 blood samples were drawn from the patients early into their admission to the medical intensive care unit. Eight healthy volunteers were also enrolled to serve as controls. Microparticles were isolated by ultracentrifugation. Monocytes were isolated using CD14 coated microbeads. Active and inactive forms of GSDM-D were analyzed in both fractions using immunoblot. Quantification was carried out using densitometry with ImageJ software. Researchers were kept blinded to patients' clinical conditions. Diagnoses and markers of severity of illness were collected and correlated with active GSDM-D values. Result(s): Active GSDM-D was detected in the microparticle and monocyte lysates and there was notable heterogeneity in band signal. Inactive p52 GSDM-D was detected only in the cell lysates. Only septic patients had elevated active GSDM-D levels in the microparticle fraction. Conversely, active GSDM-D levels in the monocyte fractions were lower in the septic patients compared to the non-septic critically ill patients. This suggests that there is release of active GSDM-D from monocytes in the inflammatory state. There were too few cases of ARDS in the cohort to make any generalizations. Conclusion(s): Our finding of elevated active GSDM-D levels only in the microparticle fraction of septic patients supports the hypothesis that GSDM-D plays an important role in sepsis. Our data also supports the hypothesis that active GSDM-D is formed in stimulated monocytes and then packaged into microparticles leading to its depletion in the cell lysates.

Hong, C. S., et al. (2014). "Isolation and characterization of CD34+ blast-derived exosomes in acute myeloid leukemia." PLoS ONE [Electronic Resource] **9**(8): e103310.

Exosomes are membrane-bound vesicles found in all biological fluids. AML patients' plasma collected at diagnosis contains elevated exosome levels relative to normal donor (ND) plasma. The molecular profile of AML exosomes changes in the course of therapy and may serve as a measure of disease progression or response to therapy. However, plasma contains a mix of exosomes derived from various cell types. To be able to utilize blast-derived exosomes as biomarkers for AML, we have developed an immunoaffinity-based capture method utilizing magnetic microbeads coated with anti-CD34 antibody (Ab). This Ab is specific for CD34, a unique marker of AML blasts. The capture procedure was developed using CD34+ exosomes derived from Kasumi-1 AML cell culture supernatants. The capture capacity of CD34microbeads was shown to linearly correlate with the input exosomes. A 10 uL aliquot of CD34 microbeads was able to capture all of CD34+ exosomes present in 100-1,000 uL of AML plasma. The levels of immunocaptured CD34+ exosomes correlated with the percentages of CD34+ blasts in the AML patients' peripheral blood. The immunocaptured exosomes had a typical cup-shaped morphology by transmission electron microscopy, and their molecular cargo was similar to that of parental blasts. These exosomes were biologically-active. Upon co-incubation with natural killer (NK) cells, captured blast-derived exosomes down-regulated surface NKG2D expression, while non-captured exosomes reduced expression levels of NKp46. Our data provide a proof-of-principle that blast-derived exosomes can be quantitatively recovered from AML patients' plasma, their molecular profile recapitulates that of autologous blasts and they retain

the ability to mediate immune suppression. These data suggest that immunocaptured blast-derived exosomes might be useful in diagnosis and/or prognosis of AML in the future.

Hong, G., et al. (2014). "Near-infrared II fluorescence for imaging hindlimb vessel regeneration with dynamic tissue perfusion measurement." Circulation: Cardiovascular Imaging **7**(3): 517-525.

Background-Real-time vascular imaging that provides both anatomic and hemodynamic information could greatly facilitate the diagnosis of vascular diseases and provide accurate assessment of therapeutic effects. Here, we have developed a novel fuorescence-based all-optical method, named near-infrared II (NIR-II) fuorescence imaging, to image murine hindlimb vasculature and blood fow in an experimental model of peripheral arterial disease, by exploiting fuorescence in the NIR-II region (1000-1400 nm) of photon wavelengths. Methods and Results-Because of the reduced photon scattering of NIR-II fuorescence compared with traditional NIR fuorescence imaging and thus much deeper penetration depth into the body, we demonstrated that the mouse hindlimb vasculature could be imaged with higher spatial resolution than in vivo microscopic computed tomography. Furthermore, imaging during 26 days revealed a signifcant increase in hindlimb microvascular density in response to experimentally induced ischemia within the frst 8 days of the surgery (P<0.005), which was confrmed by histological analysis of microvascular density. Moreover, the tissue perfusion in the ischemic hindlimb could be quantitatively measured by the dynamic NIR-II method, revealing the temporal kinetics of blood fow recovery that resembled microbead-based blood fowmetry and laser Doppler blood spectroscopy. Conclusions-The penetration depth of millimeters, high spatial resolution, and fast acquisition rate of NIR-II imaging make it a useful imaging tool for murine models of vascular disease. © 2014 American Heart Association, Inc.

Hong, X., et al. (2014). "Research progress of AlphaLISA technology in food safety detection." Journal of Food Safety and Quality **5**(1): 198-202.

Homogeneous time-resolved fluoroimmunoassay (AlphaLISA) is a new homogeneous detection technology based on light stimulating of the chemiluminescence of nano micro-bead. Compared with the traditional ELISA, the AlphaLISA has characteristics of homogeneity, free of cleaning, high sensitivity and specificity. This paper introduced the principles and characteristics of AlphaLISA, briefly summarized the application research of AlphaLISA technology at home and abroad in recent years, reviewed the research progress of food safety field (including biological toxins and drug residues), and the future development of this technology was also prospected.

Hopkins, A. M., et al. (2017). "Intracellular CD3+ T Lymphocyte Teriflunomide Concentration Is Poorly Correlated with and Has Greater Variability Than Unbound Plasma Teriflunomide Concentration." Drug Metabolism & Disposition **45**(1): 8-16.

Leflunomide's active metabolite teriflunomide inhibits dihydro-oroate dehydrogenase, an enzyme essential to proliferation of T lymphocytes. As teriflunomide must reach the target site to have this effect, this study assessed the distribution of teriflunomide into T lymphocytes, as intracellular concentrations may be a superior response biomarker to plasma concentrations. CD3 MicroBeads (Miltenyi Biotec, Bergisch Gladbach, Germany) were used to extract CD3⁺ T cells from the peripheral blood of patients with rheumatoid arthritis who were taking a stable dose of leflunomide. Unbound plasma and intra-CD3⁺ T cell teriflunomide concentrations were quantified using liquid chromatography-mass spectrometry. Concentration (log transformed) and partition differences were assessed through paired Student t tests. Sixteen patients provided plasma steady-state teriflunomide samples, and eight provided a sample 6-12 weeks later. At time-point one, the geometric mean teriflunomide

concentration (range) in CD3⁺ T cells was 18.12 mug/L (6.15-42.26 mug/L) compared with 69.75 mug/L (32.89-263.1 mug/L) unbound in plasma (P < 0.001). The mean partition coefficient (range) for unbound plasma teriflunomide into CD3⁺ T cells was 0.295 (0.092-0.632), which was significantly different from unity (P < 0.001). The median (range) change in teriflunomide concentration between the two time points was 14% (-10% to 40%) in unbound plasma and -29% (-69 to 138%) for CD3⁺ T cells. Because teriflunomide concentrations in CD3⁺ T cells were lower and displayed a higher intraindividual variability than the unbound plasma concentrations, its applicability as a therapeutic drug-monitoring marker may be limited.

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Horcajo-Berná, E., et al. (2019). "Necropsy of a Green Turtle (Chelonia mydas) and the Impacts of Plastic Pollution in Tioman Island, Malaysia." Marine Turtle Newsletter(158): 14-15.

Hori, T., et al. (2020). "Fuel cell and electrolyzer using plastic waste directly as fuel." Waste Management **102**: 30-39.

The effective utilization of plastic waste, including its use as an energy or chemical resource, has attracted much attention. Nevertheless, energy recovery from plastics via incineration generates air pollutants and toxic compounds, while chemical conversion requires significant energy inputs, especially in the case of gasification. Herein, we report the electrochemical conversion of plastics into electricity or hydrogen without the use of special procedures. When a mixture of plastic solid combined with an acidic solution was fed into an electrochemical cell, the solid was found to dissolve in the solution at 100degreeC or higher, followed by the release of protons from the anode to the cathode according to a multi-electron oxidation reaction. This oxidation reaction required an anode that was sufficiently porous so as to allow transport of the

reactants. Taking the sponge sample as an example, the dissolved polyurethane had a molecular weight of 2000 or higher, the transport of which was facilitated using a carbon support with a pore diameter of approximately 10nm. In addition, carbon black having an ordered porous structure exhibited better reagent transport compared to a disordered porous carbon black with similar pore diameters. As a consequence, this cell continuously provided power densities on the order of mW cm⁻² in the fuel cell mode and generated hydrogen at a low cell voltage of 0.55V in the electrolyzer mode, using plastics as fuels at an operational temperature of 200degreeC.

Horikawa, S., et al. (2011). "Effects of surface functionalization on the surface phage coverage and the subsequent performance of phage-immobilized magnetoelastic biosensors." Biosensors and Bioelectronics **26**(5): 2361-2367.

One of the important applications for which phage-immobilized magnetoelastic (ME) biosensors are being developed is the wireless, on-site detection of pathogenic bacteria for food safety and bio-security. Until now, such biosensors have been constructed by immobilizing a landscape phage probe on gold-coated ME resonators via physical adsorption. Although the physical adsorption method is simple, the immobilization stability and surface coverage of phage probes on differently functionalized sensor surfaces need to be evaluated as a potential way to enhance the detection capabilities of the biosensors. As a model study, a filamentous fd-tet phage that specifically binds streptavidin was adsorbed on either bare or surface-functionalized gold-coated ME resonators. The surface functionalization was performed through the formation of three self-assembled monolayers with a different terminator, based on the sulfur-gold chemistry: AC (activated carboxy-terminated), ALD (aldehyde-terminated), and MT (methyl-terminated). The results, obtained by atomic force microscopy, showed that surface functionalization has a large effect on the surface phage coverage (46.8%, 49.4%, 4.2%, and 5.2% for bare, AC-, ALD-, and MT-functionalized resonators, respectively). In addition, a direct correlation of the observed surface phage coverage with the quantity of subsequently captured streptavidin-coated microbeads was found by scanning electron microscopy and by resonance frequency measurements of the biosensors. The differences in surface phage coverage on the differently functionalized surfaces may then be used to pattern the phage probe layer onto desired parts of the sensor surface to enhance the detection capabilities of ME biosensors.

Horn, D., et al. (2019). "Microplastics are ubiquitous on California beaches and enter the coastal food web through consumption by Pacific mole crabs." Marine Pollution Bulletin **139**: 231-237.

Microplastics are commonly found in marine ecosystems, but their distribution, prevalence, and impacts on resident fauna are still not well understood. Microplastics in coastal sediments expose invertebrate infauna to the risk of ingestion of plastic debris and associated toxicants. We assessed the prevalence of microplastics in beach sediments and ingested by Pacific mole crabs (Emerita analoga) at sandy beaches spanning >900 km of the California coast. Microplastics were present in sediments of every one of 51 beaches sampled. At a subset of 38 beaches Pacific mole crabs were collected and crabs at every beach had ingested microplastics. Across all beaches sampled, an average of 35% of Pacific mole crabs examined had microplastics in their guts. Our study demonstrates that microplastics are ubiquitous in sediments on California beaches and they are frequently consumed by a filter-feeding crustacean that is a common prey item in the diet of a wide variety of taxa, including fishes and birds.

Horrocks, A. R. (1996). "RECYCLING AND RECOVERY STRATEGIES." Recycling Textile & Plastic Waste: 3-15.

The article discusses the recycling and recovery strategies of the textile industries in Europe. It is stated that the complexity and value of many technical and industrial textiles had created opportunities for their effective recovering and recycling practices. It is noted that the recycling strategies of the textiles industries which are observed during the coming of the 21st century focus on the ecological perspectives and economic forces. It is concluded that the movement towards recycling requires consumer education, local authority cooperation and conceptualization of legislation.

Horrocks, J. A. (1996). "RECYCLING OF PLASTIC FIBRE AND PACKAGING WASTE." Recycling Textile & Plastic Waste: 61-76.

The article offers methods of recycling plastic fibers and packaging wasts from three sources including the in-house, post industrial and post consumer. It is stated that the simplest method of recycling is by granulating and producing a product which is impossible to reuse directly. The standard method of extrusion is by melting, filtering and pelletizing. It highlights the Erema process which was introduced by three Austrian engineers in 1982. The Erema process is an in-line extrusion process that is dust free, low noise level, occupies small space, low energy usage and low maintenance cost.

Horstmann, J. P., et al. (2013). "NLRP3 inflammasome recovery improves monocyte function after major trauma." Shock **2)**: 38.

Objectives: Suppressed function of monocytes in the early posttraumatic response plays a key role in the initiation of the inflammatory response by inflammasome activation and subsequent IL-1beta release. NLRP3 inflammasome deficiency is associated with several inflammatory diseases. We analyzed the monocyte function in a 5-day time course after trauma and their capacity to recover by NLRP3 gene insertion in isolated cells from trauma patients. Method(s): Twenty seven severely injured trauma patients [ISSQ16] and ten healthy volunteers were enrolled. Monocytes were isolated by CD14+ microbeads daily up to day 5 after trauma and assayed for their ex vivo in vitro IL-1beta production after LPS-stimulation (10mug/ml, 24h) by ELISA. Fresh monocyte RNA was analyzed for IL-1beta daily. In parallel, isolated monocytes were transfected with an expression plasmid encoding NLRP3 and 48 h later they were stimulated with LPS to uncover their functionality. Result(s): LPS-stimulation increased markedly the IL-1beta release in healthy volunteers compared to unstimulated controls (p<0.05) and the LPS-response early after trauma. IL-1beta mRNA in samples from trauma patients was significantly enhanced compared to healthy volunteers early after trauma declining on day 3 and 4. Transfecting monocytes obtained from trauma patients after admission and on day 3 after trauma with NLRP3 significantly increased IL-1beta release after LPSstimulation compared to corresponding unstimulated samples. The IL- 1beta release in NLRP3-transfected and LPS-stimulated monocytes from patients was comparable to IL-1beta release in healthy volunteers. Conclusion(s): Reduced IL-1beta release from monocytes early after trauma is paralleled by enhanced IL-1beta gene expression. This monocyte dysbalance can be partly counterbalanced by NLRP3 gene insertion, suggesting potential new targets and strategies for immunorecovery after trauma.

Horton, A. A. and S. J. Dixon (2018). "Microplastics: An introduction to environmental transport processes." Wiley Interdisciplinary Reviews **5**(2).

Microplastic pollution is widespread across the globe, pervading land, water, and air. These environments are commonly considered independently, however, in reality these are closely linked. This review gives an overview of the background knowledge surrounding sources, fate and transport of microplastics within the environment. We introduce a new "Plastic Cycle" concept in order to better understand the processes influencing flux and retention of microplastics between and across the wide range of environmental matrices. As microplastics are a pervasive, persistent and potentially harmful pollutant, an understanding of these processes will allow for assessment of exposure to better determine the likely long-term ecological and human health implications of microplastic pollution. WIREs Water 2018, 5:e1268. doi: 10.1002/wat2.1268 This article is categorized under: Engineering Water > Water, Health, and Sanitation Science of Water > Water and Environmental Change Water and Life > Stresses and Pressures on Ecosystems

Horton, A. A., et al. (2018). "The influence of exposure and physiology on microplastic ingestion by the freshwater fish Rutilus rutilus (roach) in the River Thames, UK." Environmental Pollution **236**: 188-194.

Microplastics are widespread throughout aquatic environments. However, there is currently insufficient understanding of the factors influencing ingestion of microplastics by organisms, especially higher predators such as fish. In this study we link ingestion of microplastics by the roach Rutilus rutilus, within the non-tidal part of the River Thames, to exposure and physiological factors. Microplastics were found within the gut contents of roach from six out of seven sampling sites. Of sampled fish, 33% contained at least one microplastic particle. The majority of particles were fibres (75%), with fragments and films also seen (22.7% and 2.3% respectively). Polymers identified were polyethylene, polypropylene and polyester, in addition to a synthetic dye. The maximum number of ingested microplastic particles for individual fish was strongly correlated to exposure (based on distance from the source of the river). Additionally, at a given exposure, the size of fish correlated with the actual quantity of microplastics in the gut. Larger (mainly female) fish were more likely to ingest the maximum possible number of particles than smaller (mainly male) fish. This study is the first to show microplastic ingestion within freshwater fish in the UK and provides valuable new evidence of the factors influencing ingestion that can be used to inform future studies on exposure and hazard of microplastics to fish.

Horton, A. A., et al. (2020). "Accumulation of polybrominated diphenyl ethers and microbiome response in the great pond snail Lymnaea stagnalis with exposure to nylon (polyamide) microplastics." Ecotoxicology & Environmental Safety **188**: 109882.

Microplastics attract widespread attention, including for their potential to transport toxic chemicals in the form of plasticisers and associated hydrophobic organic chemicals, such as polybrominated diphenyl ethers (PBDEs). The aims of this study were to investigate how nylon (polyamide) microplastics may affect PBDE accumulation in snails, and the acute effects of nylon particles and PBDEs on survival, weight change and inherent microbiome diversity and community composition of the pond snail Lymnaea stagnalis. Snails were exposed for 96h to BDEs-47, 99, 100 and 153 in the presence and absence of 1% w/w nylon microplastics in quartz sand sediment. No mortality was observed over the exposure period. Snails not exposed to microplastics lost significantly more weight compared to those exposed to microplastics. Increasing PBDE concentration in the sediment resulted in an increased PBDE body burden in the snails, however microplastics did not significantly influence total PBDE uptake. Based on individual congeners, uptake of BDE 47 by snails was significantly reduced in the presence of microplastics. The diversity and composition of the snail microbiome was not significantly altered by the presence of PBDEs nor by the microplastics, singly or combined. Significant effects on a few individual operational taxonomic units (OTUs) occurred when comparing the highest PBDE concentration with the control treatment, but in the absence of microplastics only. Overall within these acute experiments, only subtle effects on weight loss and slight microbiome alterations occurred. These results therefore highlight that L. stagnalis are resilient to acute exposures to microplastics and PBDEs, and that microplastics are unlikely to influence HOC accumulation or the microbiome of this species over short timescales.

Horton, A. A., et al. (2018). "Acute toxicity of organic pesticides to Daphnia magna is unchanged by co-exposure to polystyrene microplastics." Ecotoxicology and Environmental Safety **166**: 26-34.

Daphnia magna were exposed to two pesticides in the presence or absence of microplastics (300 000 particles ml⁻¹ 1 micro m polystyrene spheres) and to microplastics alone. The pesticides were dimethoate, an organophosphate insecticide with a low log Kow, and deltamethrin, a pyrethroid insecticide with a high log Kow. Daphnia were exposed to a nominal concentration range of 0.15, 0.31, 0.63, 1.25, 2.5, 5 mg l⁻¹ dimethoate and 0.016, 0.08, 0.4, 2, 5 and 10 micro g l⁻¹ deltamethrin. Exposure to polystyrene microplastics alone showed no effects on Daphnia magna survival and mobility over a 72 h exposure. In the dimethoate exposures, mobility and survival were both affected from a concentration of 1.25 mg l⁻¹, with effects were seen on mobility from 28 h and survival from 48 h, with greater effects seen with increasing concentration and exposure time. In deltamethrin exposures, survival was affected from a concentration of 0.4 micro g l⁻¹ and mobility from a concentration of 0.08 micro g l⁻¹. Effects of deltamethrin on mobility were seen from 5 h and on survival from 28 h, with greater effects on survival and mobility seen with increasing concentration and exposure time. Contrary to expectations, pesticide toxicity to Daphnia magna was not affected by the presence of microplastics, regardless of chemical binding affinity (log Kow). This therefore suggests that polystyrene microplastics are unlikely to act as a significant sink, nor as a vector for increased uptake of pesticides by aquatic organisms. Capsule: Polystyrene microplastics are unlikely to act as vector for increased uptake of pesticides by aquatic organisms.

Horton, A. A., et al. (2017). "Microplastics in freshwater and terrestrial environments: Evaluating the current understanding to identify the knowledge gaps and future research priorities." Science of the Total Environment **586**: 127-141.

Plastic debris is an environmentally persistent and complex contaminant of increasing concern. Understanding the sources, abundance and composition of microplastics present in the environment is a huge challenge due to the fact that hundreds of millions of tonnes of plastic material is manufactured for societal use annually, some of which is released to the environment. The majority of microplastics research to date has focussed on the marine environment. Although freshwater and terrestrial environments are recognised as origins and transport pathways of plastics to the oceans, there is still a comparative lack of knowledge about these environmental compartments. It is highly likely that microplastics will accumulate within continental environments, especially in areas of high anthropogenic influence such as agricultural or urban areas. This review critically evaluates the current literature on the presence, behaviour and fate of microplastics in freshwater and terrestrial environments and, where appropriate, also draws on relevant studies from other fields including nanotechnology, agriculture and waste management. Furthermore, we evaluate the relevant biological and chemical information from the substantial body of marine microplastic literature, determining the applicability and comparability of this data to freshwater and terrestrial systems. With the evidence presented, the authors have set out the current state of the knowledge, and identified the key gaps. These include the volume and composition of microplastics entering the environment, behaviour and fate of microplastics under a variety of environmental conditions and how characteristics of microplastics influence their toxicity. Given the technical challenges surrounding microplastics research, it is especially important that future studies develop standardised techniques to allow for comparability of data. The identification of these research needs will help inform the design of future studies, to determine both the extent and potential ecological impacts of microplastic pollution in freshwater and terrestrial environments.

Horvath, B., et al. (2018). "Designing Business Solutions for Plastic Waste Management to Enhance Circular Transitions in Kenya." Sustainability **10**(5).

Least-developed countries face many challenges regarding their plastic waste management systems. In 2017, Kenya imposed a selective ban targeting manufacturers and consumers of plastic carrier bags. However, this selectivity does not avoid the continuous use of other plastic products. The present paper states that circular priorities, which have been defined to advanced economies, would not be entirely valid for the rest of the world. While high-income countries face only the impacts of their own consumption, developing nations must endure the externalities of these developed economies. Thus, the focus of the least developed part of the world must not be on reducing its relatively normal (or even low) consumption, but to manage its surplus material flow. According to the employed circular evaluation methodology (CEV—Circular Economic Value), the circularity level in Kenya's plastic material flow stands on a rather low stage with 32.72%. This result outlines the linear deficiencies of the plastic waste management system and urges the prevention of further material leakage (such as energy use). Through the Business Model Canvas (BMC) approach this study offers a holistic business solution which can improve the system's sustainability.

Hosoda, J., et al. (2014). "Monitoring of organic micropollutants in Ghana by combination of pellet watch with sediment analysis: e-waste as a source of PCBs." Marine Pollution Bulletin **86**(1-2): 575-581.

Plastic resin pellets collected at 11 beaches covering the whole Ghanaian coastline were analyzed for polychlorinated biphenyls (PCBs). PCB concentrations (13 congeners) were higher in Accra, capital city, and Tema (39-69 ng/g-pellets) than those in rural coastal towns (1-15 ng/g-pellets) which are close to global background, indicating local inputs of PCBs. River sediments were also analyzed for PCBs together with molecular markers. Sedimentary PCBs concentrations were highest at a site (AR02) downstream of an electronic waste (e-waste) scrapyard. At the site (AR02), concentration of linear alkylbenzenes (LABs), a marker of municipal wastewater, was lower than another site (AR03) which is located at the downstream of downtown Accra. This result suggests that PCBs are introduced more to the river from the e-waste site than from activities in downtown Accra. PAHs concentrations were relatively higher in urban areas with strong petrogenic signature. Abundance of triphenylbenzenes suggested plastic combustion near e-waste scrapyard.

Hosoki, K., et al. (2013). "Differential activation of eosinophils by bacteria associated with asthma." International Archives of Allergy & Immunology **161 Suppl 2**: 16-22.

BACKGROUND: It has been suggested that there is a complex interaction between microbiota and various human diseases. Some bacteria have been reported to be involved in the inception and progression of asthma, and others in the protection against asthma. We know very little about the mechanisms by which bacteria do harm or good with regard to asthma. This study investigated whether bacteria exert differential effects on the functions of eosinophils, major effector cells in airway inflammation in asthma.

METHODS: Eosinophils were purified from healthy adult volunteers by Percoll density gradient centrifugation and negative immunomagnetic bead selection using anti-CD16 microbeads. Three

kinds of heat-killed bacteria that have been implicated in asthma, namely Staphylococcus aureus (SA), Haemophilus influenzae (HI) and a Prevotella sp. (PS), were tested for their effects on the secretion of eosinophil-derived neurotoxin (EDN), the generation of superoxides and the production of cytokines/chemokines.

RESULTS: SA, but not HI or PS, induced significant EDN release in a dose-dependent manner. Superoxide generation was significantly enhanced by each of the bacterial species, but most strongly by SA, which induced significantly greater TNF-alpha production by eosinophils than either HI or PS. Conversely, interleukin 10, an anti-inflammatory cytokine, was more strongly induced by HI and PS than by SA.

CONCLUSIONS: Bacteria exert differential effects on eosinophils. Based on these results, SA may be involved in the exacerbation of, and HI and PS in the inhibition of, eosinophilic inflammation in asthma.

Hosoki, K., et al. (2011). "Differential effects of GAS6 and protein S in human eosinophils." Journal of Thrombosis and Haemostasis **2)**: 824-825.

Background: GAS6 and protein S belong to vitamin K-dependent protein family; their amino acid sequence homology is 43%. They bind to the TAM receptor tyrosine kinases (Tyro3, Axl and Mer). TAM receptors are expressed by cells of the immune, nervous, reproductive, and vascular systems. Some reports have shown that they can inhibit inflammation. However, there is little information about the role of TAM receptors in allergy. Objective(s): To assess the function of TAM receptors in eosinophils, the cardinal effector cells in allergic inflammation. Method(s): Eosinophils were purified from healthy adult volunteers with percoll density gradient centrifugation and negative immunomagnetic beads selection using anti-CD16 microbeads. The presence of TAM receptors in human peripheral blood eosinophils was evaluated by PCR. Eosinophils were stimulated with ligands of TAM receptors (GAS 6 or protein S) and their effects on survival, secretion of eosinophil-derived neurotoxin (EDN), and cytokine production were examined. Result(s): PCR showed that Tyro3 and Mertk, but not Axl, are expressed in human peripheral eosinophils. Protein S significantly prolonged eosinophil survival and this effect was comparable to the effect of granulocyte/macrophage-colony stimulating factor (GMCSF). Protein S had no effect on EDN release from eosinophils in the presence or absence of GM-CSF. In contrast, GAS 6 significantly induced EDN release and this effect was comparable to that induced by GM-CSF, but it had no effect on survival. Protein S, but not GAS6, inhibited IL-1beta secretion from eosinophils. Conclusion(s): Although both GAS 6 and protein S bind to TAM receptors, they had differential effects in human eosinophils. GAS 6 and protein S may be involved in the pathogenesis of eosinophilrelated inflammatory diseases such as bronchial asthma.

Hossain, M. S., et al. (2019). "Microplastics in fishes from the Northern Bay of Bengal." Science of the Total Environment **690**: 821-830.

Microplastics were determined in pink Bombay-duck (Harpadon nehereus), white Bombay-duck (H. translucens) and gold-stripe sardine (Sardinella gibbosa) collected from the Northern Bay of Bengal at Bangladesh. Gastrointestinal tracts of fishes (n=25 per species) were examined for microplastics following alkali digestion protocol, microscopic observations and chemical analysis by micro-Fourier Transformed Infrared Spectroscope (micro -FTIR). A total of 443 microplastic items were found in the intestines of H. nehereus, H. translucens and S. gibbosa, averaging in the range of 3.20-8.72 items per species. Among various shapes, colours and types of microplastics, irregular (37-43%), white/transparent (26-68%) and fiber (50-55%) were dominant. The size fraction of microplastics ranging between 1 micro m and 5 mm was 6884 items/kg biomass, and micro -FTIR analysis identified 13 particles of polyethylene terephthalate and 66 particles of polyamide. The study findings raised concern that microplastics in marine fish could be a threat to public health via the food chain.

Hossain, M. S., et al. (2020). "Microplastic contamination in Penaeid shrimp from the Northern Bay of Bengal." Chemosphere **238**: N.PAG-N.PAG.

Microplastic pollution has received increased attention recently due to potential threat to marine biota and human health. This study reports microplastic (MP) content in brown shrimp (Metapenaeus monocerous) and tiger shrimp (Penaeus monodon) inhabiting in the shallow and offshore waters of the Northern Bay of Bengal, Bangladesh. Gastrointestinal tract (GT) of shrimps (n = 150) were examined for MPs following alkali digestion, microscopic observation and chemical analysis by micro-Fourier Transformed Infrared Spectroscope (μFTIR). A total of 33 and 39 MP items were found in P. monodon and M. monocerous , averaging 3.40 ± 1.23 and 3.87 ± 1.05 items/g GT, respectively. Among various shapes, types and colours of MP, filament (57–58%), fiber (32–57%) and black (48–51%) were dominant amongst the various particles identified. Tiger shrimp had high numbers (23 items) of larger size fractions of MPs (1–5 mm) but brown shrimp had high numbers (15 items) of smaller MPs (250–500 μm), and μ-FTIR data confirmed 13 particles of polyamide-6 and 6 particles of rayon polymers. These results provide a baseline of MP contamination in seafood from Bangladesh that should be useful for future monitoring efforts. Image 1 • MP items in two shrimps were ranged 33–39 with a mean abundance 3.40–3.87 items/g GT. • MP particles were dominated by black fibers and filament. • MPs were composed of polyamide-6 and rayon polymers. • MPs may transfer to humans as shrimps are often eaten without removing the intestines. [ABSTRACT FROM AUTHOR]

Houtman, M., et al. (2018). "T-cell transcriptomics from peripheral blood highlights differences between polymyositis and dermatomyositis patients." Arthritis Research & Therapy **20**(1): 188.

BACKGROUND: Polymyositis (PM) and dermatomyositis (DM) are two distinct subgroups of idiopathic inflammatory myopathies, a chronic inflammatory disorder clinically characterized by muscle weakness and inflammatory cell infiltrates in muscle tissue. In PM, a major component of inflammatory cell infiltrates is CD8+ T cells, whereas in DM, CD4+ T cells, plasmacytoid dendritic cells, and B cells predominate. In this study, with the aim to differentiate involvement of CD4+ and CD8+ T-cell subpopulations in myositis subgroups, we investigated transcriptomic profiles of T cells from peripheral blood of patients with myositis.

METHODS: Total RNA was extracted from CD4+ T cells (PM = 8 and DM = 7) and CD8+ T cells (PM = 4 and DM = 5) that were isolated from peripheral blood mononuclear cells via positive selection using microbeads. Sequencing libraries were generated using the Illumina TruSeq Stranded Total RNA Kit and sequenced on an Illumina HiSeq 2500 platform, yielding about 50 million paired-end reads per sample. Differential gene expression analyses were conducted using DESeq2.

RESULTS: In CD4+ T cells, only two genes, ANKRD55 and S100B, were expressed significantly higher in patients with PM than in patients with DM (false discovery rate [FDR] < 0.05, model adjusted for age, sex, HLA-DRB1*03 status, and RNA integrity number [RIN]). On the contrary, in CD8+ T cells, 176 genes were differentially expressed in patients with PM compared with patients with DM.

Of these, 44 genes were expressed significantly higher in CD8+ T cells from patients with PM, and 132 genes were expressed significantly higher in CD8+ T cells from patients with DM (FDR < 0.05, model adjusted for age, sex, and RIN). Gene Ontology analysis showed that genes differentially expressed in CD8+ T cells are involved in lymphocyte migration and regulation of T-cell differentiation.

CONCLUSIONS: Our data strongly suggest that CD8+ T cells represent a major divergence between PM and DM patients compared with CD4+ T cells. These alterations in the gene expression in T cells from PM and DM patients might advocate for distinct immune mechanisms in these subphenotypes of myositis.

Howard, B. (2003). "Message in a Bottle: Despite the Hype, Bottled Water is Neither Cleaner nor Greener Than Tap Water." E Magazine **14**(5): 26.

Bottled water has captured a large share of the beverage market, and many consumers prefer it over tap water. The bottled water industry has successfully created a marketing strategy based on vilifying public water sources, and glorifying the benefits of bottled water. Consumers also associate bottled water with higher social status. In fact, tap water is far more closely regulated than bottled water. Tests of bottled water have revealed numerous incidents of both biological and chemical contaminants, including carcinogenic agents. Consumers also complain about misleading labeling with regard to both source and purity of the bottled water. Another complaint is leveled by environmentalists, who note the vast amount of plastic waste generated by the bottled water market.

Howell, R. R. and M. A. Lloyd-Puryear (2016). "Implementation of newborn screening for Duchenne muscular dystrophy and spinal muscular atrophy." Journal of Inherited Metabolic Disease **39 (Supplement 1)**: S77.

Background: To be considered by theACHDNC for a newborn screening (NBS) panel in the US, pilot data at a state laboratory level, information on what drugs and treatments are available, how individuals with Duchennemuscular dystrophy (DMD) or Spinal muscular atrophy (SMA) could benefit from early administration of drugs and treatments are needed. This presentation will focus on the efforts for establishing NBS programs for DMD and SMA in the U.S. and will present a summary of a plan for the development of the DMD pilot for NBS in the U.S.A., current efforts for establishing NBS for SMA and activities accomplished to date. Method(s): Both SMA and DMD cause significant mortality in infants and children. DMD is one of the ten most severe pediatric genetic diseases and affects an estimated 1 in every 3,500-5000 male births. SMA is the leading genetic cause of infant mortality. Recent very promising clinical trials for treatments for DMD and SMA will require NBS, in order to be lifesaving. The treatments for DMD are based on the various genetic mutations causing DMD and include atalauren and eteplirsen. SMA treatments include nusinersen, olesoxime and a gene therapy trial. Result(s): In 2015, a DMD-NBS initiative was formed in partnership with the NBSTRN. DMD will screened using an immunoassay. Screens for SMA have employed liquid microbead suspensions assays; HRMA has been used to evaluate individuals with SMA for screening and diagnosis. Results from HRMA have been reported from a pilot study in 3 states. PCR has been developed for SMA diagnosis and also applied to DBS specimens. Studies show 100 % concordance with clinical status, identifying affected individuals and excluding carriers and unaffected individuals. Discussion(s): Issues raised within the work groups include a multitude of ethical issues that include screening universally vs. targeting males; reporting carrier status; identifying secondary conditions for which there are no treatments and absorption of costs associated with treatments.

Hrabina, M., et al. (2009). "Development of multiparametric immunoassays for the quantification of major allergens in grass pollen and house dust mite extracts." Allergy: European Journal of Allergy and Clinical Immunology **90)**: 105.

Background: The aim of the study was to develop and validate two multiparametric immunoassays based on Luminex technology, allowing to quantify (i) Der p 1, Der f 1 and group 2 allergens in mixtures of Dermatophagoides pteronyssinus (Dp) and Dermatophagoides farinae (Df) extracts, (ii) group 1 and 5 allergens in grass pollen extracts. Both multiparametric assays were compared to corresponding ELISA sandwich assays. Method(s): Color-coded panels of beads were coated with various capture monoclonal antibodies specific for either Der p 1, Der f 1, HDM group 2 allergens, grass pollen group 1 or 5 allergens (Stallergenes, France and Indoors Biotechnologies, UK). ELISA assays were conducted in comparison with Luminex immunoassays on 20 mixtures of Dp and Df extracts and 25 grass pollen extracts, using an universal standard (Indoors Biotechnologies, UK) for HDM allergens or a five grass pollen in house reference preparation. Fluorescence of labelled revealing monoclonal antibodies directed to each of the allergens and of micro-beads was detected using a two laser excitation system (Bio-plex array reader - Bio-Rad). Result(s): Two distinct multiparametric immunoassays based on Luminex technology were successfully established to quantify Der p 1/Der f 1/Group 2 allergens in mixtures of Dp and Df allergenic extracts, or group 1/group 5 allergens in grass pollen extracts, respectively. Repeat abilities (interassay variations) varied between 1.8% and 3.3% for all allergens tested. Intermediate precisions (intra-assay variations) were around 5% for HDM allergens and in the range of 15% for grass pollen allergens. Lower and upper limits of quantification (LLOQ and ULOQ, respectively) were 0.12-7.8 ng/ml for both Der p 1 and Der f 1, 0.04-1.56 ng/ml for HDM group 2 allergens, 0.057-58 ng/ml for grass pollen group 1, 1.06-34ng/ml for grass pollen group 5. Correlations between allergen levels assayed using Elisa and Luminex on 25 Dpt and Df mixtures and 20 grass pollen extracts were R = 0.94 for Der p 1, R = 0.98 for HDM group 2, R = 0.97 for Der f 1, and R = 0.99 for both grass pollen group 1 and group 5 allergens. Conclusion(s): LLOQ, repeatability and intermediate precision characteristics associated with Luminex were equal or better to the ones obtained with ELISA assays. Correlations between Luminex and ELISA simplex method were excellent for the 5 assays.

Hristov, M., et al. (2003). "Endothelial progenitor cells: Isolation and characterization." Trends in Cardiovascular Medicine **13**(5): 201-206.

Bone marrow of adults contains a subtype of progenitor cells that have the capacity to differentiate into mature endothelial cells and have therefore been termed endothelial progenitor cells (EPCs). Of the three cell markers (CD133, CD34, and the vascular endothelial growth factor receptor 2) that characterize the early functional EPCs, located predominantly in the bone marrow, EPCs obviously lose CD133/CD34 and start to express CD31, vascular endothelial cadherin, and von Willebrand factor when migrating to the circulation. Various isolation procedures of EPCs from different sources by using adherence culture or magnetic microbeads have been described, but published findings with regard to the number of EPCs in the peripheral circulation of healthy adults are scanty and no data regarding the lifetime of EPCs in vivo exist. Clinical studies employing EPCs for neovascularization of is-chemic organs have just been started; however, the mechanisms stimulating or inhibiting the differentiation of bone marrow-derived EPCs in vivo and the signals causing their adhesion, migration, and homing to sites of injured tissue are largely unknown at present. © 2003, Elsevier Inc.

Hruby, M., et al. (2016). "Biodegradable system for drug delivery of hydrolytically labile azanucleoside drugs." Biomedical Papers of the Medical Faculty of Palacky University in Olomouc, Czech Republic

160(2): 222-230.
BACKGROUND: The archetypal DNA methyltransferase inhibitors, 5-azacytidine (AZA) and 5-aza-2'-deoxycytidine (DAC) are potent antineoplastic agents used in the treatment of mainly, blood malignancies. However, the administration of these drugs is confounded by their hydrolytic lability which decreases plasma circulation time. Here, we describe a new biodegradable, polyanhydride formulation for drug delivery that circumvents this drawback.
METHODS: Injectable/implantable polymeric microbeads containing dispersed microcrystals of hydrophilic AZA or DAC packed in a dry environment are protected from hydrolysis, until the hydrolytic zone reaches the core. Diclofenac is embedded into the formulation to decrease any local inflammation. The efficacy of the formulations was confirmed by monitoring the induced demethylation, and cytostatic/cytotoxic effects of continuous drug release from the time-course dissolution of the microbeads, using an in vitro developed cell based reporter system.
RESULTS: Poly(sebaccic acid-co-1,4-cyclohexanedicarboxylic acid) containing 30 wt. % drug showed zero-order release (R(2) = 0.984 for linear regression), and release rate of 10.0 %/h within the first 5 h, and subsequent slower release of the remaining drug, thus maintaining the level of drugs in the outer environment considerably longer than the typical plasma half-life of free azanucleosides. At lower concentrations, the differences between powder drug formulations and microbeads were very low or negligible, however, at higher concentrations, we discovered equivalent or increasing effects of the drugs loaded in microbeads.
CONCLUSIONS: The study provides evidence that microbead formulations of the hydrolytically labile azanucleoside drugs could prevent their chemical decomposition in aqueous solution, and effectively increase plasma circulation time.

Hsiao, A. P. (2012). Methods and devices for comprehensive molecular analysis of single cells.
Typical analytical methods for evaluating the protein and gene expression of cells rely on the molecular analysis of analytes from a large number of cells. These methods, however, do not reveal insight into the heterogeneous nature of cells and instead only provide average results of the bulk population. Moreover, these methods are insensitive to low copy number proteins or mRNA that may in fact play a significant role in a cell's phenotypic state. The ability to discern the true distributions of protein and gene expression in a cell population will give rise to the effective identification of unique subpopulations. This allows for a deeper understanding of disease progression, molecular pathways, and cellular differentiation by revealing previously undetectable states of cells. Therefore, it is essential that technologies capable of isolating and comprehensively analyzing many single cells in parallel be developed. In this dissertation, I present new methods and technologies for integrating the capture and isolation of single cells with comprehensive, quantitative on-chip molecular analysis within a single microfluidic platform. I first present the design, development, and function of polymethyldisiloxane (PDMS) microfluidic devices capable of trapping and fully isolating many single cells along a series of compartments. Additionally, I discuss various methods for trapping (dielectrophoretic or hydrodynamic) and lysing (electric-field or chemical) of the cells directly in individual, nanoliter-sized compartments. Subsequently, I present methods for the fabrication, assembly, and application of high-density antibody-conjugated microbead arrays for single-cell proteome analysis. I then discuss how such arrays can be integrated directly into the PDMS devices using a protective patterning scheme to overcome current challenges in producing patterned, modified surfaces in PDMS devices. I also present methods we have developed which could enable analysis of single-cell gene expression by directly sequencing the mRNA transcripts captured from each single cell on the device. Finally, I present my work on electric field-directed assembly of enzyme-nanoparticle layers for biosensor applications. Together, these methods and devices

constitute key advancements towards the development of a technology capable of fully integrating single-cell capture and comprehensive molecular analysis.

Hsiao, L. L., et al. (1991). "Modification of host cell membrane lipid composition by the intra-erythrocytic human malaria parasite Plasmodium falciparum." Biochemical Journal **274**(Pt 1): 121-132.

The phospholipid and fatty acid compositions of the host infected erythrocyte plasma membrane (IEPM) have been determined for erythrocytes infected with the human malaria parasite Plasmodium falciparum. IEPM were prepared by selective lysis of the host erythrocyte (but not of the parasite membranes) with 0.1% saponin, followed by differential centrifugation. The purity of the IEPM was determined by measuring the membrane-specific enzyme markers acetylcholinesterase, glutamate dehydrogenase and lactate dehydrogenase, and by immunoelectron microscopy using monoclonal antibodies specific for human erythrocyte glycophorin A (4E7) and for a 195 kDa parasite membrane glycoprotein (Pf6 3B10.1). Both approaches demonstrated that the host erythrocyte plasma membrane preparation was free from contamination by parasite membranes. During intra-erythrocytic development of the parasite, the phospholipid composition of the erythrocyte membrane was strikingly altered. IEPM contained more phosphatidylcholine (38.7% versus 31.7%) and phosphatidylinositol (2.1% versus 0.8%) and less sphingomyelin (14.6% versus 28.0%) than normal uninfected erythrocytes. Similar alterations in phospholipid composition were determined for erythrocyte membranes of parasitized cells isolated by an alternative method utilizing polycationic polyacrylamide microbeads (Affigel 731). The total fatty acid compositions of the major phospholipids in IEPM were determined by g.l.c. The percentage of polyunsaturated fatty acids in normal erythrocyte phospholipids (39.4%) was much higher than in phospholipids from purified parasites (23.3%) or IEPM (24.0%). The unsaturation index of phospholipids in IEPM was considerably lower than in uninfected erythrocytes (107.5 versus 161.0) and was very similar to that in purified parasites (107.5 versus 98.5). Large increases in palmitic acid (C16:0) (from 21.88% to 31.21%) and in oleic acid (C18:1) (from 14.64% to 24.60%), and major decreases in arachidonic acid (C20:4) (from 17.36% to 7.85%) and in docosahexaenoic acid (C22:6) (from 4.34% to 1.8%) occurred as a result of infection. The fatty acid profiles of individual phospholipid classes from IEPM resembled in many instances the fatty acid profiles of parasite phospholipids rather than those of uninfected erythrocytes. Analysis of IEPM from P. falciparum-infected erythrocytes (trophozoite stage) revealed that, during intra-erythrocytic maturation of the parasite, the host erythrocyte phospholipid composition was markedly refashioned. These alterations were not dependent on the method used to isolate the IEPM, with similar results obtained using either a saponin-lysis method or binding to Affigel beads. Since mature erythrocytes have negligible lipid synthesis and metabolism, these alterations must occur as a result of parasite-directed metabolism of erythrocyte lipids and/or trafficking of lipids between the parasite and erythrocyte membranes.

Hsu, F.-Y., et al. (2018). "Macroporous microbeads containing apatite-modified mesoporous bioactive glass nanofibres for bone tissue engineering applications." Materials Science & Engineering. C, Biomimetic Materials, Sensors and Systems **89**: 346.

Mesoporous bioactive glass (MBG) has a greater surface area and pore volume than conventional BG. Hence, MBG is useful as a drug delivery carrier. Previously, MBG has been fabricated as dense or porous blocks. Compared to blocks, microbeads have a greater flexibility to fill different-shaped cavities with close packing. Moreover, fibrous materials have proven to increase cell attachment and differentiation because they mimic the three-dimensional structure of the natural extracellular matrix (ECM). Macroporous materials possess porous structures with interconnecting channels that allow the invasive growth of cells and capillaries.

Hence, the aim of this study was to fabricate macroporous microbeads containing MBG nanofibres (MMBs). We used poly(methyl methacrylate) (PMMA) microspheres as the macroporous template in the process and removed the PMMA microspheres after the calcination treatment. Scanning electron microscopy imaging showed multiple pores on the surface of the MMBs, and a micro-computed tomography image showed the presence of pores throughout the entire microbead. The cellular attachment of MG63 osteoblast-like cells was considerably higher on the MMBs than on glass beads after culturing for 4 h. However, the cell viability greatly decreased after culturing for 1 day. We speculated that the release of a high concentration of calcium ions from the MMBs decreased the cell viability. To improve the cell viability, we modified the MMBs by immersing the MMBs in a simulated body fluid to fabricate a thin apatite layer on the surface of the MMBs. The apatite-modified MMBs (Ap-MMB) decreased the release of calcium ions and improved the cell viability. In an animal study, the bone defect in the control group did not recover. In contrast to the control group, the Ap-MMBs in the defect were nearly filled with new bone. The results show that the Ap-MMBs have great potential in osteogenesis for bone tissue engineering.

Hu, B., et al. (2019). "All-Natural Food-Grade Hydrophilic-Hydrophobic Core-Shell Microparticles: Facile Fabrication Based on Gel-Network-Restricted Antisolvent Method." Acs Applied Materials & Interfaces **11**(12): 11936-11946.

Hydrophilic-hydrophobic core-shell microparticles are highly appealing for a variety of industrial applications (foods, pharmaceutics, cosmetics, biomedicines, etc.) owing to their unique properties of moisture resistance and controlled release. However, the fabrication of such structured microparticles proves to be nontrivial due to the difficulty in assembling two materials of distinctly different hydrophilicities and hydrophobicities. This paper reports a facile method to fabricate hydrophilic-hydrophobic core-shell microparticles using all-natural food-grade polysaccharides and proteins, based on a novel principle of gel-network-restricted antisolvent precipitation. Immersion of microgel beads prepared from hydrophilic polysaccharides (i.e., alginates, kappa-carrageenan, agarose) into a hydrophobic protein solution (i.e., zein in 70% aqueous ethanol) enables slow and controllable antisolvent precipitation of a protein layer around the microbead surface, leading to the formation of a hydrophilic-hydrophobic core-shell structure. The method applies to various gelling systems and can easily tailor the particle size and shell thickness. The resulting freeze-dried microparticles demonstrate restricted swelling in water, improved moisture resistance, and sustained release of encapsulants, with great potential in applications such as protection of unstable and/or hygroscopic compounds and delivery and controlled release of drugs, bioactives, flavors, etc. The method is rather universal and can be extended to prepare more versatile core-shell structures using a large variety of hydrophilic and hydrophobic materials.

Hu, D., et al. (2019). "Microplastics and nanoplastics: would they affect global biodiversity change?" Environmental Science & Pollution Research **26**(19): 19997-20002.

Micro(nano)plastics, new emerging contaminants, are ubiquitously found in the environment due to continuous release and accumulation. Widespread micro(nano)plastics can increase their exposure to organisms, pose threats to the ecological environment and human health, and potentially result in global biodiversity changes. Research has been started on micro(nano)plastics regarding their environmental distribution, contamination sources, and methods and technologies for analysis, as well as the environmental impacts and ecological effects on organisms ingesting micro(nano)plastics. However, limited information focused on the consequences of global biodiversity has been reported and the research approaches on

biodiversity change caused by micro(nano)plastics are still seldom developed. Recently, researchers in environmental and ecological groups have begun to be conscious of the relationship between micro(nano)plastics and biodiversity. Even so, more efforts are needed to assess the impacts of micro(nano)plastics on this subject, as well as the interactions between organisms and micro(nano)plastics.

Hu, D., et al. (2019). "Micro(nano)plastics: An un-ignorable carbon source?" Science of the Total Environment **657**: 108-110.

Micro(nano)plastics, new emerging contaminants, are widely found in the environment due to continuous release. Massive and widespread presence of micro(nano)plastics may have a significant impact on the calculation of total organic carbon, and potentially result in misunderstanding of the overall environmental pollution level. Previous studies typically paid attention to the environmental distribution, source, analysis methods and technologies, as well as the environmental and ecological effects of micro(nano)plastics. However, little was aware of the total organic carbon consequences. There are few evidences for the contribution of micro(nano)plastics to total organic carbon. Accordingly, more efforts need to be taken to explore the contribution of micro(nano)plastics to total organic carbon. Copyright © 2018

Hu, E., et al. (2019). "Cotransport of naphthalene with polystyrene nanoplastics (PSNP) in saturated porous media: Effects of PSNP/naphthalene ratio and ionic strength." Chemosphere **245**: 125602.

As emerging contaminants of global concern, nanoplastics are significantly potential carriers of hydrophobic organic compounds in aquatic and soil environment. However, little is known about the interactions between the transports of nanoplastics and organic contaminants in porous media. In this study, the cotransport of naphthalene with polystyrene nanoplastics (PSNP) in saturated sand columns as influenced by the PSNP/naphthalene ratio and ionic strength (IS) was investigated. The presence of PSNP dramatically enhanced the mobility of naphthalene at low IS (0.5 mM), but such effect was prohibited at high IS (5 mM and 50 mM). The mobility of PSNP in the sand column was higher when it was solely exist in the pore-water than that when in the presence of naphthalene, because of the charge-shielding effect. This work showed that the coexistence of PSNP and naphthalene would influence the mobility of each other in the saturated porous media, which highly related to their concentration ratio and IS levels.

Hu, L., et al. (2018). "Microplastics in small waterbodies and tadpoles from Yangtze River Delta, China." Environmental Science & Technology **52**(15): 8885-8893.

Although microplastic (MP) pollution in freshwater systems is gaining attention, our knowledge of its distribution in small waterbodies is scarce. Small waterbodies are freshwater habitats to many species, including amphibians, that are vulnerable to MP pollution. This study analyzed the distribution and characteristics of MPs in 25 small waterbodies from the Yangtze River Delta, China. MPs were detected in surface water, sediment, and tadpoles with abundances ranging from 0.48 to 21.52 items L⁻¹, 35.76 to 3185.33 items kg⁻¹, and 0 to 2.73 items individual⁻¹ (0 to 168.48 items g⁻¹), respectively. The dominant shape and polymer of MPs in water and tadpole samples were polyester (PES) fibers, and polypropylene (PP) fibers and fragments were dominant in sediment samples. In addition, MPs were primarily <0.5 mm in length in all samples. Tadpole length was positively correlated to the number of MPs detected. The abundance, shape, and polymer distribution of MPs in tadpoles resembled that of water rather than sediment, suggesting that tadpoles likely take up MPs from the surrounding water. This study demonstrated that MPs are abundant in these small waterbodies and are ingested by resident tadpoles. This may suggest a pathway of MP entry into aquatic and terrestrial food webs.

Hu, L., et al. (2017). "Preparation and optimization of a novel microbead formulation to improve solubility and stability of curcumin." Particulate Science and Technology **35**(4): 448-454.

Curcumin is an active ingredient which is poorly water-soluble, leading to a low oral bioavailability. The aim of this research was to prepare a novel microbead formulation, and to solubilize, solidify, and improve storage stability of curcumin. Firstly, curcumin was solubilized with Kolliphor^{TM} RH40 and then microencapsulated by cross linking of sodium alginate with calcium chloride. A three-factor, three-level Box-Behnken design was employed to acquire the optimum microbead formulation, namely the best entrapment efficiency and in vitro curcumin release. The independent variables were sodium alginate concentration, calcium chloride concentration, and the weight of curcumin solution, while the dependent variables were entrapment efficiency and in vitro curcumin release. The optimized microbead formulation was 2.06% sodium alginate, 24.33% calcium chloride, and 1.28 g curcumin solution (containing curcumin and RH40 with a ratio of 1:22, g/g). Results showed that high concentrations of sodium alginate and calcium chloride could increase the entrapment efficiency. In vitro curcumin release decreased with increasing of sodium alginate as well as decreasing of calcium chloride. In conclusion, the optimum microbead formulation increased the solubility of curcumin and enhanced its stability, and achieved a high entrapment efficiency and in vitro curcumin release. Copyright © 2017 Taylor & Francis.

Hu, L., et al. (2016). "Uptake, accumulation and elimination of polystyrene microspheres in tadpoles of Xenopus tropicalis." Chemosphere **164**: 611-617.

Microplastic is an emerging contaminant affecting freshwater and marine ecosystem across the globe. In the present study, the filter feeding tadpoles of Xenopus tropicalis were exposed to polystyrene microspheres (1 and 10 micro m) for 48 h. Microspheres were observed in gills and digestive tract of tadpoles within 1 h after exposure as well as in feces 6 h after exposure. The accumulation of microspheres in the tadpoles were concentration dependent (Univariate ANOVA, $p<0.001$), but no time dependent accumulation of microspheres was observed in tadpoles 48 h after exposure (Univariate ANOVA, $p>0.05$). After the exposed tadpoles were transferred to clean water, the number of microspheres in the tadpoles decreased dramatically after 1 d and continued to decrease gradually afterwards. The absorbed polystyrene particles in unfed tadpoles was significantly higher than those in the fed tadpoles at 12 and 24 h after exposure. After transfer to clean water, the fed tadpoles showed a significant decrease in the amount of absorbed polystyrene particles, while the unfed tadpoles showed no significant change in the amount of absorbed polystyrene particles. Our results suggested that microspheres were likely to be ingested and egested relatively fast by tadpoles. Our results indicated that aquatic vertebrate organisms might ingest more microplastics if the abundance of microplastics continues to increase while the available food becomes less.

Hu, S., et al. (2004). "Cell spreading controls balance of prestress by microtubules and extracellular matrix." Frontiers in Bioscience **9**: 2177-2182.

The controversy surrounds the cellular tensegrity model. Some suggest that microtubules (MTs) must bear a significant portion of cell contractile stress (prestress) if tensegrity is a useful model. Previously we have shown that for highly spread airway smooth muscle cells (areas>2500 microm2) MTs balance a significant but small potion (average 14%) of the prestress. To further explore if controlling the degree of cell spreading could modulate the portion of the prestress balanced by MTs, we utilized a recent method by which tractions are quantified in cells that are constrained within micropatterned adhesive islands of defined sizes on the surface of flexible polyacrylamide gels containing fluorescent microbeads. The prediction is that if MTs balance a portion of the contractile stress, then, upon their disruption, the portion of the stress balanced by MTs would shift to the substrate, causing an increase in traction and strain energy. We first activated the cells maximally with histamine and then disrupted the MTs with colchicine. Histamine resulted in an increase in intracellular calcium whereas ensuing colchicine addition in the presence of histamine did not change intracellular calcium concentration, suggesting there was no additional net increase in contractile stress inside the cell. We found that following disruption of MTs the increase in traction and strain energy varied with the degree of cell spreading: as the cell projected areas increased from 500 micrometer 2 to about 1800 micrometer 2, the percent increase in tractions decreased from 80% to about a few percent and the percent increase in strain energy decreased from 200% to almost zero percent, indicating the portion of the prestress balanced by MTs decreased as the cells increased spreading. These findings demonstrate that complementary role of the extracellular matrix and the MTs in balancing the prestress is controlled by the degree of cell spreading.

Hu, X. and J. M. Calo (2005). "Enhancement of liquid-fluidized bed classification (LFBC) of plastic particle mixtures via selective thermal particle modification." Powder Technology **151**(1-3): 44-53.

A novel method, based on temperature programming of the fluidizing medium, is investigated to improve the separation of complex plastic mixtures via liquid-fluidized bed classification (LFBC). Experiments were performed in a liquid-fluidized bed apparatus that was designed to operate in both upflow and downflow modes, for "heavier-than-water" and "lighter-than-water" plastic particle species, respectively. Temperature programming was achieved by using heated or cooled fluidizing feed water from two different reservoirs controlled at the desired temperatures. Binary beds of plastic mixtures of typical consumer/industrial plastics (PVC, PET, PS PC, LDPE, HDPE, and PP) were used. Due to differences in the thermal properties of the various plastic types, namely thermal diffusivities and glass transition temperatures, the experimental results show that the separation performance of LFBC can be significantly improved by selective modification of particle size/density via temperature programming of the fluidizing medium, water.

Hu, X., et al. (2016). "Development of a multiple immunoaffinity column for simultaneous determination of multiple mycotoxins in feeds using UPLC-MS/MS. (Special Section: Immunoanalysis for environmental monitoring and human health.)." Analytical and bioanalytical chemistry **408**(22): 6027-6036.

A sensitive and specific immunoaffinity column to clean up and isolate multiple mycotoxins was developed along with a rapid one-step sample preparation procedure for ultra-performance liquid chromatography-tandem mass spectrometry analysis. Monoclonal antibodies against aflatoxin B1, aflatoxin B2, aflatoxin G1, aflatoxin G2, zearalenone, ochratoxin A, sterigmatocystin, and T-2 toxin were coupled to microbeads for mycotoxin purification. We optimized a homogenization and extraction procedure as well as column loading and elution conditions to maximize recoveries from complex feed matrices. This method allowed rapid, simple, and simultaneous determination of mycotoxins in feeds with a single chromatographic run. Detection limits for these toxins ranged from 0.006 to 0.12 ng mL⁻¹, and quantitation limits ranged from 0.06 to 0.75 ng mL⁻¹. Concentration curves were linear from 0.12 to 40 micro g kg⁻¹ with correlation coefficients of R²>0.99. Intra-assay and inter-assay comparisons indicated excellent repeatability and reproducibility of the multiple immunoaffinity columns. As a proof of principle, 80 feed

samples were tested and several contained multiple mycotoxins. This method is sensitive, rapid, and durable enough for multiple mycotoxin determinations that fulfill European Union and Chinese testing criteria.

Hu, X., et al. (2012). "Epidermal cells delivered for cutaneous wound healing." Journal of Dermatological Treatment **23**(3): 224-237.

Re-epithelialization is the first and most important step in cutaneous wound healing. The vital role of epidermal cells, or keratinocytes, in accelerating wound healing has long been established. The technique of delivering the cultured and uncultured epidermal cells to the wound bed takes a variety of forms including cultured epithelial autografts (CEAs), tissue-engineered skin equivalent, epidermal suspension and microbead-loaded composite. These techniques, together with the keratinocyte culturing method and scaling up equipment, are still the ongoing research. Application of these techniques also bears direct impact on the outcome of the wounded patients. Best understanding of the delivery technique and its relationship with the culturing method and delivery vehicle could benefit not only the wounded patient but also the development of tissue-engineered skin equivalent.

Hu, Y., et al. (2019). "Current research trends on microplastic pollution from wastewater systems: a critical review." Reviews in Environmental Science and Bio/Technology **18**(2): 207-230.

Microplastics have been widely considered as contaminants for the environment and biota. Till now, most previous studies have focused on the identification and characterization of microplastics in freshwater, sea water, and the terrestrial environment. Although microplastics have been extensively detected in the wastewater, research in this area is still lacking and not thoroughly understood. To fill this knowledge gap, the current review article covers the analytical methods of microplastics originating from wastewater streams and describes their sources and occurrences in wastewater treatment plants (WWTPs). Studies indicated that microplastic pollution caused by domestic washing of synthetic fibers could be detected in the effluent; however, most microplastics from personal care and cosmetic products (PCCPs) can be efficiently removed during wastewater treatment. Moreover, various techniques for sampling and analyzing microplastics from wastewater systems are reviewed; while, the implementation of standardized protocols for microplastics is required. Finally, the fate of microplastics during wastewater treatments and the environmental contamination of effluent to environment are presented. Previous studies reported that the advanced wastewater treatment (e.g., membrane bioreactor) is needed for improving the removal efficiency of small-sized microplastics (<100 micro m). Although the role of microplastics as transport vectors for persistent organic pollutants (POPs) is still under debate, they have demonstrated abilities to absorb harmful agents like pharmaceuticals.

Hua, M., et al. (2018). "Aberrant expression of microRNAs in CD4 cells may contribute to the imbalance of Th17/Treg cells in primary immune thrombocytopenia." Blood. Conference: 60th Annual Meeting of the American Society of Hematology, ASH **132**(Suppl. 1).

Backgrounds:Primary immune thrombocytopenia (ITP) is an acquired autoimmune disease characterized by reduced platelet count and an increased risk of bleeding. The imbalance of Treg/Th17 cells has been demonstrated in ITP, but the mechanism of Th17/Treg cells imbalance is still not clear. In this study, we aimed to investigate whether the expression of helper T (Th) or Treg cell-related microRNAs, such as miR-183-96-182 cluster, miR-17-5p, miR-99a, miR-146-5p, miR-155-5p, miR-181-5p, and miR-326, regulates the ratio of Th17/Treg in CD4 T cells and could be used to evaluate the clinical implications of ITP patients. Method(s): Peripheral blood was

obtained from 54 patients with active ITP and 34 healthy controls. Peripheral blood mononuclear cells (PBMCs) were isolated using Ficoll density-gradient centrifugation and the CD4 cells were separated by immuno-magnetic microbeads selection. Amplification technique of RT-PCR using stem-loop primers was applied to detect the relative expression of microRNAs (miR-17-5p, miR-99a, miR-96-5p, miR- 146a-5p, miR-155-5p, miR-181a-5p, miR-182-5p, miR-183-5, miR-326) and U6 was normalized as control for miRNA quantification. The frequencies of Th17 and Treg cells in peripheral blood were analyzed by flow cytometry. The mRNA expression levels of Il-6, Il-10, Il-17, Rorgamma-t and Foxp-3 in CD4 cells were determined by RT-PCR. Platelet autoantibodies specific for GPIIb/IIIaor GPIb/IX were measured using MAIPA method. CD4+ cells were transfected with miRNAs (miR-99a, miR-182-5p, miR-183-5), mimics or inhibitors, which were used to detect the function of miRNAs. Cytokines in culture medium were determined by ELISA. Result(s): Our results showed that the relative expression of miR-182-5p and miR-183-5p in CD4 cells was significantly increased in active ITP patients, compared to healthy controls (miR-182-5p, median 9.2678 vs 5.2723, $p < 0.05$, Fig. 1a; miR-183-5p, median 5.4435 vs 2.009, $p < 0.05$, Fig. 1b). In addition, the relative expression of miR-99a in ITP patients was lower than that of healthy controls (median 3.4214 vs 7.9648, $p < 0.05$; Fig. 1c). Moreover, the frequency of Treg cells decreased significantly in ITP patients compared to those in controls (1.89+/-1.59% vs 4.12+/-1.42%, $p < 0.05$; Fig. 2a), and the percentage of Treg cells was positively correlated with the relative expression of miR-99a in ITP patients(r=0.461, p< 0.05; Fig. 2c) and health controls(r=0.729, p< 0.05; Fig. 2d). Though the percentage of Th17 cells increased in ITP patients compared to the health controls (3.51+/-2.13%vs 1.85+/-0.63%, $p < 0.05$; Fig. 2b), there was no correlation between the percentage of Th17 and the relative expression of microRNAs in ITP patients or health controls. Besides, there was no correlation between the expression of mRNAs (Il-10, Il-17, Rorgamma-t and Foxp-3) and microRNAs (miR-99a, miRNA-182-5p or miR-183-5p). No significant correlation was found between the microRNAs expression and platelets counts or different autoantibody subsets in ITP patients. The relative expression of other microRNAs (miR-17-5p, miR-96-5p, miR-146a-5p, miR- 155-5p, miR-181-5p, miR-326) revealed no difference in CD4 cells between ITP patients and health controls. Furthermore, the down-regulated expression of miR-183-5p with inhibitors promoted to the differentiation of Th17 cells(Fig. 3a), while up-regulated expression of miR-99a with mimics contributed to Treg cells in CD4 cells from ITP patients (Fig. 3b). Meanwhile, the IL-17A in culture medium decreased in inhibitor group of miR-183-5p or miR-183-5p. However, miR-182-5p inhibitor had no effect on the differentiation of Th17 cells. Conclusion(s): Our results show the abnormal expression of microRNAs (miR-99a, miRNA-182-5p and miR-183-5p) in CD4 cells and the miR-99a was closely correlated with the Treg cells. The aberrant expression of microRNAs may contribute to the imbalance of Th17/Treg cells in the development of ITP patients and potentially constitute a novel therapeutic target. (Figure Presented).

Hua, M., et al. (2018). "NLRP3 inflammsome activation in pbmcs controls the T cell response in adult patients with chronic immune thrombocytopenia." HemaSphere **2 (Supplement 2)**: 393.

Background: Immune thrombocytopenia (ITP) is an acquired autoimmune disorder, which is characterized by imbalanced adaptive immunity of T cells. NLRP3 inflammasome has recently been reported to be involved in diverse inflammatory or immune diseases. However, NLRP3 inflammasome activation in the pathophysiology of ITP remains unclear. Aim(s): To explore the effects of NLRP3 inflammsome activation on the T cells in adult patients with chronic ITP. Method(s): Peripheral blood was obtained from 28 adult patients with chronic ITP. PBMCs were isolated using Ficoll density-gradient centrifugation and the CD4+ cells were purified by positive immuno-magnetic microbeads selection. The PBMCs, CD4+ or CD8+ cells were primed with LPS, then stimulated with ATP and finally cultured in plate-bound anti-human CD3 and soluble anti-human CD28 plus IL-2. After four days, the percentage of CD4+ cells and CD8+ cells, the T helper cell subsets (Th cells) of Th1, Th2, Th17 and T-reg cells, the inhibitory molecules, PD1 and CTLA4, and the CFSE-labeled cells were analyzed by flow cytometry. IFN-gamma, IL-4, IL-17 and TGF-beta in cultured supernatants were assayed by ELISA. The mRNA expression level of cytokines associated with Th cells (Ifn-gamma, Il-6, IL-10, Il-17), the key transcription factors of Th cells (T-bet, Gata3, Foxp3, Ror-gammat) and the inhibitory molecules (Ctla-4, Btla, Tim3, Lag3, Pd1 and Vista) was determined by Real-Time PCR. Result(s):We found that NLRP3 inflammasome activation in PBMCs initiated caspase-1-dependent IL-1beta secretion, and thereby weakened the Th1 cell differentiation (unstimulated control 13.3% vs. stimulation 5.3%; p=0.015), which can be restored, at least in part, by caspase-1 inhibitor Z-YVADFMK (Figure 1). The production of IFN-gamma and the expression of Ifn-gamma, were significantly down-regulated after NLRP3 inflammsome activation. However, the percentage of Th2 or Th17 was not significantly different between the stimulated and unstimulated groups. Meanwhile, the percentage of Treg cells was also decreased after stimulation by LPS plus ATP in PBMCs (unstimulated control 6.67% vs. stimulation 4.39%; p=0.033). More importantly, NLRP3 inflammasome activation significantly suppressed the proliferation but didn't induce the apoptosis of CD4+ cells and CD8+ cells (Figure 2). Accordingly, the mRNA expression of inhibitory molecules (Ctla-4, Btla, Tim3, Pd1 and Vista) of T cells and the PD1 or CTLA4 (Figure 3) on the membrane surface of CD4+ and CD8+ cells were up-regulated after the activation of NLRP3 inflammasome in PBMCs. Furthermore, the percentage of CD8+ cells significantly decreased after NLRP3 inflammasome activation in PBMCs. However, LPS plus ATP took no effect on purified CD4+ or CD8+ cells in contrast with PBMCs. Summary/Conclusion: NLRP3 inflammsome-mediated innate immune reaction may play an important role in controlling the T cell responses of adaptive immunity by the inhibitory molecules and might prevent disease progression in adult chronic ITP. (Figure Presented).

Huang, D., et al. (2011). "Losartan inhibits oxidized-low density lipoprotein induced immune maturation of dendritic cells." European Heart Journal **1)**: 511.

Purpose: The angiotensin II receptor blocker (ARB) has generally been shown to have anti-inflammatory effects and dendritic cells (DCs) are the most efficient antigen presenting cells that play an active role in the development of atherosclerosis through inflammatory-immune responses. The effects of ARB on DCs maturation and immune function remain unknown and we, therefore, studied the influence of ARB losartan on the maturation and immune function of DCs. Method(s): Peripheral blood mononuclear cells were obtained from healthy volunteers by density gradient centrifugation. Human monocytes were purified using CD14+ immunomagnetic micro beads and incubated in RPMI-1640 medium supplemented with GM-CSF (100ng/mL) and IL-4 (50ng/mL). After 5 days, immature DCs were derived. Losartan (1, 10 and 100mumol/L) was added to the medium for 24 hours. Ox-LDL (50mug/ml) was then added to the medium for another 24 hours. The immunophenotypic expressions (CD1a, CD40, CD83, CD86 and HLADR) were analyzed by FACS. The capacity of DCs to stimulate T-cell proliferation was measured by allogenic mixed lymphocyte reaction (MLR). To understand the anti-inflammatory mechanisms of losartan, the angiotensin II secretions of culture supernatants of ox-LDL (10, 50 and 100mug/ml) were measured with ELISA. We also studied the effects of ox-LDL and angiotensin II (0.1, 1 and 10mumol/L) on the maturation of DCs and the expressions of scavenger receptors (SR-A, CD36 and LOX-1) on DCs. Result(s): (1) Ox-LDL and angiotensin IIinduced DCs maturation accompanied with increased expressions of CD1a, CD40, CD83, CD86 and HLA-DR. The capacity of DCs to stimulate T-cell proliferation was also enhanced by ox-LDL and angiotensin II. (2)

Ox-LDL enhanced the secretion of angiotensin IIof DCs in a concentration-dependent manner. (3) Losartan reduced ox-LDL-induced immunophenotypic expressions and capacity to stimulate T-cell proliferation of DCs. (4) Ox-LDL and angiotensin II significantly upregulated SR-A and LOX-1, other than CD36, expression on DCs and the upregulation was attenuated by losartan. (5) Ox-LDL-induced immunophenotypic expression was partly inhibited by either an anti-LOX-1 or anti-SR-A neutralizing antibody. Conclusion(s): Losartan could inhibit the ox-LDL-induced maturation and immune function of DCs partly through attenuated the effect of angiotensin II secreted by DCs which was enhanced by ox-LDL. SR-A and LOX-1 played an important role in the ox-LDL- or angiotensin II- induced DCs maturation. These findings might explain in part the interactive roles of ox-LDL, renin-angiotensin system (RAS) and DCs in the processes of atherosclerosis.

Huang, D. Y., et al. (2013). "Pollution characteristics of volatile organic compounds, polycyclic aromatic hydrocarbons and phthalate esters emitted from plastic wastes recycling granulation plants in Xingtan Town, South China." Atmospheric Environment **71**: 327-334.

With the aim to investigate the main pollution characteristics of exhaust gases emitted from plastic waste recycling granulation plants, mainly volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and phthalate esters (PAEs) were analyzed in Xingtan Town, the largest distribution center of plastic waste recycling in China. Both inside and outside the plants, the total concentrations of volatile monocyclic aromatic hydrocarbons (MAHs), PAHs and PAEs ranged from 2000 to 3000 mug m⁻³, 450 to 1200 ng m⁻³, and 200 to 1200 ng m⁻³, respectively. Their concentration levels inside the plants were higher than those outside the plants, and PAHs and PAEs were mainly distributed in the gas-phase. Notably, highly toxic benzo[a]pyrene (BaP) could be detected inside the plants, and harmful PAEs could be detected not only inside but also outside the plants, although PAEs are non-volatile. The exhaust gas composition and concentration were related to the plastic feedstock and granulation temperature. © 2013 Elsevier Ltd.

Huang, F. Y., et al. (2019). "[Effects of Microplastics on Antibiotic Resistance Genes in Estuarine Sediments]." Huanjing Kexue/Environmental Science **40**(5): 2234-2239.

Microplastics and antibiotic resistance genes (ARGs) are emerging pollutants/contaminants, and are also the research hotspots concerning environmental health in the past few years. To explore the effects of microplastics on ARGs in estuarine sediment, three different microplastics were added to microcosm incubation experiments of sediments. Then, we investigated the persistence, abundance, diversity, and shifts of the ARGs in estuarine sediments by high-throughput quantitative polymerase chain reaction (PCR). The results showed that the microplastics significantly changed the structure of ARGs in the sediments. PVC and PE, which are hard to degrade, had significant effects on the structures and types of ARGs. However, the PVA, which is soluble, reduced the types and persistence of ARGs significantly. The abundance of ARGs in S_PVC, S_PE, and S_PVA were 4.1x10⁹, 8.1x10⁹, and 2.0x10⁹ copies.g⁻¹, respectively. The abundance of ARGs in sediments with added PE almost increased by one order of magnitude, implying that microplastics could significantly increase the abundance of ARGs in sediments. Furthermore, OLS regression analysis showed that ARGs are significantly correlated with transposon and integron, suggesting that mobile genetic elements (MGEs) may promote the transfer and dissemination of ARGs.

Huang, H., et al. (2017). "Hexabromocyclododecanes in soils and plants from a plastic waste treatment area in North China: occurrence, diastereomer- and enantiomer-specific profiles, and metabolization."

Environmental Science & Pollution Research **24**(27): 21625-21635.

Plastic waste is a source of organic contaminants such as hexabromocyclododecanes (HBCDs). HBCDs have been found to cause developmental and reproductive toxicity; it is important to investigate the occurrence and metabolization of HBCDs in the soil environments with plastic waste contamination. This work analyzed HBCDs and their metabolites in soil and plant samples collected from Xinle and Dingzhou-the major plastic waste recycling centers in North China.

Huang, H., et al. (2019). "Biodegradation of Structurally Diverse Phthalate Esters by a Newly Identified Esterase with Catalytic Activity toward Di(2-ethylhexyl) Phthalate." Journal of Agricultural & Food Chemistry **67**(31): 8548-8558.

Herein, we report a double enzyme system to degrade 12 phthalate esters (PAEs), particularly bulky PAEs, such as the widely used bis(2-ethylhexyl) phthalate (DEHP), in a one-pot cascade process. A PAE-degrading bacterium, Gordonia sp. strain 5F, was isolated from soil polluted with plastic waste. From this strain, a novel esterase (GoEst15) and a mono(2-ethylhexyl) phthalate hydrolase (GoEstM1) were identified by homology-based cloning. GoEst15 showed broad substrate specificity, hydrolyzing DEHP and 10 other PAEs to monoalkyl phthalates, which were further degraded by GoEstM1 to phthalic acid. GoEst15 and GoEstM1 were heterologously coexpressed in Escherichia coli BL21 (DE3), which could then completely degrade 12 PAEs (5 mM), within 1 and 24 h for small and bulky substrates, respectively. To our knowledge, GoEst15 is the first DEHP hydrolase with a known protein sequence, which will enable protein engineering to enhance its catalytic performance in the future.

Huang, H., et al. (2009). "Rapid analysis of alpha-fetoprotein by chemiluminescence microfluidic immunoassay system based on super-paramagnetic microbeads." Biomedical Microdevices **11**(1): 213-216.

A rapid and sensitive chemiluminescence microfluidic immunoassay system based on super-paramagnetic microbeads for determination of alpha-fetoprotein (AFP) is described. In this system we use CO(2) laser to fabricate microfluidic chip, and use super-paramagnetic microbeads as solid carrier of antibody, chemiluminescence as detection signal. With this system we can perform AFP analysis within 20 min, and the linear range of AFP concentration is 1 approximately 800 ng/mL, the detection limit is 0.23 ng/mL. By this method no separation or preconcentration steps are needed. Most of all, the chip can be reused.

Huang, J. S., et al. (2020). "Microplastic accumulation in fish from Zhanjiang mangrove wetland, South China." Science of the Total Environment **708**: 134839.

Microplastics (MPs) are widespread in marine and estuarine environments, but the contamination of MPs in mangrove wetlands is relatively unknown. Here, we quantify the presence of MPs in fish collected from Zhanjiang mangrove wetland, the largest mangrove in South China, which provide baseline data on MPs accumulation in fish in mangrove environment as the first evidence in China. MPs were found in 30 out of 32 fish species at an average abundance of 2.83+/-1.84items individual⁻¹, ranged from 0.6 to 8.0items individual⁻¹ in each species. MPs were detected in gills, stomach and intestine, and not found in muscles and livers. Positive relationship was found between MPs abundance and body length or weight of mangrove fish. The dominant polymers identified by micro-FTIR were polyethylene, polyethylene terephthalate, polypropylene and cellophane. MPs consisted primarily of fibers and with the prominent size range of 0.02-1mm. The body sizes, living habitats and feeding habits of fish are important factors affecting MPs accumulation in different fish species. This study revealed the wide presences of MPs in fish species within a mangrove wetland.

Huang, L. and X. Fang (2008). "Immunoaffinity fractionation of plasma proteins by chicken IgY antibodies." Methods in Molecular Biology **425**: 41-51.

Separation of complex mixtures having a wide dynamic range of protein concentration, such as plasma or serum, presents a significant challenge for proteomic analysis. Immunoaffinity fractionation is one of the most effective methods used during sample preparation to improve the ability to detect low-abundant proteins (LAP), enhancing biomarker discovery. Avian IgY (Immunoglobulin Yolk) antibodies have unique and advantageous features, which include strong avidity, high specificity, low nonspecific binding, and accumulative production. Polyclonal IgY antibodies covalently coupled to microbeads are particularly effective in specifically removing high-abundant proteins (HAP) from plasma, serum, CSF, urine, and other body fluid or cellular sources. IgY-12 is a composition of IgY microbeads designed for one-step removal of the 12 most abundant proteins in human serum or plasma: albumin, IgG, transferrin, fibrinogen, alpha1-antitrypsin, IgA, IgM, alpha2-macroglobulin, haptoglobin, apolipoproteins A-I and A-II, and orosomucoid (alpha1-acid glycoprotein). Removal of the 12 HAPs enables improved resolution and dynamic range for one-dimensional gel electrophoresis (1DGE), two-dimensional gel electrophoresis (2DGE), and liquid chromatography/mass spectrometry (LC/MS).

Huang, L., et al. (2005). "Immunoaffinity separation of plasma proteins by IgY microbeads: meeting the needs of proteomic sample preparation and analysis." Proteomics **5**(13): 3314-3328.

Separation of complex protein mixtures that have a wide dynamic range of concentration, such as plasma or serum, is a challenge for proteomic analysis. Sample preparation to remove high-abundant proteins is essential for proteomics analysis. Immunoglobulin yolk (IgY) antibodies have unique and advantageous features that enable specific protein removal to aid in the detection of low-abundant proteins and biomarker discovery. This report describes the efficiency and effectiveness of IgY microbeads in separating 12 abundant proteins from plasma with an immunoaffinity spin column or LC column. The protein separation and sample preparation process was monitored via SDS-PAGE, 2-DE, LC-MS/MS, or clinical protein assays. The data demonstrate the high specificity of the protein separation, with removal of 95-99.5% of the abundant proteins. IgY microbeads against human proteins can also selectively remove orthologous proteins of other mammals such as mouse, rat, etc. Besides the specificity and reproducibility of the IgY microbeads, the report discusses the factors that may cause potential variations in protein separation such as protein-protein interactions (known as "Interactome"), binding and washing conditions of immunoaffinity reagents, etc. A novel concept of Seppromics is introduced to address methodologies and science of protein separation in a context of proteomics.

Huang, M. C. and J. J. Lin (2008). "Characteristics and management of infectious industrial waste in Taiwan." Waste Management **28**(11): 2220-2228.

Infectious industrial waste management in Taiwan is based on the specific waste production unit. In other countries, management is based simply on whether the producer may lead to infectious disease. Thus, Taiwan has a more detailed classification of infectious waste. The advantage of this classification is that it is easy to identify the sources, while the disadvantage lies in the fact that it is not flexible and hence increases cost. This study presents an overview of current management practices for handling infectious industrial waste in Taiwan, and addresses the current waste disposal methods. The number of small clinics in Taiwan increased from 18,183 to 18,877 between 2003 and 2005. Analysis of the data between 2003 and 2005 showed

that the majority of medical waste was general industrial waste, which accounted for 76.9%-79.4% of total medical waste. Infectious industrial waste accounted for 19.3%-21.9% of total medical waste. After the SARS event in Taiwan, the amount of infectious waste reached 19,350 tons in 2004, an increase over the previous year of 4000 tons. Waste minimization was a common consideration for all types of waste treatment. In this study, we summarize the percentage of plastic waste in flammable infectious industrial waste generated by medical units, which, in Taiwan was about 30%. The EPA and Taiwan Department of Health have actively promoted different recycling and waste reduction measures. However, the wide adoption of disposable materials made recycling and waste reduction difficult for some hospitals. It has been suggested that enhancing the education of and promoting communication between medical units and recycling industries must be implemented to prevent recyclable waste from entering the incinerator.

Huang, Q., et al. (2020). "Modelling the global impact of China's ban on plastic waste imports." Resources, Conservation and Recycling **154 (no pagination)**(104607).

China has long been the world's leading plastic waste importer. However, in January 2018 the Chinese Government enacted a new policy to permanently ban the import of most plastic waste into the country. This raises an important question: what will the impact of this policy be both domestically and globally? It is argued that the answer to this question can in part be systematically revealed by employing three methods of analysis. (1) A combined multiregional input-output model with structural path analysis (SPA) to understand how consumption patterns domestically and globally drive China's plastic waste imports. (2) An ecological network analysis to identify which region is the dominant controller of the global plastic waste trade network. Lastly, (3) a hypothetical extraction method to investigate the value-added change for China and the increased requirement of waste treatment capacity for other economies. The results indicate that the imported plastic waste was mainly driven by China's domestic consumption of products containing recycled plastic. Given this demand, it is recommended that the Chinese Government undertake various actions to increase local plastic waste recycling to compensate for the loss of recycled plastic material since the import ban took place. China is a dominant controller, along with the US, the European Union and Germany of the global plastic waste trade network. At this stage it is not possible for other large economies to replace the role of China in the short term. China's waste import ban caused a minor economic loss for China, however, it has resulted in the need for other economies to increase their waste treatment capacity. As well as increasing local plastic waste recycling, it is recommended the Chinese Government consider reopening imports for high quality recycled material and to seek global collaboration, which would not only ease the shortage of recycled plastic material but also buy time for other economies to build new waste treatment plants. Copyright © 2019 Elsevier B.V.

Huang, Q., et al. (2018). "Gelatin Nanoparticle-Coated Silicon Beads for Density-Selective Capture and Release of Heterogeneous Circulating Tumor Cells with High Purity." Theranostics **8**(6): 1624-1635.

Background: Circulating tumor cells (CTCs) are a burgeoning topic in cancer biomarker discovery research with minimal invasive blood draws. CTCs can be used as potential biomarkers for disease prognosis, early cancer diagnosis and pharmacodynamics. However, the extremely low abundance of CTCs limits their clinical utility because of technical challenges such as the isolation and subsequent detailed molecular and functional characterization of rare CTCs from patient blood samples. Methods: In this study, we present a novel density gradient centrifugation method employing biodegradable gelatin nanoparticles coated on silicon beads for the isolation, release, and downstream analysis of CTCs from colorectal and breast cancer

patients. Results: Using clinical patient/spiked samples, we demonstrate that this method has significant CTC-capture efficiency (>80%) and purity (>85%), high CTC release efficiency (94%) and viability (92.5%). We also demonstrate the unparalleled robustness of our method in downstream CTC analyses such as the detection of PIK3CA mutations. Conclusion: The efficiency and versatility of the multifunctional density microbeads approach provides new opportunities for personalized cancer diagnostics and treatments.

Huang, X., et al. (2015). "A Dual-Mode Large-Arrayed CMOS ISFET Sensor for Accurate and High-Throughput pH Sensing in Biomedical Diagnosis." IEEE Transactions on Biomedical Engineering **62**(9): 2224-2233.

GOAL: The existing ISFET-based DNA sequencing detects hydrogen ions released during the polymerization of DNA strands on microbeads, which are scattered into microwell array above the ISFET sensor with unknown distribution. However, false pH detection happens at empty microwells due to crosstalk from neighboring microbeads. In this paper, a dual-mode CMOS ISFET sensor is proposed to have accurate pH detection toward DNA sequencing.

METHODS: Dual-mode sensing, optical and chemical modes, is realized by integrating a CMOS image sensor (CIS) with ISFET pH sensor, and is fabricated in a standard 0.18-mum CIS process. With accurate determination of microbead physical locations with CIS pixel by contact imaging, the dual-mode sensor can correlate local pH for one DNA slice at one location-determined microbead, which can result in improved pH detection accuracy. Moreover, toward a high-throughput DNA sequencing, a correlated-double-sampling readout that supports large array for both modes is deployed to reduce pixel-to-pixel nonuniformity such as threshold voltage mismatch.

RESULTS: The proposed CMOS dual-mode sensor is experimentally examined to show a well correlated pH map and optical image for microbeads with a pH sensitivity of 26.2 mV/pH, a fixed pattern noise (FPN) reduction from 4% to 0.3%, and a readout speed of 1200 frames/s.

CONCLUSION: A dual-mode CMOS ISFET sensor with suppressed FPN for accurate large-arrayed pH sensing is proposed and demonstrated with state-of-the-art measured results toward accurate and high-throughput DNA sequencing.

SIGNIFICANCE: The developed dual-mode CMOS ISFET sensor has great potential for future personal genome diagnostics with high accuracy and low cost.

Huang, Y., et al. (2019). "Distribution characteristics of microplastics in Zhubi Reef from South China Sea." Environmental Pollution **Part 1. 255 (no pagination)**(113133).

As a new type of emerging pollutant in the ocean, microplastics have received global attention in recent years. Considering the increasing amount of human activities around the South China Sea, it is important to determine the current status of microplastic pollution in this region. In this study, we analyzed the abundance and distribution of microplastics at Zhubi Reef in the South China Sea. Microplastic abundance ranged from 1400 to 8100 items/m³ of surface water, which was much higher than the values reported from other ocean areas. About 80% of the microplastics were smaller than 0.5 mm in size. Fibers and pellets comprised the most common microplastic types. The dominant microplastics were transparent or blue in color. The main polymer types were polypropylene (25%) and polyamide (18%). In general, our results revealed Zhubi Reef was contaminated with microplastics, which were likely derived from the intensive fisheries in the area and emissions from coastal cities. This study also provides baseline data that are useful for additional studies of microplastics in the South China Sea. Microplastics pollution in South China Sea. Copyright © 2019 Elsevier Ltd

Huang, Y., et al. (2019). "LDPE microplastic films alter microbial community composition and enzymatic activities in soil." Environmental Pollution **254**(Pt A): 112983.

Concerns regarding microplastic contamination have spread from aquatic environments to terrestrial systems with a growing number of studies have been reported. Notwithstanding, the potential effects on soil ecosystems remain largely unexplored. In this study, the effects of polyethylene microplastics on soil enzymatic activities and the bacterial community were evaluated, and the microbiota colonizing on microplastics were also investigated. Microplastic amendment (2000 fragments per kg soil) significantly increased the urease and catalase activities in soil after 15 days, and no discernible alteration of invertase activities was detected.

Huang, Z., et al. (2019). "Sustainable, Reshapable Surfactant-Polyelectrolyte Plastics Employing Water as a Plasticizer." Acs Applied Materials & Interfaces **11**(34): 31311-31316.

Natural polymers such as those present in foods contain abundant noncovalent intra- and intermolecular interactions, notably hydrogen bonds, which make them rigid when dry, but on exposure to water soften, due to disruption of these interactions. This softening process allows them to be reshaped. Food-derived materials, however, have limited practical use due to their high brittleness and gradual degradation. Nevertheless, inspired by such properties, surfactant-polyelectrolyte-based polymers that contain abundant ionic interactions and can be repeatedly reshaped using water as plasticizer are described. The polymers, on the basis of main chain anionic poly(styrene sulfonates) combined with phosphonium surfactant, are readily synthesized with well-defined lamellar domains through interfacial metathesis reactions. The polymers present typical stress-strain characteristics of plastics, and their modulus undergoes a decrease of ca. 3 orders of magnitude upon shear and stretch forces after plasticizing with water. Since recycling of plastics generally involves complicated and energy-intensive processes (that leads to the majority of plastics being land-filled or incinerated), it is envisaged that reshapable polymers, such as those described here, could reduce the amount of plastic waste as they can be remolded as and when required, thus reducing pollution and the depletion of resources, ultimately contributing to a more sustainable society.

Hua-Shan, T. and C. You-Shen (2007). "Mixing Recovered Waste Fiber-Reinforced Plastic with Polyethylene Plastic Waste." Practice Periodical of Hazardous, Toxic & Radioactive Waste Management **11**(3): 158-163.

Polyblending was applied to mix waste fiber-reinforced plastic (FRP) and polyethylene (PE) plastic waste in various proportions and particle sizes. Compatibility, morphology, mechanical properties, and dynamical mechanical analyses of the matrix composites were used as indices to justify the physical behaviors of composites. Differential scanning calorimetry measurements and scanning electron microscopy observations showed that PE and FRP in the blends were incompatible. The mechanical strengths of blends were decreased if the FRP ratio or particle size increased. Results of tensile and impact strength tests indicated that the blends had a brittle property. The loss tangent (tan δ) of dynamical mechanical analysis also increased with the increase of the FRP ratio and particle size. These results reveal a weakening interaction between the FRP and plastic matrix. As PE lost ability to cover FRP, external forces were unable to be transferred or dispersed properly across the composite matrix. This increased the tendency of the blends to fracture. [ABSTRACT FROM AUTHOR]

Hübner, M., et al. (2019). "Myeloid-Derived Suppressor Cells Mediate Immunosuppression After Cardiopulmonary Bypass." Critical Care Medicine **47**(8): e700-e709.

OBJECTIVESCardiopulmonary bypass is associated with severe immune dysfunctions. Particularly, a cardiopulmonary bypass-related long-lasting immunosuppressive state predisposes patients to a higher risk of postoperative complications, such as persistent bacterial infections. This study was conducted to elucidate mechanisms of post-cardiopulmonary bypass immunosuppression.DESIGNIn vitro studies with human peripheral blood mononuclear cells.SETTINGCardiosurgical ICU, University Research Laboratory.PATIENTSSeventy-one patients undergoing cardiac surgery with cardiopulmonary bypass (enrolled May 2017 to August 2018).INTERVENTIONSPeripheral blood mononuclear cells before and after cardiopulmonary bypass were analyzed for the expression of immunomodulatory cell markers by real-time quantitative reverse transcription polymerase chain reaction. T cell effector functions were determined by enzyme-linked immunosorbent assay, carboxyfluorescein succinimidyl ester staining, and cytotoxicity assays. Expression of cell surface markers was assessed by flow cytometry. CD15 cells were depleted by microbead separation. Serum arginine was measured by mass spectrometry. Patient peripheral blood mononuclear cells were incubated in different arginine concentrations, and T cell functions were tested.MEASUREMENTS AND MAIN RESULTSAfter cardiopulmonary bypass, peripheral blood mononuclear cells exhibited significantly reduced levels of costimulatory receptors (inducible T-cell costimulator, interleukin 7 receptor), whereas inhibitory receptors (programmed cell death protein 1 and programmed cell death 1 ligand 1) were induced. T cell effector functions (interferon γ secretion, proliferation, and CD8-specific cell lysis) were markedly repressed. In 66 of 71 patients, a not yet described cell population was found, which could be characterized as myeloid-derived suppressor cells. Myeloid-derived suppressor cells are known to impair immune cell functions by expression of the arginine-degrading enzyme arginase-1. Accordingly, we found dramatically increased arginase-1 levels in post-cardiopulmonary bypass peripheral blood mononuclear cells, whereas serum arginine levels were significantly reduced. Depletion of myeloid-derived suppressor cells from post-cardiopulmonary bypass peripheral blood mononuclear cells remarkably improved T cell effector function in vitro. Additionally, in vitro supplementation of arginine enhanced T cell immunocompetence.CONCLUSIONSCardiopulmonary bypass strongly impairs the adaptive immune system by triggering the accumulation of myeloid-derived suppressor cells. These myeloid-derived suppressor cells induce an immunosuppressive T cell phenotype by increasing serum arginine breakdown. Supplementation with L-arginine may be an effective measure to counteract the onset of immunoparalysis in the setting of cardiopulmonary bypass.

Huerta Lwanga, E., et al. (2017). "Field evidence for transfer of plastic debris along a terrestrial food chain." Scientific Reports **7**(1).

Although plastic pollution happens globally, the micro- (<5 mm) and macroplastic (5-150 mm) transfer of plastic to terrestrial species relevant to human consumption has not been examined. We provide first-time evidence for micro- and macroplastic transfer from soil to chickens in traditional Mayan home gardens in Southeast Mexico where waste mismanagement is common. We assessed micro- and macroplastic in soil, earthworm casts, chicken feces, crops and gizzards (used for human consumption). Microplastic concentrations increased from soil (0.87+or-1.9 particles g⁻¹), to earthworm casts (14.8+or-28.8 particles g⁻¹), to chicken feces (129.8+or-82.3 particles g⁻¹). Chicken gizzards contained 10.2+or-13.8 microplastic particles, while no microplastic was found in crops. An average of 45.82+or-42.6 macroplastic particles were found per gizzard and 11+or-15.3 macroplastic particles per crop, with 1-10 mm particles being significantly more abundant per gizzard (31.8+or-27.27 particles) compared to the crop (1+or-2.2 particles). The data show that micro- and macroplastic are capable of entering terrestrial food webs.

Huffer, T. and T. Hofmann (2016). "Sorption of non-polar organic compounds by micro-sized plastic particles in aqueous solution." Environmental Pollution **214**: 194-201.

The presence of microscale polymer particles (i.e., microplastics) in the environment has become a major concern in recent years. Sorption of organic compounds by microplastics may affect the phase distribution within both sediments and aqueous phases. To investigate this process, isotherms were determined for the sorption of seven aliphatic and aromatic organic probe sorbates by four polymers with different physico-chemical properties. Sorption increased in the order polyamide < polyethylene < polyvinylchloride < polystyrene. This order does not reflect the particle sizes of the investigated microplastics within the aqueous dispersions, indicating the influence of additional factors (e.g., pi-pi-interactions) on the sorption of aromatic compounds by polystyrene. Linear isotherms by polyethylene suggested that sorbate uptake was due to absorption into the bulk polymer. In contrast, non-linear isotherms for sorption by PS, PA, and PVC suggest a predominance of adsorption onto the polymer surface, which is supported by the best fit of these isotherms using the Polanyi-Manes model. A strong relationship between the sorption coefficients of the microplastics and the hydrophobicity of the sorbates suggests that hydrophobic interactions are of major importance.

Huffer, T., et al. (2019). "Polyethylene microplastics influence the transport of organic contaminants in soil." Science of the Total Environment **657**: 242-247.

Plastics are now found in all natural environments including soil. The effects of microplastics in terrestrial systems, however, remain largely unexplored. Polyethylene is one of the mass-manufactured polymers found in terrestrial environments. It is used in many different sectors, for example in agricultural mulches, composite materials, and packaging. The presence of microplastics in soil, including polyethylene, can affect the transport of hydrophobic organic pollutants including pesticides. The objective of this study was to investigate the influence of polyethylene microplastics (<250mum) on the transport of two selected organic plant-protection agents (atrazine and 4-(2,4-dichlorophenoxy) butyric acid) in soil under different aqueous conditions, using inverse liquid chromatography. The distribution coefficients for the sorbates that were sorbed to pure polyethylene microplastic were found to be significantly smaller than those for the sorbates sorbed to pure soil. The addition of 10% (w/w) polyethylene to the soil therefore led to an overall reduction in sorption, but the sorption trends due to variations in pH and ionic strength were not affected. The results imply that the presence of polyethylene microplastics in soil may therefore increase the mobility of organic contaminants by reducing the sorption capacity of natural soils, which must be validated by further research.

Huffer, T., et al. (2017). "Microplastic Exposure Assessment in Aquatic Environments: Learning from Similarities and Differences to Engineered Nanoparticles." Environmental Science & Technology **51**(5): 2499-2507.

Microplastics (MPs) have been identified as contaminants of emerging concern in aquatic environments and research into their behavior and fate has been sharply increasing in recent

years. Nevertheless, significant gaps remain in our understanding of several crucial aspects of MP exposure and risk assessment, including the quantification of emissions, dominant fate processes, types of analytical tools required for characterization and monitoring, and adequate laboratory protocols for analysis and hazard testing. This Feature aims at identifying transferrable knowledge and experience from engineered nanoparticle (ENP) exposure assessment. This is achieved by comparing ENP and MPs based on their similarities as particulate contaminants, whereas critically discussing specific differences. We also highlight the most pressing research priorities to support an efficient development of tools and methods for MPs environmental risk assessment.

Huffer, T., et al. (2019). "The molecular interactions of organic compounds with tire crumb materials differ substantially from those with other microplastics." Environmental Science. Processes & Impacts **06**: 06.

Tire materials are the most commonly found elastomers in the environment and they account for a significant fraction of microplastic pollution. In the discussions on the environmental impact of microplastics tire materials and their sorption properties have been largely overlooked. In this study we used experimental sorption data from six organic probe sorbates sorbing to two tire materials and their major components, styrene butadiene rubber and carbon black, to gain a better understanding of the underlying sorption processes of tire materials. Commonly applied models used to describe non-linear sorption processes were unable to fully explain sorption to tire materials but showed that absorption into the rubber fraction dominated the sorption process. Hydrophobicity was approximated using the hexadecane-water partitioning constant, which correlated very well with the distribution data obtained for styrene rubber, whereas the correlations between hydrophobicity of sorbates and the sorption data to the tire materials were poor. Although hydrophobicity plays an important role in sorption to tire materials, additional interactions must be taken into account. Overall, the processes involved in sorption to tire materials differed significantly from those governing sorption to other microplastics.

Huffer, T., et al. (2018). "Sorption of organic compounds by aged polystyrene microplastic particles." Environmental Pollution **236**: 218-225.

Microplastics that are released into the environment undergo aging and interact with other substances such as organic contaminants. Understanding the sorption interactions between aged microplastics and organic contaminants is therefore essential for evaluating the impact of microplastics on the environment. There is little information available on how the aging of microplastics affects their sorption behavior and other properties. We have therefore investigated the effects of an accelerated UV-aging procedure on polystyrene microplastics, which are used in products such as skin cleaners and foams. Physical and chemical particle characterizations showed that aging led to significant surface oxidation and minor localized microcrack formation. Sorption coefficients of organic compounds by polystyrene microplastics following aging were up to one order of magnitude lower than for pristine particles. Sorption isotherms were experimentally determined using a diverse set of probe sorbates covering a variety of substance classes allowing an in-depth evaluation of the poly-parameter linear free-energy relationship (ppLFER) modelling used to investigate the contribution of individual molecular interactions to overall sorption. The ppLFER modelling was validated using internal cross-validation, which confirmed its robustness. This approach therefore yields improved estimates of the interactions between aged polystyrene microplastics and organic contaminants.

Hufnagl, B., et al. (2019). "A methodology for the fast identification and monitoring of microplastics in environmental samples using random decision forest classifiers (A short video showing the application of the RDF model using the datasets 'Microplastic' and 'RefEnv1' is available through DOI: 10.5281/zenodo.2541745) (Electronic supplementary information (ESI) available: Classification results of the datasets 'Microplastic', 'RefEnv1' and 'RefEnv2' (data not shown) are provided as *.png and MATLAB*.mat files. See DOI: 10.1039/c9ay00252a)." Analytical Methods **11**(17): 2277-2285.

A new yet little understood threat to our ecosystems is microplastics. These microscopic particles accumulate in our oceans and in the end may find their way into the food chain. Even though their origin and the laws governing their formation have become ever more clear fast and reliable methodologies for their analysis and identification are still lacking or at an early stage of development. The first automatic approaches to analyze µFTIR images of microplastics which have been enriched on membrane filters are promising and provide the impetus to put further effort into their development. In this paper we present a methodology which allows discrimination between different polymer types and measurement of their abundance and their size distributions with high accuracy. In particular we apply random decision forest classifiers and compute a multiclass model for the polymers polyethylene, polypropylene, poly(methyl methacrylate), polyacrylonitrile and polystyrene. Further classification results of the analyzed µFTIR images are given for comparability. The study also briefly discusses common issues that can arise in classification such as the curse of dimensionality and label noise.

Hug, H. and R. Schuler (2003). "Measurement of the number of molecules of a single mRNA species in a complex mRNA preparation." Journal of Theoretical Biology **221**(4): 615-624.

The normalization of data obtained from hybridization experiments with DNA chips to determine mRNA expression and concentration (gene expression profiling) is an unsolved problem. Furthermore, slight changes in mRNA expression or small numbers of mRNA molecules which may be relevant to disease cannot be detected so far. We have designed a method to calculate the number of molecules of a single mRNA species in a complex mRNA preparation. The basic concept is the transformation of a quantitative problem into a qualitative problem. Individual molecules pertaining to the same molecular species (IMPSMS) are transformed to a mixture of new different molecular species (DMS) and amplified. We propose two implementations of the method. The first procedure is based on a method for cloning tagged nucleic acid molecules onto the surface of micro-beads. It should be possible to transform and determine up to 10(6) IMPSMS into new DMS. The second strategy uses multimeric linkers, a method frequently used in DNA computing to assemble random DNA. The second strategy should be easier to implement but is limited to a few hundred IMPSMS.

Hughes, A., et al. (2000). "Studies with natural rapeseed and microbially derived polyhydroxybutyrate to simulate extraction of plastic from transgenic material." Bioprocess Engineering **23**(3): 257-263.

The creation of transgenic plants with high levels of products such as plastic particles, takes a number of seasons to scale-up. In the interim, studies of natural plant material with microbially derived product, in this case polyhydroxybutyrate (PHB), can indicate what may be possible and where difficulties are likely. Large scale processes exist for the removal of oil from rapeseed, and an earlier study examined their applicability prior to the recovery of PHB. The present study examined the subsequent separation of PHB from protein meal. In particular, the density and size characteristics of PHB in a single particle and aggregate form and of the meal were examined. These were used to predict separation by sedimentation with and without the use of a densifying material (52% w/w sucrose). Sedimentation did not yield a full separation but densification of the medium allowed an almost complete separation. As an alternative approach, the selective dissolution of the protein meal was examined and 2 M sodium hydroxide was found to be the most effective agent. It did not cause a molecular weight change of the PHB provided the pH was lower than 11. The protein was precipitated subsequent to separation of the PHB by the use of acids with phosphoric acid being the most effective (80% recovery). The relationship of this approach to the use of a second solvent for PHB dissolution is briefly discussed.

Hugues-Ayala, A. M., et al. (2020). "Airbrush encapsulation of Lactobacillus rhamnosus GG in dry microbeads of alginate coated with regular buttermilk proteins." LWT Food Science and Technology **117**(108639).

Lactobacillus rhamnosus GG (L. rhamnosus GG) loaded calcium alginate microbeads were prepared via an airbrush system and subsequently coated with regular butter milk proteins (RBMP). Scanning electron micrographs and changes in zeta potential demonstrated the presence of RBMP on microbeads surface. Survivability of probiotics after microbead lyophilization was higher in coated microbeads (8.91+or-0.03 log cfu) than in the uncoated ones (7.67+or-0.09 log cfu). After storage at -20 degrees C for 30 d, the coated and uncoated microbeads showed 0.4 log and 0.8 log cfu/g loss in cell number, respectively. RBMP also enhance the survival of L. rhamnosus GG after exposure to sequential simulated gastrointestinal conditions. These results suggest that coating alginate capsules with RBMP is an effective strategy for the survival of L. rhamnosus GG when encapsulated with an airbrush system.

Humar, M., et al. (2017). "Biomaterial microlasers implantable in the cornea, skin, and blood." Optica **4**(9): 1080-1085.

Stand-alone laser particles that are implantable into biological tissues have potential to enable novel optical imaging, diagnosis and therapy. Here we demonstrate several types of biocompatible microlasers and their lasing action within biological systems. Dye-doped polystyrene beads were embedded in the cornea and optically pumped to generate narrowband emission. We fabricated microbeads with poly(lactic-co-glycolic acid) and poly(lactic acid)-substances approved for medical use-and demonstrate lasing from within tissues and whole blood. Furthermore, we demonstrate biocompatible cholesterol-derivative microdroplet lasers via self-assembly to an onion-like radially-resonant photonic crystal structure.

Hung, K. Y., et al. (2001). "Dipyridamole inhibits human peritoneal mesothelial cell proliferation in vitro and attenuates rat peritoneal fibrosis in vivo." Kidney International **59**(6): 2316-2324.

BACKGROUND: Peritoneal fibrosis (PF) is one of the most serious complications after long-term continuous ambulatory peritoneal dialysis (CAPD). Proliferation of human peritoneal mesothelial cells (HPMC) and matrix over-production are regarded as the main processes predisposing to PF. Dipyridamole (DP) has been reported to have potential as an antiproliferative and antifibrotic agent. We thus investigated the effect of DP in inhibiting proliferation and collagen synthesis of HPMC. A rat model of peritonitis-induced PF was also established to demonstrate the in vivo preventive effect of DP.

METHODS: HPMC was cultured from human omentum by an enzyme digestion

METHOD: Cell proliferation was measured by the methyltetrazolium assay. Intracellular cAMP was measured using an enzyme immunoassay (EIA) kit. Total collagen synthesis was measured by (3)H-proline incorporation assay. Expression of collagen alpha1 (I) and collagen alpha 1 (III) mRNAs was determined by Northern blotting. The rat model of peritonitis-induced PF was developed by adding dextran microbeads (Cytodex, 8 mg/1 mL volume) to a standardized

suspension (3 x 10(9)) of Staphylococcus aureus. DP was administrated via intravenous infusion (4 mg in 1 h) daily for seven days. Macroscopic grading of intraperitoneal adhesions and histological analyses of peritoneal thickness and collagen expression were performed.
RESULTS: Addition of DP to HPMC cultures suppressed serum-stimulated cell proliferation and collagen synthesis. The antimitogenic and antifibrotic effects of DP appear to be predominantly mediated through the cAMP pathway, as DP increased intracellular cAMP in a dose-dependent manner. The macroscopic grade of intraperitoneal adhesion and peritoneal thickness were both significantly increased in animals treated with Cytodex plus S. aureus; on the other hand, DP attenuated these fibrotic changes with statistical significance (P < 0.01). Analysis of gene expression of collagen alpha 1 (I) and alpha1 (III) in the peritoneal tissue of experimental animals yielded similar results.
CONCLUSIONS: This study suggests that dipyridamole may have therapeutic potential in treating peritoneal fibrosis.

Huq, T., et al. (2017). "Alginate based nanocomposite for microencapsulation of probiotic: Effect of cellulose nanocrystal (CNC) and lecithin." Carbohydrate Polymers **168**: 61-69.
Probiotic (Lactobacillus rhamnosus ATCC 9595) was encapsulated in alginate-CNC-lecithin microbeads to produce nutraceutical microcapsules. Addition of CNC and lecithin in alginate microbeads (ACL-1) improved the viability of L. rhamnosus during gastric passage and storage. The compression strength of the freeze-dried ACL-1 microbeads improved 40% compared to alginate microbeads alone. Swelling studies revealed that addition of CNC and lecithin in alginate microbeads decreased (around 47%) the gastric fluid absorption but increased the dissolution time by 20min compared to alginate microbeads (A-0). During transition through the gastric passage, the viability of L. rhamnosus in dried ACL-1 microbeads was increased 37% as compared to A-0 based beads. At 25 and 4degreeC storage conditions, the viability of L. rhamnosus encapsulated in ACL-1 microbeads decreased by 1.23 and 1.08 log respectively, whereas the encapsulation with A-0 microbeads exhibited a 3.17 and 1.93 log reduction respectively.

Huq, T., et al. (2014). "Microencapsulation of nisin in alginate-cellulose nanocrystal (CNC) microbeads for prolonged efficacy against Listeria monocytogenes." Cellulose **21**(6): 4309-4321.
The present study was undertaken to develop edible nisin-microencapsulated beads in order to inhibit growth of Listeria monocytogenes in ready-to-eat (RTE) ham. Different concentrations of nisin (16, 31, and 63 mu g/ml) were microencapsulated into alginate-cellulose nanocrystal beads. Microencapsulation kept the available nisin (63 mu g/ml) content 20 times greater compared with free nisin (63 mu g/ml) during 28 days of storage at 4 degree C. Results showed that 63 mu g/ml microencapsulated nisin exhibited 31.26 mu g/ml available nisin content after 28 days of storage at 4 degree C, whereas there was no available nisin content left for free nisin. Cooked ham slices were then coated by the microencapsulated nisin beads, inoculated with L. monocytogenes [~3 log colony-forming units (CFU)/g], and stored at 4 degree C under vacuum packaging for 28 days. The beads containing 16, 31, and 63 mu g/ml nisin significantly (P less than or equal to 0.05) reduced the L. monocytogenes counts by 2.65, 1.50, and 3.04 log CFU/g after 28 days of storage compared with free nisin. Furthermore, microencapsulated nisin beads did not change the physicochemical properties (pH and color) of RTE ham during storage.

Hurley, R., et al. (2018). "Microplastic contamination of river beds significantly reduced by catchment-wide flooding." Nature Geoscience **11**(4): 251-257.
Microplastic contamination of the oceans is one of the world's most pressing environmental

concerns. The terrestrial component of the global microplastic budget is not well understood because sources, stores and fluxes are poorly quantified. We report catchment-wide patterns of microplastic contamination, classified by type, size and density, in channel bed sediments at 40 sites across urban, suburban and rural river catchments in northwest England. Microplastic contamination was pervasive on all river channel beds. We found multiple urban contamination hotspots with a maximum microplastic concentration of approximately 517,000 particlesm⁻². After a period of severe flooding in winter 2015/16, all sites were resampled. Microplastic concentrations had fallen at 28 sites and 18 saw a decrease of one order of magnitude. The flooding exported approximately 70% of the microplastic load stored on these river beds (equivalent to 0.85+or-0.27 tonnes or 43+or-14 billion particles) and eradicated microbead contamination at 7 sites. We conclude that microplastic contamination is efficiently flushed from river catchments during flooding.

Hurley, R. R., et al. (2018). "Validation of a Method for Extracting Microplastics from Complex, Organic-Rich, Environmental Matrices." Environmental Science & Technology **52**(13): 7409-7417.

Complex and organic-rich solid substrates such as sludge and soil have been shown to be contaminated by microplastics; however, methods for extracting plastic particles have not yet been systemically tested or standardized. This study investigated four main protocols for the removal of organic material during analysis of microplastics from complex solid matrices: oxidation using H₂O₂, Fenton's reagent, and alkaline digestion with NaOH and KOH. Eight common polymer types were used to assess the influence of reagent exposure on particle integrity. Organic matter removal efficiencies were established for test sludge and soil samples. Fenton's reagent was identified as the optimum protocol. All other methods showed signs of particle degradation or resulted in an insufficient reduction in organic matter content. A further validation procedure revealed high microplastic extraction efficiencies for particles with different morphologies. This confirmed the suitability of Fenton's reagent for use in conjunction with density separation for extracting microplastics. This approach affords greater comparability with existing studies that utilize a density-based technique. Recommendations for further method optimization were also identified to improve the recovery of microplastic from complex, organic-rich environmental samples.

Hurley, R. R., et al. (2017). "Ingestion of Microplastics by Freshwater Tubifex Worms." Environmental Science and Technology **51**(21): 12844-12851.

Microplastic contamination of the aquatic environment is a global issue. Microplastics can be ingested by organisms leading to negative physiological impacts. The ingestion of microplastics by freshwater invertebrates has not been reported outside the laboratory. Here we demonstrate the ingestion of microplastic particles by Tubifex tubifex from bottom sediments in a major urban waterbody fed by the River Irwell, Manchester, UK. The host sediments had microplastic concentrations ranging from 56 to 2543 particles kg⁻¹. 87% of the Tubifex-ingested microplastic particles were microfibers (55-4100 mum in length), while the remaining 13% were microplastic fragments (50-4500 mum in length). FT-IR analysis revealed ingestion of a range of polymers, including polyester and acrylic fibers. While microbeads were present in the host sediment matrix, they were not detected in Tubifex worm tissue. The mean concentration of ingested microplastics was 129 +/- 65.4 particles g⁻¹ tissue. We also show that Tubifex worms retain microplastics for longer than they retain other particulate components of the ingested sediment matrix. Microplastic ingestion by Tubifex worms poses a significant risk for trophic transfer and biomagnification of microplastics up the aquatic food chain. Copyright © 2017 American Chemical Society.

Hurst, G. B., et al. (1999). "Analysis for TNF- using solid-phase affinity capture with radiolabel and MALDI-MS detection." Analytical Chemistry **71**(20): 4727-4733.

Screening of mutant mice for subtle phenotypes requires sensitive, high-throughput analyses of sentinel proteins in functional pathways. The cytokine TNF- is upregulated during inflammatory reactions associated with auto-immune diseases. We have developed a method to monitor the concentration of TNF- under physiological conditions. TNF- is captured, purified, and concentrated using monoclonal antibody-coated microbeads. The capture is efficient (gt;80%) and can be used in the concentration range 100 pg/mL to gt;50 ng/mL, as determined by detection of 125I-labeled TNF-. The bead capture of TNF- can be combined with direct detection by MALDI-MS for sample concentrations of gt;10 ng/mL. TNF- can be captured and detected from diluted mouse serum, with minimal interferences observed in the MALDI spectrum. This method is adaptable to high-throughput sample handling with microfluidic devices and automated mass spectrometric analysis.

Husain, B., et al. (2019). "Extracellular Protein Microarray Technology for High Throughput Detection of Low Affinity Receptor-Ligand Interactions." Journal of Visualized Experiments **143**(01): 07.

Secreted factors, membrane-tethered receptors, and their interacting partners are main regulators of cellular communication and initiation of signaling cascades during homeostasis and disease, and as such represent prime therapeutic targets. Despite their relevance, these interaction networks remain significantly underrepresented in current databases; therefore, most extracellular proteins have no documented binding partner. This discrepancy is primarily due to the challenges associated with the study of the extracellular proteins, including expression of functional proteins, and the weak, low affinity, protein interactions often established between cell surface receptors. The purpose of this method is to describe the printing of a library of extracellular proteins in a microarray format for screening of protein-protein interactions. To enable detection of weak interactions, a method based on multimerization of the query protein under study is described. Coupled to this microbead-based multimerization approach for increased multivalency, the protein microarray allows robust detection of transient protein-protein interactions in high throughput. This method offers a rapid and low sample consuming-approach for identification of new interactions applicable to any extracellular protein. Protein microarray printing and screening protocol are described. This technology will be useful for investigators seeking a robust method for discovery of protein interactions in the extracellular space.

Hussein, A. K. and G. Fetih (2006). "Novel optimization of shape, swelling and release behaviors of tolmetin sodium loaded alginate microbeads." Asian Journal of Andrology **8**(3): 165-174.

In the design of oral delivery, alginates (Alg) have attracted increasing attention. However, due to their hydrophilic character incorporation of small hydrophilic drugs such as tolmetin sodium (TOL) into Alg beads will not provide the desired regular shape as well as delayed drug release. There is no study investigating the effect of methylcellulose (MC) and dual cross-linking (CaCl sub(2) and glutaraldehyde, GA) on their shape, swelling and release behaviors. Hence this study aimed to evaluate the influence of MC and cross-linking agents on these behaviors of Alg microbeads prepared using the ionotropic gelation method compared with Alg microspheres prepared with wlo emulsion method. The results obtained display some interesting information. Both concentration of MC and type of cross-linking agent had dramatic effects on shape as well as swelling, erosion and release behaviors of the prepared microbeads. Swelling through ion-exchange process of Alg/MC blend single cross-linked microbeads was hindered in the case of dual cross-linked microbeads. The release of the drug from Alg/MC dual cross-linked microbeads was extended for up to 12 h and the release mechanism was shifted from erosion type release to time-independent release process. Analgesic activity study indicated significantly different response patterns compared with plain TOL solution.

Huttinger, K. J., et al. (1987). "Influence of surface chemistry of the substrate on the adsorption of Escherichia coli." Zentralblatt fur Bakteriologie, Mikrobiologie und Hygiene - Serie B, Umwelthygiene, Krankenhaushygiene, Arbeitshygiene, Praventive Medizin **184**(6): 538-547.

The adsorption of Escherichia coli as influenced by the surface chemistry of different absorbents was studied with microbeads of (1) polystyrene, hydroxymethylated, chloromethylated and aminomethylated polystyrene, (2) cation and anion exchange resins, (3) glass and siliconized glass using a shake test. The adsorption kinetics can be described by a first order rate law for all materials. The specific surface free energy is not even a rough correlation parameter for the adsorption effect. Polar groups with the exception of those with a negative charge (cation exchange resin) favour adsorption of Escherichia coli, but the type of the polar surface group plays a dominating role. Adsorption was maximum with protonated aminomethylated polystyrene which is attributed to the interaction of the positive charge with the negatively charged bacterial surface.

Huysman, S., et al. (2017). "Performance indicators for a circular economy: A case study on post-industrial plastic waste." Resources, Conservation and Recycling **120**: 46-54.

A linear economy approach results in many environmental challenges: resources become depleted and end up as waste and emissions. One of the key strategies to overcome these problems is using waste as a resource, i.e. evolving toward a circular economy. To monitor this transition, suitable indicators are needed that focus on sustainability issues whilst taking into account the technical reality. In this paper, we develop such an indicator to quantify the circular economy performance of different plastic waste treatment options. This indicator is based on the technical quality of the plastic waste stream and evaluates resource consumption by using the Cumulative Exergy Extraction from the Natural Environment (CEENE) method. To illustrate the use of this new indicator, it was applied in a case study on post-industrial plastic waste treatment. The results show that the indicator can be a very useful approach to guide waste streams towards their optimal valorization option, based on quality of the waste flow and the environmental benefit of the different options. Copyright © 2017 Elsevier B.V.

Huysman, S., et al. (2015). "The recyclability benefit rate of closed-loop and open-loop systems: A case study on plastic recycling in Flanders." Resources, Conservation and Recycling **101**: 53-60.

Over the last few years, waste management strategies are shifting from waste disposal to recycling and recovery and are considering waste as a potential new resource. To monitor the progress in these waste management strategies, governmental policies have developed a wide range of indicators. In this study, we analyzed the concept of the recyclability benefit rate indicator, which expresses the potential environmental savings that can be achieved from recycling the product over the environmental burdens of virgin production followed by disposal. This indicator is therefore, based on estimated environmental impact values obtained through Life Cycle Assessment (LCA) practices. We quantify the environmental impact in terms of resource consumption using the Cumulative Exergy Extraction from the Natural Environment method. This research applied this indicator to two cases of plastic waste recycling in Flanders: closed-loop recycling (case A) and open-loop recycling (case B). Each case is compared to an incineration scenario and a landfilling scenario. The considered plastic waste originates from small domestic appliances and household waste other than plastic bottles. However, the existing recyclability benefit rate indicator does not consider the potential substitution of different materials occurring in open-loop recycling. To address this issue, we further developed the indicator for open-loop recycling and cascaded use. Overall, the results show that both closed-loop and open-loop recycling are more resource efficient than landfilling and incineration with energy recovery. Copyright © 2015 The Authors. Published by Elsevier B.V.

Hwang, J., et al. (2019). "An assessment of the toxicity of polypropylene microplastics in human derived cells." Science of the Total Environment **684**: 657-669.

Environmental pollution caused by plastic waste is a growing global problem. Discarded plastic products and debris (microplastic particles) in the oceans detrimentally affect marine ecosystems and may impact human. Humans are exposed to plastic debris via the consumption of seafood and drinking water, contact with food packaging, or inhalation of particles. The accumulation of microplastic particles in humans has potential health risks such as cytotoxicity, hypersensitivity, unwanted immune response, and acute response like hemolysis. We investigated the cellular responses of secondary polypropylene microplastics (PP particles) of approximately ~20mum and 25-200mum in different condition and size to normal cells, immune cells, blood cells, and murine immune cells by cytokine analysis, ROS assay, polarization assay and proliferation assay. We found that PP particles showed low cytotoxicity effect in size and concentration manner, however, a high concentration, small sized, DMSO method of PP particles stimulated the immune system and enhanced potential hypersensitivity to PP particles via an increase in the levels of cytokines and histamines in PBMCs, Raw 264.7 and HMC-1 cells.

Hwang, J. Y., et al. (2014). "Cell membrane deformation induced by a fibronectin-coated polystyrene microbead in a 200-MHz acoustic trap." IEEE Transactions on Ultrasonics Ferroelectrics & Frequency Control **61**(3): 399-406.

The measurement of cell mechanics is crucial for a better understanding of cellular responses during the progression of certain diseases and for the identification of the cell's nature. Many techniques using optical tweezers, atomic force microscopy, and micro-pipettes have been developed to probe and manipulate cells in the spatial domain. In particular, we recently proposed a two-dimensional acoustic trapping method as an alternative technique for small particle manipulation. Although the proposed method may have advantages over optical tweezers, its applications to cellular mechanics have not yet been vigorously investigated. This study represents an initial attempt to use acoustic tweezers as a tool in the field of cellular mechanics in which cancer cell membrane deformability is studied. A press-focused 193-MHz single-element lithium niobate ($LiNbO_3$) transducer was designed and fabricated to trap a 5-mum polystyrene microbead near the ultrasound beam focus. The microbeads were coated with fibronectin, and trapped before being attached to the surface of a human breast cancer cell (MCF-7). The cell membrane was then stretched by remotely pulling a cell-attached microbead with the acoustic trap. The maximum cell membrane stretched lengths were measured to be 0.15, 0.54, and 1.41 mum at input voltages to the transducer of 6.3, 9.5, and 12.6 Vpp, respectively. The stretched length was found to increase nonlinearly as a function of the voltage input. No significant cytotoxicity was observed to result from the bead or the trapping force on the cell during or after the deformation procedure. Hence, the results convincingly demonstrated the possible application of the acoustic trapping technique as a tool for cell manipulation.

Hwang, S. M., et al. (2011). "Thrombomodulin phenotype of a distinct monocyte subtype is an

independent prognostic marker for disseminated intravascular coagulation." Critical Care **15 (2) (no pagination)**(R113).

Introduction: Thrombomodulin, which is expressed solely on monocytes, along with tissue factor (TF), takes part in coagulation and inflammation. Circulating blood monocytes can be divided into 3 major subtypes on the basis of their receptor phenotype: classical (CD14^{bright}CD16^{negative}, CMs), inflammatory (CD14^{bright}CD16^{positive}; IMs), and dendritic cell-like (CD14^{dim}CD16^{positive}DMs). Monocyte subtype is strongly regulated, and the balance may influence the clinical outcomes of disseminated intravascular coagulation (DIC). Therefore, we investigated the phenotypic difference in thrombomodulin and TF expression between different monocyte subtypes in coagulopathy severity and prognosis in patients suspected of having DIC. Method(s): In total, 98 patients suspected of having DIC were enrolled. The subtypes of circulating monocytes were identified using CD14 and CD16 and the thrombomodulin and TF expression in each subtype, expressed as mean fluorescence intensity, was measured by flow cytometry. Plasma level of tissue factor was measured by ELISA. In cultures of microbead-selected, CD14-positive peripheral monocytes, lipopolysaccharide (LPS)- or interleukin-10-induced expression profiles were analyzed, using flow cytometry. Result(s): The proportion of monocyte subtypes did not significantly differ between the overt and non-overt DIC groups. The IM thrombomodulin expression level was prominent in the overt DIC group and was well correlated with other coagulation markers. Of note, IM thrombomodulin expression was found to be an independent prognostic marker in multivariate Cox regression analysis. In addition, in vitro culture of peripheral monocytes showed that LPS stimulation upregulated thrombomodulin expression and TF expression in distinct populations of monocytes. Conclusion(s): These findings suggest that the IM thrombomodulin phenotype is a potential independent prognostic marker for DIC, and that thrombomodulin-induced upregulation of monocytes is a vestige of the physiological defense mechanism against hypercoagulopathy. © 2011 Hwang et al.; licensee BioMed Central Ltd.

Hylton, L., et al. (2018). "Microplastic pollution in Indiana's White River: an exploratory study." Proceedings of the Indiana Academy of Science **127**(1): 72-81.

Plastic material is now a ubiquitous source of aquatic pollution. Microplastics, tiny plastic pieces often not visible to the naked eye, are a growing environmental concern in both marine and freshwater ecosystems. While many studies have documented the abundance and danger of microplastics in global oceans, little research is available on microplastic presence and impact in riverine ecosystems. This exploratory study aims to build on the findings of recent freshwater microplastic studies by reporting on the occurrence and types of microplastic pollution found in the West Fork White River in central Indiana. Fifteen surface water samples were collected from three bridge sites along the river over a four-month period (August-November 2015) and analyzed using established NOAA laboratory methods. Analysis revealed various microplastic particle types in the White River, with synthetic fibers being the predominant type collected. A total of 146 plastic pieces were collected across all sites and collection periods, with an average microplastic concentration of 0.71 items m⁻³. Surprisingly, there were no significant differences in microplastic concentrations among sites of differing population density. Further, a local wastewater treatment plant had no effect on particle type or abundance. These findings contribute to current gaps in microplastic research on freshwater, especially fluvial, environments. This contribution may guide researchers in better understanding the extent to which these synthetic particles are polluting U.S. surface waters as a whole.

Iannilli, V., et al. (2018). "Microplastics in <i>Talitrus saltator</i> (Crustacea, Amphipoda): new evidence of ingestion from natural contexts." Environmental science and pollution research international **25**(28): 28725-28729.

Using Fourier transform infrared spectroscopy (FT-IR) measurements and comparing the spectrum peaks (range 4000–600 cm−1) with reference spectra database and instrument libraries, we observed new evidence of the ingestion of microplastic particles analyzing the digestive tracts of Talitrus saltator. Specimens, sampled in central Italy, probably ingested the particles with natural detritus. Since worldwide many species of invertebrates and vertebrates (e.g., birds) feed on Amphipoda along coastal ecosystems, we hypothesized that microplastic in these crustaceans can be accumulated along the food chain.

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Iannilli, V., et al. (2019). "First evidence of microplastics ingestion in benthic amphipods from Svalbard." Environmental Research **179**(Pt A): 108811.

The present paper provides the first record of ingestion of microplastics in natural context by Gammarus setosus from Svalbard Archipelago. The plastic particles were identified both by Nile Red staining and Micro FT-IR spectroscopy. The species studied ingests microplastic particles in natural conditions if present in its habitat, probably mistaking them as food. The microplastic particles ingested may be available for uptake to predators that consume this Arctic amphipod, producing consequences to the food web.

Iansante, V., et al. (2018). "A New High Throughput Screening Platform for Cell Encapsulation in Alginate Hydrogel Shows Improved Hepatocyte Functions by Mesenchymal Stromal Cells Co-encapsulation." Frontiers in Medicine **5**: 216.

Hepatocyte transplantation has emerged as an alternative to liver transplant for liver disease. Hepatocytes encapsulated in alginate microbeads have been proposed for the treatment of acute liver failure, as they are able to provide hepatic functions while the liver regenerates. Furthermore, they do not require immunosuppression, as the alginate protects the hepatocytes from the recipient's immune cells. Mesenchymal stromal cells are very attractive candidates for regenerative medicine, being able to differentiate into cells of the mesenchymal lineages and having extensive proliferative ability. When co-cultured with hepatocytes in two-dimensional cultures, they exert a trophic role, drastically improving hepatocytes survival and functions. In this study we aimed to (i) devise a high throughput system (HTS) to allow testing of a variety of different parameters for cell encapsulation and (ii) using this HTS, investigate whether mesenchymal stromal cells could have beneficial effects on the hepatocytes when co-encapsulated in alginate microbeads. Using our HTS platform, we observed some improvement of hepatocyte behavior with MSCs, subsequently confirmed in the low throughput analysis of cell function in alginate microbeads. Therefore, our study shows that mesenchymal stromal cells may be a good option to improve the function of hepatocytes microbeads. Furthermore, the platform developed may be used for HTS studies on cell encapsulation, in which several conditions (e.g., number of cells, combinations of cells, alginate modifications) could be easily compared at the same time.

Ida Laila, A., et al. (2017). "Tapered Microfluidic for Continuous Micro-Object Separation Based on Hydrodynamic Principle." IEEE transactions on biomedical circuits and systems **11**(6): 1413-1421.

Recent advances in microfluidic technologies have created a demand for a simple and efficient separation intended for various applications such as food industries, biological preparation, and medical diagnostic. In this paper, we report a tapered microfluidic device for passive continuous separation of microparticles by using hydrodynamic separation. By exploiting the hydrodynamic properties of the fluid flow and physical characteristics of micro particles, effective size based separation is demonstrated. The tapered microfluidic device has widening geometries with respect to specific taper angle which amplify the sedimentation effect experienced by particles of different sizes. A mixture of 3-µm and 10-µm polystyrene microbeads are successfully separated using 20° and 25° taper angles. The results obtained are in agreement with three-dimensional finite element simulation conducted using Abaqus 6.12. Moreover, the feasibility of this mechanism for biological separation is demonstrated by using polydisperse samples consists of 3-µm polystyrene microbeads and human epithelial cervical carcinoma (HeLa) cells. 98% of samples purity is recovered at outlet 1 and outlet 3 with flow rate of 0.5-3.0 µl/min. Our device is interesting despite adopting passive separation approach. This method enables straightforward, label-free, and continuous separation of multiparticles in a stand-alone device without the need for bulky apparatus. Therefore, this device may become an enabling technology for point of care diagnosis tools and may hold potential for micrototal analysis system applications.

Iemma, F., et al. (2008). "Removal of metal ions from aqueous solution by chelating polymeric microspheres bearing phytic acid derivatives." European Polymer Journal **44**(4): 1183-1190.

The aim of this study was to investigate the possibility to synthesize new chelating polymeric microspheres owing immobilized biocompatible agent as chelating functional groups and to evaluate their performance in metal ions removal from aqueous solution. The microparticles were synthesized via precipitation polymerization of 4-O-(4-vinylbenzyl)-myo-inositol 1,3,5-orthoformate with ethylene glycol dimethacrylate (EGDMA) and subsequent exhaustive phosphorylation of myo-inositol groups using phosphoric acid. Spherical geometry with monodisperse nature of the polymeric microparticles was confirmed by scanning electron micrographs (SEM) and dimensional analysis. A large surface area of the microspheres provided a maximum interaction of metal ions and the chelating functional groups on the surface. Absorption capacity of the beads for the selected metal ions, i.e., Cu(II), Ni(II), Fe(III), was investigated in detail in aqueous solution at pH 5.0 utilizing UV /Vis spectroscopy. This study showed that the macromolecular systems are very effective in chelating these metal ions and the affinity order of the microbeads toward metal ions is: Fe(III)>Ni(II)>Cu(II). The chelating beads can be easily regenerated by 1.0M HNO sub(3) with high effectiveness. These features make the synthesized beads a potential candidate for metal ions removal at high capacity.

Igoli, J. O., et al. (2015). "Chromatographic and spectroscopic analysis of the components present in the phenanthridinium trypanocidal agent isometamidium." Analytical and bioanalytical chemistry **407**(4): 1171-1180.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for

the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis The chromatographic isolation and characterisation of the four compounds present in the quaternary phenanthridine veterinary trypanocidal agent, isometamidium chloride hydrochloride (ISM), is reported. The isolated compounds were unambiguously characterised using spectroscopic (NMR, UV, IR and MS) methods as 3-amino-8-[3-(3-carbamimidoyl-phenyl)-triazenyl]-5-ethyl-6-phenylethidium (1a) and related isomers,
8-amino-3-[3-(3-carbamimidoyl-phenyl)-triazenyl]-5-ethyl-6-phenylethidium,
3,-8-diamino-7-[3-(3-carbamimidoyl-phenyl)-triazenyl]-5-ethyl-6-phenylethidium and
3,-8-bis[3-(3-carbamimidoyl-phenyl)-triazenyl]-5-ethyl-6-phenylethidium. During the course of this study, it was realised that the nature of the solvent used in the NMR study was critical as in DMSO-d^sub 6^ the quaternary group in the compounds was reduced to dihydro forms (e.g. 2a).

Ilagan, B. G. (2008). The development of an elastomeric scaffold for small diameter blood vessel tissue engineering.

In coronary artery bypass surgery the autologous saphenous vein is the most commonly used vascular graft. However, in a growing number of patients this vein is not available due to disease or availability. To date, there are no commercially available vascular grafts to replace the autologous saphenous vein. Nevertheless, it is widely accepted that a successful small diameter blood vessel alternative will be found using a tissue engineering approach. A photo-cross-linked biodegradable elastomer of acrylated star-poly(e-caprolactone-co-D,L-lactide) (ASCP) has recently been developed. The elastomer possesses many desirable properties, such as manufacturability and mechanical properties, making it an interesting scaffolding material candidate for this application. To test the feasibility of the ASCP elastomer as a scaffolding material, a porous scaffold with 90% porosity was constructed using paraffin microbeads combined with an emulsion of ASCP prepolymer and water. Native arterial mechanical properties were matched with an 1800 Da ASCP elastomeric scaffold (ELAS 1800) having 85% porosity. In vitro degradation of scaffolds prepared with two different ASCP M sub(n) (1800 and 4500 Da) was investigated for 8 weeks. Bulk hydrolysis was the mode of degradation regardless of configuration, with the porous scaffold degrading slower than the nonporous control. In addition, the ELAS 4500 scaffold also degraded faster than the ELAS 1800 scaffold with the same porosity. In order to promote the cellular response to this potential vascular scaffold, the surface of the elastomer was modified to enhance bovine coronary artery smooth muscle cell (SMC) attachment and proliferation. Base etching the surface was not as effective as adding a small peptide sequence Gly-Arg-Gly-Asp-Ser (GRGDS) known to enhance cell adhesion. The surface modifications did not change SMC phenotype as all surfaces expressed the contractile marker proteins smooth muscle a-actin and h-caldesmon. The SMCs also expressed these marker proteins when seeded on porous scaffolds. Finally, it was possible to integrate the porous scaffold into a biomimetic blood vessel design. With this initial testing, it appears that the ASCP elastomer is a feasible scaffolding material for small diameter blood vessel tissue engineering. Nevertheless, more detailed testing of mechanical properties and cell behaviour must be conducted to ascertain that the ASCP elastomer and the proposed biomimetic blood vessel design can be appropriate replacements for the autologous saphenous vein.

Ileana, S., et al. (2010). "Characterization of some composites ALG-HA potentially used as bone regeneration scaffolds." European Cells and Materials **1)**: 42.

INTRODUCTION: Sodium alginate (ALG) is extracted with a diluted alkali solution from marine

brown algae and is not a random polysaccharide, but depending on the algae source, consists of blocs of similar and strictly alternating residue (i.e. MMM, GGG, GMGMGM), each of which has different conformational preferences and behaviours. ALG is soluble in aqueous solutions and forms stable gels at room temperature in the presence of non-cytotoxic concentrations of certain bivalent cations (i.e., Ca²⁺) through ionic interaction between G acid groups. This leads to 3D structures, often with viable cells embedded in the gel by cross-linking in non-cytotoxic conditions. Nafcillin, is a semi-synthetic antistaphylococcal penicillin, highly effective in penicillinase-producing staphylococcal infections, in which the activity is mainly created through steric hindrance. Unlike penicillin, ampicillin, or the extended-spectrum penicillins, nafcillin resists hydrolysis by penicillinase; therefore, along with other agents in the same group (e.g., oxacillin, dicloxacillin), this antibiotic is active against penicillinase-producing Staphylococcus aureus. In the present work, ALG-hydroxyapatite composites have been created as cross-linkable materials physically loaded with nafcillin. The drug-release efficiency was explored by UV-VIS spectroscopy. These materials are intended as bone fillers presenting, besides the incorporated drug, the advantage of low-invasive delivery in the bone-defect through injection, followed by an improvement of the mechanical strength due to in vivo Ca²⁺ cross-linking. METHOD(S): ALG solution (2% wt%) in physiologic saline (0.9% NaCl) was mixed with different concentrations of hydroxyapatite (HA) powder: 5%, 10%, 50%, 200% and 500% (wt%). The phase distribution of the inorganic filler in the organic matrix was evaluated through scanning electron microscopy (SEM). The rheograms have been drawn to control the injectability of the formulations. The drug release has been performed using cross-linked composites microbeads loaded with 10 and, respectively, 20% (wt%) antibiotic. The beads have been cross-linked in CaCl2 (50mM in saline). They have been rinsed with saline and then suspended in saline. The supernatant has been systematically analysed with respect to nafcillin release in time; this was monitored as specific absorbance at 330 nm over time. The end of the release, as obtained through UV-VIS, was confirmed through FT-IR. RESULT(S): Five composites formulations have been prepared and then loaded with nafcillin (two different ratios: 10 and 20% wt). The HA has been homogeneously distributed in the composites, as shown in figure 1. Increasing the inorganic filler ratios has lead to increasing viscosity of the composites, the formulations remaining injectable. (Figure presented) The inorganic filler content has proved to play an important role in the drug release enhancing the phenomenon. DISCUSSION & CONCLUSION(S): This work reports the potential of ALG-HA composites to be used as in situ cross-linkable bone regeneration scaffolds deliverable through minimally invasive surgery (injection). Nevertheless, the bone healing process could be sustained through progressive localized antibiotic release. The release kinetics as well as the mechanical properties of the resulting scaffolds are controllable through the balance organic/inorganic. Nevertheless, the in situ cross-linking of the ALG improves the stability of the materials and the biomechanical performance.

Illhardt, T., et al. (2015). "T-and B-cell depleted haploidentical stem cell transplantation in relapsed metastatic high-risk neuroblastoma." Bone Marrow Transplantation **1)**: S468.

Introduction: Outcome in patients with relapsed metastatic neuroblastoma is still very poor despite advances in chemotherapy and surgery. There is growing evidence for Graftversus-tumor effects in solid tumors after haploidentical stem cell transplantation. We present an analysis of 2 prospective trials with 31 patients who received T- and B-cell depleted haploidentical stem cells Materials (or patients) and methods: All donors were >=2 HLA loci mismatched parents. G-CSF mobilized peripheral stem cells were T-cell depleted by using CD3-coated microbeads. B-cell depletion was done by either using CD19-coated microbeads or by in vivo depletion with antiCD20-mAb (Rituximab). 14 Patients received MIBG-therapy during 4 weeks prior to transplantation. The myeloablative conditioning consisted of fludarabine (40 mg/m²), thiotepa (2 x 5 mg/kg) and melphalan (2x70 mg/m²). One patient was treated without melphalan and fludarabine was replaced by clorafabine (4x50 mg/m²) in one patient. OKT3 was given as graft rejection prophylaxis (0- 1 mg/kg per day for 10 days) and was replaced in 2012 by ATG-F (30 mg/kg total dose, n=4 patients). Short course Mycophenolate mofetil was given as prophylactic immune suppression, if residual T cells in the graft exceeded 2-5 x 104/ kg BW.G-CSF was routinely started on day +4 in 20/31 patients. Remission status before transplantation after salvage therapy was: CR (n=4 patients), PR (n= 20 patients), non-response/ progression (n=7 patients). 19 patients have been transplanted in first and 6 patients in second or subsequent relapse. 6 patients never reached remission before SCT. Result(s): 8/31 patients are alive after a median follow-up of 5.24 years (0.92-9.28). 5-year overall and event-free survival was 22% and 20% respectively. Primary engraftment was observed in 28/31 (91%) patients, 3 (9%) patients rejected and were rescued with an autologeous backup. No transplant related mortality was observed. 23 Patients relapsed in the first year after transplantation. Relapse was very unlikely after 1 year. ANC was reached after a median of 11 days (9-33). We observed a rapid increase of natural killer cells in the early posttransplant period, reaching 230 cells/mul in the mean (SD=113) on day 21. Regeneration of T- and B-cells started around day 30 and reached 110/ml (SD=193) and 38/ml (SD=43) in the mean at day 90 and 292/ml (SD=285) and 177/ml (SD=172) at day 180. Toxicity was tolerable. 26 patients (84%) suffered from degreeIII-IV gastrointestinal toxicity including mucositis, nausea and diarrhoea. 3-fold elevated liver enzymes were found in 10 patients (32%). Hypoxia requiring O<inf>2</inf>-Substitution occurred in 3 patients. No cardiac, neurological, renal or dermatological degreeIII-IV toxicities were observed. No veno-occlusive disease occurred. Acute degreeI-II GvHD was observed in 21 and degreeIII in 3 patients. No degreeIV aGvHD was observed. Chronic degreeI-II GvHD occurred in 11 patients. No degreeIII-IV cGvHD was observed. Conclusion(s): Haploidentical stem cell transplantation is feasible for treatment of patients with relapsed neuroblastoma with acceptable toxicity and morbidity. Incidence of GvH was low. However, NK cell mediated GvT effects still have to be evaluated and seem to be not sufficient in the majority of patients since 80% relapsed. Thus, additional post transplant means to increase GvT effects on the basis of the new established immune system like use of anti-GD2 mAbs, DLI and cytokine stimulation need to be urgently investigated.

Im, H., et al. (2015). "Digital diffraction analysis enables low-cost molecular diagnostics on a smartphone." Proceedings of the National Academy of Sciences of the United States of America **112**(18): 5613-5618.

The widespread distribution of smartphones, with their integrated sensors and communication capabilities, makes them an ideal platform for point-of-care (POC) diagnosis, especially in resource-limited settings. Molecular diagnostics, however, have been difficult to implement in smartphones. We herein report a diffraction-based approach that enables molecular and cellular diagnostics. The D3 (digital diffraction diagnosis) system uses microbeads to generate unique diffraction patterns which can be acquired by smartphones and processed by a remote server. We applied the D3 platform to screen for precancerous or cancerous cells in cervical specimens and to detect human papillomavirus (HPV) DNA. The D3 assay generated readouts within 45 min and showed excellent agreement with gold-standard pathology or HPV testing, respectively. This approach could have favorable global health applications where medical access is limited or when pathology bottlenecks challenge prompt diagnostic readouts.

Im, J. S., et al. (2016). "The use of ex vivo expanded human invariant natural killer T cells as a novel cell therapy to modulate graft-versus-host-disease." Biology of Blood and Marrow Transplantation **1)**: S399.

CD1d-restricted invariant Natural Killer (iNK) T cells are powerful innate cells that can influence adaptive immunity either toward inflammation or immune-suppression via production of Th1-type (IFNg and TNFa) or Th2-type (IL-4, Il- 5, IL-13) cytokines, respectively. Several studies suggest that iNK T cells may play a role in preventing graft versus host disease (GVHD) in allogeneic stem cell transplantation (ASCT). Moreover, iNK T cells may mediate additional antileukemia effects through NK-like effector function. Thus, iNK T cells can be the ideal cells for novel therapy to prevent GVHD and promote graft versus leukemia (GVL) effects in ASCT. Here, we sought to compare phenotypic and functional differences of expanded iNK T cells from cord blood (CB) and adult PBMC, and evaluated the modulatory property in a murine xenograft GVHD model. Because iNK T cells are rare cells consisting of only less than 0.1% of T cells, we first enriched iNK T cells using anti-iNKT MicroBead and MiniMacsTM Separator, prior to expansion with dendritic cells plus iNKT ligand, a-galactosyl ceramide and IL-2. After 2 weeks, we obtained up to 107 iNK T cells with >= 90% purity from single CB unit or 2x10⁸ adult PBMC. Expanded CB iNK T cells were mostly CD4⁺CD25⁺ CD127^{low}, while expanded adult iNK T cells consisted of varying percentages of CD4⁺ iNK T cells comparable to phenotypic distribution of unmanipulated adult iNK T cells. Unlike CB iNK T cells, CD4⁻CD8a⁺ iNK T cells from adult PBMC were disproportionally expanded, constituting up to 40% of iNK T cells. Compared to expanded CB iNK T cells, expanded adult iNK T cells expressed higher levels of NK receptors such as NKG2C, NKG2D, NKR-P1A, CD16 and CD56. In addition, expanded CB iNK T cells preferentially produced Th2-cytokines, while adult iNK T cells preferentially produced Th1- cytokines. Despite predisposition to polarize towards Th1, the expanded adult iNK T cells tend to decrease GVHDrelated mortality at 28 days but not statistically significant (HR 0.3921, p=0.0712), when 5x10⁵ iNK T cells were coinfused with 3x10⁶ human PBMC in irradiated NOD-SCID IL2gamma^{-/-} mice. In summary, we demonstrated it is feasible to selectively expand iNK T cells from CB and adult PBMC. The expanded CB iNK T cells maintained regulatory phenotype and were polarized toward Th2-response, while iNK T cells from adult PBMC exhibited a phenotype consistent with greater effector and were polarized toward Th1 responses, suggesting that CB might be a preferred source for iNK T cell therapy to modulate GVHD. Nonetheless, adult iNK T cells showed a decrease in GVHD related mortality in a murine xenograft GVHD model although not statistically significant, supporting a potential role for immune-modulation post transplantation. Further investigation is ongoing to delineate unique regulator-effector function of CD4⁺ vs CD4⁻ vs CD8a⁺ iNK T cells in modulating GVHD.

Im, P., et al. (2017). "Fabrication of cell-benign inverse opal hydrogels for three-dimensional cell culture." Journal of Colloid & Interface Science **494**: 389-396.

Inverse opal hydrogels (IOHs) for cell culture were fabricated and optimized using calcium-crosslinked alginate microbeads as sacrificial template and gelatin as a matrix. In contrast to traditional three-dimensional (3D) scaffolds, the gelatin IOHs allowed the utilization of both the macropore surface and inner matrix for cell co-culture. In order to remove templates efficiently for the construction of 3D interconnected macropores and to maintain high cell viability during the template removal process using EDTA solution, various factors in fabrication, including alginate viscosity, alginate concentration, alginate microbeads size, crosslinking calcium concentration, and gelatin network density were investigated. Low viscosity alginate, lower crosslinking calcium ion concentration, and lower concentration of alginate and gelatin

were found to obtain high viability of cells encapsulated in the gelatin matrix after removal of the alginate template by EDTA treatment by allowing rapid dissociation and diffusion of alginate polymers. Based on the optimized fabrication conditions, gelatin IOHs showed good potential as a cell co-culture system, applicable to tissue engineering and cancer research.

Imai, T., et al. (2003). "Comparison of the Recyclability of Flame-Retarded Plastics." Environmental Science & Technology **37**(3): 652.

Mechanical recycling of plastics from waste from electrical and electronical equipment (WEEE) is increasingly expected by regulators and demanded by original equipment manufacturers (OEMs); however, mechanical recycling is generally recognized to be the most economically costly and technically challenging method of recovering WEEE plastics. With 12% of WEEE plastics requiring the use of flameretardants in order to ensure appropriate levels of consumer fire safety, there is a distinct need for data from comparative tests on recyclability of various flameretarded plastics. Ten commercially available flame-retarded plastic grades commonly used in electronic equipment (eight "halogen-free" grades and two grades containing brominated flame-retardants (BFRs)) were subjected to two different recycling scenarios. A standard recycling scenario was carried out by repeatedly extruding the materials and an accelerated hydrolysis scenario was carried out to study the influence of humidity from air during use on the process. Both, virgin and recycled materials were tested for a potential formation of polybrominated dibenzodioxins/furans (PBDD/Fs), their mechanical properties were assessed and the fire safety rating was determined. Results indicate that none of the tested materials showed a potential to form the PBDD/Fs regulated by the German Chemicals Banning Ordinance. The halogen-free plastic grades showed a significant deterioration of mechanical properties after recycling, whereas those plastics containing BFRs were able to pass all test criteria, thus maintaining their original properties. With respect to the fire safety rating, none of the eight tested halogen-free plastic grades could maintain their fire safety rating after five recycling loops, whereas both BFR plastics continued to achieve their fire safety ratings. Therefore the tested BFR containing plastic materials showed superior recycling properties compared to the tested halogen-free plastic grades with... [ABSTRACT FROM AUTHOR]

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Imber, M. J. (1996). "The food of Cook's petrel Pterodroma cookii during its breeding season on Little Barrier Island, New Zealand." Emu **96**(3): 189-194.

Food samples were obtained from 69 Cook's Petrels Pterodroma cookii on Little Barrier Island. New Zealand, during the breeding seasons (October-March) of 1972 to 1977. Food comprised Cephalopoda, fish, Crustacea and Tunicata in that order of importance by volume. Dietary oil formed about 38% by volume of food fed to chicks. The main cephalopods (of 26 species) preyed on were members of the Cranchiidae, Spurilidae (entirely Spirula spirula) and Histioteuthidae (37, 24 and 22% respectively by mass). About 90% by mass of fishes taken were lantern-fishes (Myctiophidae), and about 50% by mass of crustaceans were decapod prawns. Seasonal variation was found in the proportion only of the cephalopods Argonauta and Leachia in the diet. Pumice and plastic particles were ingested. The diet revealed by these samples showed extensive reliance on small, mesopelagic, bioluminescent prey, most of which could

have been taken by active feeding at night. Selection of prey was related to the petrel's small size: over half of the cephalopods eaten were juvenile or immature.

Imhof, H. K., et al. (2013). "Contamination of beach sediments of a subalpine lake with microplastic particles." Current Biology **23**(19): R867-868.

Imhof, H. K. and C. Laforsch (2016). "Hazardous or not - are adult and juvenile individuals of Potamopyrgus antipodarum affected by non-buoyant microplastic particles?" Environmental Pollution **218**: 383-391.

Microplastic has been ubiquitously detected in freshwater ecosystems. A variety of freshwater organisms were shown to ingest microplastic particles, while a high potential for adverse effects are expected. However, studies addressing the effect of microplastic in freshwater species are still scarce compared to studies on marine organisms. In order to gain further insights into possible adverse effects of microplastic particles on freshwater invertebrates and to set the base for further experiments we exposed the mud snail (Potampoyrgus antipodarum) to a large range of common and environmentally relevant non-buoyant polymers (polyamide, polyethylene terephthalate, polycarbonate, polystyrene, polyvinylchloride). The impact of these polymers was tested by performing two exposure experiments with irregular shaped microplastic particles with a broad size distribution in a low (30%) and a high microplastic dose (70%) in the food. First, possible effects on adult P. antipodarum were assessed by morphological and life-history parameters. Second, the effect of the same mixture on the development of juvenile P. antipodarum until maturity was analyzed. Adult P. antipodarum showed no morphological changes after the exposure to the microplastic particles, even if supplied in a high dose. Moreover, although P. antipodarum is an established model organism and reacts especially sensitive to endocrine active substances no effects on embryogenesis were detected. Similarly, the juvenile development until maturity was not affected. Considering, that most studies showing effects on marine and freshwater invertebrates mostly exposed their experimental organisms to very small (<=20 micro m) polystyrene microbeads, we anticipate that these effects may be highly dependent on the chemical composition of the polymer itself and the size and shape of the particles. Therefore, more studies are necessary to enable the identification of harmful synthetic polymers as some of them may be problematic and should be declared as hazardous whereas others may have relatively moderate or no effects.

Imhof, H. K., et al. (2016). "Pigments and plastic in limnetic ecosystems: A qualitative and quantitative study on microparticles of different size classes." Water Research **98**: 64-74.

Recently, macroplastic (>5 mm) and especially microplastic (<5 mm) particles have been reported as emerging contaminants in marine and limnetic ecosystems. Their coloration is gained by the addition of pigments to the polymer blend which is the major component of the respective product. However, color is also a feature of paint and coatings whereby the pigment is the major component. Once abraded from a surface, paint particles may enter the environment via similar pathways as microplastic particles. So far no detailed studies of microplastic particles (pigmented and non-pigmented) as well as paint particles have been performed focusing on very small microparticles (1-50 mum), in either marine or limnetic ecosystems. Using Raman microspectroscopy with a spatial resolution down to 1 mum, we report a remarkable increase in the occurrence of (pigmented) microplastic particles below 500 mum. Among those, most particles were found at a size of ~130 mum in a freshwater ecosystem (subalpine Lake Garda, Italy). Moreover, our qualitative and quantitative analyses revealed that the number of paint microparticles significantly increased below the size range of 50 mum due

to their brittleness (the smallest detected paint particle had a size of 4 mum). Inductively coupled plasma mass spectrometry measurements showed that both colored particles found in nature as well as virgin particles contain a high variety of metals such as cadmium, lead and copper. These additives may elicit adverse effects in biota ingesting these microparticles, thus paints and associated compounds may act as formerly overlooked contaminants in freshwater ecosystems.

Imhof, H. K., et al. (2017). "Do microplastic particles affect Daphnia magna at the morphological, life history and molecular level?" PLoS ONE **12**(11).

Microplastic particles are ubiquitous not only in marine but also in freshwater ecosystems. However, the impacts of microplastics, consisting of a large variety of synthetic polymers, on freshwater organisms remains poorly understood. We examined the effects of two polymer mixtures on the morphology, life history and on the molecular level of the waterflea Daphnia magna (three different clones). Microplastic particles of ~40 µm were supplied at a low concentration (1% of the food particles) leading to an average of ~30 particles in the digestive tract which reflects a high microplastic contamination but still resembles a natural situation. Neither increased mortality nor changes on the morphological (body length, width and tail spine length) or reproductive parameters were observed for adult Daphnia. The analyses of juvenile Daphnia revealed a variety of small and rather subtle responses of morphological traits (body length, width and tail spine length). For adult Daphnia, alterations in expression of genes related to stress responses (i.e. HSP60, HSP70 & GST) as well as of other genes involved in body function and body composition (i.e. SERCA) were observed already 48h after exposure. We anticipate that the adverse effects of microplastic might be influenced by many additional factors like size, shape, type and even age of the particles and that the rather weak effects, as detected in a laboratory, may lead to reduced fitness in a natural multi-stressor environment.

Imhof, H. K., et al. (2012). "A novel, highly efficient method for the separation and quantification of plastic particles in sediments of aquatic environments." Limnology and Oceanography: Methods **10**(7): 524-537.

Although plastic debris is constantly accumulating in aquatic environments, the impact on aquatic ecosystems is not yet fully understood. A first important step to assess the consequences of plastic debris in aquatic ecosystems is the establishment of a reliable, verified, and standardized method to quantify the amount of plastic particles in the environment. We improved the density separation approach by the construction of the so called Munich Plastic Sediment Separator (MPSS). It enables a reliable separation of different ecologically relevant size classes of plastic particles from sediment samples. A ZnCl sub(2)-solution (1.6-1.7 kg/L) as separation fluid allows for an extraction of plastic particles ranging from large fragments to small microplastic particles (S-MPP, <1 mm). Subsequent identification and quantification of the particles with spatial resolution down to 1 mu m can be performed using Raman microspectroscopy. Our study is the first providing validated recovery rates of 100% for large microplastic particles (L-MPP, 1-5 mm) and 95.5% for S-MPP. The recovery rate for S-MPP, using the MPSS, was significantly higher than the value obtained by application of classical density separation setup (39.8%). Moreover, our recovery rates were significantly higher than those based on froth flotation (55.0% for L-MPP) commonly used in recycling industries. Hence, our improved method can be used for a reliable and time-efficient separation, identification and quantification of plastic fragments down to S-MPP. This will help foster studies quantifying the increasing contamination of aquatic environments with microplastic particles, which is a crucial prerequisite for future risk assessment and management strategies.

Immerseel, F. v., et al. (2004). "Microencapsulated short-chain fatty acids in feed modify colonization and invasion early after infection with Salmonella Enteritidis in young chickens." Poultry Science **83**(1): 69-74.

Short-chain fatty acids (SCFA) are widely used as feed additives in poultry for the control of pathogenic bacteria, such as Salmonella enteritidis. Recently, a new range of products was developed in which SCFA are encapsulated in mineral carriers, resulting in a slow release during the transport of these carriers through the intestinal tract. To test the efficacy of this type of products against early colonization after Salmonella infection in poultry, a challenge experiment with S. enteritidis was performed. Five groups of 20 chickens were given feed with no supplement or feed supplemented with acetic acid (0.24%), formic acid (0.22%), or propionic acid (0.27%) as film-coated microbeads or butyric acid (0.15%) as spray-cooled microcapsules. The 5 groups were challenged with 5.10³ cfu S. enteritidis at d 5 and 6 posthatch, and samples of ceca, liver, and spleen were taken at d 8 and analysed for the number of colony-forming units of Salmonella per gram of tissue. Feed supplementation with acetic acid, and to a lesser extent formic acid, resulted in an increase of colonization of ceca and internal organs. Birds receiving propionic acid-coated microbeads as feed supplement were colonized with Salmonella to the same extent as controls. Butyric acid-impregnated microbeads in the feed, however, resulted in a significant decrease of colonization by S. enteritidis in the ceca but not in liver and spleen.

Imparato, G., et al. (2013). "Bottom-up strategy to build up functional 3D dermis equivalent in vitro by tuning microscaffold degradation rate." Regenerative Medicine **1)**: 19.

One of the most challenging issues of in vitro tissue engineering is the implementation of strategies to successfully culture large and viable constructs in vitro, mimicking the natural tissue organization. Most of the natural tissues are often a combination of small repeating units assembled over several scales. As a consequence, from an engineering point of view, it was proposed to build tissues by assembling blocks mimicking those units in a bottom-up or modular approach. We proposed a versatile strategy yielding 3D dermis tissue constructs of defined size and geometry by means of the biological sintering of cell seeded microscaffold so-called microtissue precursors (muTPs). In the present study we produce 3D dermis equivalent exploiting muTPs assembling strategy, and investigate the role of microscaffold properties in guiding ECM organization and assembly towards the realization of the 3D final tissue. To this end we tuned the stiffness and degradation rate of the gelatin microscaffold by varying its crosslinking extent and realizing muTP with each kind of microscaffold type. We hypothesized that microscaffold properties strongly affect the collagen deposition in the extracellular space as well as its assembly and composition, resulting in 3D dermal-like tissue having different final properties. Gelatin porous microcarriers (GPM) were prepared according to a modified double emulsion technique (O/W/O) and then chemically crosslinked by means of glyceraldeide at 3%, 4% and 5% w/w of the microbeads in order to obtain microscaffolds characterized by different degradation rate. Building blocks for bottom-up tissue applications, such as muTPs were obtained by dynamic cell seeding of human dermal fibroblasts on the realized GPM by means of a spinner flask bioreactor. Dynamic culture lasts nine days during which muTPs samples were withdrawn for morphological and histological analyses. At end of spinner culture muTPs were transferred to a maturation chamber where under optimized culture conditions are induced to assembling generating a 3D dermal equivalent tissue. Time and space evolution of de novo synthesized collagen within the 3D growing tissue was monitored by means of histological analyses (staining with Picro sirius Red, hematoxylin eosin and masson's trichrome), second harmonic generation imaging (SHG) and ultra-structure analyses. Results showed that dynamic seeding performed on GPM at each crosslinking extents led to generation of muTP able to sustain the successively formation of 3D dermal equivalents tissues (Figure 1A). Endogenous ECM was present in the 3D tissues equivalent realized as highlighted by hystology, polarization microscopy with picrosirius red (Figure 1B) and SHG imaging (Figure 1C). Imaging analysis performed on picro sirius red staining images of 3D tissue equivalents allowed to discern between thck/mature fiber of collagen and thin/immature fiber of collagen. This quantitative analysis was exploited to monitor collagen maturation confirming that ECM's time evolution, organization and collagen assembly kinetics strongly depended upon the microscaffold's crosslinking extent. In particular, the increase of the crosslinking extent sped up collagen assembly kinetic obtaining stiffer ECM able to balance both scaffold's mass loss and cell traction. The results reached in this study demonstrate that muTP precursor assembly approach can be exploited to build-up human dermal tissue equivalent in vitro completely made up by endogenous ECM components. Due to the fundamental role played by microscaffol's degradation rate in the collagen maturation, it emerges the importance of controlling initial microscaffold properties in order to obtain 3D tissue having desired final features. (Figure Presented).

Imran, M., et al. (2019). "Co-selection of multi-antibiotic resistance in bacterial pathogens in metal and microplastic contaminated environments: An emerging health threat." Chemosphere **215**: 846-857.

Misuse/over use of antibiotics increases the threats to human health since this is a main reason behind evolution of antibiotic resistant bacterial pathogens. However, metals such as mercury, lead, zinc, copper and cadmium are accumulating to critical concentration in the environment and triggering co-selection of antibiotic resistance in bacteria. The co-selection of metal driven antibiotic resistance in bacteria is achieved through co-resistance or cross resistance. Metal driven antibiotic resistant determinants evolved in bacteria and present on same mobile genetic elements are horizontally transferred to distantly related bacterial human pathogens. Additionally, in marine environment persistent pollutants like microplastics is recognized as a vector for the proliferation of metal/antibiotics and human pathogens. Recently published research confirmed that horizontal gene transfer between phylogenetically distinct microbes present on microplastics is much faster than free living microbes. Therefore, microplastics act as an emerging hotspot for metal driven co-selection of multidrug resistant human pathogens and pose serious threat to humans which do recreational activities in marine environment and ingest marine derived foods. Therefore, marine environment co-polluted with metal, antibiotics, human pathogens and microplastics pose an emerging health threat globally.

Imre, L., et al. (2011). "Detection of mutations by flow cytometric melting point analysis of PCR products." Cytometry Part A: The Journal of the International Society for Analytical Cytology **79**(9): 720-726.

Exploring the possibilities offered by flow cytometric microbead analyses for the detection of genetic alterations, an assay based on the dependence of the melting point of double-stranded DNA molecules on their length has been developed, making use of PCR products carrying biotin and fluorescent moiety on their two ends. The samples of different length PCR products immobilized on streptavidine coated microbeads are heat-treated in the presence of formamide at temperatures between the melting point of the longer and that of the shorter PCR product, when the mean fluorescence intensity of the beads carrying the shorter molecules decreases as a result of denaturation, as opposed to the sample containing the longer product. The efficacy and sensitivity of the method is demonstrated in the case of the assessment of the degree of triplet expansion in Huntington's disease. Its utility for the detection of point mutations in heterozygous clinical samples is shown in the case of the BRCA1 gene. The assay is simple and may be offered for the purposes of clinical diagnostics of a number of genetic conditions. These include screening of samples for triplet expansions and SNPs predisposing for particular pathological or pharmacogenomic conditions. In general, the method described herein is offered for the diagnosis of any pathological condition where the length of a genomic or cDNA sequence is expected to be different from that of the normal allele.

Ings, S. (2017). "Animal or mineral?" New Scientist **234**(3122): 26-27.
The article reports on the photograph of Copeopod langisticus taken by the Mandy Barker and also talks about the small, immotile organism known as plankton who ingest plastic particles by mistaking them for food and because many larger creatures depend on plankton as a crucial source of food. Mandy Barker has been selected for this years Prix Pictet photography prize.

Iniguez, M. E., et al. (2017). "Microplastics in Spanish Table Salt." Scientific Reports **7**(1): 8620.
Marine debris is widely recognized as a global environmental problem. One of its main components, microplastics, has been found in several sea salt samples from different countries, indicating that sea products are irremediably contaminated by microplastics. Previous studies show very confusing results, reporting amounts of microparticles (MPs) in salt ranging from zero to 680 MPs/kg, with no mention of the possible causes of such differences. Several errors in the experimental procedures used were found and are reported in the present work. Likewise, 21 different samples of commercial table salt from Spain have been analyzed for MPs content and nature. The samples comprise sea salts and well salts, before and after packing. The microplastic content found was of 50-280 MPs/kg salt, being polyethylene-terephthalate (PET) the most frequently found polymer, followed by polypropylene (PP) and polyethylene (PE), with no significant differences among all the samples. The results indicate that even though the micro-particles might originate from multiple sources, there is a background presence of microplastics in the environment.

Inoue, T., et al. (2008). "Interleukin-8 as an independent predictor of long-term clinical outcome in patients with coronary artery disease." International Journal of Cardiology **124**(3): 319-325.
BACKGROUND: Accumulating evidence suggests that inflammation plays an essential role in the pathogenesis of atherosclerosis and that circulating inflammatory markers predict future cardiovascular events. However, previous studies evaluated the predictive value of only a single cytokine at a time.
AIMS: This study was designed to simultaneously measure plasma levels of multiple cytokines in patients with coronary artery disease and to evaluate their ability to predict long-term prognosis.
METHODS: The study enrolled 158 consecutive patients with angiographically identified stable coronary artery disease. Using the Luminex micro-beads array system, we simultaneously measured plasma levels of the following 10 cytokines: interleukin (IL)-1beta, IL-2, IL-4, IL-5, IL-6, IL-8, IL-10, tumor necrosis factor (TNF)-alpha, granulocyte-macrophage colony stimulating factor (GM-CSF) and gamma-interferon (IFN-gamma).
RESULTS: None of the 10 cytokine levels as well as high-sensitive C reactive protein (hs-CRP) was correlated with the severity of coronary artery disease. During a 7-year follow-up period, cardiovascular events occurred in 56 patients (35%). Multi-vessel disease, diabetes, and high levels of all of the 10 measured cytokines and hs-CRP were significant predictors of cardiovascular events in univariate analysis. However, multivariate analysis using multi-vessel disease, diabetes and the levels of all of 10 cytokines and hs-CRP showed that the only

independent predictor was IL-8 (RR, 2.98; 95%CI, 1.64-7.24; P=0.0001).
CONCLUSION: IL-8 was the only cytokine that predicted cardiovascular events independent of the other 9 cytokines and hs-CRP. Since IL-8 is a neutrophil chemokine, these results suggest that neutrophil activation may be related to the occurrence of cardiovascular events.

Inui, T. A., et al. (2018). "Daidzein-Stimulated Increase in the Ciliary Beating Amplitude via an [Cl⁻]_i Decrease in Ciliated Human Nasal Epithelial Cells." International Journal of Molecular Sciences **19**(12): 26.

The effects of the isoflavone daidzein on the ciliary beat distance (CBD, which is a parameter assessing the amplitude of ciliary beating) and the ciliary beat frequency (CBF) were examined in ciliated human nasal epithelial cells (cHNECs) in primary culture. Daidzein decreased [Cl⁻]_i and enhanced CBD in cHNECs. The CBD increase that was stimulated by daidzein was mimicked by Cl⁻-free NO3⁻ solution and bumetanide (an inhibitor of Na+/K+/2Cl⁻ cotransport), both of which decreased [Cl⁻]_{i.} Moreover, the CBD increase was inhibited by 5-Nitro-2-(3-phenylpropylamino)benzoic acid (NPPB, a Cl⁻ channel blocker), which increased [Cl⁻]_i. CBF was also decreased by NPPB. The rate of [Cl⁻]_i decrease evoked by Cl⁻-free NO3⁻ solution was enhanced by daidzein. These results suggest that daidzein activates Cl⁻ channels in cHNECs. Moreover, daidzein enhanced the microbead transport driven by beating cilia in the cell sheet of cHNECs, suggesting that an increase in CBD enhances ciliary transport. An [Cl⁻]_i decrease enhanced CBD, but not CBF, in cHNECs at 37 degreeC, although it enhanced both at 25 degreeC. Intracellular Cl⁻ affects both CBD and CBF in a temperature-dependent manner. In conclusion, daidzein, which activates Cl⁻ channels to decrease [Cl⁻]_i, stimulated CBD increase in cHNECs at 37 degreeC. CBD is a crucial factor that can increase ciliary transport in the airways under physiological conditions.

Inui, T. A., et al. (2019). "Enhancement of ciliary beat amplitude by carbocisteine in ciliated human nasal epithelial cells." Laryngoscope **11**: 11.

OBJECTIVE: Carbocisteine (CCis), a mucoactive agent, is used to improve the symptoms of sinonasal diseases. However, the effect of CCis on nasal ciliary beating remains uncertain. We examined the effects of CCis on ciliary beat distance (CBD, an index of amplitude), and ciliary beat frequency (CBF) in ciliated human nasal epithelial cells (cHNECs) in primary culture.
METHODS: The cHNECs were prepared from the nasal tissue resected from patients required surgery for chronic sinusitis (CS) or allergic rhinitis (AR). CBD and CBF were measured using videomicroscopy equipped with a high-speed camera.
RESULTS: CCis increased CBD by 30%, but not CBF, and decreased intracellular Cl⁻ concentration ([Cl⁻]_i) in cHNECs. The CCis' actions were mimicked by the Cl⁻ -free NO₃ ⁻ solution. In contrast, prior treatment of NPPB (20 muM) or CFTR(inh)-172 (1 muM), which increased [Cl⁻]_i by 20%, decreased CBF by 10% and CBD by 25% and inhibited the CCis' actions. However, prior treatment of T16Ainh-A01 (10 muM) did not inhibit the CCis' actions, although it decreased [Cl⁻]_i by 10% and CBD by 15%. Thus, CCis stimulates Cl⁻ channels including cystic fibrosis transmembrane conductance regulator (CFTR). Moreover, CCis enhanced the transport of microbeads driven by the beating cilia in cHNECs. The CCis actions were similar in cHNECs from both types of pateints.
CONCLUSION: CCis increased CBD by 30% in cHNECs via an [Cl⁻]_i decrease

stimulated by activation of Cl⁻ channels, including CFTR. CCis may stimulate nasal mucociliary clearance by increasing CBD in patients contracting CS or AR.
LEVEL OF EVIDENCE: NA. Laryngoscope, 2019.

Ionescu, S., et al. (2011). "RISK OF EXPOSURE TO ASBESTOS IN CASE OF THE MECHANICAL DEGRADATION OF SOME ASBOCEMENT COMPOSITES." Environmental Engineering & Management Journal (EEMJ) **10**(11): 1773-1777.

The hereby article presents a part of the results of the research made by the author during his PhD degree preparation with respect to asbestos and plastics wastes recycling in the form of composite with polymeric matrix, respectively the toxicological tests performed on the new product. In this respect, three categories of tests were made based on complex and modern analysis methodologies, with high results accuracy: spectral analysis of the wear wastes, morphological analysis of the wear wastes and analysis of other air samples from the impact area. The results of the investigations performed have denied the supposed toxicity of asbestos in the conditions of its embedding in a polymeric mass and could thus represent important arguments in the direction of making the applicable legislation flexible in the sense of allowing unrestricted sale of the resulted product. [ABSTRACT FROM AUTHOR]

Iqbal, R., et al. (2019). "In-vitro GIT Tolerance of Microencapsulated Bifidobacterium bifidum ATCC 35914 Using Polysaccharide-Protein Matrix." Probiotics & Antimicrobial Proteins **11**(3): 830-839.

Longevity of probiotic is the main concern for getting maximum benefits when added in food product. Bifidobacterium, a probiotic, tends to lose its viability during gastrointestinal track (GIT) transit and storage of food. Their viability can be enhanced through microencapsulation technology. In this study, Bifidobacterium bifidum (B. bifidum) ATCC 35914 was encapsulated by using two experimental plans. In the first plan, chitosan (CH) at 0.6, 0.8, and 1.0% and sodium alginate (SA) at 4, 5, and 6% were used. Based on encapsulation efficiency, 6% sodium alginate and 0.8% chitosan were selected for single coating of the bacteria, and the resulting micro beads were double coated with different concentrations (5, 7.5, and 10%) of whey protein concentrate (WPC) in the second plan. Encapsulation efficiency and GIT tolerance were determined by incubating the micro beads in simulated gastrointestinal juices (SIJ) at variable pH and exposure times, and their release (liberation of bacterial cells) profile was also observed in SIJ. The microencapsulated bacterial cells showed significantly (P < 0.01) higher viability as compared to the unencapsulated (free) cells during GIT assay. The double-coated micro beads SA 6%-WPC 5% and CH 0.8%-WPC 5% were proven to have the higher survival at pH 3.0 after 90 min of incubation time and at pH 7.0 after 3-h exposure in comparison to free cells in simulated conditions of the stomach and intestine, respectively. Moreover, double coating with whey protein concentrate played a significant role in the targeted (10⁶⁻⁹ CFU/mL) delivery under simulated intestinal conditions.

Ira, T. and S. Mukta (2012). "Awareness and interpretation of the symbols and codes by housewives used in plastic packaging." Asian Journal of Home Science **7**(1): 59-63.

Food packaging has played an important role in the life of consumers. Packaging is best tool for

transportation, protection and in preservation of food. Packaging phenomenon has grown from plant leaves to polymeric chemical compound plastic and thus continuously replacing its other counterparts, its various properties e.g. lightweight, strength, moisture resistance and durability has made it favorite for packaging industry so causing an increase in plastic production at a rate of about 5 per cent per year since 1973 (IWMB, 2003). The Indian polymer industry continues to show a growth rate of 15 per cent per annum. Studies have reported that plastics polymers pose potential hazards on human ecology, they have tendency of migrating the toxic chemicals as well as plastic's economical and environmental impact. Chemical additives used in plastics like phthalates or phthalic acid esters (PAE's), bisphenol A (BPA) could be transferred to human directly from plastics, via food and drink that is packaged in plastics. Plastics can be identified by the resin type code given from American Plastics Council. The picture and codes printed on plastics packaging can play an important role in spreading awareness regarding plastic produce toxicity for health and environment. Therefore, in this paper an attempt has been made to study the awareness and interpretation of symbols and codes printed on plastic packages among house wives. Data were collected by interview-cum-questionnaire method. It was found that awareness level was very less regarding plastic resin code though they knew about recycling symbols.

Iribarren, D., et al. (2012). "Preliminary assessment of plastic waste valorization via sequential pyrolysis and catalytic reforming." Journal of Material Cycles and Waste Management **14**(4): 301-307.

In this article, a life cycle assessment approach is used to carry out a preliminary assessment of the environmental and energy performance of a specific chemical recycling and recovery system that supplies a variety of petrochemical blendstocks through the sequential pyrolysis and catalytic reforming of plastic wastes. Characterization results are presented for a selection of seven impact categories: abiotic depletion, global warming, acidification, eutrophication, ozone layer depletion, photochemical oxidant formation and cumulative non-renewable energy demand. From a combined environmental and energy perspective, the results suggest the suitability of this system for plastic waste valorization. However, improvement actions aimed at reducing the thermal energy demand and mitigating direct emissions to the air should be undertaken. Furthermore, the environmental profiles of the proposed petrochemical blendstocks are compared with those of conventional energy products. A comparison among this chemical recycling and recovery system and two conventional management practices (municipal incineration and landfilling) is also addressed. The results show that the considered system could entail relevant environmental and energy benefits when compared to conventional energy systems and waste management strategies.

Ishii, K., et al. (2018). "Pemphigus foliaceus IgG autoantibodies block heterophilic trans-interaction of desmoglein 1 and desmocollin 1 without intracellular signaling." Journal of Investigative Dermatology **138 (5 Supplement 1)**: S145.

Pemphigus foliaceus (PF) is an autoimmune blistering disease caused by autoantibodies against desmoglein 1 (Dsg1). It is controversial whether blister formation is due to direct inhibition of Dsg interaction or intracellular signaling events that cause desmosome destabilization or both. A recent study showed that heterophilic binding of Dsg and desmocollin (Dsc) is important for adhesive unit of desmosomes. Here we analyzed that PF autoantibodies can block the trans-interaction of Dsg1 and Dsc1. Ectodomains of Dsg1 and Dsc1 were produced by a mammalian expression system and then coated on microbeads. Beads coated with Dsg1 alone or Dsc1 alone showed minimal aggregation while a mixture of Dsg1 beads and Dsc1 beads formed large aggregates after 30 min incubation, confirming that the heterophilic binding of

Dsg1 and Dsc1 is dominant. The aggregation required a mature form of Dsg1 and Dsc1, consistent with adhesion being a property only of mature, not proprotein. To determine if PF Abs can directly block Dsg/Dsc adhesion, we tested anti-Dsg1 mAbs isolated from a PF patient by phage display. A pathogenic anti-Dsg1 IgG or scFv mAb which binds putative trans-adhesive interface of Dsg1 could block the aggregation of Dsg1 and Dsc1 beads. On the other hand, non-pathogenic Dsg1 IgG or scFv mAbs did not inhibit aggregation. These findings indicated that this in vitro aggregation bead assay can discriminate pathogenic vs. non-pathogenic PF Abs. Furthermore, sera from 8 PF patients with active disease all inhibited the aggregation of Dsg1 and Dsc1 beads. When paired sera obtained from 3 PF patients in active stage and in remission were compared, the former inhibited aggregation much better than the latter, as determined by aggregate size. These findings show direct evidence that PF autoantibodies cause steric hindrance of the heterophilic transinteraction of Dsg and Dsc that provide adhesion to desmosomes. Furthermore, this assay will be a valuable and simple tool to assess pathogenic strength of PF autoantibodies.

Ishimatsu, R., et al. (2013). "An organic thin film photodiode as a portable photodetector for the detection of alkylphenol polyethoxylates by a flow fluorescence-immunoassay on magnetic microbeads in a microchannel." Talanta **117**: 139-145.

An organic thin film photodiode (OPD) was successfully employed as a portable photodetector in a competitive enzyme-linked immunosorbent assay (ELISA) of a class of nonionic surfactants, namely alkylphenol polyethoxylates (APnEOs) which are an environmental pollutant. Microbeads that were chemically immobilized with an anti-APnEOs antibody were used in the assay. The OPD consisted of a layer of copper phthalocyanine (CuPc), C60 and a second layer of bathocuproine (BCP) with a bulk heterojunction composed of CuPc and C60 prepared by a vapor deposition method on an indium-tin oxide coated glass substrate. The OPD showed an incident photon-current efficiency (IPCE) of approximately 19% for light at a wavelength of 585 nm. This relatively high IPCE at 585 nm makes it suitable for detecting the fluorescence of resorufin (lambdaem=585 nm), the product of the competitive ELISA, produced through the enzymatic reaction of Amplex Red with horseradish peroxidase (HRP) and H2O2. A fluorometric detector was assembled on a microchip by combining the fabricated OPD and a commercial LED as a photodetector and a light source, respectively. The photocurrent of the OPD due to the fluorescence of resorufin was proportional to the concentration of resorufin in the concentration range from 0 to 8 muM. When the fabricated OPD was used as a portable photodetector, the competitive ELISA of APnEOs using HRP labeled APnEOs (HRP-APnEOs) was performed on magnetic microbeads on which surface an anti-APnEOs antibody had been immobilized. A typical sigmoidal calibration curve was obtained and the data were in good agreement with a numerical simulation, where the photocurrent of the OPD was plotted against the concentration of APnEOs, determined via the competitive ELISA. The detection limit of the immunoassay for APnEOs was approximately 2 and 4 ppb in batch and flow system, respectively.

Ishioka, E., et al. (2016). "Elevated proportion of cd38highigd+ b cells in peripheral blood is related to disease activity in patients with primary sjogren's syndrome." Arthritis and Rheumatology **68 (Supplement 10)**: 1408-1409.

Background/Purpose: Primary Sjogren's syndrome (pSS) is well recognized as an autoimmune disease accompanied by hypergammaglobulinemia and production of autoantibodies such as anti-Ro/SSA and anti-La/SSB antibodies. Although these serological aberrations suggest that abnormally activated B cells play a key role in the pathogenesis of pSS, the possible involvement of hyperactivated B cells in the development of pSS has not been fully understood. In this study, we tried to identify B cell subsets in peripheral blood which may be responsible for disease activities of pSS. Method(s): Peripheral blood was collected from pSS patients (n = 34) and gender- matched healthy controls (HC, n = 20), and the proportion of B cell subsets characterized by anti-CD19, anti-IgD and anti-CD38 antibodies was analyzed by flow cytometry. CD19⁺B cells prepared from pSS patients and HC by using CD19-microbeads were stimulated in vitro with a mixture of an anti-IgM antibody, recombinant human CD40 ligand, recombinant human IL-4 and recombinant human soluble BAFF (B cell stimulation). IgG production by the cells was measured by ELISA. Disease activities of the pSS patients were quantified based on the European League against Rheumatism (EULAR) Primary Sjogren's syndrome disease activity index (ESSDAI). The serological data of the patients were collected by clinical records. Result(s): The proportion of CD19⁺ B cells was significantly increased in pSS patients as compared with HC. In addition, IgG production by CD19⁺ B cells in vitro upon B cell stimulation was also significantly increased in pSS patients. Moreover, the IgG production was positively and significantly correlated with serum IgG levels of the patients. Interestingly, FACS analysis of whole blood samples revealed that both CD38^{high}IgD⁺ and CD38^{high}IgD⁻ B cells were significantly increased in pSS patients compared with HC. Moreover, the number of CD38^{high}IgD⁺ B cells was significantly higher than that of CD38^{high}IgD⁻ B cells in the patients. In addition, the proportion of CD38^{high}IgD⁺ B cells to CD19⁺B cells was positively and significantly correlated with ESSDAI, serum levels of IgG, anti-Ro/SSA and anti-La/SSB antibodies. Conclusion(s): Our results suggest that CD38^{high}IgD⁺ B cells, which are known as activated B cells, are involved in overproduction of IgG and associated with disease activity of pSS. Our findings may shed light on the mechanism of pathogenesis of pSS.

Islam, A., et al. (2018). "Numerical simulation of gas injection in vertical water saturated porous media." Environmental Modeling & Assessment **23**(4): 459-469.

We present numerical simulations of drainage induced by air injection in a vertical water-saturated Hele-Shaw cell filled with glass microbeads. We use the macroscale Subsurface Transport Over Multiple Phases (STOMP) simulator developed by the Pacific Northwest National Laboratory's Hydrology Group. To trigger fingering, we use random permeability fields consistent to capillary entry pressure fields. We compare the numerical results to our own experimental results shown in a previous study. We analyze the effects of the microheterogeneity degree as well as the macroscopic parameters on the gas saturation results. The main objective of the work is to investigate how microscopic effects could be accounted for by macroscopic variables during drainage.

Islam, S., et al. (2019). "Targeting microplastic particles in the void of diluted suspensions." Environment International **123**: 428-435.

Accumulation of microplastic in the environment and food chain will be a grand challenge for our society. Polyurethanes are widely used synthetic polymers in medical (e.g. catheters) and industrial products (especially as foams). Polyurethane is not abundant in nature and only a few microbial strains (fungi and bacteria) and enzymes (polyurethaneases and cutinases) have been reported to efficiently degrade polyurethane. Notably, in nature a long period of time (from 50 to >100 years depending on the literature) is required for degradation of plastics. Material binding peptides (e.g. anchor peptides) bind strongly to polymers such as polypropylene, polyethylene terephthalate, and polyurethane and can target specifically polymers. In this study we report the fusion of the anchor peptide Tachystatin A2 to the bacterial cutinase Tcur1278 which accelerated the degradation of polyester-polyurethane nanoparticles by a factor of 6.6 in comparison to wild-type Tcur1278. Additionally, degradation half-lives of polyester-polyurethane nanoparticles were reduced from 41.8 h to 6.2 h (6.7-fold) in a diluted polyester-polyurethane suspension (0.04% w/v). Graphical abstract Unlabelled Image Highlights • Material binding peptides such as anchor peptides strongly bind synthetic polymers. • The anchor peptide Tachystatin A2 served as adhesion promoter for cutinase Tcur1278. • Tachystatin A2 enhanced enzymatic degradation of polyester-polyurethane by 6.6-fold. • Tachystatin A2 reduced half-life of polyester-polyurethane nanoparticles by 6.7-fold. • Prominent anchoring effect of adhesion promoter in highly diluted nanoparticles. [ABSTRACT FROM AUTHOR]

Isobe, A. (2016). "Percentage of microbeads in pelagic microplastics within Japanese coastal waters." Marine Pollution Bulletin **110**(1): 432-437.

To compare the quantity of microbeads with the quantity of pelagic microplastics potentially degraded in the marine environment, samples were collected in coastal waters of Japan using neuston nets. Pelagic spherical microbeads were collected in the size range below 0.8mm at 9 of the 26 stations surveyed. The number of pelagic microbeads smaller than 0.8mm accounted for 9.7% of all microplastics collected at these 9 stations. This relatively large percentage results from a decrease in the abundance of microplastics smaller than 0.8mm in the upper ocean, as well as the regular loading of new microbeads from land areas, in this size range. In general, microbeads in personal care and cosmetic products are not always spherical, but rather are often a variety of irregular shapes. It is thus likely that this percentage is a conservative estimate, because of the irregular shapes of the remaining pelagic microbeads.

Isobe, A., et al. (2019). "Abundance of non-conservative microplastics in the upper ocean from 1957 to 2066." Nature communications **10**(1): 417.

Laboratory-based studies have suggested that marine organisms can be harmed by ingesting microplastics. However, unless the current and future microplastic abundance in the ocean environment is quantified, these experimental studies could be criticized for using an unrealistic density or sparsity of microplastics. Here we show the secular variations of pelagic microplastic abundance in the Pacific Ocean from 1957 to 2066, based on a combination of numerical modeling and transoceanic surveys conducted meridionally from Antarctica to Japan. Marine plastic pollution is an ongoing concern especially in the North Pacific, and pelagic microplastics are regarded as non-conservative matter due to the removal processes that operate in the upper ocean. The results of our numerical model incorporating removal processes on a 3-year timescale suggested that the weight concentrations of pelagic microplastics around the subtropical convergence zone would increase approximately twofold (fourfold) by 2030 (2060) from the present condition.

Isobe, A., et al. (2014). "Selective transport of microplastics and mesoplastics by drifting in coastal waters." Marine Pollution Bulletin **89**(1/2): 324-330.

The quantity and size distributions of small plastic fragments in the Seto Inland Sea, Japan were

investigated using field surveys and a numerical particle-tracking model. The model was used to interpret the distributions of small plastic fragments and the possible transport processes in coastal waters. Of note, the size and quantity of mesoplastics (approximately >5 mm) gradually increased close to the coast irrespective of the existence of river mouths, which probably act as a major source of anthropogenic marine debris. Additionally, microplastics were more dominant as we moved further offshore. The numerical model reproduced the near-shore trapping of mesoplastics, suggesting that mesoplastics are selectively conveyed onshore by a combination of Stokes drift and terminal velocity, dependent on fragment sizes. It is suggested that mesoplastics washed ashore on beaches degrade into microplastics, and that the microplastics, which are free from near-shore trapping, are thereafter spread offshore in coastal waters.

Isobe, A., et al. (2015). "East Asian seas: A hot spot of pelagic microplastics." Marine Pollution Bulletin **101**(2): 618-623.

To investigate concentrations of pelagic micro- (5mm) in the East Asian seas around Japan, field surveys using two vessels were conducted concurrently in summer 2014. The total particle count (pieceskm-2) was computed based on observed concentrations (piecesm-3) of small plastic fragments (both micro- and mesoplastics) collected using neuston nets. The total particle count of microplastics within the study area was 1,720,000pieceskm-2, 16 times greater than in the North Pacific and 27 times greater than in the world oceans. The proportion of mesoplastics increased upstream of the northeastward ocean currents, such that the small plastic fragments collected in the present surveys were considered to have originated in the Yellow Sea and East China Sea southwest of the study area.

Isobe, A., et al. (2017). "Microplastics in the Southern Ocean." Marine Pollution Bulletin **114**(1): 623-626.

A field survey to collect microplastics with sizes <5mm was conducted in the Southern Ocean in 2016. We performed five net-tows and collected 44 pieces of plastic. Total particle counts of the entire water column, which is free of vertical mixing, were computed using the surface concentration (particle count per unit seawater volume) of microplastics, wind speed, and significant wave height during the observation period. Total particle counts at two stations near Antarctica were estimated to be in the order of 100,000pieceskm⁻².

Istamboulie, G., et al. (2007). "Highly sensitive detection of organophosphorus insecticides using magnetic microbeads and genetically engineered acetylcholinesterase." Biosensors & Bioelectronics **23**(4): 506-512.

This work presents a biosensor for organophosphorus pesticides based on immobilisation of a highly sensitive genetically engineered acetylcholinesterase (B394) by affinity interactions on metal chelate-functionalised magnetic microbeads. The developed sensor has been compared with those based on the widely used Electric eel cholinesterase and a classical entrapment procedure in a polyvinylalcohol-based matrix. The use of the B394 enzyme allowed lowering both IC50 and LOD by a factor of 100 when compared with Electric eel enzyme sensor. The oriented and site-specific immobilisation combined with the high specificity of the B349 mutant allows a more sensitive detection of insecticides, concentrations as low as 1.31(-11)M (IC10) being detected for both pesticides chlorpyriphos-oxon and chlorfenvinphos.

Ito, T., et al. (2009). "Preliminary study of a microbeads based histamine detection for food analysis using thermostable recombinant histamine oxidase from Arthrobacter crystallopoietes KAIT-B-007." Talanta **77**(3): 1185-1190.

We designed and prepared a micro biosensing system consisting of a flow through system with a

sub-micro liter injection valve and a sub-micro liter volume bioreactor. An electrochemical detector was combined with the reactor for immediate detections. The volumes of the reactor and the sample loop for the injection were 850 nl and 320 nl, respectively. This paper described about the characteristics of the sensing system in the case of histamine detection for food analysis. Histamine oxidase from KAIT-B-007 was prepared by using a gene recombination technique and they were immobilized with chitosan beads (phi -70-105 micro m). The detection less than one minute after injection made possible fast analysis for histamine. The biosensing system also showed a high performance for histamine detection in wide range of 1 micro M-1 mM. In addition, we practically measured histamine content in raw tuna stored at room temperature and 35 degrees C up to 96 h. As a result of the comparison between our sensing system and HPLC method, there was good agreement. These results show that our microfluidic biosensing system has the potential to assist miniaturization with small sample volume and short determination time for a sequential food analysis.

Ito, T., et al. (1991). "Preclinical assessment of ⁹⁰Y-labeled C110 anti-carcinoembryonic antigen immunotoxin: A therapeutic immunoconjugate for human colon cancer." Cancer Research **51**(1): 255-260.

We have synthesized ⁹⁰Y-labeled immunotoxin (IT) containing ricin A chain and C110 anti-carcinoembryonic antigen monoclonal antibody (MAb) to produce a therapeutic immunoconjugate for human colon cancer. The C110 IT was labeled with ⁹⁰Y via a benzylisothiocyanate derivative of diethylenetriaminepentaacetic acid. The efficiency of ⁹⁰Y labeling was consistently 90 to 98%, with a specific activity of about 1 muCi/mug. In in vitro stability studies, more than 80% of ⁹⁰Y remained bound to the C110 IT for up to 5 days after incubation. The percentage of binding of ⁹⁰Y-labeled C110 IT to carcinoembryonic antigen-coated microbeads was 86%, indicating good retention of the initial immunoreactivity of the C110 MAb. In in vitro protein synthesis inhibition assays, ⁹⁰Y-labeled C110 IT was approximately 3.7-fold more toxic to the LS174T human colon carcinoma cell line than unmodified C110 IT and 1380-fold more toxic than ⁹⁰Y-labeled C110 MAb. Biodistribution studies of ⁹⁰Y-labeled C110 IT in LS174T tumor-bearing mice showed that, at 24 h following i.p. injection, high accumulation of radioactivity was seen in the i.p. tumor and liver and, thereafter, high accumulation in these tissues remained almost unchanged until up to 168 h, with percentage of injected dose/g ranging from 15 to 18% in the tumor and 10 to 15% in the liver. The radioactivity in the spleen and bone gradually increased with time and reached their highest levels (approximately 8% of injected dose/g) at 168 h. Estimation of absorbed radiation doses to the tissues showed that i.p. tumor would have received an approximately 1.5 to 7 times higher radiation dose than normal organs. In in vivo therapeutic trials, ⁹⁰Y-labeled C110 IT provided survival prolongation of LS174T tumor-bearing mice superior to that with either unmodified C110 IT or ⁹⁰Y-labeled C110 MAb (4 < 0.01; Mann-Whitney U test). These results indicate that ⁹⁰Y labeled C110 anti-carcinoembryonic antigen IT may be a potent therapeutic immunoconjugate for human colon cancer and that it may have direct relevance for i.p. treatment of peritoneal carcinomatosis from colon cancers.

Ito, Y. A., et al. (2016). "A Magnetic Microbead Occlusion Model to Induce Ocular Hypertension-Dependent Glaucoma in Mice." Journal of Visualized Experiments(109): e53731.

The use of rodent models of glaucoma has been essential to understand the molecular mechanisms that underlie the pathophysiology of this multifactorial neurodegenerative disease.

With the advent of numerous transgenic mouse lines, there is increasing interest in inducible murine models of ocular hypertension. Here, we present an occlusion model of glaucoma based on the injection of magnetic microbeads into the anterior chamber of the eye using a modified microneedle with a facetted bevel. The magnetic microbeads are attracted to the iridocorneal angle using a handheld magnet to block the drainage of aqueous humour from the anterior chamber. This disruption in aqueous dynamics results in a steady elevation of intraocular pressure, which subsequently leads to the loss of retinal ganglion cells, as observed in human glaucoma patients. The microbead occlusion model presented in this manuscript is simple compared to other inducible models of glaucoma and also highly effective and reproducible. Importantly, the modifications presented here minimize common issues that often arise in occlusion models. First, the use of a bevelled glass microneedle prevents backflow of microbeads and ensures that minimal damage occurs to the cornea during the injection, thus reducing injury-related effects. Second, the use of magnetic microbeads ensures the ability to attract most beads to the iridocorneal angle, effectively reducing the number of beads floating in the anterior chamber avoiding contact with other structures (e.g., iris, lens). Lastly, the use of a handheld magnet allows flexibility when handling the small mouse eye to efficiently direct the magnetic microbeads and ensure that there is little reflux of the microbeads from the eye when the microneedle is withdrawn. In summary, the microbead occlusion mouse model presented here is a powerful investigative tool to study neurodegenerative changes that occur during the onset and progression of glaucoma.

Ivanidze, J., et al. (2016). "Assessment of cerebrospinal fluid leukotactin-1 (CCL-15) levels and blood-brainbarrier-permeability in the clinical setting." Journal of Cerebral Blood Flow and Metabolism **36 (Supplement 1)**: 258-259.

Objectives: Disruption of the Blood-Brain-Barrier (BBB) has been implicated in the pathophysiology of numerous conditions featuring an activated inflammatory milieu such as CNS malignancy, meningitis and autoimmune disorders, however, to date, there is limited clinical data on BBB permeability (BBBP). Recent studies demonstrated correlation of increase in BBBP with poor outcomes in patients with aneurysmal subarachnoid hemorrhage (SAH). CT Perfusion (CTP) allows assessment of quantitative parameters used to describe BBBP, including KEP, PS, Ktrans, and VE. KEP represents the washout rate constant of contrast agent from the EES (extravascular extracellular space) to the IVS (intravascular space), and is inversely related to BBBP. PS, the permeability surface area product, and represents the flow across the blood vessel wall. Ktrans equals plasma flow and VE represents EES volume per unit volume of tissue, respectively. Assessment of these parameters offers a promising technique to evaluate BBBP in the clinical setting. On the molecular level, increase in BBBP is thought to be mediated by inflammatory chemokines. The matrix metalloproteinase MMP-9 is inducible by chemokines, and plays a key role in the opening of the BBB. Leukotactin-1 (CCL15) is known to modulate MMP-9 release from macrophages in cardiovascular disease, however, the potential role of CCL15 in BBBP modulation has not been examined to date. The objective of this study is to correlate CCL15 protein levels in cerebrospinal fluid (CSF) with BBBP measured by CTP. Method(s): SAH patients underwent CTP in the early phase after aneurysmal rupture. CTP data were post-processed into BBBP quantitative maps of PS, K-trans, KEP, and VE using Olea Sphere software (Olea Medical, La Ciotat, France). Global cortically based ROI mean values were calculated for each patient. CSF was collected via indwelling ventriculostomy catheter (placed for intracranial pressure management) within 24 hours of CTP. CCL15 levels were measured in CSF supernatant using multiplex microbead immunoassay technology (Luminex Corp, Austin, TX). Result(s): In this preliminary study, BBBP parameters and CSF CCL15 levels were prospectively assessed in 7 patients with SAH admitted to the Neurological Intensive Care Unit at our institution. Spearman correlation analysis was performed to determine correlation between CCL15 and KEP, PS, Ktrans and VE, respectively. In the case of CCL15 and KEP, a statistically highly significant inverse correlation was found (r = - 0.96, p = 0.0028). Correlation results for PS, Ktrans, and VE were not statistically significant, however, there was a trend for positive correlation as demonstrated in Figure 1. Conclusion(s): Elevated BBBP, expressed as low KEP, correlated with elevated CSF levels of CCL15 in the clinical setting in patients with SAH, indicating a pathophysiological correlate for the presumed BBBP disruption via chemokine-induced MMP-9 upregulation. This study is limited due to its proof-of-concept character and small sample size, and future studies evaluating additional chemokines, as well as MMPs, are needed to improve understanding of BBBP disruption and to thereby improve clinical outcomes.

Ivanov, V., et al. (2004). "Removal of micro-particles by microbial granules used for aerobic wastewater treatment." Water Science & Technology **50**(12): 147-154.

Microbial granules with a diameter from 0.4 mm to 3.0 mm have been produced by fast sedimentation and retention of microbial aggregates in sequencing batch airlift reactors used for model wastewater treatment. The wastewater was with or without addition of calcium salt. The granules were able not only to degrade organic matter but to remove nano- and micro-particles from wastewater due to microchannels and pores in the matrix of the granules. To detect the removal of 0.1 microm, 0.6 pm, 4.2 microm fluorescent microspheres, and cells of Escherichia coli, stained by permeable nucleic acid stain SYTO9, the granules were incubated with these particles. The rate of particle removal and their accumulation in the granules was measured by a Fluoview300 confocal laser scanning microscope (CLSM) (Olympus, Japan); a FACSCalibur flow cytometer (Becton Dickinson, CA, USA), and a fluorescence spectrometer LS-50B (Perkin-Elmer, UK). The release or removal of biological and non-biological particles was analyzed by a flow cytometer after DNA staining. Total number of the particles bigger than 0.1 microm in the reactors was approximately 4 x 10(7) per ml, and 23% of these particles were bacterial cells. The 0.1 microm and 4.2. microm microbeads were accumulated within 250 microm in the upper layer of the microbial granule but externally added cells of Escherichia coli penetrated to the depth of approximately 800 microm in the granules without calcium addition. Microbial granules contained also attached ciliates but accumulation of the particles in protozoan cells was smaller than in the granule matrix. Kinetics of particle sorption was revealed by flow cytometry and fluorescence spectrometry. Almost half of the stained cells of E. coli can be removed by the granules for one hour. The ability of the microbial granules to remove the particles can enhance their function in aerobic treatment of wastewater.

Ivanova, M., et al. (2011). "A novel bead-based liquid assay as a platform for multiplex detection of mutations associated with myeloproliferative neoplasms." Tissue Antigens **77 (5)**: 472-473.

A plethora of aquired mutations, including JAK2 V617F, JAK2 exon 12 and MPL exon 10 mutations, have recently been reported to be associated with the pathogenesis of Philadelphia chromosome-negative myeloproliferative neoplasms (MPNs). Here we report the establishment and validation of a novel, rapid, cost-effective and high-throughput method for JAK2 and MPL mutations identification using a multiplexed bead-based suspension array platform - LuminexRxMAPTM and locked nucleic acid -modified oligonucleotide probes. The following 10 mutations relevant for diagnosis and therapy were selected: JAK2 exon 14 (V617F), 5 exon 12 mutations and deletions, 3 MPL exon 10 mutations. A 354 bp region of JAK2 exon 14, 180 bp region of exon 12 and 277 bp of MPL genes were amplified using biotinylated primers and genotyping was performed by direct hybridization with 2 oligonucleotide probes, specific for the

corresponding wild type and mutant alleles. The probes were modified with locked nucleic aicds and were synthesized with 5 amino group and 20 bases spacer oligonucleotides to allow covalent attachment to carboxylated microbeads (Luminex Corp). The method was validated by testing of on artificial plasmid constructs harboring the mutations and clinical samples from patients with MPNs, genotyped by direct DNA sequencing. Compared to previously described methods, our approach had a higher sensitivity- approximately 2% mutant DNA on a wild-type background. No discrepancies between the novel Luminex-based method and sequencing were observed. Thus, it could be successfully implemented in the diagnostic work-up for MPNs. Furthermore due to the multiplexing this system allowed simultaneous testing for the presence of various mutations associated with MPNs. Additionally, the assay allowed to quantify mutant alleles burden and therefore was applicable for assessment of minimal residual disease in patients following HSCT.

Ivanova, M., et al. (2010). "Detection of mutations associated with chronic myeloproliferative disorders using a bead-based liquid assay." Tissue Antigens **75 (5)**: 527-528.

The JAK2 V617F mutation has recently been reported to be associated with the pathogenesis of chronic myeloproliferative disorders (CMPDs). Several techniques such as restriction fragment length polymorphism, direct sequencing analysis, pyrosequencing, real-time AS-PCR6 and a denaturing high-performance liquid chromatography have been developed for the detection of this kind of mutation. Here we report the establishment and validation of a novel rapid, cost-effective and highthroughput method for JAK2 V617F mutation identification using a multiplexed microsphere-based suspension array platform - LuminexRxMAPTM. A 354 bp region of JAK2 gene was amplified using biotinilated primers and genotyping was performed by direct hybridization with 2 oligonucleotide probes, specific for the wiled type and mutant alleles. The probes were synthesized with 5' amino group and 20 bases spacer oligonucleotides to allow covalent attachment to carboxylated microbeads (Luminex Corp). The method was validated by testing of an artificial plasmid construct harboring the mutation and 80 clinical samples from patients with CMPDs, genotyped by DNA sequencing. The sensitivity of this novel assay was approximately 5% mutant DNA in a wild-type background. No discrepancies between the novel Luninex-based method and sequencing were observed. Thus, it could be successfully implemented in the diagnostic work-up for CMPDs. Additionally, the assay developed allowed to quantify mutant allele burden and therefore was applicable for assessment of minimal residual disease in patients following HSCT. Furthermore, this system would allow the design of multiplex assays for simultaneous testing for the presence of various mutations associated with CMPDs.

Ivar do Sul, J., et al. (2014). "Microplastics in the pelagic environment around oceanic islands of the Western Tropical Atlantic Ocean." Water, Air & Soil Pollution **225**(7): 1-13.

Recent evidence suggests that microplastic pollution is widespread in every oceanic basin; however, there is limited data available for the tropical South Atlantic Ocean. The purpose of this study was to examine the distribution, density and characteristics of plastic particles in plankton samples collected in the western tropical Atlantic Ocean. Neustonic tows (N = 160) were conducted near three important insular environments (Fernando de Noronha, Abrolhos and Trindade), and the presence of microplastics in the ocean surface of these areas was confirmed for the first time. The collected microplastic particles included hard plastic fragments, plastic films, paint chips and fibres and strands, which were classified as a secondary source of microplastics. The stock of plastic originates from both land-based and marine-based sources. This type of marine pollution in the tropical Atlantic Ocean is a potential threat to important

ecological species. [ABSTRACT FROM AUTHOR]
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Ivar do Sul, J. A. and M. F. Costa (2014). "The present and future of microplastic pollution in the marine environment." Environmental Pollution **185**: 352-364.
Recently, research examining the occurrence of microplastics in the marine environment has substantially increased. Field and laboratory work regularly provide new evidence on the fate of microplastic debris. This debris has been observed within every marine habitat. In this study, at least 101 peer-reviewed papers investigating microplastic pollution were critically analysed (Supplementary material). Microplastics are commonly studied in relation to (1) plankton samples, (2) sandy and muddy sediments, (3) vertebrate and invertebrate ingestion, and (4) chemical pollutant interactions. All of the marine organism groups are at an eminent risk of interacting with microplastics according to the available literature. Dozens of works on other relevant issues (i.e., polymer decay at sea, new sampling and laboratory methods, emerging sources, externalities) were also analysed and discussed. This paper provides the first in-depth exploration of the effects of microplastics on the marine environment and biota. The number of scientific publications will increase in response to present and projected plastic uses and discard patterns. Therefore, new themes and important approaches for future work are proposed.

Ivar do Sul, J. A., et al. (2013). "Pelagic microplastics around an archipelago of the Equatorial Atlantic." Marine Pollution Bulletin **75**(1-2): 305-309.
Plastic marine debris is presently widely recognised as an important environmental pollutant. Such debris is reported in every habitat of the oceans, from urban tourist beaches to remote islands and from the ocean surface to submarine canyons, and is found buried and deposited on sandy and cobble beaches. Plastic marine debris varies from micrometres to several metres in length and is potentially ingested by animals of every level of the marine food web. Here, we show that synthetic polymers are present in subsurface plankton samples around Saint Peter and Saint Paul Archipelago in the Equatorial Atlantic Ocean. To explain the distribution of microplastics around the Archipelago, we proposed a generalised linear model (GLM) that suggests the existence of an outward gradient of mean plastic-particle densities. Plastic items can be autochthonous or transported over large oceanic distances. One probable source is the small but persistent fishing fleet using the area.

Ivarsen, A., et al. (2004). "Plastic particles at the LASIK interface." Ophthalmology **111**(1): 18-23.
PURPOSE: To investigate the origin, composition, and persistence of the interface particles that frequently are observed after LASIK.
DESIGN: Small case series and experimental animal study.
METHODS: Four patients received LASIK using a Schwind Supratome (Schwind, Kleinostheim, Germany) and a MEL 70 G-Scan excimer laser (Asclepion, Jena, Germany) and were examined over the course of 1 year using slit-lamp and in vivo confocal microscopy. Four rabbits received a monocular microkeratome incision and were examined immediately after surgery without lifting the flap. After monthly evaluation for 4 months using in vivo confocal microscopy, 2 corneas were processed for histologic analysis and were sectioned serially. To measure the iron content,

atomic absorption spectrometry was performed on 2 operated and 2 unoperated rabbit corneas. The chemical composition of the metal and plastic parts of the microkeratome blade was identified using energy dispersive x-ray fluorescence (metal part), and Raman and infrared spectroscopy (plastic part). Before and after oscillation in air, the microkeratome blade and motor-head were examined using light and fluorescence microscopy. In serial sections, interface particles were identified by fluorescence microscopy and their chemical composition was determined using Coherent Antistokes Raman Scattering microscopy.

RESULTS: In LASIK patients, thousands of brightly reflecting particles (up to 30 micro m) were observed throughout the interface. The highest particle density was detected where the microkeratome blade had first entered the cornea. Both in the center and at the flap edge, the morphologic features, distribution, and density of these particles remained unaltered throughout the 1-year observation period. In rabbit corneas, interface particles were observed immediately after the microkeratome incision, even though the flap had not been lifted. These particles were similar to those observed in humans and persisted unaltered throughout the study. The operated and unoperated rabbit corneas had comparable iron content, demonstrating that the particles were not fragments of the uncoated steel blade. Only a few particles were observed on the unused microkeratome motor head and blade, whereas numerous fluorescent particles were detected after oscillation in air, the amount of particles increasing with oscillation time. Interestingly, the only fluorescent part of the microkeratome was the plastic segment of the blade. This plastic (polyetherimide) emitted fluorescence identical to that of the observed particles, whereas all metal parts of the microkeratome blade and motor head were nonfluorescent. In serial sections, interface particles showed fluorescent properties equivalent to polyetherimide and exhibited molecular resonance at 1780 and 3100 cm(-1), in accordance with the Raman spectrum of polyetherimide.

CONCLUSIONS: Numerous plastic particles are generated during microkeratome oscillation and are deposited at the interface during LASIK. The particles persist unaltered for at least 1 year.

Ivleva, N. P., et al. (2017). "Microplastic in Aquatic Ecosystems." Angewandte Chemie. International Ed. in English **56**(7): 1720-1739.

The contamination of marine and freshwater ecosystems with plastic, and especially with microplastic (MP), is a global ecological problem of increasing scientific concern. This has stimulated a great deal of research on the occurrence of MP, interaction of MP with chemical pollutants, the uptake of MP by aquatic organisms, and the resulting (negative) impact of MP. Herein, we review the major issues of MP in aquatic environments, with the principal aims 1) to characterize the methods applied for MP analysis (including sampling, processing, identification and quantification), indicate the most reliable techniques, and discuss the required further improvements; 2) to estimate the abundance of MP in marine/freshwater ecosystems and clarify the problems that hamper the comparability of such results; and 3) to summarize the existing literature on the uptake of MP by living organisms. Finally, we identify knowledge gaps, suggest possible strategies to assess environmental risks arising from MP, and discuss prospects to minimize MP abundance in aquatic ecosystems.

Iwamoto, S., et al. (2002). "Preparation of gelatin microbeads with a narrow size distribution using microchannel emulsification." AAPS PharmSciTech **3**(3): E25.

The purpose of this study was to prepare monodisperse gelatin microcapsules containing an active agent using microchannel (MC) emulsification, a novel technique for preparing water-in-oil (W/O) and oil-in-water (O/W) emulsions. As the first step in applying MC emulsification to the preparation of monodisperse gelatin microcapsules, simple gelatin microbeads were prepared using this technique. A W/O emulsion with a narrow size distribution containing gelatin in the aqueous phase was created as follows. First, the aqueous disperse phase was fed into the continuous phase through the MCs at 40 degrees C (operating pressure: 3.9 kPa). The emulsion droplets had an average particle diameter of 40.7 microm and a relative standard deviation of 5.1%. The temperature of the collected emulsion was reduced and maintained at 25 degrees C overnight. The gelatin microbeads had a smooth surface after overnight gelation; the average particle diameter was calculated to be 31.6 microm, and the relative standard deviation, 7.3%. The temperature was then lowered to 5 degrees C by rapid air cooling and finally dried. The gelatin beads were dried and could be resuspended well in iso-octane. They had an average particle diameter of 15.6 microm, and a relative standard deviation of 5.9%. Using MC emulsification, we were able to prepare gelatin microbeads with a narrow size distribution. Since this emulsification technique requires only a low-energy input, it may create desirable experimental conditions for microencapsulation of unstable substances such as peptides and proteins. This method is promising for making monodisperse microbeads.

Iwasaki, K., et al. (2019). "Suppressive Effect of Everolimus on IL-2, IL-10, IL-21, and IFNgamma Levels: Implications for the Successful Minimization of Calcineurin Inhibitor Use in Transplantation." Therapeutic Drug Monitoring **41**(3): 371-375.

Background:Success with calcineurin inhibitors (CNIs) such as cyclosporine A (CSA) and tacrolimus (TAC) in organ transplantation has demonstrated that cytokine suppression is a key factor in patient management. However, the exact effects of recently introduced immunosuppressive agents other than CNI on cytokine expression remain unknown. In this study, the action of the mTOR-inhibitor everolimus (EVR) and that of the antimetabolite mycophenolic acid (MPA) on the transcription of several cytokines was investigated. Method(s):Peripheral blood mononuclear cells obtained from healthy volunteers were stimulated with anti-CD3/28 microbeads in the presence of CSA, TAC, EVR, and/or MPA for 8 hours. The mRNA levels of each cytokine were measured using quantitative real-time polymerase chain reaction. Result(s):MPA had no inhibitory effect on any of the cytokines tested. EVR showed moderate inhibition of IL-2, IL-10, IL-21, and IFNgamma levels. These cytokines were further analyzed to investigate the additive effect of EVR in combination with CNI. The beneficial effect of EVR addition was seen at low concentrations of CSA or TAC, while no additive effect was observed at high concentrations. Conclusion(s):EVR might effectively inhibit the activation of recipient immune cells in combination with a low dose of CNI, maximizing clinical benefit by preventing graft rejection and alleviating CNI-induced adverse effects. Copyright © 2019 Wolters Kluwer Health, Inc.

Iwasaki, S., et al. (2017). "Fate of microplastics and mesoplastics carried by surface currents and wind waves: a numerical model approach in the Sea of Japan." Marine Pollution Bulletin **121**(1/2): 85-96.

A numerical model was established to reproduce the oceanic transport processes of microplastics and mesoplastics in the Sea of Japan. A particle tracking model, where surface ocean currents were given by a combination of a reanalysis ocean current product and Stokes drift computed separately by a wave model, simulated particle movement. The model results corresponded with the field survey. Modeled results indicated the micro- and mesoplastics are moved northeastward by the Tsushima Current. Subsequently, Stokes drift selectively moves mesoplastics during winter toward the Japanese coast, resulting in increased contributions of mesoplastics south of 39 degrees N. Additionally, Stokes drift also transports micro- and mesoplastics out to the sea area south of the subpolar front where the northeastward Tsushima Current carries them into the open ocean via the Tsugaru and Soya straits. Average transit time of modeled particles in the Sea of Japan is drastically reduced when including Stokes drift in the model.

Iwata, H., et al. (1988). "Microencapsulation of Langerhans Islets in Agarose Microbeads and Their Application for a Bioartificial Pancreas." Journal of Bioactive and Compatible Polymers **3**(4): 356-369.

Microencapsulation of islets is considered to be a promising approach to the development of a bioartificial pancreas. In this study agarose was examined as a material to microencapsulate islets. By a low-temperature gelation tech nique, islets can be easily microencapsulated into agarose microbeads without any adverse effect on the functions of islets. Encapsulated islets in agarose microbeads maintained their intact round shapes during the entire period of culturing. They secreted 50-70 kU islet super(-1) day super(-1) insulin into the culture medium and regulated insulin secretion minute by minute in response to the change of glucose concentration even after 140 days of in vitro culture. The molecular weight permeability of agarose microbeads can be modulated by changing the agarose concentration. Agarose microbeads containing higher than 10 wt% can hinder the penetration of bovine serum albumin (M.W. = 67,000), and thus can protect islets from the attack of immunoglobulin. Hamster islets encapsulated in microbeads containing 11 wt% agarose were xenogenically transplanted into the peritoneal cavity of a diabetic mouse. Before the transplantation plasma glucose levels were higher than 400 mg dL super(-1). After transplantation plasma glucose levels were normalized within two days and the normoglycemic period was 29 days. Although more studies are needed to prolong this period for bioartificial pancreas function, agarose is a prominent basic material for en capsulating islets.

Iwata, H., et al. (1994). "Feasibility of agarose microbeads with xenogeneic islets as a bioartificial pancreas." Journal of Biomedical Materials Research, Part B: Applied Biomaterials **28**(9): 1003-1011.

A bioartificial pancreas, that is, transplantation of islets of Langerhans (islets) which are enclosed in a semipermeable membrane, has been proposed as a treatment for type I diabetes. The islets are immuno-isolated from the host by the semipermeable membrane preventing rejection while maintaining control of glucose metabolism for an extended period. The purpose of the current research is to evaluate the feasibility of preparing agarose microbeads with xenogeneic hamster islets as a bioartificial pancreas in streptozotocin induced diabetic mice. In the recipients with a low level of anti-hamster antibodies, the combination of encapsulation of hamster islets in 5% agarose microbeads and in vitro culture of them prolonged xenograft survivals. Four of 6 recipients were still normoglycemic at 100 days after implantation. However, the same procedure was not effective in the recipients which were sensitized in advance by transplantation of free hamster islets and thus had high levels of anti-hamster antibodies. The average normoglycemic period was 32 days. Antibodies permeated through the microbeads and activated complement on the cell surfaces. The network of agarose microbeads was rendered dense by increasing the concentration of agarose to restrict the diffusion of antibodies. Graft survivals were prolonged with increasing concentrations of agarose. As an analysis using diffusion equations predicted, the survivals were inversely proportional to the diffusion coefficient of IgG in each agarose gel. Islet xenotransplantation was enabled by the combination of the microbeads with a concentration of agarose higher than 7.5% and in vitro culture even in recipients having a high level of preformed antibodies.

Iwata, H., et al. (1999). "Control of complement activities for immunoisolation." Annals of the New York Academy of Sciences **875**: 7-23.

Immunoisolation of cells by semipermeable membranes is a most promising approach to transplant xenogeneic cells. Although membranes which allow xenotranplantation have been reported, ambiguity remains as to their long term effectiveness. In this review, we would like to reconsider the immuno-isolative effectiveness of membranes reported from the standpoint of permeability and present our strategy to prepare membranes that can realize long-term functioning of xenograft. There are distinct different types of semipermeable membranes, hydrogel membranes and ultrafiltration membranes. Studies on their permeability indicated that neither of these membranes effectively fractionate solutes on the basis of molecular size under a diffusion-controlled process, nor thus can they immuno isolate xenograft for a long time. Humoral immunity including antibodies and complement proteins is suspected of playing a major role in the rejection of xenografts. Control of complement cytolytic activities, not antibody permeation, may be a key factor determining the fate of the xenograft enclosed in membranes. We found that the microbead containing poly(styrene sulfonic acid) can consume complement cytolytic activities and thus can effectively protect xenogeneic islets of Langerhans in diabetic mice from the humoral immunity.

Iwata, H., et al. (1994). "Strategy for developing microbeads applicable to islet xenotransplantation into a spontaneous diabetic NOD mouse." Journal of Biomedical Materials Research **28**(10): 1201-1207.

A bioartificial pancreas (BAP) created through the encapsulation of islets of Langerhans (islets) in a semipermeable membrane has been proposed as a promising approach to treating insulin-dependent diabetes patients. A nonobese diabetic (NOD) mouse, which shares many features of human insulin-dependent diabetes mellitus, is an ideal model for evaluating the function of BAP. However, the functions of BAPs that have been developed have been limited in NOD mice. We propose novel microbeads that can realize long-term BAP function in NOD mice. The novel microbeads were composed of agarose and poly(styrene sulfonic acid) (PSSa) mixed gel. A polyion complex layer between PSSa and polycationic polybrene was formed on and just inside the microbead, and the microbead surfaces were further covered by polyanions to produce anionic surface charges. The islets in the novel microbeads were intraperitoneally implanted. Graft-functioning periods were dependent on both PSSa concentration and the kinds of polyanion. Islets in the microbeads composed of 5% agarose and 5% PSSa, which had an outermost surface covered by carboxymethyl cellulose, produced normoglycemic periods of more than 60 days in all five recipients. Control mice receiving either transplants of unenclosed islets or islets in agarose microbeads showed normoglycemic periods of less than 12 days. We believe that agarose/PSSa microbeads are promising for producing semipermeable membranes that enable xenotransplantation of islets in spontaneous diabetes mellitus.

Jabart, E., et al. (2015). "A microfluidic method for the selection of undifferentiated human embryonic stem cells and in situ analysis." Microfluidics and Nanofluidics **18**(5-6): 955-966.

Conventional cell-sorting methods such as fluorescence-activated cell sorting (FACS) or magnetic-activated cell sorting (MACS) can suffer from certain shortcomings such as lengthy sample preparation time, cell modification through antibody labeling, and cell damage due to exposure to high shear forces or to attachment of superparamagnetic Microbeads. In light of these drawbacks, we have recently developed a label-free, microfluidic platform that can not only select cells with minimal sample preparation but also enable analysis of cells in situ. We demonstrate the utility of our platform by successfully isolating undifferentiated human embryonic stem cells (hESCs) from a heterogeneous population based on the undifferentiated stem-cell marker SSEA-4. Importantly, we show that, in contrast to MACS or FACS, cells isolated by our method have very high viability (~90 %). Overall, our platform technology could likely be applied to other cell types beyond hESCs and to a variety of heterogeneous cell populations in order to select and analyze cells of interest.

Jabeen, K., et al. (2017). "Microplastics and mesoplastics in fish from coastal and fresh waters of China." Environmental Pollution **221**: 141-149.

Plastic pollution is a growing global concern. In the present study, we investigated plastic pollution in 21 species of sea fish and 6 species of freshwater fish from China. All of the species were found to ingest micro- or mesoplastics. The average abundance of microplastics varied from 1.1 to 7.2 items by individual and 0.2-17.2 items by gram. The average abundance of mesoplastics varied from 0.2 to 3.0 items by individual and 0.1-3.9 items by gram. Microplastics were abundant in 26 species, accounting for 55.9-92.3% of the total number of plastics items in each species. Thamnaconus septentrionalis contained the highest abundance of microplastics (7.2 items/individual). The average abundance of plastics in sea benthopelagic fishes was significantly higher than in freshwater benthopelagic fishes by items/individual. The plastics were dominated by fiber in shape, transparent in color and cellophane in composition. The proportion of plastics in the stomach to the intestines showed great variation in different species, ranging from 0.5 to 1.9 by items/individual. The stomach of Harpodon nehereus and intestines of Pampus cinereus contained the highest number of plastics, (3.3) and (2.7), respectively, by items/individual. Our results suggested that plastic pollution was widespread in the investigated fish species and showed higher abundance in comparison with worldwide studies. The ingestion of plastics in fish was closely related to the habitat and gastrointestinal tract structure. We highly recommend that the entire gastrointestinal tract and digestion process be used in future investigations of plastic pollution in fish.

Jabłońska, B., et al. (2019). "Physical and Chemical Properties of Waste from PET Bottles Washing as A Component of Solid Fuels." Energies **12**(11).

The latter causes air pollution due to emissions of oxides of hydrocarbons, ammonia, sulphur dioxide, corrosive organic acids, dioxins, furans and others [7]. [...]the most appropriate form of plastic waste management seems to be mechanical (material) and chemical (raw material) recycling, which results in the same products as the initial product or products for other purposes. [...]of processes preparing waste plastic for granulation in the washing process line, waste and sub-process waste are generated. According to [30], in the digestate sewage sludge, the content of combustible parts is ca. 60%, and in cotton stalks, 63%. Despite the small amount of heavy metal ions, the wastes tested do not meet the criteria determining the possibility of storing them in a landfill other than hazardous or inert wastes due to the over-normative content of PEE and TOC. [...]pursuant to Polish law [63], the waste cannot be disposed of via landfill of non-hazardous and inert waste, if TOC >5% d.m., loss on ignition >8% d.m. and the heat of combustion >6 MJ/kg d.m., which is the case. 5.

Jacassi, A., et al. (2017). "Scanning Probe Photonic Nanojet Lithography." Acs Applied Materials & Interfaces **9**(37): 32386-32393.

The use of nano/microspheres or beads for optical nanolithography is a consolidated technique for achieving subwavelength structures using a cost-effective approach; this method exploits the capability of the beads to focus electromagnetic waves into subwavelength beams called photonic nanojets, which are used to expose the photoresist on which the beads are placed. However, this technique has only been used to produce regular patterns based on the spatial arrangement of the beads on the substrate, thus considerably limiting the pool of applications. Here, we present a novel microsphere-based optical lithography technique that offers high subwavelength resolution and the possibility of generating any arbitrary pattern. The presented method consists of a single microsphere embedded in an AFM cantilever, which can be controlled using the AFM motors to write arbitrary patterns with subwavelength resolution (down to 290 nm with a 405 nm laser). The performance of the proposed technique can compete with those of commercial high-resolution standard instruments, with the advantage of a one-order-of-magnitude reduction in costs. This approach paves the way for direct integration of cost-effective, high-resolution optical lithography capabilities into several existing AFM systems.

Jack, R. M., et al. (2014). "Continuous isolation, labeling and collection of viable CTCs using an integrated microfluidic device." Cancer Research. Conference: 105th Annual Meeting of the American Association for Cancer Research, AACR **74**(19 SUPPL. 1).

The concept of studying tumor-derived circulating tumor cells (CTCs) from a simple blood-draw of a patient, has acquired significant attention in recent years. This relatively non-invasive approach opens many avenues in understanding and monitoring quite a number of cancers where correlations have since been made with CTCs and patient survival as well as patient response to therapeutics. Additionally, studies geared towards identifying genetic markers as well as gene profiling of CTCs are ongoing in efforts to develop early screening markers as well as gain a more holistic understanding of the various forms of the disease. Moreover, the concept of personalized medicine in treating several types of cancer is deemed indispensable due to the highly heterogeneous nature of the disease. Extensive studies involving genetic material of CTCs are expected to considerably develop effective therapeutics that are tailored to meet each patient's need. However, several challenges need to be overcome in order to harness the wealth of information that can be gained from CTC studies, such as the rarity of such cells among other blood cells, where CTCs occur as rarely as 1 to 1 million among other mononuclear blood cells. In this vein we discuss the development of an integrated, continuous microfluidic device designed to isolate and label CTCs disseminated from cancer tumors. The 3-part device initially exploits the size disparity of the majority of CTCs with other blood cells and couples this with the use of size-based inertial forces to presort CTCs from whole blood at 1.2mL/min. The CTC-rich fluid stream is then mixed passively, on-chip, with EpCAM coated micro-beads which allows the cells and beads to mix at the micron length scale. This is followed by a brief period of incubation which allows cells to be sufficiently labeled, where the majority of cells have experienced at least two-thirds magnetic bead coverage using this mixing-incubation approach. Thereafter on-chip magnetic sorting of CTCs from any remaining blood cells is achieved by application of an external magnet along the magnetic sorter of the integrated device. Cells with as little as one-third bead coverage experience magnetic deflection to the CTC collection stream. To identify CTCs, cells were stained positively for DAPI and CK-19, and CD45 was used to distinguish leukocytes. We demonstrate that the isolated CTCs are not only viable but that the range of WBC decontamination is the lowest yet reported in literature. Based on PANC-1 cell-line experiments with the device, an 80% recovery rate of cancer cells from other blood cells was consistently achieved. Testing of metastatic patient samples with the device has yielded high counts of CTCs, coupled with high purity rates. We believe that the use of this system in characterizing CTCs and studying cancer will contribute to understanding this aggressive disease in a non-invasive, efficient manner.

Jackson, D. A. and P. R. Cook (1985). "A general method for preparing chromatin containing intact DNA." EMBO Journal **4**(4): 913-918.

A simple and general method is described for preparing chromatin from eukaryotic cells using isotonic conditions. First, cells are encapsulated in agarose microbeads and then lysed using

Triton X-100 in the presence of a chelating agent and a physiological concentration of salt. Most cytoplasmic proteins and RNA diffuse rapidly out through pores in the beads to leave encapsulated chromatin which is nevertheless completely accessible to enzymes and other probes. This chromatin can be manipulated freely without aggregation in a variety of different salt and detergent concentrations. It also contains intact DNA since removal of the histones releases superhelical DNA. Conditions are described for incubating this chromatin at 37 degrees C in the presence of Mg2+ ions without any nicking of the DNA. We illustrate the usefulness of this chromatin in investigations on the attachment of nascent RNA to the nucleoskeleton, the accessibility of the ribosomal locus to EcoRI and the properties of the endogenous RNA polymerase II. This type of chromatin preparation should prove useful for both structural and functional studies.

Jackson, D. A. and P. R. Cook (1986). "A cell-cycle-dependent DNA polymerase activity that replicates intact DNA in chromatin." Journal of Molecular Biology **192**(1): 65-76.

An insoluble DNA polymerase activity that replicates the intact chromatin template at 85% of the rate found in vivo has been partially characterized. HeLa cells, encapsulated in agarose microbeads, are lysed using an isotonic salt concentration: the resulting encapsulated nuclei contain polymerase associated with a nucleoskeleton and the unbroken template. This preparation can be manipulated freely without aggregation or breaking the DNA and yet is accessible to enzymes and other probes. The major activity, which is sensitive to aphidicolin, is found only in S-phase nuclei and replicates DNA semi-conservatively, forming intermediates that are ligated efficiently into larger products.

Jackson, D. A., et al. (1990). "Attachment of DNA to the nucleoskeleton of HeLa cells examined using physiological conditions." Nucleic Acids Research **18**(15): 4385-4393.

Although it is widely believed that eukaryotic DNA is looped by attachment to a nucleoskeleton, there is controversy about its composition and which sequences are attached to it. As most nuclear derivatives are isolated using unphysiological conditions, the criticism that attachments seen in vitro are generated artifactually has been difficult to rebut. Therefore we have re-investigated attachments of chromatin to the skeleton using physiological conditions. HeLa cells are encapsulated in agarose microbeads and lysed using Triton in a 'physiological' buffer. Then, most chromatin can be electroeluted after treatment with a restriction enzyme to leave some at the base of the loops still attached. Analysis of the size and amounts of these residual fragments indicates that the loops are 80-90kbp long. The residual fragments are stably attached, with about 1kbp of each fragment protected from nuclease attack. This is very much longer than a typical protein-binding site of 10-20bp.

Jackson, D. A., et al. (1993). "Visualization of focal sites of transcription within human nuclei." EMBO Journal **12**(3): 1059-1065.

HeLa cells were encapsulated in agarose microbeads, permeabilized and incubated with Br-UTP in a 'physiological' buffer; then sites of RNA synthesis were immunolabelled using an antibody that reacts with Br-RNA. After extending nascent RNA chains by < 400 nucleotides in vitro, approximately 300-500 focal synthetic sites can be seen in each nucleus by fluorescence microscopy. Most foci also contain a component of the splicing apparatus detected by an anti-Sm antibody. alpha-amanitin, an inhibitor of RNA polymerase II, prevents incorporation into these foci; then, using a slightly higher salt concentration, approximately 25 nucleolar foci became clearly visible. Both nucleolar and extra-nucleolar foci remain after nucleolytic removal of approximately 90% chromatin. An underlying structure probably organizes groups of transcription units into 'factories' where transcripts are both synthesized and processed.

Jackson, G. D., et al. (2000). "Diet of the southern opah Lampris immaculatus on the Patagonian Shelf; the significance of the squid Moroteuthis ingens and anthropogenic plastic." Marine Ecology Progress Series **206**: 261-271.

The diet of the large pelagic fish, the southern opah Lampris immaculatus was examined along the Patagonian Shelf in the Falkland Islands region. Stomachs were available for 69 fish collected in 1993 and 1994. Surprisingly, this fish had a relatively narrow range of prey items. The single most frequent prey item was the onychoteuthid squid Moroteuthis ingens (predominantly juveniles) which was eaten by 93% of the fish. The other important prey were the loliginid squid Loligo gahi, the myctophid fish Gymnoscopelus nicholsi and the southern blue whiting Micromesistius australis. There was no evidence of larger individuals of L. immaculatus ingesting larger individuals of any of the 4 main prey species. An unexpected finding was the relatively high incidence of plastic ingestion (14% of fish). The plastic came from a variety of sources including food, napkin and cigarette wrappers and various pieces of plastic line and straps used in securing boxes. In several instances, there was evidence of feeding on fishing boat discards. The findings reveal a significant impact of plastic pollution in this region of the Southwest Atlantic.

Jacob, H., et al. (2019). "No effect of polystyrene microplastics on foraging activity and survival in a post-larvae coral-reef fish, Acanthurus triostegus." Bulletin of environmental contamination and toxicology **102**(4): 457-461.

Microplastics (MP) are ubiquitous in the marine environment and have been shown to alter the behaviour of some species due to potential neurotoxic effect. However, very little is known on the effect of this stressor on behavioural responses of early and more vulnerable life stages. This study explores the effects of polystyrene MP (90 micro m diameter) on the foraging activity of newly settled surgeonfish Acanthurus triostegus and on their survival facing predators. Exposure to a high concentration of 5 MP particles per mL (5 MP mL⁻¹) for 3, 5 and 8 days did not alter their foraging activity nor their susceptibility to predation. This suggests that short-term exposures to reportedly high MP concentrations have negligible effects on the behaviour of newly settled A. triostegus. Nevertheless, responses to MP can be highly variable, and further research is needed to determine potential ecological effects of MP on reef fish populations during early-life stages.

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Microplastics (MP) are ubiquitous in the marine environment and have been shown to alter the behaviour of some species due to potential neurotoxic effect. However, very little is known on the effect of this stressor on behavioural responses of early and more vulnerable life stages. This study explores the effects of polystyrene MP (90 μm diameter) on the foraging activity of newly settled surgeonfish Acanthurus triostegus and on their survival facing predators. Exposure to a high concentration of 5 MP particles per mL (5 MP mL−1) for 3, 5 and 8 days did not alter their foraging activity nor their susceptibility to predation. This suggests that short-term exposures to reportedly high MP concentrations have negligible effects on the behaviour of newly settled A. triostegus. Nevertheless, responses to MP can be highly variable, and further research is needed to determine potential ecological effects of MP on reef fish populations during early-life stages.

Jacobsen, R., et al. (2018). "Increasing the quantity of separated post-consumer plastics for reducing combustible household waste: The case of rigid plastics in Flanders." Waste Management **78**: 708-716.

In Flanders, Belgium, rigid and soft plastics represent an interesting fraction of residual household waste as a potential 80 000 Gg a⁻¹ can be recycled instead of incinerated. Removing a large amount of rigid packaging and non-packaging plastics from the residual household waste fraction could contribute to the goal to reduce the amount of residual household waste to less than 150 kg capita⁻¹ a⁻¹ for the Flemish region, where currently only 20% of plastics are collected selectively in drop-off facilities. Given the wide range of plastic separation schemes across the region, it is the aim of this paper to identify whether the applied separation options have an impact on the quantity of separated plastics, and, moreover, which scheme is able to separate most plastics. Cross-sectional data for the period 2008-2012 were collected for all 308 Flemish municipalities to conduct a regression analysis. The results of the analysis show that the quantity of separated plastics differs significantly between the different separation schemes used. If municipalities change their separation schemes, Flanders as a whole would be able to collect more plastic waste to better comply with its own objectives and EU regulation on recycling. Improved separation-at-source recycling initiatives, by applying the appropriate separation scheme for plastics, may increase recycling growth. Copyright © 2018 Elsevier Ltd

Jacobsen, U. (1995). "Situation and perspectives relating to the agricultural utilization of sewage sludge in Lower Saxony." Korrespondenz Abwasser **42**(8): 1285-1290.

The principal findings of a sewage sludge utilization study commissioned in 1994 by the Lower Saxony Association of Municipal Authorities are presented. There were numerous problems encountered by the sewage undertakings in arranging for agricultural disposal of their sludge because of both legislative constraints and hostile public opinion. The problems of convincing both farmers and the general public of the benefits of using sludge as a fertilizer are considered. In certain cases crops grown under contract for food processing could not be grown on sludge-treated soils and even church lands were subject to a prohibition on the use of sludge by tenant farmers. Ways in which sludge recycling could be made more acceptable are discussed. Novel processes for sludge conversion to more acceptable forms were the use of bristle worms for volume reduction and dewatering of fluid sludge, partial drying of sludge by evapotranspiration from wetland plants in reed bed enclosures and gasification in conjunction with plastic waste to produce a combustible product used to generate heat and electricity. (English translation 265 pounds sterling, valid for 1996).

Jacquin, J., et al. (2019). "Microbial ecotoxicology of marine plastic debris: A review on colonization and biodegradation by the "plastisphere"." Frontiers in Microbiology **10 (APR) (no pagination)**(865).

Over the last decades, it has become clear that plastic pollution presents a global societal and environmental challenge given its increasing presence in the oceans. A growing literature has focused on the microbial life growing on the surfaces of these pollutants called the "plastisphere," but the general concepts of microbial ecotoxicology have only rarely been integrated. Microbial ecotoxicology deals with (i) the impact of pollutants on microbial communities and inversely (ii) how much microbes can influence their biodegradation. The goal of this review is to enlighten the growing literature of the last 15 years on microbial ecotoxicology related to plastic pollution in the oceans. First, we focus on the impact of plastic on marine microbial life and on the various functions it ensures in the ecosystems. In this part, we also discuss the driving factors influencing biofilm development on plastic surfaces and the potential role of plastic debris as vector for dispersal of harmful pathogen species. Second, we give a critical view of the extent to which marine microorganisms can participate in the decomposition of plastic in the oceans and of the relevance of current standard tests for plastic biodegradability at sea. We highlight some examples of metabolic pathways of polymer biodegradation. We conclude with several questions regarding gaps in current knowledge of plastic biodegradation by marine microorganisms and the identification of possible directions for future research. Copyright © 2019 Jacquin, Cheng, Odobel, Pandin, Conan, Pujo-Pay, Barbe, Meistertzheim and Ghiglione. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Jain, A., et al. (2018). "Utilization of shredded waste plastic bags to improve impact and abrasion resistance of concrete." Environment, Development and Sustainability: 1-26.

Plastic bags (PB) have become a requisite part of human beings in the present time. Hundreds of varieties of plastic bags are used for packing and protecting general things. The disposal of PB is a prime environmental problem which significantly threatens the environment, as its disposal affects fertility of land due to its non-biodegradable nature; it lowers useful land area and generates toxic gases on incineration. Hence, there is a requirement of useful applications for these increased quantities of wastes. The usage of waste plastic bags (WPB) in concrete not only solve dumping crisis of WPB but also yields cost-effective concrete, which is worthy to both plastic recycling and construction industry. In this study, the influence of shredded WPB as fine aggregate on the properties of concrete was evaluated. The replacement of WPB was maintained at 0, 5, 10, 15 and 20% by weight of fine aggregate. The finding of the tested samples showed that the workability, density, compressive strength, flexural strength, static and dynamic modulus of elasticity of concrete samples decreased with increase in the WPB content, while penetrability to water increased. Microstructural analysis of the plastic waste concrete (PWC) specimens was carried out using scanning electron microscope. The microstructural studies indicated the presence of voids and openings between mortar matrix and WPB which was the main reason for the inferior properties of PWC. However, there has been a significant improvement in abrasion resistance, impact resistance and energy absorption capacity of PWC.

Jain, S. and M. Datta (2016). "Montmorillonite-alginate microspheres as a delivery vehicle for oral extended release of Venlafaxine hydrochloride." Journal of Drug Delivery Science and Technology **33**: 149-156.

Extended release of drugs is extremely essential for patients who require medicinal treatment round the clock. Depressed patients are one of such patients who suffer from recurrent and chronic disorder requiring long-term treatment. The treatment for such disease lies in the use of anti-depressants. Venlafaxine hydrochloride (VF) is an effective third generation drug which is capable of inhibiting the reuptake of serotonin, norepinephrine and dopamine. This highly water soluble drug (534 mg/ml) has a short steady state elimination half-life of 4-5 h due to which this drug needs to be administrated 2 to 3 times in a day in order to maintain its required concentration in the blood plasma. The present study aimed at developing montmorillonite (Mt) alginate (ALG) biopolymeric composites as micro beads with 97% encapsulation efficiency for an oral extended release of VF. These micro beads were synthesized using in situ ion-exchange followed by ionotropic gelation technique. The in - vitro release profile of pure drug shows a rapid burst release followed by 100% cumulative release within 5.5 h and 3.5 h in the gastric and intestinal fluid respectively. Whereas, the in - vitro release profile of VF from Mt biopolymeric beads show substantially less burst release with cumulative release of 20% (over a period of 26 h) and 22% (over a period of 29 h) in the gastric and intestinal fluid respectively. The presence of clay not only reduces the burst effect but also results in extended release of drug. Thus, there is possibility of making a formulation for oral extended release dosage forms for Venlafaxine with better patient compliance as repeated intake (every 3-4 h) of drug will not be necessary. Copyright © 2016 Elsevier B.V. All rights reserved.

Jain, S. K., et al. (2016). "Development and in vitro characterization of a multiparticulate delivery system for acyclovir-resinate complex." Artificial Cells, Nanomedicine, & Biotechnology **44**(5): 1266-1275.

CONTEXT: Herpes viruses cause threatening infections in humans and stand second as causative agents for most human viral diseases, after influenza and cold viruses.

OBJECTIVE: A novel multiparticulate delivery system for acyclovir (ACV), based on ion-exchange resin, was developed to achieve a gastro-mucoadhesive effect in order to effectively combat the herpes simplex virus.

MATERIALS AND METHODS: A combination of ACV and cholestyramine resin was optimized and further entrapped within sodium alginate and Carbopol microbeads. The developed systems were evaluated for drug entrapment efficiency (DEE), percentage of mucoadhesion, and in vitro release characteristics in simulated gastric fluid (SGF, pH 1.2).

RESULTS: With the aid of scanning electron microscopy (SEM), differential scanning calorimetry (DSC), and Fourier-transform infrared spectroscopy (FTIR), the interaction of the resinate and polycations with alginate has been revealed, which consequently supports the formation of the membrane by the polyelectrolyte complex. The in vitro drug release studies demonstrate that formulations without the drug-resin complex (DRC) released the drug more rapidly than formulations containing DRC, which released the drug in a controlled manner, due the formation of a complex between drug and resin.

DISCUSSION AND CONCLUSION: Preliminary results from this study suggest that these DRC-entrapped microbeads may be used to incorporate other antiviral drugs and could be effective against infections caused by herpes viruses. Such formulations developed could be subjected to in vivo studies in future, in order to prove complete clearance of herpes infections.

Jalilian, I., et al. (2016). "Live multiplexed imaging of stem cell mechanotransduction and mechanoadaptation." Journal of Orthopaedic Research. Conference **34**(Supplement 1).

INTRODUCTION: The mechanical milieu of the stem cell modulates its lineage commitment.¹³ At the same time, stem cells modulate their environment directly through secretion of extracellular matrix proteins, and indirectly through growth and adaptation including shape and volume changes as well as modulation of cell-cell and cell-matrix junctions, where persistence of structure for function over time represents the final 'seal of fate'.⁴ Given the role of cytoskeleton in sensing extracellular forces and in mechanotransduction, it is crucial to test causality and elucidate mechanisms by which stem cells adapt to mechanical stress through cytoskeletal remodeling, changes in gene transcription, expression of extracellular matrix and cell junctional proteins, and ultimately lineage commitment. Live imaging methods allow for precise measurement of changes in volume and shape as well as spatiotemporal tracking of cytoskeletal dynamics in stem cells as lineage commitment unfolds. However, until recently, it has not been possible to measure these processes in concert. Here we describe a novel method for live cell multiplexed fluorescent imaging enabling quantification of spatiotemporal changes in the cell nucleus, membrane and cytoskeleton concomitant to application of controlled stresses and measurement of the

resulting subcellular strains. METHOD(S): To image the cell nucleus, membrane and cytoskeleton at the same time and to measure their spatiotemporal distribution, these respective cellular compartments were stained simultaneously with specific fluorescent dyes during exposure to controlled mechanical stress and/or strains, in embryonic murine mesenchymal stem cells (C3H1T1/2). The nucleus and membrane of the cells were stained using Hoechst and wheat germ agglutinin, respectively. In addition, to track cell membrane displacement for strain mapping using digital image correlation, live cells were tagged at time zero with Concavalin A (Con A) conjugated microbeads, which bind noncovalently to the glycoproteins of the cell glycocalyx. The cytoskeleton structures (actin filaments and tubulin) were tagged using BacMam fluorescent probes during transcription. Robustness of the approach was tested by applying the techniques successfully to other cell types including tumor cells (rat neuroblastoma B35 cells). RESULT(S): Through this multiplexed approach, the displacement and spatiotemporal distribution of each individual cellular compartment was tracked independently under the controlled mechanical stress. Finally, by pairing a multiphysics computational model with the live cell experimental mechanics approach, stem cell mechanoadaptation was mapped as a function of specific mechanical cue libraries (referred to as 'mapping the mechanome'). This novel imaging technique enabled us to image and track the changes in the cell membrane, nucleus and cytoskeleton in real time. Furthermore, by using the multiplexed imaging fluorescence technique and different fluorescent dyes, it is now possible to separate and study each cellular compartment individually and simultaneously at different time points (Fig. 1). DISCUSSION: In the current study we developed a novel method for live cell multiplexed fluorescent imaging for the spatiotemporal changes of the cell nucleus, membrane and cytoskeleton concomitant to measurement of the subcellular strains under controlled mechanical stress. Given the significant role of cytoskeleton in stem cell mechanoadaptation, mechanotransduction and differentiation, live multiplexed imaging, in combination with multiphysics computational modelling, provided an unprecedented means to quantify spatiotemporal dynamics of stem cell mechanotransduction and mechanoadaptation. Our results also showed that the specific spatiotemporal organisation of the cytoskeleton in these cells resulted in the over- or down-regulation of specific genes, providing more insights towards the critical role of cytoskeleton in stem cell differentiation. SIGNIFICANCE: For the first time to our knowledge, it is now possible to carry out controlled mechanical testing on live stem cells during the process of lineage commitment. Understanding the mechanisms underlying these processes in real time will enable prospective guidance of targeted tissue genesis and healing by stem cells.

Jamdade, S. M. and R. H. Kasliwal (2013). "Design fabrication and evaluation of microbeads for controlled release using natural polymers." International Journal of Pharma and Bio Sciences **4**(4): P644-P660.

Diclofenac sodium is an Non-steroidal anti-inflammatory drugs, having an elimination half-life of 1-2 hrs. The objective of the study is to prepare Diclofenac sodium Microbeaads using Natural Polymers in different concentrations. For this purpose calcium ions were used as cross linking agents in formulation of alginate-guar gumpectin, alginate-guar gum-lecithin and alginate-pectin-lecithin Microbeads by ionotropic gelation method. The Microbeads were investigated for swelling index, dynamic water uptake, entrapment efficiency, particle size, SEM and in-vitro release studies. The Microbeads formulations showed acceptable properties and complied with in-house specifications for tested parameters. The results of in-vitro dissolution studies indicated that formulation DF4, DF6 and DF7 could extend the drug release up to 12 hours. While an increase in the concentration of sodium alginate and other polymer dispersions

increased sphericity, size distribution, mean particle size. The successful formulation of the study, exhibited satisfactory drug release (DF4, DF6 and DF7) which suggests sustained/controlled release profile.

Jamero, M. L., et al. (2018). "Community-based adaptation in low-lying islands in the Philippines: challenges and lessons learned. (Special Issue: 1.5 degrees C and small island Developing States.)." Regional Environmental Change **18**(8): 2249-2260.

Community-based adaptation (CBA) seeks to address climate risks and socio-economic drivers of vulnerability simultaneously. However, as CBA activities appear very similar to standard development work, difficulties in identifying good practices arise. To clarify the role of CBA, this study elucidated how climate change can impact pre-existing development problems by investigating the experiences of four low-lying island communities in central Philippines. The islands currently suffer from frequent and extreme tidal flooding (following an earthquake-induced land subsidence in 2013, with a magnitude that is broadly similar to sea-level rise projections under a 1.5 to 2 degrees C global warming scenario), and endured a dry spell in 2016. The study also identified various publicly and privately initiated adaptation strategies, and evaluated their resilience against actual biophysical events. The study conducted focus group discussions with local leaders and in-depth interviews with government officials and residents in March 2016. Results show that tidal flooding impacted almost all aspects of daily life on the islands, while the dry spell completely depleted their limited water supplies. The strategies implemented by governments and NGOs (e.g., seawalls, rainwater collectors) were found to be inadequate in preventing tidal flooding and compensating for the dry spell. Also, communities used coral stones and plastic waste for raising the floors of their homes, which have an erosive effect on their capacity to adapt in the long term. Lack of community participation in publicly initiated projects and lack of adaptation funding for community-based strategies were the greatest obstacles to implementing climate-resilient solutions.

James, R., et al. (2004). "Histological processing of hydrogel scaffolds for tissue-engineering applications." Journal of Histotechnology **27**(2): 133-139.

Tissue-engineered scaffolds (e.g., select absorbable scaffolds or hydrogels) are very fragile in nature and are filled with severe histological artifacts when processed using routine histological techniques (e.g., paraffin processing). The presence of artifacts compromises adequate microscopic evaluation and the characterization of the material and device performance. This article discusses approaches used to histologically evaluate hydrogel scaffolds. In addition to routine techniques, the use of plastic resins such as Caroplastic and Technovit 7100 are discussed and illustrated. A modified Technovit 7100 embedding procedure was the most effective in preserving and retaining the hydrogel scaffold throughout the histological process. The dehydration and embedding protocol can be easily modified to accommodate scaffolds of different sizes as well as different physical and chemical properties. It is also possible to complete polymerization of the Technovit 7100 plastic resin at 4degreeC, which has the added benefit of preserving lipid and enzyme activity.

Jamieson, A. J., et al. (2019). "Microplastics and synthetic particles ingested by deep-sea amphipods in six of the deepest marine ecosystems on Earth." Royal Society Open Science **6**(2): 180667.

While there is now an established recognition of microplastic pollution in the oceans, and the detrimental effects this may have on marine animals, the ocean depth at which such contamination is ingested by organisms has still not been established. Here, we detect the presence of ingested microplastics in the hindguts of Lysianassoidea amphipod populations, in six deep ocean trenches from around the Pacific Rim (Japan, Izu-Bonin, Mariana, Kermadec, New Hebrides and the Peru-Chile trenches), at depths ranging from 7000 m to 10 890 m. This illustrates that microplastic contaminants occur in the very deepest reaches of the oceans. Over 72% of individuals examined (65 of 90) contained at least one microparticle. The number of microparticles ingested per individual across all trenches ranged from 1 to 8. The mean and standard error of microparticles varied per trench, from 0.9 +/- 0.4 (New Hebrides Trench) to 3.3 +/- 0.7 (Mariana Trench). A subsample of microfibres and fragments analysed using FTIR were found to be a collection of plastic and synthetic materials (Nylon, polyethylene, polyamide, polyvinyl alcohol, polyvinylchloride, often with inorganic filler material), semi-synthetic (rayon and lyocell) and natural fibre (ramie). Notwithstanding, this study reports the deepest record of microplastic ingestion, indicating that anthropogenic debris is bioavailable to organisms at some of the deepest locations in the Earth's oceans.

Jamiolkowski, R. M., et al. (2019). "Nanoaperture fabrication via colloidal lithography for single molecule fluorescence analysis." PLoS ONE **14**(10).

In single molecule fluorescence studies, background emission from labeled substrates often restricts their concentrations to non-physiological nanomolar values. One approach to address this challenge is the use of zero-mode waveguides (ZMWs), nanoscale holes in a thin metal film that physically and optically confine the observation volume allowing much higher concentrations of fluorescent substrates. Standard fabrication of ZMWs utilizes slow and costly E-beam nano-lithography. Herein, ZMWs are made using a self-assembled mask of polystyrene microspheres, enabling fabrication of thousands of ZMWs in parallel without sophisticated equipment. Polystyrene 1 μm dia. microbeads self-assemble on a glass slide into a hexagonal array, forming a mask for the deposition of metallic posts in the inter-bead interstices. The width of those interstices (and subsequent posts) is adjusted within 100–300 nm by partially fusing the beads at the polystyrene glass transition temperature. The beads are dissolved in toluene, aluminum or gold cladding is deposited around the posts, and those are dissolved, leaving behind an array ZMWs. Parameter optimization and the performance of the ZMWs are presented. By using colloidal self-assembly, typical laboratories can make use of sub-wavelength ZMW technology avoiding the availability and expense of sophisticated clean-room environments and equipment.

Jandric, A., et al. (2019). "Investigation of the heterogeneity of bromine in plastic components as an indicator for brominated flame retardants in waste electrical and electronic equipment with regard to recyclability." Journal of Hazardous Materials **(no pagination)**(121899).

Waste electrical and electronic equipment (WEEE) can contain brominated flame retardants (BFRs) that pose a threat to human health and the environment. In addition, Br-containing plastics reduce the recycling potential of WEEE. In order to gain a better insight into the distribution of Br in plastics from WEEE, the total concentration of Br was measured on the level of device types and plastic components using handheld X-ray fluorescence (hXRF). In 35 % of the sample size (882 components from 369 different devices, which originate from 6 device types) Br was detected, 5 % exceeded the RoHS limit. Only few and older devices contained high Br concentrations, while the majority were below the RoHS limit and could be recycled. In addition, 18 different plastic types were identified by infrared spectroscopy, with acrylonitrile butadiene styrene being the most abundant (44 % of all samples). Manual dismantling of devices into individual plastic components enabled us to examine Br hotspots and the variety of plastic types in WEEE. Based on this analytical procedure, WEEE recyclers could exclude certain equipment or plastic components (e.g. power supplies or PC housings) directly on-site prior to WEEE recycling and shredding in order to produce high-quality recycled products and avoid cross-contamination. Copyright © 2019 Elsevier B.V.

Jang, M., et al. (2018). "Formation of microplastics by polychaetes (Marphysa sanguinea) inhabiting expanded polystyrene marine debris." Marine Pollution Bulletin **131**: 365-369.

Fragmentation of large plastic debris into smaller particles results in increasing microplastic concentrations in the marine environment. In plastic debris fragmentation processes, the influence of biological factors remains largely unknown. This study investigated the fragmentation of expanded polystyrene (EPS) debris by polychaetes (Marphysa sanguinea) living on the debris. A large number of EPS particles (131+or-131 particles/individual, 0.2-3.8 mm in length) were found in the digestive tracts of burrowing polychaetes living on EPS debris. To confirm the formation of microplastics by polychaetes and identify the quantity and morphology of produced microplastics, polychaetes were exposed to EPS blocks in filtered seawater under laboratory conditions. Polychaetes burrowed into the blocks and created numerous EPS microplastic particles, indicating that a single polychaete can produce hundreds of thousands of microplastic particles per year. These results reveal the potential role of marine organisms as microplastic producers in the marine environment.

Jang, M., et al. (2019). "A close relationship between microplastic contamination and coastal area use pattern." Water Research **171**: 115400.

Human activity is thought to affect the abundance and contamination characteristics of microplastics (MPs) in the environment, which may in turn affect aquatic species. However, few studies have examined the impact of coastal area use pattern on characteristics of MPs in coastal regions. In this study, we investigated MP contamination of abiotic matrices (seawater and sediment) and biotic matrices (bivalves and polychaetes) in three coastal regions characterized by different types of human activity, covering urban, aquafarm, and rural areas. MP abundance was higher in sediment from the urban site than in that from the rural site, but similar to that from the aquafarm site. In the abiotic matrices, different MP polymer compositions were observed among the three sites. Diverse polymers were found in marine matrices from the urban site, implying diverse MP sources in highly populated and industrialized areas. Polystyrene was more abundant in the aquafarm site, reflecting the wide use of expanded polystyrene aquaculture buoys. Polypropylene was more abundant at the rural site, probably due to the use of polypropylene ropes and nets in fishing activity. MP accumulation profiles in marine invertebrates showed trends similar to those exhibited by abiotic matrices, reflecting coastal area use patterns. These results indicate that marine MPs are generated from both land- and marine-based sources, and that the abiotic and biotic marine matrices reflect the MP characteristics.

Jang, M., et al. (2017). "Widespread detection of a brominated flame retardant, hexabromocyclododecane, in expanded polystyrene marine debris and microplastics from South Korea and the Asia-Pacific coastal region." Environmental Pollution **231**(Pt 1): 785-794.

The role of marine plastic debris and microplastics as a carrier of hazardous chemicals in the marine environment is an emerging issue. This study investigated expanded polystyrene (EPS, commonly known as styrofoam) debris, which is a common marine debris item worldwide, and its additive chemical, hexabromocyclododecane (HBCD). To obtain a better understanding of chemical dispersion via EPS pollution in the marine environment, intensive monitoring of HBCD levels in EPS debris and microplastics was conducted in South Korea, where EPS is the predominant marine debris originate mainly from fishing and aquaculture buoys. At the same

time, EPS debris were collected from 12 other countries in the Asia-Pacific region, and HBCD concentrations were measured. HBCD was detected extensively in EPS buoy debris and EPS microplastics stranded along the Korean coasts, which might be related to the detection of a quantity of HBCD in non-flame-retardant EPS bead (raw material). The wide detection of the flame retardant in sea-floating buoys, and the recycling of high-HBCD-containing EPS waste inside large buoys highlight the need for proper guidelines for the production and use of EPS raw materials, and the recycling of EPS waste. HBCD was also abundantly detected in EPS debris collected from the Asia-Pacific coastal region, indicating that HBCD contamination via EPS debris is a common environmental issue worldwide. Suspected tsunami debris from Alaskan beaches indicated that EPS debris has the potential for long-range transport in the ocean, accompanying the movement of hazardous chemicals. The results of this study indicate that EPS debris can be a source of HBCD in marine environments and marine food web.

Jang, S., et al. (2019). "Carbon-Based, Ultraelastic, Hierarchically Coated Fiber Strain Sensors with Crack-Controllable Beads." Acs Applied Materials & Interfaces **11**(16): 15079-15087.

Fiber-based electronics or textronics are spotlighted as a promising strategy to develop stretchable and wearable devices for conformable machine-human interface and ubiquitous healthcare systems. We have prepared a highly sensitive fiber-type strain sensor (maximum gauge factor (GF) = 863) with a broad range of strain (epsilon < 400%) by introducing a single active layer onto the fiber. In contrast to other metal-based fiber-type electronics, our hierarchical fiber sensors are based on coating carbon-based nanomaterials with responsive microbeads onto elastic fibers. Utilizing the formation of uniform cracks around the microbeads, the device performance was maximized by adjusting the number of microbeads in the carbon-coating layer. We overcoated the carbon-based coating layer of the elastic fiber with a protective polymeric layer and verified no effects on the GF and the range of strain. Our fiber sensors were repeatedly tested more than 5000 times, exhibiting excellent cyclic responses to on/off switching behaviors. For practical applications, the hierarchical fiber sensors were sewed into electrical fabric bands, which are integrable to a wireless transmitter to monitor waveforms of pulsations, respirations, and various postures of level of bending a spinal cord.

Janossy, G., et al. (2003). "New trends in affordable CD4+ T-cell enumeration by flow cytometry in HIV/AIDS." Clinical and Applied Immunology Reviews **4**(2): 91-107.

Inexpensive antiretroviral therapy (ART) might soon be available to treat human immunodeficiency virus (HIV) infections in resource-restricted areas of the globe. The number of CD4+ T-cells in the blood is the single most important laboratory parameter to select patients for therapy at the right time and to monitor the effect of ART. The question is asked whether flow cytometry is adaptable to change from an expensive and complicated scientific analytical instrumentation to become a practical diagnostic tool that can be widely operated. Recent studies indicate that a branch of clinical/practical flow cytometry is gaining a new identity by a confident simplification and improvement of clinical protocols. These new observations can be marshaled into three new areas of development. First, the changes in the choices of reagents and staining protocols have been initiated by the preferred use of primary immunological gating during the flow-cytometric analysis, exploiting the exquisite discriminating power of antibodies. The recent National Institutes of Health (NIH) and Centers for Disease Control and Prevention (CDC) guidelines introduced CD45-assisted protocols that are also at the heart of the PanLeucogating protocol that revitalized the testing of absolute CD4 counts on double-platform. With CD45 staining the leucocyte populations can be reliably studied in aging samples. It is now also documented that minimal technology, that is primary gating with CD4 (or CD8) antibodies, provides excellent CD4 (or CD8) T-cell counts. Consequently the optimal affordable protocol uses CD45 and CD4 antibodies in combination. The second area of development is the absolute counting facility on flow cytometers. Most frequently, microbeads are added to blood to define the sample volume in instruments that are not equipped with a volumetric microsyringe. The beads are, however, expensive, and the utilization of the stable flow rate of the excellent instruments might soon provide an answer to replace dear microbeads. With stable flow, the time span of analysis tells the sample volume and the absolute counts can be calculated. Finally, stabilized blood cell standards and blood stabilizing fluid, referred to as Transfix, have recently been introduced for quality assurance. These products are important to prove the precision and accuracy of the new affordable protocols and also to check, and guide if necessary, the performance of the laboratories even in remote areas. These recent developments provide evidence about the renaissance of affordable flow cytometry, a precise, costeffective and quantitative technology that is capable of providing CD4+ T-lymphocyte counts in as high volume as >400 patient assessment per day at the fraction of the cost of the current Western prices. These recent achievements need to be taken into consideration when alternative, nonflow CD4-counting methods are assessed. © 2003 Elsevier Inc. All Rights Reserved.

Janssen, C. R., et al. (1998). "The use of biomarkers in Daphnia magna toxicity testing -- III. Rapid toxicity testing of pure chemicals and sediment pore waters using ingestion and digestive enzyme activity." Chemosphere **37**(13): 2677.

In this study, 4 rapid (90 min) toxicity tests were developed using ingestion and digestive enzyme activity of Daphnia magna juveniles. Ingestion activity was assessed using fluorescent labelled latex micro-beads and digestive enzyme activity (trypsin, beta-galactosidase andesterase) was measured in homogenates using chromogenic (N-benzoyl-L-arginine-4-nitroanilide) and fluorogenic (4-methylumbelliferyl-B-D-galactoside and fluorescein diacetate) substrates. All assays and toxicity endpoints were evaluated for their potential use as routine toxicity testing tools for pure chemicals and sediment pore waters. The observed high correlation coefficients (r2>0.9) between the short-term toxicity values and the acute toxicity endpoint (24h EC50) for pure chemicals suggests that these biomarker-based assays are good predictors of acute toxicity levels to Daphnia magna.In the sediment pore water toxicity tests, ingestion activity was generally more sensitive than the conventional endpoint, while the enzymatic endpoints were less sensitive than the 24h immobility criterion. The use and limitations of the developed toxicity tests are discussed in the light of their application in ecotoxicity monitoring programmes. [ABSTRACT FROM AUTHOR]

Janssen, W. E. and A. M. Rios (1989). "Non-specific cell binding characteristics of para-magnetic polystyrene microspheres used for antibody-mediated cell selection." Journal of Immunological Methods **121**(2): 289-294.

The binding of cells to paramagnetic polystyrene microbeads in the absence of coupling antibodies was measured. Cells from normal bone marrow, from an acute lymphoblastic leukemia (ALL) cell line or from a neuroblastoma cell line, were labeled with the fluorochrome Hoechst 33342 and incubated with microbeads by rotation at 4 degrees C. Following this

incubation, the microbeads with all attached cells were collected using an externally applied magnetic field and visualized by microscopic examination under ultraviolet illumination. The incubation variables included the protein content of the medium, and the period of rotation. Normal bone marrow was found to adhere sparingly to the microbeads; less than 1.0% of the total nucleated cell population was recovered with the beads, whereas greater than 5% of the ALL cells and greater than 30% of the neuroblastoma cells were found to bind non-specifically to the microspheres. Neither changes in the protein concentration of the medium or in the incubation period significantly altered the non-specific binding of the cell types examined. It is thus apparent that the use of these microspheres for positive selection of cells, such as the collection of hematopoietic stem cells for transplantation, would be compromised by a sizeable non-specific interaction. Modification of the surface of the microspheres to substantially reduce this interaction will be necessary before efforts at positive selection using the magnetic microspheres can be fruitful.

Jasinska, U. T., et al. (2018). "Immobilization of Bifidobacterium infantis cells in selected hydrogels as a method of increasing their survival in fermented milkless beverages." Journal of Food Quality **9267038**(42).

The aim of the study was to examine whether immobilization of Bifidobacterium infantis inside hydrogels could prolong their survival in fermented milkless beverages. The starter culture Streptococcus thermophilus was used to obtain fermented nonmilk beverages: oat, oat-banana, and oat-peach. The biota of beverages were supplemented with Bifidobacterium infantis cells, free and immobilized, in three types of spherical hydrogel particles: microcapsules with a liquid and gelled core, microbeads of 0.5 mm diameter, and beads of 2.5 mm diameter. As a carrier material, low-methoxylated pectin and alginate were used. Microbeads and microcapsules were obtained using extrusion techniques: vibrating and electrostatic method, and beads were obtained using manual method with a syringe. A significantly lower decrease in the count of cells immobilized in hydrogels compared to free cells was observed during storage of fermented beverages at 4 degrees C. Microcapsules were more effective compared to microbeads in terms of bacterial cells protection. The observed effect was better for higher biopolymer concentration. The highest survival of the strain was noted in cells immobilized in low-methoxylated pectin beads of 2.5 mm diameter. Supplementing the biota of fermented beverages with microencapsulated bacteria did not negatively affect the overall sensory quality of beverages during the entire storage period.

Jasmine, F., et al. (2018). "A novel pooled-sample multiplex luminex assay for high-throughput measurement of relative telomere length." American Journal of Human Biology **30**(4): e23118.

OBJECTIVES: Relative telomere length (RTL) is a potential biomarker of aging and risk for chronic disease. Previously, we developed a probe-based RTL assay on Luminex platform, where probes for Telomere (T) and reference gene (R) for a given DNA sample were tested in a single well. Here, we describe a method of pooling multiple samples in one well to increase the throughput and cost-effectiveness.

METHODS: We used four different microbeads for the same T-probe and four different microbeads for the same R-probe. Each pair of probe sets were hybridized to DNA in separate plates and then pooled in a single plate for all the subsequent steps. We used DNA samples from 60 independent individuals and repeated in multiple batches to test the precision.

RESULTS: The precision was good to excellent with Intraclass correlation coefficient (ICC) of 0.908 (95% CI 0.856-0.942). More than 67% of the variation in the RTL could be explained by sample-to-sample variation; less than 0.1% variation was due to batch-to-batch variation and

0.3% variation was explained by bead-to-bead variation. We increased the throughput of RTL Luminex assay from 60 to 240 samples per run. The new assay was validated against the original Luminex assay without pooling (r = 0.79, P = 1.44 x 10⁻¹⁵). In an independent set of samples (n = 550), the new assay showed a negative correlation of RTL with age (r = -0.41), a result providing external validation for the method.

CONCLUSION: We describe a novel high throughput pooled-sample multiplex Luminex assay for RTL with good to excellent precision suitable for large-scale studies.

Jativa, F., et al. (2015). "Confined self-assembly of cellulose nanocrystals in a shrinking droplet." Soft Matter **11**(26): 5374-5380.

We have studied how cellulose nanocrystals (CNC) self-assemble into liquid crystalline phases in shrinking, isolated droplets. By adjusting the water dissolution rate of an aqueous CNC droplet immersed in a binary toluene-ethanol mixture we can control the final morphology of the consolidated microbead. At low ethanol concentration in the surrounding fluid dense microbeads of spherical morphology are produced while collapsed core-shell particles are obtained at high ethanol concentration. Polarized light microscopy was used to follow the spatial evolution and coalescence of birefringent spheroids during droplet shrinkage. Electron microscopy reveals the resultant nematic microstructure. This method of confined CNC assembly provides thus the possibility to prepare ordered microbeads, which can be useful as templates or for their optical properties.

Jawale, J. K. and A. D. Shinde (2015). "Formulation and evaluation of mucoadhesive drug delivery system of Valsartan." Der Pharmacia Lettre **7**(6): 10-30.

The purpose of the research work was to develop mucoadhesive drug delivery system of antihypertensive drug Valsartan by ionotropic gelation technique. In order to prolong the gastric residence time and increase the overall bioavailability of the drug from dosage form. The Microbeads were prepared by varying the concentration of sodium alginate and Sodiumcarboxymethylcellulose using calcium chloride as cross linking agent. The drugpolymer compatibility was studied by FTIR studies. The prepared Microbeads were evaluated for swelling ratio, particle size, and drug entrapment efficacy, scanning electron microscopy, differential scanning calorimetry, mucoadhesion study and in vitro release study. A 2-factor, 2-level full factorial design (2²) was employed for optimization of Valsartan beads with Sodium Alginate amount (%, X1) and polymers (SCMC%, X2) as the prime selected independent variables, which were varied at 2 different levels (low and high). The effect of formulation variables on the response variables were statistically evaluated by using a commercially available software package Design-Expert version 8.0.1. The mean particle size increases with increasing the polymer concentration. The drug entrapment efficacy for all formulation was found to be 65.38%-77.54%. The mucoadhesion test result reveled that as the concentration of mucoadhesive polymer decreased, mucoadhesion of beads also decreased. SEM results revealed that all beads prepared were spherical in shape that indicating uniform distribution of drug in polymer network. In vitro release studies were carried out in phosphate buffer pH 6.8. The optimized formulation shows the controlled drug release.

Jayapal, J., et al. (2014). "Studies on the plant diversity of Muniandavar sacred groves of Thiruvaiyaru, Thanjavur, Tamil nadu, India." Hygeia **6**(1): 48-62.

Plan: Muniandavar Sacred Groves from Vaduvakudi at Thiruvaiyaru Taluk, Thanjavur district of Tamil Nadu was selected for floristic exploration to know the plant diversity of the vegetation, the availability of rare and endangered floras, the ecological significance, regeneration status and the anthropogenic pressures, to document the religious beliefs and spirituality and the participation of locals on conservation. Outcome(s): In the present study, the flora of Muniandavar Sacred Groves comprises about 180 plant species belonging to 158 genera and 75 plant families, Key stone species available in the Sacred groves includes Anacardium occidentale, Borassus flabellifer, Ficus benghalensis that harbors a number of birds and other survival of many other species. Muniandavar sacred grove is in good vegetation status and the conservationists should take necessary action to protect this grove from plastic pollution. An environmental awareness programme is planned to conduct for the local people in order to safeguard this sacred grove from pollution. © 2014.

Jayasiri, H., et al. (2013). "Plastic litter accumulation on high-water strandline of urban beaches in Mumbai, India." Environmental Monitoring & Assessment **185**(9): 7709-7719.

Today, almost every beach on every coastline is threatened by human activities. The inadequate recycling and poor management of waste in developing countries has resulted in considerable quantities of plastic contaminating beaches. Though India has long coastline of 5,420 km along the mainland with 43 % of sandy beaches, data on litter accumulation, particularly the plastics, which are one of the most common and persistent pollutants in marine environment, are scanty. The abundance and distribution of plastic litter was quantitatively assessed in four sandy beaches in Mumbai, India, bimonthly from May 2011 to March 2012. Triplicates of 2 × 2 m (4 m) quadrats were sampled in each beach with a total of 72 quadrats. Overall, average abundance of 11.6 items m (0.25-282.5 items m) and 3.24 g m (0.27-15.53 g m) plastic litter was recorded in Mumbai beaches. Plastic litter accumulation significantly varied temporally and spatially at p = 0.05. Significantly higher plastic litter accumulation was recorded in Juhu beach. Furthermore, the highest abundance by weight was recorded in November and May numerically. More than 80 % of plastic particles were within the size range of 5-100 mm both by number and weight. Moreover, coloured plastics were predominant with 67 % by number of items and 51 % by weight. Probably, the intense use of beaches for recreation, tourism, and religious activities has increased the potential for plastic contamination in urban beaches in Mumbai. [ABSTRACT FROM AUTHOR]

Jayasiri, H. B., et al. (2013). "Quantitative analysis of plastic debris on recreational beaches in Mumbai, India." Marine Pollution Bulletin **77**(1-2): 107-112.

Plastic litter was quantified on four sandy beaches in Mumbai. The mean abundance of 7.49 g and 68.83 items per square metre was recorded. The abundance of plastics significantly varied among the beaches showing an increasing trend in the southern part. The abundance of plastics by weight in Dadar was significantly higher than that in Aksa. The size fractionation of plastics proved that small particles (1-20 mm) are predominant with 41.85% microplastics (1-5 mm) which emphasizes the high risk to marine organisms due to possible ingestion. The highest quantity of microplastics was seen in Juhu beach (55.33%) followed by Versova, Aksa and Dadar. The major contributing factors for the abundance are beach usage for different activities such as recreational, religious and fishing which suggest that the land-based sources provide major inputs to plastic pollution in these beaches.

Jayshree, P., et al. (2018). "Carcinogenic effects of plastic particulates in the air, water and food articles: a brief review article." Environment Conservation Journal **19**(1/2): 187-189.

In today's fast paced world, due to time crunch people are using packaged readymade food and water on a scale never seen before. Most of the packed food material, water and other beverages are served or sealed in plastic containers, plastic dissolves in miniscule quantities over a long period of time, which can lead to carcinogenic effects like respiratory, gastric tumours etc. Various short term and long-term research works are being done on this alarming condition. This article tries to throw some light on this Global health phenomena. The American Cancer Society estimates that 6% of cancers are related to environmental causes (https://www.polymersolutions.com).

Jazia, D. B., et al. (2013). "Absorption of water/ethanol microdroplets into model porous networks." Colloids and Surfaces A: Physicochemical and Engineering Aspects **436**: 363-370.

In this paper, the imbibition kinetics of model nanoporous substrates is analyzed. The model nanoporous networks were formed by polystyrene microbeads assemblies. Spontaneous imbibition of these structures with sessile droplets was achieved using water/ethanol mixtures of higher wettability than pure water. The lowest concentration of ethanol leading to the spontaneous imbibition was 30%, and the diameter of the microbeads that ranges from ~420nm to ~2230nm. For ethanol concentrations slightly above this threshold value of 30%, the time dependence of the penetration depth was found to follow the expected t^{0.5} time dependence. In this low ethanol concentration range, the imbibition rate was shown to decrease as the diameter of the microbeads increases. This result was attributed to the resistive filling of the throats formed around the contact between two beads that increases with the diameter of the microbeads. At constant bead diameter, an acceleration of the fluid progression was observed when increasing the ethanol concentration, i.e. the capillary force. At high ethanol concentrations the penetration no longer followed the t^{0.5} dependence, but linear time dependence over the whole life of the droplet. This acceleration of the imbibition rate was attributed to a prewetting of the internal porous structure by the most volatile ethanol component of the mixture that condenses in the throat formed around the contact between two beads. © 2013 Elsevier B.V.

Jeanes, C. (1996). "TURNING ENVIRONMENTAL CONCERN INTO REAL PROFIT." Recycling Textile & Plastic Waste: 29-31.

The article discusses the efforts of business institutions toward environment protection via waste management. It is stated that the growth of people who have woken up to the need for careful management of all assets and major changes of attitude are being brought about by government legislation. The legislation obliges all producers of waste to consider recycling instead of disposal in a landfill site or discharge into air or water. It highlights the prime opportunity for reducing waste which was identified in Wigan, England.

Jemec, A., et al. (2016). "Uptake and effects of microplastic textile fibers on freshwater crustacean Daphnia magna." Environmental Pollution **219**: 201-209.

Microplastic fibers (MP) from textile weathering and washing are increasingly being recognized as environmental pollutants. The majority of studies on the bioavailability and effects of microplastic focused on small polystyrene spherical plastic particles, while less data are available for fibers and for other materials besides polystyrene. We investigated the ingestion and effects of ground polyethylene terephthalate (PET) textile microfibers (length range: 62-1400 micro m,

width 31-528 micro m, thickness 1-21.5 micro m) on the freshwater zooplankton crustacean Daphnia magna after a 48 h exposure and subsequent 24 h of recovery in MP free medium and algae. The majority of ingested fibers by D. magna were around 300 micro m, but also some very large twisted MP fibers around 1400 micro m were found inside the gut. Exposure to these fibers results in increased mortality of daphnids after 48 h only in the case where daphnids were not pre-fed with algae prior to experiment, but no effect was found when daphnids were fed before the experiments. Regardless of the feeding regime, daphnids were not able to recover from MP exposure after additional 24 h incubation period in a MP free medium with algae. The uptake and effects of PET textile MP on D. magna are presented here for the first time.

Jemec Kokalj, A., et al. (2019). "An exploratory ecotoxicity study of primary microplastics versus aged in natural waters and wastewaters." Environmental Pollution **254**: N.PAG-N.PAG.

Current understanding of how environmental aging of microplastics contributes to their ecotoxicity is low. We investigated whether incubation of microplastics in waters with different organic load and toxic potential alters the toxicity of microplastics to crustacean Daphnia magna , fish embryos Danio rerio and plant Lemna minor. Polyethylene primary microplastics; specifically microbeads from facial scrub; were subjected to 3-weeks incubation in low affected spring water, river water, effluent from the municipal wastewater treatment plant (WWTP) and municipal landfill leachate. Primary microplastics had no acute effect on D. magna mobility and D. rerio embryos development. While high organic load wastewaters; WWTP effluent and landfill leachate; showed evident toxicity for D. magna and D. rerio embryos, microplastics aged in these wastewaters had no effect. This suggests that adsorption of pollutants from wastewaters to microplastic particles was not high enough to induce acute toxicity to D. magna and D. rerio. On the contrary, primary microplastics affected the root growth of L. minor. Interestingly, aging of microplastics in low organic-load waters mitigated the toxicity of microplastics for L. minor , while microplastics aged in high-organic load waters had the same adverse effect as primary microplastics. Partly, these effects can be explained by different extent of coating on microplastics in different water samples. This study suggests that aging of microplastics in wastewaters and natural waters did not significantly enhance the toxicity to selected test species, but further studies on plants may be of interest. Image 1 • Coating of aged microplastics in natural waters and wastewaters differs from primary microplastics. • Aged microplastics have different sinking properties. • Aging of microplastics does not increase the toxicity to daphnids, duckweed and zebrafish. • Primary microplastics affect only duckweed root length. • Aging in some waters may mitigate toxic effects of microplastics for roots. Microplastics aged in wastewaters and natural waters are not more toxic as primary microplastics. [ABSTRACT FROM AUTHOR]

Jendelova, P., et al. (2005). "Magnetic resonance tracking of human CD34+ progenitor cells separated by means of immunomagnetic selection and transplanted into injured rat brain." Cell Transplantation **14**(4): 173-182.

Magnetic resonance imaging (MRI) provides a noninvasive method for studying the fate of transplanted cells in vivo. We studied whether superparamagnetic nanoparticles (CD34

microbeads), used clinically for specific magnetic sorting, can be used as a magnetic cell label for in vivo cell visualization. Human cells from peripheral blood were selected by CliniMACS CD34 Selection Technology (Miltenyi). Purified CD34+ cells were implanted into rats with a cortical photochemical lesion, contralaterally to the lesion. Twenty-four hours after grafting, the implanted cells were detected in the contralateral hemisphere as a hypointense spot on T2 weighted images; the hypointensity of the implant decreased during the first week. At the lesion site we observed a hypointensive signal 10 days after grafting that persisted for the next 3 weeks, until the end of the experiment. Prussian blue and anti-human nuclei staining confirmed the presence of magnetically labeled human cells in the corpus callosum and in the lesion 4 weeks after grafting. CD34+ cells were also found in the subventricular zone (SVZ). Human DNA (a human-specific 850 base pair fragment of alpha-satellite DNA from human chromosome 17) was detected in brain tissue sections from the lesion using PCR, confirming the presence of human cells. Our results show that CD34 microbeads superparamagnetic nanoparticles can be used as a magnetic cell label for in vivo cell visualization. The fact that microbeads coated with different commercially available antibodies can bind to specific cell types opens extensive possibilities for cell tracking in vivo.

Jensen, L. H., et al. (2019). "Sources, distribution and fate of microfibres on the Great Barrier Reef, Australia." Scientific Reports **9**(1): 9021.

Marine microdebris, in particular microplastics (plastics <5 mm), has become an issue of international concern due to its prevalence, persistence and potential adverse impacts on marine ecosystems. Informing source reduction based on ecological effects requires an understanding of the origin, distribution and characteristics of microdebris and the interactions with marine organisms. Here we show widespread contamination of the central Great Barrier Reef environment with microdebris, with microfibres comprising 86% of all items detected. Microdebris intake by coral reef fish was non-random, with chemical composition, shape and colour differing significantly from that detected in surface waters. Furthermore, the origin of microdebris contamination in surface waters is non-random with riverine discharge a likely source for microdebris detected at inshore, but not at offshore reef locations. Our findings demonstrate the complexities associated with determining marine microdebris exposure and fate, and assist in improving future ecological assessments and prioritizing source reduction.

Jeon, C., et al. (2015). "Application of mage A1-6 and HTERT RT-PCR for detecting circulating tumor cells." Clinical Chemistry and Laboratory Medicine **1)**: S192.

BACKGROUND-AIM To detect circulating tumor cells (CTCs), we had designed melanoma associated gene (MAGE) A1-6 and human telomerase reverse transcriptase (hTERT) RT-PCR. The PCR methods were utilized for detecting CTCs. METHODS We had used 37 bloods of cancer patients and 47 bloods from the patients of benign diseases. The patients had been evaluated and diagnosed at the Daegu Catholic University Medical Center. Most of cancer patients were following up after surgical resection, chemotherapy or supportive treatments. After removal of red blood cells, cancer cells were enriched by magnetic separation with anti-CD45 microbeads (Miltenyi Biotec, Auburn, CA). The CD45 negative cells were extracted with RNeasy Mini Kit (Qiagen, Duesseldorf, Germany). To amplify the MAGE A1-6 and the hTERT gene, gene specific RT-nested PCR and oligo-dT RT PCR were used using LightCycler FastStart DNA Master SYBR Green I (Roche, Mannheim, Germany). As a control gene, protein tyrosine phosphatase receptor type C gene was amplified. RESULTS In the blood of benign diseases, MAGE A1-6, hTERT and the both gene RT PCR showed the specificities of 89.4%, 84.8% and 73.9%. In the blood of cancer patients, MAGE A1-6, hTERT and the both gene RT PCR showed the sensitivities of 48.6%, 51.4%

and 64.9%. In the patient of cholangio (N=4), colorectal (N=9), gastric (N=10) and hepatic (N=8) cancer, the positive rates of the both gene were 100%, 33.3%, 60% and 62.5% respectively. Between the cases of recurred or metastatic cases and those of negative, the positive rates of MAGE A1-6, hTERT and the both gene were 52.9% versus 31.3%, 52.9% versus 37.5%, and 76.5% versus 43.8% respectively. CONCLUSION MAGE A1-6 and hTERT gene RT PCR showed good specificities for CTCs detection. The both RT PCR showed high positive rates in the blood of cholangio and hepatic cancer patients. MAGE A1-6 and hTERT gene RT PCR results correlated with their clinical status of cancer patients.

Jeon, C., et al. (2014). "Detection of blood tumor cells by mage A1-6 and hTERT gene single tube nested PCR." Clinical Chemistry and Laboratory Medicine **1)**: S409.

BACKGROUND: Many researchers are studying to detect circulating tumor cells (CTC), but until now no definite method was developed. We developed single tube nested (STN) PCR method which used a same PCR tube for the first and the second round PCR to avoid target contamination. METHOD(S): We spiked SNU 1 gastric cancer cell lines to 2 mL of blood having 3,000 cells/mL, 300 cells/mL, 30 cells/ mL and 3 cells/mL. The blood were obtained from remnant bloods of non-malignant patients visiting Daegu Catholic University Medical Center (DCUMC). To remove red blood cells, the blood treated with ammonium chloride buffer, then SNU1 cells were enriched by magnetic separation with anti-CD45 microbeads (Miltenyi Biotec, Auburn, CA). The SNU1 cells and CD45 negative mononuclear cells were extracted with RNeasy Mini Kit (Qiagen, Duesseldorf, Germany). Melanoma associated gene (MAGE) A1-6 and human telomerase reverse transcriptase (hTERT) gene was amplified with STN PCR method using LightCycler FastStart DNA Master SYBR Green I (Roche, Mannheim, Germany). Ten folds high concentration of primer sets for the second round were added after the first round PCR for STN PCR. As negative controls, thirty remnant bloods of non-malignant patients diagnosed in the DCUMC were used. RESULT(S): MAGE A1-6 and hTERT gene STN PCR detected 3 SNU1 cells per milliliter. In the 30 negative controls, MAGE A1-6 gene STN PCR showed one positive results (96.7% of specificity), while hTERT STN PCR showed 5 positive results (83.3% of specificity). CONCLUSION(S): MAGE A1-6 and hTERT gene STN PCR showed sensitive and specific results for blood cancer cell detection. These method will be effectively utilized as a CTC detection tool. Especially, MAGE A1-6 STN PCR would be a very sensitive and specific method for MAGE expressing tumors.

Jeong, C.-B., et al. (2018). "Nanoplastic Ingestion Enhances Toxicity of Persistent Organic Pollutants (POPs) in the Monogonont Rotifer Brachionus koreanus via Multixenobiotic Resistance (MXR) Disruption." Environmental Science & Technology **52**(19): 11411.

Among the various materials found inside microplastic pollution, nanosized microplastics are of particular concern due to difficulties in quantification and detection; moreover, they are predicted to be abundant in aquatic environments with stronger toxicity than microsized microplastics. Here, we demonstrated a stronger accumulation of nanosized microbeads in the marine rotifer Brachionus koreanus compared to microsized ones, which was associated with oxidative stress-induced damages on lipid membranes. In addition, multixenobiotic resistance conferred by P-glycoproteins and multidrug resistance proteins, as a first line of membrane defense, was inhibited by nanoplastic pre-exposure, leading to enhanced toxicity of 2,2′,4,4′-tetrabromodiphenyl ether and triclosan in B. koreanus. Our study provides a molecular mechanistic insight into the toxicity of nanosized microplastics toward aquatic invertebrates and further implies the significance of synergetic effects of microplastics with other environmental persistent organic pollutants.

Jeong, J. and J. Choi (2019). "Adverse outcome pathways potentially related to hazard identification of microplastics based on toxicity mechanisms." Chemosphere **231**: 249-255.

Increasing concern over microplastics has recently brought increased attention to studies on microplastic toxicity. Here, we conduct a systematic review on toxicity of microplastics that focuses on identifying data gaps in the mechanisms of microplastic toxicity. We observe that microplastic toxicology research thus far has focused on ecotoxicity using apical endpoints and only a few studies deal with toxicity mechanisms. Based on this review, we propose putative Adverse Outcome Pathways (AOPs) applicable to microplastic management to understand microplastic toxicity. We matched toxicity mechanisms and apical endpoints to a key event (KE) and adverse outcome (AO) information from the AOP Wiki. Overall, our results suggest that the molecular initiating event (MIE) was reactive oxygen species (ROS) formation and the AO was increased mortality, decreased growth and feeding, and reproduction failure. However, there are a limited number of studies on toxicity mechanisms of microplastics and, therefore, evidence concerning the relationship between KEs is not sufficient. Clearly, more studies on toxicity mechanisms are required to fill these gaps in data. This study also suggests that the AOP framework is a suitable tool to integrate existing data from various literature sources and can identify data gaps in microplastic toxicity mechanisms. Image 1 • Microplastic toxicity mechanisms in terms of ecotoxicity and human health toxicity were reviewed. • Microplastic toxicology research has focused on ecotoxicity using apical endpoints. • Toxicity mechanisms matched with KE from the AOP Wiki and putative AOPs were proposed. • MIE is ROS formation and AOs are increasing mortality, reduction of growth, and reproduction failure. [ABSTRACT FROM AUTHOR]

Jerschow, E., et al. (2015). "H-PGD synthase (H-PGDS) gene expression increases in eosinophils of aspirin exacerbated respiratory disease (AERD) patients after oral graded aspirin challenge." Journal of Allergy and Clinical Immunology **1)**: AB160.

RATIONALE: 10% of adult asthmatics suffer from AERD, characterized by adult onset of moderate to severe asthma and nasal polyps, peripheral and tissue eosinophilia, and a hypersensitivity reaction (bronchospasm, rhinorrhea, and/or conjunctivitis) in response to cyclooxygenase-1 (COX- 1) inhibition. They also have increased PGD2metabolites in blood and urine that has been reported to come from mast cells. We hypothesized that eosinophils of AERD patients have a higher expression of the HPGDS gene after aspirin-induced hypersensitivity reaction. METHOD(S): We collected eosinophils from AERD patients (n=8) and aspirin-tolerant asthmatics (n=10) at baseline, and after oral graded aspirin challenge. Eosinophils were isolated to >97% purity by depletion of noneosinophils using magnetic labeling and conjugation to MicroBeads. RNA was extracted from eosinophils and RNA expression was measured in comparison to internal housekeeper transcripts using RNA-specific RTqPCR by RNA-specific RT-qPCR. RESULT(S): After an aspirin-induced hypersensitivity reaction, eosinophil H-PGDS gene expression significantly increased from baseline in AERD patients ($p<0.01$) in contrast to aspirin-tolerant asthmatics, where there was no change. Urine levels of PGD2 metabolite (tetranor PGDM) after aspirin challenge significantly increased in AERD patients

(p=0.02) and accompanied the increases in H-PGDS gene expression. Tetranor PGDM decreased in aspirin-tolerant asthmatics (p<0.01). CONCLUSION(S): Peripheral blood eosinophils differentially express the H-PGDS gene in response to aspirin challenges in AERD patients as compared to aspirin-tolerant asthmatics. In addition to the previously demonstrated PGD2 production by mast cells, our results suggest that eosinophils may contribute to the elevated PGD2 levels in this disorder.

Jesacher, A., et al. (2006). "Holographic optical tweezers for object manipulations at an air-liquid surface." Optics Express **14**(13): 6342-6352.

We investigate holographic optical tweezers manipulating micro-beads at a suspended air-liquid interface. Axial confinement of the particles in the two-dimensional interface is maintained by the interplay between surface tension and gravity. Therefore, optical trapping of the micro-beads is possible even with a long distance air objective. Efficient micro-circulation of the liquid can be induced by fast rotating beads, driven by the orbital angular momentum transfer of incident Laguerre-Gaussian (doughnut) laser modes. Our setup allows various ways of creating a tailored dynamic flow of particles and liquid within the surface. We demonstrate examples of surface manipulations like efficient vortex pumps and mixers, interactive particle flow steering by arrays of vortex pumps, the feasibility of achieving a "clocked" traffic of micro beads, and size-selective guiding of beads along optical "conveyor belts".

Jha, A. K. and A. Bhattacharya (2009). "Preparation and evaluation of sweet potato starch-blended sodium alginate microbeads." Asian Journal of Pharmaceutics **3**(4): 299-303.

The design of effective drug delivery systems has recently become an integral part of the development of new medicines. Hence, research continuously keeps searching for ways to deliver drugs over an extended period of time with a well- controlled release profile. The ionotropic gelation method was used to prepare sweet potato starch-blended controlled release alginate microbeads of ibuprofen. Sweet potato is an important crop in many developing countries. Although sweet potato originated from Central America, its ability to adapt to a wide variety of climatic conditions allows it to grow both in tropical and in moderate temperature regions of Africa, Asia and the Americas. The influence of various formulation factors such as in vitro drug release, entrapment efficiency, swelling study and micrometric properties was investigated. Other variables included sweet potato starch concentration, percentage drug loading, curing time, cross-linking agent and stirring speed during the microencapsulation process. The entrapment efficiencies were found in the range of 71.85 2.04 - 94.53 1.02%. The particle sizes were found in the range of 0.82 0.006 - 1.08 0.009 mm. This suggested that the ionotropic gelation method was successful in producing sweet potato starch-blended alginate microbeads.

Ji, C., et al. (2019). "Establishment of fluorescent microbead-based immunoassay for the detection of IgG antibodies against H1 and H3 subtypes swine influenza virus." Chinese Veterinary Science / Zhongguo Shouyi Kexue **49**(2): 159-168.

Effective prevention and control of swine influenza requires the help of accurate and rapid detection methods. In order to establish a highly efficient and rapid multiple detection method, this study applied H1 and H3 subtypes swine influenza virus (SIV) hemagglutinin (HA) protein antigen coupled with different encoded fluorescent microspheres, and used the indirect method for detecting the IgG antibodies against H1 and H3 subtypes SIV. The immunological microspheres of IgG antibodies against swine influenza virus were detected and compared with the methods of blood coagulation inhibition test (HI), virus neutralization test (VN) and enzyme linked immunosorbent assay (ELISA). The results showed that the detection sensitivity of the antibodies was 100-1 000 times higher than that of the ELISA method. There was no cross-reactivity with the positive serum with porcine reproductive and respiratory syndrome virus, type II porcine circovirus, swine fever virus, pseudorabies virus and Japanese encephalitis virus and there was no cross-reaction between the H1 and H3 subtype SIV sera. Repeatability experiments showed that the intra and inter batch precision test indexes were 10.2% and 12.8% respectively. Compared with HI, VN and ELISA, the total coincidence rates were 97.82%, 98.27% and 97.83% respectively. In conclusion, the detection method established in this study has dual detection characteristics, good specificity, high sensitivity and strong repeatability, which can be used for the differential diagnosis of the antibodies of H1 and H3 subtype SIV.

Ji, S., et al. (2019). "Human Umbilical Cord Mesenchymal Stem Cells Attenuate Ocular Hypertension-Induced Retinal Neuroinflammation via Toll-Like Receptor 4 Pathway." Stem Cells International **2019**.

Glaucoma is characterized by progressive, irreversible damage to the retinal ganglion cells (RGCs) and their axons. Our previous study has shown that the intravitreal transplantation of human umbilical cord mesenchymal stem cells (hUC-MSCs) reveals a neuroprotective role in microsphere injection-induced ocular hypertension (OHT) rat models. The protection is related to the modulation of glial cells, but the mechanisms are still unknown. The purpose of the present study is to clarify the potential neuroinflammatory mechanisms involved in the neuroprotective role of hUC-MSCs. OHT models were established with SD rats through intracameral injection of polystyrene microbeads. The animals were randomly divided into three groups: The normal group, the OHT+phosphate-buffered saline (PBS) group, and the OHT+hUC-MSC group. Retinal morphology was evaluated by measuring the inner retinal thickness via optical coherence tomography (OCT). Retinal cell apoptosis was examined by TUNEL staining and Bax expression 14 days following hUC-MSC transplantation. The expression levels of glial fibrillary acidic protein (GFAP), ionized calcium binding adapter molecule 1 (iba-1), and toll-like receptor 4 (TLR4) were assessed via immunohistochemistry, real-time quantitative PCR, and Western blot. RNA and proteins were extracted 14 days following transplantation, and the expression levels of the TLR4 signaling pathways and proinflammatory cytokines-myeloid differentiation factor 88 (MyD88), IL-1β, IL-6, and TNF-α-were determined. OCT showed that the intravitreal transplantation of hUC-MSCs significantly increased the inner thickness of the retina. A TUNEL assay and the expression of Bax suggested that the apoptosis of retinal cells was decreased by hUC-MSCs 14 days following transplantation. Intravitreal hUC-MSC transplantation resulted in a decreased expression of GFAP, iba-1, TLR4, MyD88, IL-1β, IL-6, and TNF-α 14 days following transplantation. In addition, via in vitro experiments, we found that the increased expression of the TLR4 signaling pathway induced by lipopolysaccharide (LPS) was markedly decreased after hUC-MSCs were cocultured with rMC-1 and BV2 cells. These findings indicate that hUC-MSC transplantation attenuates OHT-induced retinal neuroinflammation via the TLR4 pathway. © 2019 Shangli Ji et al.

Ji, X., et al. (2017). "A novel method for plastic particle sizing in suspension based on acoustic impedance spectrum." Ultrasonics **77**: 224-230.

The objective of this paper is to explore the relationship between the characteristics of plastic particles in suspension and acoustic impedance spectrum and to present a novel non-invasive methodology for both spherical and non-spherical particle sizing. By modifying the ultrasonic attenuation spectral model, theories relating acoustic impedance spectrum to particle characteristics have been established to implement quite a few numerical simulations for the first time, revealing that the acoustic impedance of plastic particles is sensitive to changes in particle concentration and size. Afterwards, experiments were carried out on polystyrene suspensions made by particles with different sizes. On the basis of the theoretical analysis, different transducers were employed over a frequency varied from 10MHz to 100MHz for different particle sizes respectively. Not only were spherical particles chosen for the experiment, but also non-spherical particles with three different size distributions considering the fact that practical particles have irregular shapes. All the samples were verified by optical microscope technique and their comparisons with the experimental results show that the plastic particles with different sizes are distinguishable by using acoustic impedance spectrum.

Jia, M. J., et al. (2019). "Cherenkov-excited luminescence scanned imaging using scanned beam differencing and iterative deconvolution in dynamic plan radiation delivery in a human breast phantom geometry." Medical Physics **46**(7): 3067-3077.

Purpose: The purpose of this study was to demonstrate high resolution optical luminescence sensing, referred to as Cherenkov excited luminescence scanning imaging (CELSI), could be achieved during a standard dynamic treatment plan for a whole breast radiotherapy geometry. Method(s): The treatment plan beams induce Cherenkov light within tissue, and this excitation projects through the beam trajectory across the medium, inducing luminescence where there can be molecular reporter. Broad beams generally produce higher signal but low spatial resolution, yet for dynamic plans the scanning of the multileaf collimator allows for a beam-narrowing strategy by recursively temporal differencing each of the Cherenkov images and associated luminescence images. Then reconstruction from each of these size-reduced beamlets defined by the differenced Cherenkov images provides a well-conditioned matrix inversion, where the spatial frequencies are limited by the higher signal-to-noise ratio beamlets. A built-in stepwise convergence relies on stepwise beam size reduction, which is associated with a widening of the bandwidth of Cherenkov spatial frequency and resultant increase in spatial resolution. For the phantom experiments, europium nanoparticles were used as luminescent probes and embedded at depths ranging from 3 to 8 mm. An intensity modulated radiotherapy (IMRT) plan was used to test this. Result(s): The Cherenkov images spatially guided where the luminescence was measured from, providing high lateral resolution, and iterative reconstruction convergence showed that optimization of the initial and stopping beamlet widths could be achieved with 15 and 4.5 mm, respectively, using a luminescence imaging frame rate of 5/s. With the IMRT breast plan, the original lateral resolution was improved 2X, that is, 0.08-0.24 mm for target depths of 3-8 mm. In comparison, a dynamic wedge (DW) plan showed an inferior image fidelity, with relative contrast recovery decreasing from 0.86 to 0.79. The methodology was applied to a three-dimensional dataset to reconstruct Cherenkov excited luminescence intensity distributions showing volumetric recovery of a 0.5 mm diameter object composed of 0.5 muM luminescent microbeads. Conclusion(s): High resolution CELSI was achieved with a clinical breast external beam radiotherapy (EBRT) plan. It is anticipated that this method can allow visualization and localization for luminescence/fluorescence tagged vasculature, lymph nodes, or superficial tagged regions with most dynamic treatment plans. Copyright © 2019 American Association of Physicists in Medicine

Jia, Q. L., et al. (2019). "[Removal of Microplastics by Different Treatment Processes in Shanghai Large Municipal Wastewater Treatment Plants]." Huanjing Kexue/Environmental Science **40**(9): 4105-4112.

Wastewater treatment plants are important sources of microplastics (MPs) in aquatic environments. The present study was conducted to investigate the number concentration, removal rate, and fate of MPs in two large municipal treatment plants in Shanghai. The MPs

number concentration in the influent water of WWTP1 and WWTP2 were (226.27+/-83.00) piece.L⁻¹ and (171.89+/-62.98) piece.L⁻¹, respectively. WWTP1 had a MPs removal efficiency of 63.25%, which is slightly higher than that of WWTP2, at 59.84%. The removal efficiency during the primary treatment process of the two sewage treatment plants on MPs accounted for 70%-80% of the whole treatment process. The primary treatment process and secondary treatment process transferred (48.10%+/-1.62%) and (12.97%+/-0.05%) of MPs in the sewage to the sludge, respectively. As a whole, (38.82%+/-1.55%) of MPs in the sewage treatment plants were finally discharged into natural waters, and the remaining (61.18%+/-1.55%) entered the sludge. This study shows that the removal rate of MPs in Shanghai's municipal treatment plants is low and that after treatment, large amounts still enter the natural waters with the final effluent, which causes significant ecological risks. This study provides basic data of MPs removal and trends of large urban sewage treatment plants in a plain river network area, which can provide reference for further design of MPs removal processes.

Jia, X., et al. (2018). "The aberrant expression of microRNAs in B lymphocytes of patients with immune thrombocytopenia." Research and Practice in Thrombosis and Haemostasis **2 (Supplement 1)**: 51.

Background: Immune thrombocytopenia (ITP) is an acquired autoimmune disease characterized by a transient or persistent decrease in platelet count. The pathogenesis of ITP has proven complicated, involving CTL-mediated platelet lysis, disturbed T helper cell response balance, dysregulated secretion of cytokines, etc. Among all of these pathological factors, autoreactive B cells that produce platelet antigen specific autoantibodies still take center stage. Altered expression of microRNAs (miRNAs) have been reported in patients with ITP. However, the levels of miRNAs in B cells and their effects on ITP remain unclear. Aim(s): To investigate the expression profiles of five disease-related miRNAs (miR-144-3p, -142-3p, -3162-3p, -320c and let-7b-5p) in CD19⁺ B cells of ITP patients and healthy controls. Target prediction and pathway enrichment analysis were performed. Method(s): The peripheral blood samples of 21 ITP patients and 21 healthy controls were obtained. The CD19⁺ B cells were isolated from PBMCs using immunomagnetic microbeads. The miRNA levels were detected by quantitative real-time PCR and calculated using the comparative cycle threshold method. Result(s): The expression of five miRNAs in CD19⁺ B cells of ITP patients and healthy controls were evaluated. The levels of miR-3162-3p and let-7b-5p were significantly increased in ITP patients compared to healthy controls (P=0.0341 and P<0.0001, respectively) (Figure 1). No significant difference for miR-144-3p, -142-3p and -320c was found. The association between miRNAs and peripheral platelet count in ITP patients was also analyzed and no significance was found. Bioinformatics analysis indicated that the highest scoring functional pathways associated with ITP were cell cycle and thyroid hormone signaling pathway. Conclusion(s): The aberrant expression of miR-3162-3p and let-7b-5p were verified in CD19⁺ B cells of ITP patients, which may contribute to ITP pathogenesis by targeting cell cycle and thyroid hormone signaling pathway (Figure Presented).

Jia, Y. W., et al. (2019). "Occurrence and mass loads of biocides in plastic debris from the Pearl River system, South China." Chemosphere **246**: 125771.

Chemical pollution in the plastic debris is an increasing global concern as most pollutants might transfer from the environment to living organisms via plastic debris. In this study, biocides in the plastic debris floating on the surface water of the Pearl River system were investigated. The abundances of large plastic debris and microplastics in the surface water were 0.07 +/- 0.13 and 0.94 +/- 1.87 items/m³, respectively. Totally, 15 and 16 out of 19 biocides were detected in the large plastic debris and microplastics, with the concentration of each biocide in the ranges of 22.6-2460 ng/g and 16.9-2890 ng/g, respectively. Meanwhile, the concentration ranges of the detected biocides were 0.01-215 ng/L in surface water. Triclosan, triclocarban, methylparaben, and N,N-diethyl-3-methylbenzamide (DEET) were the frequently detected compounds in the plastic samples and surface water. The partition coefficients (K_d) of biocides between the plastic debris and surface water showed a weak positive correlation with K_{ow} values. Biocides were also detected on the natural floats (tree leaves and branches) at concentrations of 13.7-786 ng/g. The annual mass load of biocides in plastic debris at each site was up to 265 g/y, thereby suggesting that plastic debris might be an important carrier for the emerging contaminants, such as biocides.

Jiang, C., et al. (2019). "Microplastic pollution in the rivers of the Tibet Plateau." Environmental Pollution **249**: 91-98.

The presence of microplastics was detected in the rivers of the Tibet Plateau. The Tibet Plateau, the so-called Third Pole of the world, is home to the headstreams of many great rivers. The levels of microplastic pollution in those rivers, however, are unknown. In this study, surface water and sediment samples were collected from six sampling sites along five different rivers. The surface water and sediment samples were collected with a large flow sampler and a stainless steel shovel, respectively. The abundance of microplastics ranged from 483 to 967 items/m³ in the surface water and from 50 to 195 items/kg in the sediment. A large amount of small, fibrous, transparent microplastics were found in this study. Five types of microplastics with different chemical compositions were identified using micro-Raman spectroscopy: polyethylene terephthalate (PET), polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyamide (PA). These results demonstrate that rivers in the Tibet Plateau have been contaminated by microplastics, not only in developed areas with intense human activity but also in remote areas, where microplastic pollution requires further attention. Copyright © 2019 Elsevier Ltd

Jiang, H., et al. (2012). "Effects of cobalt nanoparticles on human T cells in vitro." Biological Trace Element Research **146**(1): 23-29.

Limited information is available on the potential risk of degradation products of metal-on-metal bearings in joint arthroplasty. The aim of this study was to investigate the cytotoxicity and genotoxicity of orthopedic-related cobalt nanoparticles on human T cells in vitro. T cells were collected using magnetic CD3 microbeads and exposed to different concentrations of cobalt nanoparticles and cobalt chloride. Cytotoxicity was evaluated by methyl thiazolyl tetrazolium and lactate dehydrogenase release assay. Cobalt nanoparticles dissolution in culture medium was determined by inductively coupled plasma-mass spectrometry. To study the probable mechanism of cobalt nanoparticles effects on T cells, superoxide dismutase, catalase, and glutathione peroxidase level was measured. Cobalt nanoparticles and cobalt ions could inhibit cell viability and enhance lactate dehydrogenase release in a concentration- and time-dependent manner ($P < 0.05$). The levels of cobalt ion released from cobalt nanoparticles in the culture medium were less than 40% and increased with cobalt nanoparticles concentration. Cobalt nanoparticles could induce primary DNA damage in a concentration-dependent manner, and the DNA damage caused by cobalt nanoparticles was heavier than that caused by cobalt ions. Cobalt nanoparticles exposure could significantly decrease superoxide dismutase, catalase, and glutathione peroxidase activities at subtoxic concentrations (6 muM, <CC(50)). These findings suggested that cobalt nanoparticles could generate potential risks to the T cells of patients suffer from metal-on-metal total hip arthroplasty, and the inhibition of antioxidant capacity may play important role in cobalt

nanoparticles effects on T cells.

Jiang, M., et al. (2009). "Anti-inflammatory cytokines suppress the TLR3-induced antiviral activity of non-parenchymal liver cells." Journal of Hepatology **1)**: S324.

Background and Aims: The liver is constantly exposed to a variety of foreign pathogens including HBV and HCV that can lead to chronic hepatitis. Here, Kupffer cells (KC) and liver sinusoidal endothelial cells (LSEC), as the most abundant non-parenchymal liver cells (NPC), have unique and important functions in innate and adaptive immune responses against these viruses. HCV in particular has been shown to induce IFNs and other cytokines by activating the Toll-like receptor (TLR) 3 pathway. However, only little is known about the regulation of this pathway by anti-inflammatory cytokines in NPC. Method(s): We have isolated murine KC by counterflow elutriation as well as murine LSEC by anti-LSEC microbeads (>99% purity as controlled by FACS). Cells were cultivated in the presence or absence of anti- inflammatory cytokines (IL-10, TGF-beta) and stimulated by TLR3 ligands (poly I:C). Then, supernatants were collected to perform antiviral assays (EMCV) on L929 cells. Neutralizing antibodies against IFN-alpha and IFN-beta were used to block the antiviral effects. To assess the effects on the transcriptional level total RNA was isolated and analyzed by quantitative rt-PCR. Result(s): TLR3 stimulation had no direct antiviral effect on L929 cells. When supernatants from TLR3-stimulated KC and LSEC were used, however, a potent, dose-dependent antiviral activity could be observed as early as 4 hours after stimulation. Poly I:C induced a number of ISGs in murine KC and LSEC. Pretreatment of KC and LSEC with IL-10 or TGF-beta strongly suppressed the antiviral activity of TLR3-stimulated NPC which correlated with suppressed ISG induction by poly I:C on the transcriptional level. The suppressive effects of IL-10 and TGF-beta were dose-dependent and can, at least in part, be explained by a down-regulation of TLR3 expression by these cytokines. Conclusion(s): Our data indicate for the first time that the TLR3-induced antiviral activity of NPC can be suppressed by anti-inflammatory cytokines. This is of particular relevance for the regulation of the local innate immune response against viral infections of the liver.

Jiang, N., et al. (2018). "Microfluidic Contact Lenses." SMALL **14**(15): e1704363.

Contact lens is a ubiquitous technology used for vision correction and cosmetics. Sensing in contact lenses has emerged as a potential platform for minimally invasive point-of-care diagnostics. Here, a microlithography method is developed to fabricate microconcavities and microchannels in a hydrogel-based contact lens via a combination of laser patterning and embedded templating. Optical microlithography parameters influencing the formation of microconcavities including ablation power (4.3 W) and beam speed (50 mm s⁻¹) are optimized to control the microconcavity depth (100 micro m) and diameter (1.5 mm). The fiber templating method allows the production of microchannels having a diameter range of 100-150 micro m. Leak-proof microchannel and microconcavity connections in contact lenses are validated through flow testing of artificial tear containing fluorescent microbeads (O = 1-2 micro m). The microconcavities of contact lenses are functionalized with multiplexed fluorophores (2 micro L) to demonstrate optical excitation and emission capability within the visible spectrum. The fabricated microfluidic contact lenses may have applications in ophthalmic monitoring of metabolic disorders at point-of-care settings and controlled drug release for therapeutics.

Jiang, R., et al. (2018). "Quantifying nanoplastic-bound chemicals accumulated in <i>Daphnia magna</i> with a passive dosing method." Environmental Science: Nano **5**(3): 776-781.

Because of their large surface area and high hydrophobicity, nanoplastics (NPs) possess a large

sorption capacity for and strong affinity to hydrophobic organic chemicals, which may substantially alter the environmental behavior, especially the bioaccumulation of hydrophobic organic compounds. The present study aims to examine the effects of nano-size polystyrene (PS) on the bioaccumulation of polychlorinated biphenyls (PCBs) in Daphnia magna. A novel passive dosing method was developed to quantify the accumulation of NPs in D. magna in different exposure suspensions with various NP concentrations during 2 h and 24 h exposure. Addition of NPs enhanced the amount of PCBs accumulated in D. magna by 1.4–2.6 times compared to no presence of NPs during 24 h exposure. The relative amounts of NP-bound PCBs accumulated in D. magna were 18% to 81% for different PCB congeners at various NP concentrations. The significance of different uptake pathways in the accumulation of PCBs in D. magna with the presence of NPs was found to relate to the chemical properties of PCBs, the ingestion rate of plastics and the exposure conditions. These results have justified additional research efforts toward investigating the fate and toxic effects of NP-bound contaminants ingested by organisms.

Jiang, W., et al. (2013). "DNA-polyfluorophore Chemosensors for Environmental Remediation: Vapor-phase Identification of Petroleum Products in Contaminated Soil." Chemical Science **4**(8): 3184-3190.

Contamination of soil and groundwater by petroleum-based products is an extremely widespread and important environmental problem. Here we have tested a simple optical approach for detecting and identifying such industrial contaminants in soil samples, using a set of fluorescent DNA-based chemosensors in pattern-based sensing. We used a set of diverse industrial volatile chemicals to screen and identify a set of five short oligomeric DNA fluorophores on PEG-polystyrene microbeads that could differentiate the entire set after exposure to their vapors in air. We then tested this set of five fluorescent chemosensor compounds for their ability to respond with fluorescence changes when exposed to headgas over soil samples contaminated with one of ten different samples of crude oil, petroleum distillates, fuels, lubricants and additives. Statistical analysis of the quantitative fluorescence change data (as DELTA(R,G,B) emission intensities) revealed that these five chemosensors on beads could differentiate all ten product mixtures at 1000 ppm in soil within 30 minutes. Tests of sensitivity with three of the contaminant mixtures showed that they could be detected and differentiated in amounts at least as low as one part per million in soil. The results establish that DNA-polyfluorophores may have practical utility in monitoring the extent and identity of environmental spills and leaks, while they occur and during their remediation.

Jiang, X., et al. (2019). "Toxicological effects of polystyrene microplastics on earthworm (Eisenia fetida)." Environmental Pollution **259**: 113896.

Microplastics are plastic fragments of particle sizes less than 5 mm, which are widely distributed in marine and terrestrial environments. In this study, earthworms Eisenia fetida were exposed to 100 and 1000 mug of 100 nm and 1300 nm fluorescent polystyrene microplastics (PS-MPs) per kg of artificial soil for 14 days. Uptake or accumulation of PS-MPs in earthworm intestines, histopathological changes, oxidative stress, and DNA damage were assessed to determine the toxicological effects of PS-MPs on E. fetida. The results showed that the average accumulated concentrations in the earthworm intestines were higher for 1300 nm PS-MPs (0.084 +/- 0.005 and 0.094 +/- 0.003 mug/mg for 100 and 1000 mug/kg, respectively) than for 100 nm PS-MPs (0.015 +/- 0.001 and 0.033 +/- 0.002 mug/mg for 100 and 1000 mug/kg, respectively). In addition, histopathological analysis indicated that the intestinal cells were damaged after exposure to PS-MPs. Furthermore, PS-MPs significantly changed glutathione (GSH) level and

superoxide dismutase (SOD) activity. The GSH levels were 86.991 +/- 7.723, 165.436 +/- 4.256-167.767 +/- 18.642, and 93.590 +/- 4.279-173.980 +/- 15.523 mumol/L in the control, 100 nm, and 1300 nm PS-MPs treatment groups. In addition, the SOD activities were 10.566 +/- 0.621, 9.039 +/- 0.787-9.408 +/- 0.493, and 7.959 +/- 0.422-9.195 +/- 0.327 U/mg protein for the control, 100 nm, and 1300 nm PS-MPs treatment groups, respectively, indicating that oxidative stress was induced after PS-MPs exposure. Furthermore, the comet assay suggested that exposure to PS-MPs induced DNA damage in earthworms. Overall, 1300 nm PS-MPs showed more toxic effect than 100 nm PS-MPs on earthworms. These findings provide new insights regarding the toxicological effects of low concentrations of microplastics on earthworms, and on the ecological risks of microplastics to soil animals.

Jiang, X., et al. (2019). "Ecotoxicity and genotoxicity of polystyrene microplastics on higher plant Vicia faba." Environmental Pollution **250**: 831-838.

Nano- and microplastics have been widely spread in environmental matrices, especially in marine and terrestrial systems. In this study, higher plant Vicia faba root tips were exposed to 5mum and 100nm with 10, 50 and 100mg/L polystyrene fluorescent microplastics (PS-MPs) for 48h. Root length, weight, oxidative stress and genotoxicity of V. faba were assessed to investigate toxic effects of PS-MPs. The results showed that the biomass and catalase (CAT) enzymes activity of V. faba roots decreased under 5mum PS-MPs whereas superoxide dismutase (SOD) and peroxidase (POD) enzymes activity significantly increased. Under the 100nm PS-MPs exposure a significant decrease of growth was observed only at the highest concentration (100mg/L). However, micronucleus (MN) test and antioxidative enzymes activities showed that 100nm PS-MPs induce higher genotoxic and oxidative damage to V. faba than 5mum PS-MPs. Furthermore, the laser confocal scanning microscopy (LCSM) demonstrated that 100nm PS-MPs can accumulate in V. faba root and most probably block cell connections or cell wall pores for transport of nutrients. These findings provide a new insight into the toxic effects of microplastics on V. faba, and further apply to the ecological risk assessment of microplastics on higher plants.

Jiang, X., et al. (2019). "Quantifying the bioaccumulation of nanoplastics and PAHs in the clamworm Perinereis aibuhitensis." Science of the Total Environment **655**: 591-597.

The impact of nanometer-scale plastics (<1000 nm nanoplastics, NPs) on the bioaccumulation of hydrophobic organic pollutants, and especially polycyclic aromatic hydrocarbons (PAHs), in marine organisms has become of urgent concern. However, simultaneous determinations of the bioaccumulation of NPs and PAHs have been hindered by the lack of an efficient digestion method that removes background interference from the tissue without altering the surface properties of the plastic and destroying the PAHs. To solve this problem, an enzymatic digestion-based protocol using proteinase K and subsequent quantification methods were developed on a typical marine benthic invertebrate - the clamworm Perinereis aibuhitensis. Enzymatic digestion removed 91% of the biological tissues, comparable to the amount removed using 65% HNO<inf>3</inf> (93% removed) and better than that removed using 30% H<inf>2</inf>O<inf>2</inf> or 10% KOH digestion (76% and 66%, respectively). After enzymatic digestion, roughly 92% of the NPs and 88% of the amount of pyrene were recovered, without significant modification of the NPs or pyrene degradation. By contrast, the NP and pyrene recovery achieved with HNO<inf>3</inf> digestion was only 1.4% and 0.1%, respectively. The newly developed protocol was successfully applied to a 96-h bioaccumulation study. The use of radioactively labeled ¹⁴C-pyrene and fluorescently labeled NPs allowed the simultaneous quantification of NPs and PAHs in the clamworm and revealed a bioconcentration factor (BCF) of 1.96 +/- 0.93 and 402.7 +/- 47.0, respectively. The quantification of NPs and pyrene indicated that NP-adsorbed pyrene accounted for <1% of the total pyrene accumulation in the clamworm body when the concentration of NPs in seawater was as low as 0.4 mg/L. Our enzymatic digestion and dual-labeling technique thus provides the first reported BCF value of NPs in a marine benthic organism and new insights into the vector effects of these particles on the bioaccumulation of organic contaminants in a marine ecosystem. Copyright © 2018 Elsevier B.V.

Jiang, X. F., et al. (2005). "[VEGF-induced tubulogenesis of endothelial cells from human brain malignant glioma in the three dimentional model]." Chung-Hua Ping Li Hsueh Tsa Chih - Chinese Journal of Pathology **34**(9): 579-582.

OBJECTIVE: To compare the tubulogenesis capability of malignant glioma-derived microvessel endothelial cells (GDMEC) from human brain with that of ECV304 cells in a three dimentional model and to explore the significance of GDMEC in the study on angiogenesis.

METHODS: The GDMEC were isolated from malignant gliomas of human brain and purified by selective binding to the monoclonal antibody against CD105 bound to the magnetic MACS MicroBeads. GDMEC and endothelial-like cell line ECV304 were compared with their capabilities of formatting tubule-like structure (TLS) in the three dimentional collagen matrix, with or without inducement by various concentration of vascular endothelial growth factor (VEGF).

RESULTS: The obtained GDMEC had a high purification (98%) and could be successfully cultured in vitro. GDMECs formed more TLS than ECV304 cells of the same number and at the same time points. VEGF could induce rapid formation of TLS in a dose-dependent manner, however, ECV304 cells were less response to VEGF stimulation.

CONCLUSIONS: GDMEC could maintain their endothelial characteristics and potential capability of angiogenesis. They were more response to VEGF than ECV304, therefore, more suitable for in vitro studies on tumor angiogenesis.

Jiang, Y., et al. (2019). "Heterogeneous Strain Distribution of Elastomer Substrates To Enhance the Sensitivity of Stretchable Strain Sensors." Accounts of Chemical Research **52**(1): 82-90.

Stretchable strain sensors, which convert mechanical stimuli into electrical signals, largely fuel the growth of wearable bioelectronics due to the ubiquitous, health-related strain in biological systems. In contrast to rigid conventional strain sensors, stretchable strain sensors present advantages of conformality and stretchability, solving the mechanical mismatch between electronics and the human body. However, the great challenge of stretchable strain sensors lies in achieving high sensitivity, which is required for both signal fidelity and cost considerations. Recent advances to solve this sensitivity challenge have focused on material optimization, in search of the optimum combination of conductive active materials and elastomer substrates among a myriad of artificial or natural materials. However, high sensitivity with a gauge factor larger than 50 remains a grand challenge, especially within large-strain regions. Here we present heterogeneous strain distribution of elastomer substrates as a powerful strategy to significantly enhance the sensitivity of stretchable strain sensors. The theoretical foundation of this strategy is mathematically proven on the basis of Ohm's law in electrics and mechanics of materials. First, the extent of the sensitivity enhancement is proved to be determined by the local strain in resistance-testing segments of heterogeneous strain sensors. Next, the local strain is proved to be quantitatively decided by material properties such as section area and Young's modulus. Thus, the necessary and sufficient condition to achieve high sensitivity in heterogeneous strain sensors is that the Young's modulus reciprocal or section area reciprocal in the resistance-testing segment is larger than the mean value. This provides a theoretical design guideline to achieve high sensitivity via heterogeneous strain distribution. On the basis of this guideline, we systematically summarize concrete instances of heterogeneity-induced sensitivity improvement in stretchable strain sensors, in sequence of increasing dimensionality. A typical example of a one-dimensional heterogeneous strain sensor is a structured fiber with microbeads, where the varied section area along the fiber axis results in heterogeneous strain and sensitivity improvement. Two-dimensional heterogeneous sensors in the form of thin films contain thickness gradient sensors and auxetic mechanical metamaterial sensors. The former exhibit heterogeneous section area via the self-pinning method, while the latter show heterogeneity in both the strain direction and amplitude, leading to a 24-fold improvement in sensitivity. Three-dimensional strain sensors include rationally structured sensors for out-of-plane force detection and asymmetric active materials in electronic whiskers. The resultant enhanced sensitivity in these heterogeneous strain sensors is beneficial for applications such as continuous health monitoring, biomedical diagnostics, and replacement prosthetics, taking advantage of augmented detection accuracy and declined device cost. Finally, we discuss possible future work in exploiting heterogeneous strain distributions, involving extended methodology to achieve heterogeneity, employing suppressed strain for stretchable electrodes, cyclic durability for long-term applications, and multifunctional system-level integration. We believe that this strategy of using heterogeneous strain distribution to enhance sensitivity can strongly promote the development of stretchable strain sensors for both practical and theoretical requirements.

Jimenez, C., et al. (2010). "A single dose of vitamin A improves haemoglobin concentration, retinol status and phagocytic function of neutrophils in preschool children." British Journal of Nutrition **103**(6): 798-802.

Since there is a reported interrelationship between vitamin A and Fe metabolism, and with immunological response, the objective was to evaluate the effect of a single dose of vitamin A administered to preschool children, on Fe and vitamin A nutritional status, anaemia and phagocytic function of neutrophils, 30 d after supplementation. A total of eighty children (sixty-eight supplemented and twelve controls) were supplemented orally with 200,000 IU (60 mg) vitamin A, and evaluated for nutritional, haematological and immunological responses at the beginning of the study and 30 d after supplementation. Parameters studied included Hb, serum ferritin, retinol and Fe concentrations, transferrin saturation, IL-4, interferon-gamma and phagocityc capacity of neutrophils using non-fluorescent latex microbeads. After supplementation there was a significant increase in Hb concentration ($P = 0.03$), mean corpuscular Hb concentration ($P = 0.001$) and serum retinol ($P = 0.0078$). Prevalences of anaemia and vitamin A deficiency decreased significantly from 17.6 % to 13.2 % and from 25 % to 13.2 %, respectively. Regarding phagocytic function, there was a significant increase in the number of microbeads engulfed by neutrophils ($P < 0.05$) and no significant changes in cytokine concentrations at 1 month after treatment. A single dose of 200,000 IU (60 mg) vitamin A administered orally to a group of preschool children with a high prevalence of vitamin A deficiency enhanced serum retinol and Hb concentrations, decreased the prevalence of anaemia and vitamin A deficiency and improved the constitutive phagocytic capacity of neutrophils. Vitamin A supplementation could help to decrease vitamin A deficiency, anaemia prevalence and to improve the innate immunity response in preschool children. The effects were obtained without Fe supplementation.

Jimenez, S., et al. (2011). "Analysis of Environmental Management for the Treatment of Plastic Waste in Mexico: Government Strategies." Journal of Environmental Science and Engineering **5**(8): 1031-1042.

In Mexico, garbage represents a high pollution index according to national and international

organizations; eighty percent of waste products stay in sanitary landfills, out of doors, where no tailings management exists. Plastic products represent 16% of this pollution (one and one-half kilos daily per person in a country with a population of 107 million people). These sanitary landfills are methane deposits, and consequently emit gases and toxins that cause serious health problems. The object of this is to analyze governmental programs, strategies, policies and procedures which regulate both industrial sectors and society. Society and government share a responsibility since they must implement norms which include the separation, reduction, recycling and reuse of garbage. Results demonstrate that government strategies used to treat tailings are complex and are directed more towards sanctions than to motivation. Furthermore these strategies discourage a cultural transformation toward industrial sustainability. Instead of reducing the garbage accumulation problem, they increase the difficulty.

Jin, L., et al. (2014). "Polybrominated diphenyl ethersin in plants from a plastic waste recycling area in China." Environmental Chemistry - Huanjing Huaxue **33**(6): 901-907.

Levels and profiles of polybrominated diphenyl ethers (PRDEs) were investigated in 13 plants from a typical plastic waste recycling site in north China, in order to understand the plant accumulation in the heavily polluted soils. The investigated results showed that the concentrations of 21 congeners of PRDEs ranged from 11.3 to 122 ng times g super(-1) dry weight (dw), with a mean value of 51.2 ng times g super(-1) dw. Compared with some previous studies, the results showed that PRDE levels in plants in this study were similar to those in some e-waste recycling areas, but much higher than those in other general areas. There was obvious difference among the plants. The highest concentration of PRDEs was detected in Pharbitis nil (Linn.) Choisy. RDE 209 was the dominant congener (mean 96.9%) in all samples, which ranged from 10.8 to 116 ng times g super(-1). Among the other congeners, RDE 47 and RDE 208 were relatively higher but accounted for less than 1% of the total concentrations of 21 congeners. The PRDE congener profiles in these plant samples from our studied area exhibited more distinguishable sources from deca-RDE products than those in e-waste recycling areas and other areas.

Jin, S. Q., et al. (2009). "Multiplexed bead-based mesofluidic system for detection of food-borne pathogenic bacteria." Applied & Environmental Microbiology **75**(21): 6647-6654.

In the present study, a simple and rapid multiplexed bead-based mesofluidic system (BMS) was developed for simultaneous detection of food-borne pathogenic bacteria, including Staphylococcus aureus, Vibrio parahaemolyticus, Listeria monocytogenes, Salmonella, Enterobacter sakazakii, Shigella, Escherichia coli O157:H7, and Campylobacter jejuni. This system is based on utilization of isothiocyanate-modified microbeads that are 250 mum in diameter, which were immobilized with specific amino-modified oligonucleotide probes and placed in polydimethylsiloxane microchannels. PCR products from the pathogens studied were pumped into microchannels to hybridize with the oligonucleotide-modified beads, and hybridization signals were detected using a conventional microarray scanner. The short sequences of nucleic acids (21 bases) and PCR products characteristic of bacterial pathogens could be detected at concentrations of 1 pM and 10 nM, respectively. The detection procedure could be performed in less than 30 min with high sensitivity and specificity. The assay was simple and fast, and the limits of quantification were in the range from 500 to 6,000 CFU/ml for the bacterial species studied. The feasibility of identification of food-borne bacteria was investigated with samples contaminated with bacteria, including milk, egg, and meat samples. The results demonstrated that the BMS method can be used for effective detection of multiple pathogens in different foodstuffs.

Jin, Y., et al. (2019). "Impacts of polystyrene microplastic on the gut barrier, microbiota and metabolism of mice." Science of the Total Environment **649**: 308-317.

Microplastics (MPs), which are new environmental pollutants with a diameter of <5 mm, have received wide attention in recent years. However, there are still very limited data regarding the risks of MPs to animals, especially higher mammals. In this study, we exposed male mice to 5 micro m pristine and fluorescent polystyrene MP for six weeks. The results showed that the polystyrene MP was observed in the guts of mice and could reduce the intestinal mucus secretion and cause damage the intestinal barrier function. In addition, high-throughput sequencing of the V3-V4 region of the 16S rRNA gene was used to explore the change of the gut microbiota composition in the cecal content. At the phylum level, the content of Actinobacteria decreased significantly in the polystyrene MP-treated group. The PD whole-tree indexes of the alpha diversity and principal component analysis (PCA) of the beta diversity indicated that the diversity of gut microbiota was altered after polystyrene MP exposure. At the genus level, a total of 15 types of bacteria changed significantly after exposure to polystyrene MP. Furthermore, the predicted KEGG (Kyoto Encyclopedia of Genes and Genomes) metabolic pathway differences indicated that the main metabolic pathways of the functional genes in the microbial community were significantly influenced by the polystyrene MP. In addition, indexes of amino acid metabolism and bile acid metabolism in the serum were analyzed after polystyrene MP exposure. These results indicated that polystyrene MP caused metabolic disorders. In conclusion, the polystyrene MP induced gut microbiota dysbiosis, intestinal barrier dysfunction and metabolic disorders in mice. This study provided more data on the toxicity of MPs in a terrestrial organism to aid in the assessment of the health risks of polystyrene MP to animals.

Jin, Y., et al. (2018). "Polystyrene microplastics induce microbiota dysbiosis and inflammation in the gut of adult zebrafish." Environmental Pollution **235**: 322-329.

Microplastic (MP) are environmental pollutants and have the potential to cause varying degrees of aquatic toxicity. In this study, the effects on gut microbiota of adult male zebrafish exposed for 14 days to 100 and 1000 micro g/L of two sizes of polystyrene MP were evaluated. Both 0.5 and 50 micro m-diameter spherical polystyrene MP increased the volume of mucus in the gut at a concentration of 1000 micro g/L (about 1.456x10¹⁰ particles/L for 0.5 micro m and 1.456x10⁴ particles/L for 50 micro m). At the phylum level, the abundance of Bacteroidetes and Proteobacteria decreased significantly and the abundance of Firmicutes increased significantly in the gut after 14-day exposure to 1000 micro g/L of both sizes of polystyrene MP. In addition, high throughput sequencing of the 16S rRNA gene V3-V4 region revealed a significant change in the richness and diversity of microbiota in the gut of polystyrene MP-exposed zebrafish. A more in depth analysis, at the genus level, revealed that a total of 29 gut microbes identified by operational taxonomic unit (OTU) analysis were significantly changed in both 0.5 and 50 micro m-diameter polystyrene MP-treated groups. Moreover, it was observed that 0.5 micro m polystyrene MP not only increased mRNA levels of IL1 alpha , IL1 beta and IFN but also their protein levels in the gut, indicating that inflammation occurred after polystyrene MP exposure. Our findings suggest that polystyrene MP could induce microbiota dysbiosis and inflammation in the gut of adult zebrafish.

Jinhui, S., et al. (2019). "Effects of microplastics and attached heavy metals on growth, immunity, and heavy metal accumulation in the yellow seahorse, Hippocampus kuda Bleeker." Marine Pollution Bulletin **149**: 110510.

Microplastics represent a new kind of environmental pollutant that has recently attracted extensive attention and become a research hotspot. Microplastics are similar in size to the food items of many marine organisms and are thus, often consumed by them, with potentially harmful and toxic effects. We examined the effects of microplastics on the growth of the yellow seahorse Hippocampus kuda. Seahorses were split into three groups fed Mysis+microplastics+heavy metals (group A), Mysis+microplastics (group B), and Mysis alone (group C). We analyzed and compared the accumulations of microplastics and heavy metals among the groups and monitored seahorse growth following the different treatments. Body length, body weight, condition factor, specific growth rate, and survival rate were all lower in group A compared with the other groups, but there was no significant difference in any of the parameters between groups B and C. The accumulation of microplastics was similar in groups A and B, and the accumulation of heavy metals was similar in groups B and C. These results suggest that the effect of microplastics on seahorse growth is caused by the accumulation of heavy metals, rather than by the microplastics themselves.

Jitraruch, S., et al. (2017). "Cryopreservation of Hepatocyte Microbeads for Clinical Transplantation." Cell Transplantation **26**(8): 1341-1354.

Intraperitoneal transplantation of hepatocyte microbeads is an attractive option for the management of acute liver failure. Encapsulation of hepatocytes in alginate microbeads supports their function and prevents immune attack of the cells. Establishment of banked cryopreserved hepatocyte microbeads is important for emergency use. The aim of this study was to develop an optimized protocol for cryopreservation of hepatocyte microbeads for clinical transplantation using modified freezing solutions. Four freezing solutions with potential for clinical application were investigated. Human and rat hepatocytes cryopreserved with University of Wisconsin (UW)/10% dimethyl sulfoxide (DMSO)/5% (300 mM) glucose and CryoStor CS10 showed better postthawing cell viability, attachment, and hepatocyte functions than with histidine-tryptophan-ketoglutarate/10% DMSO/5% glucose and Bambanker. The 2 freezing solutions that gave better results were studied with human and rat hepatocytes microbeads. Similar effects on cryopreserved microbead morphology (external and ultrastructural), viability, and hepatocyte-functions post thawing were observed over 7 d in culture. UW/DMSO/glucose, as a basal freezing medium, was used to investigate the additional effects of cytoprotectants: a pan-caspase inhibitor (benzyloxycarbonyl-Val-Ala-dl-Asp-fluoromethylketone [ZVAD]), an antioxidant (desferoxamine [DFO]), and a buffering and mechanical protectant (human serum albumin [HSA]) on RMBs. ZVAD (60 micro M) had a beneficial effect on cell viability that was greater than with DFO (1 mM), HSA (2%), and basal freezing medium alone. Improvements in the ultrastructure of encapsulated hepatocytes and a lower degree of cell apoptosis were observed with all 3 cytoprotectants, with ZVAD tending to provide the greatest effect. Cytochrome P450 activity was significantly higher in the 3 cytoprotectant groups than with fresh microbeads. In conclusion, developing an optimized cryopreservation protocol by adding cytoprotectants such as ZVAD could improve the outcome of cryopreserved hepatocyte microbeads for future clinical use.

Jitraruch, S., et al. (2014). "Alginate microencapsulated hepatocytes optimised for transplantation in acute liver failure." PLoS ONE [Electronic Resource] **9**(12): e113609.

BACKGROUND AND AIM: Intraperitoneal transplantation of alginate-microencapsulated human hepatocytes is an attractive option for the management of acute liver failure (ALF) providing short-term support to allow native liver regeneration. The main aim of this study was to establish an optimised protocol for production of alginate-encapsulated human hepatocytes and evaluate their suitability for clinical use.

METHODS: Human hepatocyte microbeads (HMBs) were prepared using sterile GMP grade materials. We determined physical stability, cell viability, and hepatocyte metabolic function of HMBs using different polymerisation times and cell densities. The immune activation of peripheral blood mononuclear cells (PBMCs) after co-culture with HMBs was studied. Rats with ALF induced by galactosamine were transplanted intraperitoneally with rat hepatocyte microbeads (RMBs) produced using a similar optimised protocol. Survival rate and biochemical profiles were determined. Retrieved microbeads were evaluated for morphology and functionality.

RESULTS: The optimised HMBs were of uniform size (583.5+/-3.3 micro m) and mechanically stable using 15 min polymerisation time compared to 10 min and 20 min (p<0.001). 3D confocal microscopy images demonstrated that hepatocytes with similar cell viability were evenly distributed within HMBs. Cell density of 3.5x10(6) cells/ml provided the highest viability. HMBs incubated in human ascitic fluid showed better cell viability and function than controls. There was no significant activation of PBMCs co-cultured with empty or hepatocyte microbeads, compared to PBMCs alone. Intraperitoneal transplantation of RMBs was safe and significantly improved the severity of liver damage compared to control groups (empty microbeads and medium alone; p<0.01). Retrieved RMBs were intact and free of immune cell adherence and contained viable hepatocytes with preserved function.

CONCLUSION: An optimised protocol to produce GMP grade alginate-encapsulated human hepatocytes has been established. Transplantation of microbeads provided effective metabolic function in ALF. These high quality HMBs should be suitable for use in clinical transplantation.

Jitraruch, S., et al. (2012). "Human hepatocyte alginate microbeads: Preparation under GMP conditions and assessment of cell viability, metabolic function and physical integrity." Hepatology **1)**: 728A-729A.

Encapsulated human hepatocyte (microbeads) transplantation is an attractive option in the management of acute liver failure in children. Microbeads can be safely and easily transplanted intraperitoneally and avoids the need of immunosuppression. Cell function could be demonstrated for 4-6 weeks giving either the native liver time to recover or act as bridge to whole liver replacement. However, there are limited data on synthetic and detoxification functions of hepatocytes and physical integrity of microbeads prepared under GMP conditions. AIM: To evaluate hepatocyte-specific functions and activities, and assess physical integrity of human hepatocyte alginate microbeads. Also to investigate cell number and viability in relation to cell distribution in microbeads. METHOD(S): Microbeads were produced using an encapsulator (250mu nozzle) and GMP grade materials. Human hepatocytes were encapsulated (1.5% sodium alginate solution; polymerised in 1.2% calcium chloride for 10min; 2.5x106cells/ml alginate). Immediately after encapsulation (control group), human hepatocyte microbeads (HMBs) were assessed for cell overall metabolic activity (MTT assay), viability [fluorescein diacetate/propidium iodide (FDA/PI) staining], and morphology. Physical stability of HMBs was determined using an osmotic pressure test by incubation for 3h in transplant medium (CMRL; isotonic) or water (hypotonic). Microbead size (n=100/sample), MTT assay and viability (FDA/PI) were evaluated. Hepatocyte-specific functions (albumin and urea synthesis) in HMBs were assessed after maintenance in CMRL for 24h. Average cell number and viability per microbead was determined using FDA/PI and 3D confocal microscopy. RESULT(S): GMP grade HMBs obtained were of uniform size and shape (mean diameter: 584.0+/-SEM 0.9mum). HMBs maintained their size and functional activity when incubated for 3h in CMRL. HMBs had similar hepatocyte overall activity and viability after 24h incubation in CMRL compared to control. Synthesis of albumin was 64.0+/-18.8ng, and urea was 4.25+/-1.85mug per ml/1x106cells/day. There was a statistically significant increase in microbead diameter after incubation in water

(671.0+/-1.4mum) vs control (p<0.001) without leading to disintegration. 3D reconstruction of confocal microscope images demonstrated that average cell number per microbead was 238+/-23, with no significant difference in cell viability within the microbead (inner half 61.2+/-5.4% vs outer half 61.4+/-3.7%). CONCLUSION(S): GMP grade human hepatocyte microbeads were produced, which had good cell viability, function, and physical integrity. These conditions may be used for preparation of hepatocyte microbeads for clinical transplantation.

João Pinto da, C., et al. (2019). "Microplastics in soils: assessment, analytics and risks." Environmental chemistry (Online) **16**(1): 18-30.

Abstract. There has been an increasing interest by both the general public and the scientific community in microplastic-related pollution. Owing to their physical and chemical characteristics, these highly ubiquitous contaminants may be ingested by numerous organisms at the base of food-webs. Furthermore, owing to their tendency to adsorb other chemical substances, such as persistent organic pollutants (POPs), these plastic particles can lead to bioaccumulation and bioamplification phenomena, which significantly increases their potential environmental effects. However, most of the current research available is focussed on the prevalence and effects of these materials in water, and, more precisely, in oceans. Although this is understandable, owing to the alarming accumulation of plastics in this environmental compartment, little attention has been paid to the sources, fate and effects of microplastics (MPs) in terrestrial settings. This is further complicated by the current lack of universally accepted methods for the assessment and identification of MPs, not only in liquid, but also in solid matrices. We overview the most current data regarding the presence and prevalence of MPs in soils and evaluate their recognised impacts and potential consequences. We also appraise the current sampling, isolation and identification methodologies and suggest methods that may contribute to the development of standard operating procedures (SOPs) for the sampling and characterisation of these pervasive pollutants in complex matrices, such as soils.

Johansen, M. P., et al. (2019). "Biofilm-enhanced adsorption of strong and weak cations onto different microplastic sample types: Use of spectroscopy, microscopy and radiotracer methods." Water Research **158**: 392-400.

The adsorption of metals and other elements onto environmental plastics has been previously quantified and is known to be enhanced by surface-weathering and development of biofilms. However, further biofilm-adsorption characterisation is needed with respect to the fate of radionuclides. This study uses spectroscopy, microscopy and radiotracer methods to investigate the adsorption capacity of relatively strong and weak cations onto different microplastic sample types that were conditioned in freshwater, estuarine and marine conditions although marine data were limited. Fourier-transform infrared spectroscopy confirmed that surface oxidation chemistry changes induced by gamma irradiation were similar to those resulting from environmental exposures. Microscopy elemental mapping revealed patchy biofilm development, which contained Si, Al, and O, consistent with microbial-facilitated capture of clays. The plastics+biofilm of all sample types had measurable adsorption for Cs and Sr radiotracers, suggesting environmental plastics act broadly as a sink for the key pervasive environmental radionuclides of ¹³⁷Cs and ⁹⁰Sr associated with releases from nuclear activities. Adsorption onto high-density polyethylene plastic types was greater than that on polypropylene. However, in most cases, the adsorption rates of all types of plastic+biofilm were much lower than those of reference sediments and roughly consistent with their relative exchangeable surface areas.

Johansen, M. P., et al. (2018). "Initial data on adsorption of Cs and Sr to the surfaces of microplastics with biofilm." Journal of Environmental Radioactivity **190-191**: 130-133.

The adsorption of radiocesium and radiostrontium onto a range of natural materials has been well quantified, but not for the new media of environmental plastics, which may have enhanced adsorption due to surface-weathering and development of biofilms. Microplastic samples were deployed in freshwater, estuarine and marine conditions, then characterised using infrared spectroscopy to document changes to the plastic surface (vs interior). Synchrotron elemental mapping data revealed surfaces that were well-covered by accumulation of reactive water solutes and sulphur, but, in contrast, had highly discrete coverage of elements such as Fe and Ti, indicating adhered mineral/clay-associated agglomerates that may increase overall adsorption capacity. Plastics that had been deployed for nearly five months adsorbed radionuclides in both freshwater and estuarine conditions with the highest K<inf>d</inf> for cesium (Cs) in freshwater (80 ml g⁻¹) and lowest for strontium (Sr) in estuarine conditions (5 ml g⁻¹). The degree of Cs and Sr adsorption onto plastics appears to be approximately 2-3 orders of magnitude lower than for sediment reference values. While lower than for sediments, adsorption occurred on all samples and may indicate a significant radionuclide reservoir, given that plastics are relatively buoyant and mobile in water regimes, and are increasing in global aquatic systems. Copyright © 2018

Johansson, J.-E. (2009). "VARIED APPROACHES TO PLASTICS PROBLEM." Materials Recycling Week **193**(2): 12-13.

The article provides information about several issues related to the plastic industry in Great Britain. According to a report, nine of the 29 countries studied already recover more than 80 percent of their plastics waste through a combination of recycling and energy recovery. The European collection rate for mechanical recycling of post-consumer plastics waste has shown an increment of 20.1 percent in 2007 from 11 percent in 2006. This increase is a result of higher polymer prices and improved collection and sorting technology. Several graphs are also presented providing information about the decoupling of plastic waste and landfill, and growth of recycling and energy recovery.

Johansson, M. W., et al. (2013). "Alphambeta2 integrin-mediated adhesion and motility of interleukin-5-stimulated eosinophils on periostin." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **187**(MeetingAbstracts).

RATIONALE: Periostin is an extracellular matrix protein that is up-regulated by T helper cell type 2 (Th2) cytokines in the asthmatic airway, considered a marker of "Th2-high" asthma, and implicated in mouse and human studies as promoting or being associated with airway eosinophilic inflammation. We asked whether periostin modulates eosinophil adhesion and motility in vitro. METHOD(S): Adhesion of purified human blood eosinophils to adsorbed periostin in the absence or presence of different concentrations of a cytokine was studied in polystyrene multi-well plates using eosinophil peroxidase as a readout. Adhesive structures were imaged by fluorescent microscopy. Random motility of adherent eosinophils was assayed using a microbead monolayer assay. RESULT(S): Periostin supported adhesion of eosinophils stimulated by interleukin-5 (IL-5), IL-3, or granulocyte macrophage-colony stimulating factor (GM-CSF), but did not support adhesion of eosinophils treated with IL-4 or IL-13. The degree of adhesion depended on the concentrations of periostin during coating and activating cytokine during the adhesion assay. Both full-length periostin and alternatively spliced periostin, lacking C-terminal exons 17, 18, 19, and 21, supported adhesion. Adhesion was inhibited by monoclonal antibody to alphaM or beta2 integrin subunits, but not by antibodies to other eosinophil

integrin subunits. In the presence of IL-5, eosinophils adherent on periostin formed punctate structures positive for filamentous actin, gelsolin, and phosphotyrosine. These structures fit the criteria for podosomes, highly dynamic adhesive contacts that are distinct from classical focal adhesions and have been suggested to be required for or facilitate migration of many cell types. Periostin supported alphaMbeta2-dependent random motility of IL-5-stimulated eosinophils with optimal movement at an intermediate coating concentration. CONCLUSION(S): The results establish alphaMbeta2 integrin (CD11b/CD18, Mac-1) as an adhesive and pro-migratory periostin receptor on cytokine-stimulated eosinophils and suggest that periostin may function as a haptotactic stimulus able to guide eosinophils to areas of high periostin density in the asthmatic airway. The periostin-alphaMbeta2 interaction may be a possible therapeutic target in asthma.

Johnsen, H. E., et al. (1999). "Selective loss of progenitor subsets following clinical CD34+ cell enrichment by magnetic field, magnetic beads or chromatography separation." Bone Marrow Transplantation **24**(12): 1329-1336.

In this preclinical evaluation we have compared the efficacy of three clinical CD34+enrichment procedures with respect to purity, yield and recovery, as well as risk of selective loss of CD34+ lineage-specific subsets. The three devices work by different principles and have several different manipulation steps: The magnetic field separator uses paramagnetic iron-dextran particles; the magnetic microbead selection is based on the advantage of a large surface area for immobilisation of the monoclonal antibody within a very small volume; the original immunoabsorption technique is based on the use of biotinylated antibody applied to a column of avidin-coated sephadex beads. The results of this evaluation gave a median purity 96% (88-98%), 86% (62-97%), and 49% (18-85%), and median yield of 65% (54-100%), 40% (21-74%), and 30% (8-55%), respectively. Subset analysis recognised a selective loss of CD34+/61+ after enrichment, most likely due to class I-II antibodies used for the enrichment step or, alternatively, nonspecific binding of megakaryocytic progenitors. Tumour cell spiking experiments on a clinical scale documented an expected 2-4 log reduction resulting in a number of potentially malignant cells in the CD34 enriched product. Our data support four major conclusions: First, that magnetic field separation is superior to magnetic beads and chromatography selection, mainly due to the risk of cell loss and insufficient recovery with the two latter methods. Second, that late differentiated progenitors with CD34 class III epitopes present are lost during the enrichment procedures. The third major conclusion is that chromatography selection results in a selective loss of CD34bright cells, which are most likely uncommitted early progenitors. This was an unexpected finding which may be a consequence of an imbalance between the strong forces between biotin-avidin and insufficient physical manipulation for CD34+ cell release. Finally, the data document that CD34 selection alone is an inappropriate way to eliminate tumour cells due to the uncontrolled variables and the inconsistent outcome. The only products which can be expected to be purged free of tumour cells are the ones with very minimal (<10-5) contamination in the starting products, ie products documented tumour free with the most sensitive techniques for quantitation. If this is not the case, the optimal purging strategy may be a two-step procedure including CD34 selection and subsequent depletion of the tumour cells in question.

Johnson, G. (2015). "MICROPLASTIC pollution." Alive: Canada's Natural Health & Wellness Magazine(395): 103-106.

Johnston, B., et al. (2018). "The Microbial Production of Polyhydroxyalkanoates from Waste Polystyrene

Fragments Attained Using Oxidative Degradation." Polymers **10**(9): 29.

Excessive levels of plastic waste in our oceans and landfills indicate that there is an abundance of potential carbon sources with huge economic value being neglected. These waste plastics, through biological fermentation, could offer alternatives to traditional petrol-based plastics. Polyhydroxyalkanoates (PHAs) are a group of plastics produced by some strains of bacteria that could be part of a new generation of polyester materials that are biodegradable, biocompatible, and, most importantly, non-toxic if discarded. This study introduces the use of prodegraded high impact and general polystyrene (PS0). Polystyrene is commonly used in disposable cutlery, CD cases, trays, and packaging. Despite these applications, some forms of polystyrene PS remain financially and environmentally expensive to send to landfills. The prodegraded PS0 waste plastics used were broken down at varied high temperatures while exposed to ozone. These variables produced PS flakes (PS1-3) and a powder (PS4) with individual acid numbers. Consequently, after fermentation, different PHAs and amounts of biomass were produced. The bacterial strain, Cupriavidus necator H16, was selected for this study due to its well-documented genetic profile, stability, robustness, and ability to produce PHAs at relatively low temperatures. The accumulation of PHAs varied from 39% for prodegraded PS0 in nitrogen rich media to 48% (w/w) of dry biomass with the treated PS. The polymers extracted from biomass were analyzed using nuclear magnetic resonance (NMR) and electrospray ionization tandem mass spectrometry (ESI-MS/MS) to assess their molecular structure and properties. In conclusion, the PS0-3 specimens were shown to be the most promising carbon sources for PHA biosynthesis; with 3-hydroxybutyrate and up to 12 mol % of 3-hydroxyvalerate and 3-hydroxyhexanoate co-monomeric units generated.

Johnston, L., et al. (2015). "Comparing methods for ex vivo characterization of human monocyte phenotypes and in vitro responses." Immunobiology **220**(12): 1305-1310.

Monocytes are key innate effector cells and their phenotype and function may be a useful biomarker of disease state or therapeutic response. However, for such an assay to be clinically feasible it needs to be simple and reproducible, which this study aimed to address. Peripheral blood mononuclear cells (PBMC)(2) isolated from whole blood using Histopaque-1077 or cell preparation tubes (CPT) showed no difference in the ex vivo monocyte activation marker expression or in vitro responses; however, a delayed isolation using CPT significantly altered ex vivo and in vitro phenotypes and responses. Furthermore, purification of monocytes using CD14(+) microbeads resulted in a loss of CD14(low)CD16(+) monocytes compared to PBMC samples. Thus, the use of CPT reduced complexity and time compared to Histopaque, and PBMC isolation allowed the analysis of all 3 major monocyte subsets. Finally, because the delayed isolation of PBMC from CPT significantly altered monocytes, time delays should be standardized.

Jonas Germain, L. and R. C. Burns (2018). "Drinking water in West Virginia (USA): tap water or bottled water – what is the right choice for college students?" Journal of Water and Health **16**(5): 827-838.

West Virginia has had a history of water quality issues. In parallel, the world is facing a plastic pollution crisis. In order to better understand behavioral responses to perceived water quality, a survey was conducted at a major research university to ask participants about water quality perceptions and drinking water behaviors. A total of 4,188 students completed the survey during the Spring 2017 semester. Logistic regression analyses were used to predict behaviors. Results indicated that a third of the student population primarily used bottled water for drinking purposes at home, while 39% used a filter at home and 26% drank water directly from the tap. On campus, bottled water use was reported by 36% of the students, water fountain use represented 31%, and 29% of the students brought their own water with reusable cups/bottles.

Health risk perceptions, organoleptic perceptions (i.e., taste, odor, color), and environmental concern were predictors of the different behaviors. Students originally from West Virginia had a higher propensity of using bottled water. We argue that bottled water consumption should be reduced in areas where water quality is not an issue. In this sense, there is a need for education among the student population in West Virginia.

Jones, E. A., et al. (2006). "Optimization of a flow cytometry-based protocol for detection and phenotypic characterization of multipotent mesenchymal stromal cells from human bone marrow." Cytometry Part B, Clinical Cytometry **70**(6): 391-399.

BACKGROUND: To study the biology of rare bone marrow (BM) multipotent mesenchymal stromal cells (MSCs), recognized protocols are needed. Colony-forming unit-fibroblast (CFU-F) assays have historically been used for the enumeration of MSCs. However, the need to isolate and further analyze MSCs requires new strategies based on cell surface markers. The purpose of this work was to verify the phenotype of BM MSCs in vivo and to develop flow cytometry-based methods for their evaluation.

METHODS: Pre-enrichment with D7-FIB-conjugated microbeads, cell sorting for CD45low D7-FIB+ LNGFR+ cells, and CFU-F assay were used to confirm the phenotype of BM MSCs in vivo. Further phenotypic characterization of MSCs was performed using three-color flow cytometry following pre-enrichment or by direct four-color flow cytometry. The sensitivity of direct flow cytometry/rare event analysis for the accurate enumeration of MSCs was validated using 85 samples from patients with neoplastic BM diseases.

RESULTS: In normal BM, a significant correlation was found between the frequencies of CFU-Fs and CD45low D7-FIB+ LNGFR+ cells ($n = 19$, $R = 0.719$, $P = 0.001$). Following cell sorting, 15% of these cells were clonogenic. The same cells were enriched using LNGFR-based positive selection, CD45/Glycophorin A-based depletion, or plastic adherence. CD45low D7-FIB+ LNGFR+ cells expressed classic makers of cultured MSCs CD73/SH3 and CD105/SH2 and markers of stromal reticular cells CD106/VCAM and alkaline phosphatase. Novel markers were identified including leukemia inhibitory factor receptor and gp130. CD45low D7-FIB+ LNGFR+ cells were increased fourfold in the floating fat fraction of normal BM aspirates. Their frequency was decreased in chronic lymphocytic leukemia (threefold, $n = 13$, $P = 0.049$) and chronic myelogenous leukemia (ninefold, $n = 11$, $P = 0.001$) compared with that in age-matched controls ($n = 26$ and $n = 31$, respectively).

CONCLUSIONS: This study demonstrates the usefulness of flow cytometry-based methods for the detection, enumeration and further phenotypic analysis of BM MSCs. These findings have broad applications for the future evaluation of BM MSCs in health and disease.

Jones, E. A., et al. (2002). "Isolation and characterization of bone marrow multipotential mesenchymal progenitor cells." Arthritis & Rheumatism **46**(12): 3349-3360.

OBJECTIVE: There is an increased interest in rheumatology in mesenchymal progenitor/stem cells (MPCs) and their roles in rheumatic diseases, but little is known about the phenotype of these cells in vivo. The aim of this study was to isolate and characterize human bone marrow (BM) MPCs.

METHODS: Fluorescence microscopy was used to identify putative MPCs among adherent BM cells. To purify them, a positive selection with antifibroblast microbeads was used, combined with fluorescence-activated cell sorting (FACS) for microbead+,CD45(low) cells. A more detailed phenotype of these cells was determined using 4-color flow cytometry, and standard chondrogenic, osteogenic, and adipogenic assays were used to investigate their differentiation potentials.

RESULTS: Putative MPCs microscopically identified as large, fibroblast-like, D7-FIB+ cells were purified using positive selection with D7-FIB-conjugated (antifibroblast) microbeads followed by FACS for specifically bound microbead+,CD45(low) cells. These cells represented 0.01% of mononuclear cells in the BM. They were uniformly positive for CD105, LNGFR, HLA-DR, CD10, CD13, CD90, STRO-1, and bone morphogenetic protein receptor type IA (BMPRIA) and were negative for CD14, CD34, CD117, and CD133. Only cells with this phenotype could proliferate and produce adherent cell monolayers capable of chondrogenic, osteogenic, and adipogenic differentiation. D7-FIB- cells in the BM lacked any MPC activity. Uncultured skin fibroblasts had a phenotype similar to that of BM MPCs, but were negative for LNGFR, STRO-1, HLA-DR, and BMPRIA.

CONCLUSION: This study shows the distinct phenotype, morphology, and method of isolation of BM MPCs. The findings may have implications for defining the physiologic roles of MPCs in arthritis, bone diseases, and joint regeneration.

Jones, J. E., et al. (2013). "Skin grafting for venous leg ulcers." Cochrane Database of Systematic Reviews(1): CD001737.

BACKGROUND: Venous leg ulceration is a recurrent, chronic, disabling condition. It affects up to one in 100 people at some time in their lives. Standard treatments are simple dressings and compression bandages or stockings. Sometimes, despite treatment, ulcers remain open for months or years. Sometimes skin grafts are used to stimulate healing. These may be taken, or grown into a dressing, from the patient's own uninjured skin (autografts), or applied as a sheet of bioengineered skin grown from donor cells (allograft). Preserved skin from other animals, such as pigs, has also been used (xenografts).

OBJECTIVES: To assess the effect of skin grafts for treating venous leg ulcers.

SEARCH METHODS: For this update we modified the search strategies and conducted searches of The Cochrane Wounds Group Specialised Register (searched 27 July 2012); The Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2012, Issue 7); Ovid MEDLINE (2008 to July Week 3 2012); Ovid MEDLINE (In-Process & Other Non-Indexed Citations, July 26, 2012); Ovid EMBASE (2008 to 2012 Week 29); and EBSCO CINAHL (2008 to 26 July 2012). We did not apply date or language restrictions.

SELECTION CRITERIA: Randomised controlled trials (RCTs) of skin grafts in the treatment of venous leg ulcers.

DATA COLLECTION AND ANALYSIS: Two review authors independently undertook data extraction and assessment of study quality.

MAIN RESULTS: For this update of the review, we identified one new trial, bringing the total to 17 trials (1034 participants) - all of which were generally at moderate or high risk of bias. In 12 trials participants also received compression bandaging.Eleven trials compared a graft with standard care in which no graft was used. Two of these trials (102 participants) compared a dressing with an autograft; three trials (80 participants) compared frozen allografts with dressings, and two trials (45 participants) compared fresh allografts with dressings. Two trials (345 participants) compared tissue-engineered skin (bilayer artificial skin) with a dressing. In two trials (97 participants) a single-layer dermal replacement was compared with standard care.Six trials compared alternative skin grafting techniques. The first trial (92 participants) compared autografts with frozen allograft, a second (51 participants) compared a pinch graft (autograft) with porcine dermis (xenograft), the third (110 participants) compared growth-arrested human keratinocytes and fibroblasts with placebo, the fourth (10 participants) compared an autograft delivered on porcine pads with an autograft delivered on porcine gelatin microbeads, the fifth trial (92 participants) compared a meshed graft with a cultured keratinocyte autograft, and the sixth trial (50 participants) compared a frozen keratinocyte allograft with a lyophilised

(freeze-dried) keratinocyte allografts.Significantly more ulcers healed when treated with bilayer artificial skin than with dressings. There was insufficient evidence from the other trials to determine whether other types of skin grafting increased the healing of venous ulcers.
AUTHORS' CONCLUSIONS: Bilayer artificial skin, used in conjunction with compression bandaging, increases venous ulcer healing compared with a simple dressing plus compression. Further research is needed to assess whether other forms of skin grafts increase ulcer healing.

Jones, K. L., et al. (2020). "Microplastic accumulation in a Zostera marina L. bed at Deerness Sound, Orkney, Scotland." Marine Pollution Bulletin **152**: 110883.

Seagrasses have global distribution and are highly productive and economically valuable habitats. They are sensitive and vulnerable to a range of human-induced pressures, including ongoing exposure to marine litter, such as microplastic particles (<5mm). In this study, a Zostera marina bed in Deerness Sound, Orkney was selected to determine whether microplastics accumulate in seagrass beds and adhere to seagrass blades. Sediment, seagrass blade, biota and seawater samples were collected. 280 microplastic particles (0.04 to 3.95mm (mean=0.95mm+/-0.05 SE)) were observed in 94% of samples collected (n=111). These were visually categorised into type (fibre, flake, fragment) and colour, and 50 were successfully identified as plastic using ATR-FTIR. Fibres contributed >50% of the total microplastics observed across all samples. This is the first known study on Z. marina to describe microplastic loading within a seagrass bed and to identify microplastic adherence to seagrass blades.

Jones, P. H., et al. (1974). "Biodegradability of photodegraded polymers. I. Development of experimental procedures." Environmental Science and Technology **8**(10): 919-923.

Methods have been developed to study the biological oxidation of plastic fragments in natural soils and sewage sludge using a modification of the conventional Warburg apparatus. Rates of biodegradation are estimated from the consumption of oxygen under carefully controlled conditions. Whereas high molecular weight plastic particles are shown to be resistant to biodegradation, degraded branched polyethylene and polypropylene show significant rates of oxidation in both environments. Degraded polystyrene appears to be more resistant to microbial attack.

Jones, P. H., et al. (1974). "Biodegradability of Photodegraded Polymers: 1. Development of Experimental Procedures." Environmental Science & Technology **8**(10): 919.

Methods are developed for studying the biological oxidation of plastic fragments in natural soils and sewage sludge using a modification of the conventional warburg apparatus. Biodegradation rates are estimated from oxygen consumption under carefully controlled conditions. High-molecular-weight plastic particles are shown to be resistant to biodegradation, degraded branched polyethylene and polypropylene show significant oxidation rates, and degraded polystyrene seems to be more resistant to microbial attack.

Joo, S. H. (2007). Synthesis and screening of support-bound combinatorial cyclic peptide and free carbon-terminal peptide libraries.

One-bead one-compound (OBOC) peptide libraries have been useful tools in the biomedical sciences. However, OBOC peptide libraries usually display the N-termini of peptides on the surface as conventional solid phase peptide synthesis proceeds in the C to N direction. While large combinatorial libraries of cyclic peptides can be synthesized by the split-and-pool synthesis method, the sequence determination has been a challenge. Also, peptide libraries with free C-termini face the same problem as well as the difficulty of synthesis in the N to C direction. We report here the development of cyclic peptide libraries and C-terminal peptide libraries for high-throughput screening and sequencing. TentaGel microbeads (90 mu m) were spatially segregated into outer and inner layers; cyclic peptides were displayed on the bead surface, whereas the inner core of each bead contained the corresponding linear encoding peptide. After screening of the cyclic peptide library, the identity of hit peptides was determined by sequencing the linear encoding peptides using a partial Edman degradation/mass spectrometry method. Using the same spatial segregation approach peptides were synthesized in the conventional C to N direction, with their C-termini attached to the support through an ester linkage on the bead surface but through an amide bond in the inner layer. The surface peptides were cyclized between N-terminal amine and a carboxyl group installed at a C-terminal linker sequence, while the internal peptides stayed in the linear form. Base hydrolysis of the ester linkage in the cyclic peptides exposed a free alpha -carboxyl group at the C-termini of the peptides attached to the resin via the N-termini. An inverted peptide library containing five random residues was synthesized and screened for binding to PDZ domains. The identity of the binding peptides was determined from the encoding peptides. Consensus recognition motifs were identified for the PDZ domains and representative peptides were individually synthesized and confirmed for binding to their cognate PDZ domains. These methods expanded the utility of OBOC peptide libraries by displaying peptides in different ways.

Jordan, D. R. (2003). "Soft-tissue fillers for wrinkles, folds and volume augmentation." Canadian Journal of Ophthalmology **38**(4): 285-288.

Hyaluronic acid gels, with or without dextran beads, and collagen with suspended PMMA microbeads are exciting new soft-tissue fillers that are becoming increasing popular for facial rejuvenation. Each material provides wrinkle reduction, contour improvement and volume augmentation when placed into lines and furrows or when used for lip augmentation. The duration of action varies from 6 months to permanent, depending on the product. [References: 17]

Joshi, C., et al. (2019). "A perspective on a locally managed decentralized circular economy for waste plastic in developing countries." Environmental Progress & Sustainable Energy **38**(1): 3-11.

Unsound post-consumer disposal is the primary pathway of plastic into the ecosystem. One way of addressing this problem is through the establishment of a circular economy for plastic. Much of the unsound disposal comes from economically disadvantaged regions where waste disposal and recycling infrastructure is limited. In economically disadvantaged regions however, the establishment of a circular economy for plastic must be locally managed and decentralized, meaning that the disposal, collection, remanufacture, and use must all occur within the same community. We suggest that waste plastic abatement strategies must be targeted to reduce, reuse, and recycle plastic waste onsite at the local level, initiating a circular economy appropriate for infrastructure limited regions. Technologies for recycling plastic must be low cost, economically viable, socially acceptable, and not adversely impact the environment, and also produce a product that has a ready local market. This is critical because unless proposed solutions are also economically viable and socially appropriate, they are unlikely to be successful, especially in underdeveloped regions. Using big data analysis, a metric for identifying countries that will have the most potential to benefit from a locally managed decentralized circular economy for plastic has been developed. The information obtained from this metric will help researchers and policy makers promote a locally managed decentralized circular economy of plastic for managing the accumulation of waste on land and its eventual migration into waterways. Additionally, we present a case study of a proposed locally managed decentralized

waste plastic abatement strategy in the municipal solid waste infrastructure limited country of Uganda. © 2018 American Institute of Chemical Engineers Environ Prog, 38: 3–11, 2019 [ABSTRACT FROM AUTHOR]

Jouet, E., et al. (2017). "Let us resuscitate our waste." Annals of Intensive Care **7 (1 Supplement 1)**: 181-182.

Introduction The healthcare activity is recognized as a major polluting activity. In France, it generates 800,000 tons of waste cremated each year, and represents 12% of the tertiary energy consumptions. In the United States, it generates 7000 tons of waste per day and 7% of total CO<inf>2</inf> emissions in 2007 were attributed to him. Ultimately, such waste production is associated with adverse environmental and health effects. Nevertheless, near half of the hospital waste would be recyclable, particularly in our intensive care units (ICU) [1]. Furthermore, sustainable development solutions generate profts. The aim of this study is to make an overview of waste produced in a ICU and offer solutions to conserve natural resources and reduce the carbon footprint bound to the healthcare activity. Materials and methods Experimental study, single-center, concerning a period of 6 months in an ICU-high surveillance unit compound of 16 beds. We have identifed all waste generated. Our packaging were given to the recycling company in connection with the hospital. Then we have studied the impact of the implementation of sustainable development solutions. Results Firstly, we have studied the non-recycled waste and the quantity produced over a period of 1 month. Approximately 8 kg of waste is produced per patient per day with 45% of infectious waste and 55% of general waste. These results were linked with a bad distribution of garbage bags in the rooms (130 L of infectious waste versus 50 L of general waste). Secondly, we have improved our way to sort and consume and we have created recycling dies without compromising patient safety. All these measures have not increased workload. Changing bags in the rooms (20 L of infectious waste and 2 bags of 50 L of general waste) allowed to reach the normal goals of 2 sectors with a net beneft estimated at 4500 euros per year. The medical broken glass containing drugs was thrown into plastic containers of 5 L for infectious waste to prevent the risk of cuts. By creating a specifc die intended to the general waste, we could quantify the production of this glass to 10 kg per week and to spare the use and the incineration of 350 containers of 5 L per year (global economy of 1000 euros). Plastic packaging represented an important proportion of the cremated waste. We have created 3 sectors of recycling including the polypropylene (80-200 kg per month), the polyethylene colorless and colored polyethylene. This plastic is sold to be recycled without additional cost for the hospital. The linerboards was cremated. We have created a recycling die (50 kg per month). This sector was subsequently extended to the entire hospital structure, particularly the pharmacy that produces 12 containers of 400 L per month. They are now sold without additional cost. Many unnecessary plastic waste is generated daily. We have removed using mild soap plastic bottles of 30 ml by using the same mild soap in pump of 500 ml (economy of 1000 euros). The use of 100 L plastic bags for the transitional deposit of linen has been deleted (economy of 450 euros). Concerning the paper: 100% of the impressions were made in simplex. Printers were parametrized on both sides by default allowing the economy of 60 reams per year (30,000 sheets), several thousand liters of water and the reduction of CO 2 emissions. Discussion Recycling is only one component of the sustainable development in health. Other avenues that could be considered to improve ICU sustainability would include examining water use (for linen), electricity use (reducing non-essential use at night). Beyond these actions, we need to encourage our suppliers to turn to sustainable and recyclable packages to reduce the use of polluting and depletable fossil fuels such as oil. But also to develop with them circular economies where waste is returned to them to be reused. Conclusion We must ask the question also resuscitate our tons of waste. Our ICU produce large quantities of waste (over 2 tons per year per bed). However, a signifcant proportion, especially plastic, is recyc able with a signifcant environmental and fnancial beneft. Waste management also requires an optimal and rational use of supplies because "the best waste is that which is not producedTM and that excess is not a guarantee of quality. As already said St Exupery in 1939: "We do not inherit the Earth from our parents, we borrow it from our children.TM So do not expect tomorrow to reduce major adverse ecological impact paradoxically generated by a great profession whose ultimate goal is to cure people.

Jovanović, B. (2017). "Ingestion of microplastics by fish and its potential consequences from a physical perspective." Integrated Environmental Assessment & Management **13**(3): 510-515.

ABSTRACT The European Marine Strategy Framework Directive and the United States Microbead Free Waters Act are credited for being ambitious in their goals for protecting the marine environment from microplastics pollution. As a result, the microplastic pollution of marine environments and the incidence of microplastic ingestion by fish is rapidly receiving an increase in overdue attention. This commentary summarizes recent discoveries regarding the potential negative effects of micro- and nanoplastic ingestion by fish. Analysis shows that the occurrence of microplastics in the gastrointestinal tract of fish is ephemeral, with low accumulation potential in the gastrointestinal tract, although translocation to the liver may occur. Nevertheless, the total load of micro- and nanoplastics that will pass through the gastrointestinal tract of a fish in its lifetime is likely high and will keep increasing in the future. This may pose a risk because there is evidence that micro- and nanoplastic ingestion can interfere with fish health. Observed effects of microplastics ingestion include (but are not necessarily limited to) intestinal blockage, physical damage, histopathological alterations in the intestines, change in behavior, change in lipid metabolism, and transfer to the liver. Integr Environ Assess Manag 2017;13:510-515. © 2017 SETAC [ABSTRACT FROM AUTHOR]

Jovanovic, B., et al. (2018). "Virgin microplastics are not causing imminent harm to fish after dietary exposure." Marine Pollution Bulletin **130**: 123-131.

Among aquatic organisms, fish are particularly susceptible to ingesting microplastic particles due to their attractive coloration, buoyancy, and resemblance to food. However, in previous experimental setups, fish were usually exposed to unrealistically high concentrations of microplastics, or the microplastics were deliberately contaminated with persistent organic chemicals; also, in many experiments, the fish were exposed only during the larval stages. The present study investigated the effects of virgin microplastics in gilt-head seabream (Sparus aurata) after 45 days' exposure at 0.1 g kg⁻¹ bodyweight day⁻¹ to 6

common types of microplastics. The overall growth, biochemical analyses of the blood, histopathology, and the potential of the microplastics to accumulate in gastrointestinal organs or translocate to the liver and muscles were monitored and recorded. The results revealed that ingestion of virgin microplastics does not cause imminent harm to the adult gilt-head seabream during 45 days of exposure and an additional 30 days of depuration. The retention of virgin microplastics in the gastrointestinal tract was fairly low, indicating effective elimination of microplastics from the body of the fish and no significant accumulation after successive meals. Therefore, both the short- and the long-term retention potential of microplastics in the gastrointestinal tract of fish is close to zero. However, some large particles remained trapped in the liver, and 5.3% of all the livers analyzed contained at least one microplastic particle. In conclusion, the dietary exposure of S. aurata to 6 common types of virgin microplastics did not induce stress, alter the growth rate, cause pathology, or cause the microplastics to accumulate in the gastrointestinal tract of the fish.

Jovanovic, Z., et al. (2012). "In vitro investigation of cytotoxicity and antimicrobial activity of silver/alginate nanocomposite microbeads." Journal of Tissue Engineering and Regenerative Medicine **1)**: 218.

Biomaterials are often used as carriers or matrixes in different medical applications, which usually demand the use of multifunctional materials meeting the requirements of their purpose without being harmful to the surrounding tissue. Here, silver/alginate nanocomposite microbeads were obtained using electrochemical synthesis of silver nanoparticles in alginate solution at constant current density of 50 mA/cm-2, followed by electrostatic extrusion of synthesized Ag/alginate colloid solution. In vitro determination of Ag/alginate microbeads cytotoxicity against immunocompetent peripheral blood mononuclear cells (PBMC) was performed by MTT test. In order to investigate the antimicrobial activity against E. coli and S. aureus using the test in suspension, Ag/ alginate microbeads were synthesized so to have Ag concentration equal to that without cytotoxic effects against PBMC. The presence of Ag/alginate microbeads having 1 mM AgNO3 in the initial solution for synthesis and less decreased the PBMC survival up to 59.04 +/- 35.45%. Higher concentrations of nanosilver in Ag/alginate microbeads induced pronounced decrease in PBMC survival. Ag/alginate microbeads obtained from initial Ag/alginate colloid solution with 1 mM AgNO3 significantly decreased the bacterial colonies count of E. coli and S. aureus comparing to the control sample for 2 and 3 orders of magnitude, respectively. This work has shown potentials for biomedical applications of Ag/alginate nanocomposite microbeads.

Jowett, E. C. and M. L. McMaster (1995). "On-site wastewater treatment using unsaturated absorbent biofilters." Journal of Environmental Quality **24**(1): 86-95.

A new type of single-pass aerobic biofilter is being developed as an alternative to the conventional septic tile bed and for treatment of wastewater in general. The Waterloo Biofilter uses absorbent filter media that combine long retention times, separate flowpaths for wastewater and air, and large surface areas, thereby enabling loading rates 10 times greater than that for solid particle filter media. Although absorbent sphagnum peat and coarse sand plug readily at loading rates of 50 to 80 cm d⁻¹, absorbent plastic particles provide consistent treatment with no plugging problems. The latest field trial removes 97.8% BOD<inf>7</inf>, 96.1% TSS, and 99.5% fecal coliform bacteria with 12 to 16degreeC wastewater loaded at 49 cm d⁻¹. Surge flows up to 204 cm d⁻¹ over several days are handled with little effect on effluent quality. In laboratory column experiments, removal of fecal coliforms averages >99.99% at 80 cm d⁻¹ loading, and >99.999% at

10 cm d⁻¹ after a 10- to 14-d acclimatization period. Ammonium is thoroughly oxidized to NO<inf>3</inf>/⁻ with typically <2.5 mg L⁻¹ NH<inf>4</inf>/⁺-N in the effluent. Overall treatment improves with forced air flow compared with natural convection. Cold influent and plugging by freezing are the main causes of poor treatment. A typical household would likely require a biofilter with 3.3-m² surface area in cold climates when flow is balanced, possibly less in warmer areas. This biofilter should also find general application in renovating polluted water, including water for domestic consumption in developing regions of the world.

Ju, H., et al. (2019). "Effects of polyethylene microplastics on the gut microbial community, reproduction and avoidance behaviors of the soil springtail, Folsomia candida." Environmental Pollution **247**: 890-897.
Microplastics (MPs) are an emerging contaminant and are confirmed to be ubiquitous in the environment. Adverse effects of MPs on aquatic organisms have been widely studied, whereas little research has focused on soil invertebrates. We exposed the soil springtail Folsomia candida to artificial soils contaminated with polyethylene MPs (<500 micro m) for 28 d to explore the effects of MPs on avoidance, reproduction, and gut microbiota. Springtails exhibited avoidance behaviors at 0.5% and 1% MPs (w/w in dry soil), and the avoidance rate was 59% and 69%, respectively. Reproduction was inhibited when the concentration of MPs reached 0.1% and was reduced by 70.2% at the highest concentration of 1% MPs compared to control. The half-maximal effective concentration (EC₅₀) value based on reproduction for F. candida was 0.29% MPs. At concentrations of 0.5% dry weight in the soil, MPs significantly altered the microbial community and decreased bacterial diversity in the springtail gut. Specifically, the relative abundance of Wolbachia significantly decreased while the relative abundance of Bradyrhizobiaceae, Ensifer and Stenotrophomonas significantly increased. Our results demonstrated that MPs exerted a significant toxic effect on springtails and can change their gut microbial community. This can provide useful information for risk assessment of MPs in terrestrial ecosystems.

Judy, J. D., et al. (2019). "Microplastics in municipal mixed-waste organic outputs induce minimal short to long-term toxicity in key terrestrial biota." Environmental Pollution **252**(Part A): 522-531.
Sustainable alternatives to landfill disposal for municipal mixed wastes represents a major challenge to governments and waste management industries. In the state of New South Wales (NSW) Australia, mechanical biological treatment (MBT) is being used to reduce the volume and pathogen content of organic matter isolated from municipal waste. The product of this treatment, a compost-like output (CLO) referred to as mixed waste organic output (MWOO), is being recycled and applied as a soil amendment. However, the presence of contaminants in MWOO including trace organics, trace metals and physical contaminants such as microplastic fragments has raised concerns about potential negative effects on soil health and agriculture following land application. Here, we used multiple lines of evidence to examine the effects of land application of MWOO containing microplastics in three soils to a variety of terrestrial biota. Treatments included unamended soil, MWOO-amended soil and MWOO-amended soil into which additional high-density polyethylene (HDPE), polyethylene terephthalate (PET), or polyvinyl chloride (PVC) microplastics were added. Tests were conducted in soil media that had been incubated for 0, 3 or 9 months. Addition of microplastics had no significant negative effect on wheat seedling emergence, wheat biomass production, earthworm growth, mortality or avoidance behaviour and nematode mortality or reproduction compared to controls. There was also little evidence the microplastics affected microbial community diversity, although measurements of microbial community structure were highly variable with no clear trends.

Julienne, F., et al. (2019). "From macroplastics to microplastics: Role of water in the fragmentation of polyethylene." Chemosphere **236**: 124409.

In this work, the artificial photodegradation of polyethylene films was studied in laboratory to compare the fragmentation pathways of this polymer at air and in water. Oxidation, surface mechanical properties, crystallinity and crack propagation were monitored to investigate their influence on fragmentation. Without any external stress, fragmentation only occurred in water despite a higher level of oxidation for films weathered at air. The cracking of the films did not appear correlated with the oxidation level and the presence of water appeared as a promoter of cracking propagation. The results also showed that the mechanical properties at the surface play a major role in the fragmentation pathway whereas the fabrication process may influence the propagation direction of the cracks. Consequently, the distribution in size of plastic fragments in the aquatic environment may be linked to the nature of the polymer but also to its manufacturing process. In this study, after 25 weeks of weathering in water, 90% of the fragments were >1mm with very similar shapes showing that micrometric fragments were not yet abundant. These results suggest that long times of weathering in water and many steps of fragmentation appear necessary from macroplastics to reach sizes <1mm in the aquatic environment. These results constitute a first attempt to understand the pathways leading from macroplastics to microplastics in water. They have to be confirmed for other polymers and the long-term behavior of the fragments needs to be studied to predict their decrease in size among time.

Jun, B. H., et al. (2012). "Fluorescence-based multiplex protein detection using optically encoded microbeads." Molecules **17**(3): 2474-2490.

Potential utilization of proteins for early detection and diagnosis of various diseases has drawn considerable interest in the development of protein-based multiplex detection techniques. Among the various techniques for high-throughput protein screening, optically-encoded beads combined with fluorescence-based target monitoring have great advantages over the planar array-based multiplexing assays. This review discusses recent developments of analytical methods of screening protein molecules on microbead-based platforms. These include various strategies such as barcoded microbeads, molecular beacon-based techniques, and surface-enhanced Raman scattering-based techniques. Their applications for label-free protein detection are also addressed. Especially, the optically-encoded beads such as multilayer fluorescence beads and SERS-encoded beads are successful for generating a large number of coding.

Jung, I., et al. (2014). "A dip-stick type biosensor using bioluminescent bacteria encapsulated in color-coded alginate microbeads for detection of water toxicity." Analyst **139**(18): 4696-4701.

The use of genetically engineered bioluminescent bacteria, in which bioluminescence is induced by different modes of toxic action, represents an alternative to acute toxicity tests using living aquatic organisms (plants, vertebrates, or invertebrates) in an aqueous environment. A number of these bacterial strains have been developed, but there have been no attempts to develop a hand-held type of biosensor for monitoring or identification of toxicity. We report a facile dip-stick type biosensor using genetically engineered bioluminescent bacteria as a new platform for classification and identification of toxicity in water environments. This dip-stick type biosensor is composed of eight different optically color-coded functional alginate beads that each encapsulates a different bioluminescent bacterial strain and its corresponding fluorescent microbead. These color-coded microbeads exhibit easy identification of encapsulated microbeads, since each microbead has a different color code depending on the bioluminescent bacterial strain contained and improved cell-stability compared to liquid culture. This dip-stick type biosensor can discriminate different modes of toxic actions (i.e. DNA damage, oxidative damage, cell-membrane damage, or protein damage) of sample water tested by simply dipping the stick into the water samples. It was found that each color-coded microbead emitted distinct bioluminescence, and each dip-stick type biosensor showed different bioluminescence patterns within 2 hours, depending on the toxic chemicals contained in LB medium, tap water, or river water samples. This dip-stick type biosensor can, therefore, be widely and practically used in checking toxicity of water in the environment primarily in situ, possibly indicating the status of biodiversity.

Jung, J., et al. (2019). "Valorization of sewage sludge via non-catalytic transesterification." Environment International **131**(105035).

To seek a way to valorize sewage sludge (SS), it was chosen as a raw material for biodiesel production. As such, non-catalytic transesterification of dried SS was carried out, to enhance its value. Note that picking a waste material such as SS as an inexpensive lipid feedstock for biodiesel production, without lipid extraction, greatly increases the economic viability of biodiesel. Also, to enhance biodiesel sustainability, ethanol (EtOH) was employed as the acyl acceptor, in this study, and this was experimentally justified by results showing that employing EtOH as an acyl acceptor provided an effective means for compensating for the lower heating value arising from the large amount of palmitic (C₁₆) acid in SS. This study experimentally proved that the fatty acid ethyl ester (FAEE) yield at 380 degrees C reached up to 13.33 wt% of dried SS. Given that the lipid content of dried SS is 14.01+or-0.64 wt%, the FAEE yield of 13.33 wt% implied that 95.14 wt% of lipid in dried SS had been converted into FAEEs. The introduced SS valorization in this study offered an excellent opportunity to address diverse environmental hazards arising from SS and associated emerging contaminants. Given that the optimal temperature for the non-catalytic conversion for biodiesel production from SS was found to be 380 degrees C, emerging contaminants, such as microplastics and antimicrobials, were simultaneously degraded, due to their inferior thermal stabilities. Lastly, considering that the introduced biodiesel conversion process is thermally induced, the SS reside after the biodiesel conversion process can be further used in thermo-chemical processes as raw materials for gasification and pyrolysis (future work).

Jungnickel, H., et al. (2016). "Time-of-flight secondary ion mass spectrometry (ToF-SIMS)-based analysis and imaging of polyethylene microplastics formation during sea surf simulation." Science of the Total Environment **563-564**: 261-266.

Plastic particles smaller than 5mm, so called microplastics have the capability to accumulate in rivers, lakes and the marine environment and therefore have begun to be considered in eco-toxicology and human health risk assessment. Environmental microplastic contaminants may originate from consumer products like body wash, tooth pastes and cosmetic products, but also from degradation of plastic waste; they represent a potential but unpredictable threat to aquatic organisms and possibly also to humans. We investigated exemplarily for polyethylene (PE), the most abundant constituent of microplastic particles in the environment, whether such fragments could be produced from larger pellets (2mmx6mm). So far only few analytical methods exist to identify microplastic particles smaller than 10mum, especially no imaging mass spectrometry technique. We used at first time-of-flight secondary ion mass spectrometry (ToF-SIMS) for analysis and imaging of small PE-microplastic particles directly in the model system Ottawa sand during exposure to sea surf simulation. As a prerequisite, a method for identification of PE was established by identification of characteristic ions for PE out of an analysis of grinded polymer samples. The method was applied onto Ottawa sand in order to investigate the influence of simulated environmental conditions on particle transformation. A severe degradation of the primary PE pellet surface, associated with the transformation of larger particles into smaller ones already after 14days of sea surf simulation, was observed. Within the subsequent period of 14days to 1month of exposure the number of detected smallest-sized particles increased significantly (50%) while the second smallest fraction increased even further to 350%.

Jun-Kit, W., et al. (2018). "Distribution of Microplastics and Nanoplastics in Aquatic Ecosystems and Their Impacts on Aquatic Organisms, with Emphasis on Microalgae." Reviews of Environmental Contamination & Toxicology **246**: 133-158.

Jurischka, C., et al. (2019). "Tyramide signal amplification as universal detection method on protein coated microbeads." Journal of Cellular Biotechnology **4**(1-2): 15-22.

Quantitative analysis of a target molecule in a microbead-based fluorescent assay requires a specific labeling procedure. For nucleic acid analysis the hybridization with florescent labeled oligonucleotides is the most common method. However, disadvantages are the necessity for direct labeling of probes and the sensitivity to detect low amounts of target molecules. In this study we established an alternative detection method for biomolecules on microbeads, the tyramide signal amplification (TSA). Hereby, biomolecules are detected by enzymatically activated and fluorophore-conjugated tyramides that bind to specific protein residues. This method has proven to be a versatile and robust enzyme amplification technique for sensitive immunohistochemical detection. Now, we present the feasibility of the TSA procedure to detect hybridized biotinylated oligonucleotide probes bound to protein coated microbead surfaces TSA was performed using fluorescent, sizeencoded and streptavidin coated microbeads that were loaded with dual-biotinylated DNA capture probes, prepared from polymerase chain reaction. Beside streptavidin alone for surface coating of those microbeads, we applied different quantities of streptavidin in combination with bovine serum albumin, immunoglobulin G or Protein G/A, to check for positive effects on the resulting signal intensities through specific binding of tyramide molecules. For this method, streptavidin turned out as appropriate protein for the surface binding, without the need for further molecules. In comparison to a standard detection with common streptavidin-fluorophore-conjugates TSA showed its advantage in the detection of low probe amounts down to a concentration of 3.310-4 ng/L. Copyright © 2019 IOS Press.

Kaartinen, T., et al. (2017). "Low interleukin-2 concentration favors generation of early memory T cells over effector phenotypes during chimeric antigen receptor T-cell expansion." Cytotherapy **19**(6): 689-702.

BACKGROUND: Adoptive T-cell therapy offers new options for cancer treatment. Clinical results suggest that T-cell persistence, depending on T-cell memory, improves efficacy. The use of interleukin (IL)-2 for in vitro T-cell expansion is not straightforward because it drives effector T-cell differentiation but does not promote the formation of T-cell memory. We have developed a cost-effective expansion protocol for chimeric antigen receptor (CAR) T cells with an early memory phenotype.

METHODS: Lymphocytes were transduced with third-generation lentiviral vectors and expanded using CD3/CD28 microbeads. The effects of altering the IL-2 supplementation (0-300 IU/mL) and length of expansion (10-20 days) on the phenotype of the T-cell products were analyzed.

RESULTS: High IL-2 levels led to a decrease in overall generation of early memory T cells by both decreasing central memory T cells and augmenting effectors. T memory stem cells (T_{SCM}, CD95⁺CD45RO⁻CD45RA⁺CD27⁺) were present variably during T-cell expansion. However, their presence was not IL-2 dependent but was linked to expansion kinetics. CD19-CAR T cells generated in these conditions displayed in vitro antileukemic activity. In summary, production of CAR T cells without any cytokine supplementation yielded the highest proportion of early memory T cells, provided a 10-fold cell expansion and the cells were functionally potent.

DISCUSSION: The number of early memory T cells in a T-cell preparation can be increased by simply reducing the amount of IL-2 and limiting the length of T-cell expansion, providing cells with potentially higher in vivo performance. These findings are significant for robust and cost-effective T-cell manufacturing.

Kacemi, A., et al. (1996). "Culture of endothelial cells from human placental microvessels." Cell & Tissue Research **283**(2): 183-190.

Endothelial cells are known to participate in angiogenesis, adaptation of vascular tonus and maintenance of blood fluidity in the microcirculation. To investigate these functions in the placenta, we devised a method of isolation and culture of endothelial cells from villous microvessels. In primary culture, these intraplacental endothelial cells exhibited many features observed in microvascular endothelium from other organs: spindle-shape, rosette associations, circular arrangements and confluence. In contrast to the confluent endothelial cells derived from the umbilical vein, cells from microvessels did not form a cobblestone network. After trypsin digestion of microvessels, magnetic microbeads coated with S-Endol immunoglobulin, antithrombomodulin and Ulex europaeus-I lectins were tested for sorting endothelial cells. Only the microbeads coated with antithrombomodulin allowed a suitable magnetic cell separation after trypsinization. By contrast, the microbeads coated with each of these antibodies or with lectins attached to confluent cells from the second passage. The microbeads detached from the cells at different rates. Their examination by scanning microscopy indicates that a portion of these microbeads was phagocytosed. Microvascular endothelial cells from the second passage were intensively stained by the anti-von Willebrand reaction and only weakly by the anti-smooth muscle alpha-actin reaction. They incorporated acetylated-low density lipoproteins coupled to a fluorescent probe. The positive reactions against the anti-von Willebrand factor and the uptake of the fluorescent acetylated-low density lipoproteins were modified after eight passages.

Kadiombo, T. A., et al. (2016). "Glomerular chemokine expression in murine lupus nephritis." International Journal of Rheumatic Diseases **19 (Supplement 2)**: 18.

Background/Purpose: Although chemokines are thought to play a crucial role in recruiting inflammatory cells to local diseased sites, little is known about profiles of glomerular chemokine expression in lupus nephritis. The objective of the current study is to explore the profiles of chemokine gene expression in isolated glomeruli from lupus-prone mice and to examine their relationship with infiltrating inflammatory cells and glomerular damages. Method(s): Glomerular expressions of CCL-2, CCL-5, and CXCL-10, which are potent chemotractants for T cells and monocytes, were examined with real-time polymerase chain reaction after purifying glomeruli using the magnetic microbead method from lupus-prone MRL/lpr mice and control MRL/+ mice. Infiltrating T-cells and monocytes in glomeruli were detected by immunohistochemistry using anti-CD3 and F4/80 antibodies, respectively. Histologic glomerular damages were scored semi-quantitatively. Result(s): The number of infiltrating T cells and monocytes and chemokine expressions in glomeruli of MLR/lpr mice significantly increased with age. Among the parameters examined, glomerular damage score was significantly correlated with number of monocytes, T-cells, and the expression level of glomerular CCL-2 ($r = 0.745$, $P = 0.002$; $r = 0.730$, $P < 0.001$; $r = 0.513$, $P = 0.012$, respectively). There was no correlation between damage score and CCL- 5 or CXCL-10. Of note, number of infiltrating monocytes was highly correlated with glomerular CCL-2 ($r = 0.865$, $P < 0.001$). Conclusion(s): Our data suggest that glomerular infiltrating T cells, monocytes and CCL-2 might have a potential role in glomerular damage of lupus-prone mice. (Figure Presented).

Kadish, A. H. (1947). "Coagulation of the blood in lusteroid tubes: A study of normal persons and patients with arterial or venous thrombosis." American Heart Journal **34**(2): 212-224.

The clotting time of whole blood in lusteroid (a synthetic plastic resin) tubes was studied in an effort to find a means of estimating an acceleration of the clotting process. The technique employed was essentially the standard Lee-White procedure; paraffined syringes and needles were used. The end-point was inversion of the tube without displacing the clot, tested at 30-second intervals. According to this test the time for 50 normal persons 18 to 40 years of age averaged 19 minutes with a range of 14 to 28 minutes. Different batches of lusteroid tubes give significantly different times and this may account for the lack of agreement on 'normal' clotting time in 'lusteroid' tubes. It also appears that tube diameter is a very important factor when the end-point is determined by inverting the tube. The coagulation time of the blood of 18 patients with arteriosclerosis obliterans was shorter than normal in nine cases; three of ten patients with thrombo-angiitis obliterans and eight of eleven patients with thrombophlebitis showed shorter times. The frequency of shortened times was greater with lusteroid tubes than with glass tubes. The data are too few for the statistical analysis called for in view of overlap of control and diseased ranges.

Kadleck, C. (2010). "U.S. PET recycling rate rises by 1% for 2009." Waste & Recycling News **16**(14): 12-12.

The article reports that the recycling rate of polyethylene terephthalate containers increased in 2009. According to the National Association for PET Container Resources and the Association of Postconsumer Plastic Recyclers, the recycling rate has increased for the sixth time in the U.S., consecutively. It mentions that recycled PET was used in several applications including strapping, food containers, and carpets.

Kain, E. C., et al. (2016). "Plastic ingestion by Newell's (Puffinus newelli) and wedge-tailed shearwaters (Ardenna pacifica) in Hawaii." Environmental science and pollution research international **23**(23): 23951-23958.

The ingestion of plastic by seabirds has been used as an indicator of pollution in the marine environment. On Kaua'i, HI, USA, 50.0 % of Newell's (Puffinus newelli) and 76.9 % of wedge-tailed shearwater (Ardenna pacifica) fledglings necropsied during 2007-2014 contained plastic items in their digestive tract, while 42.1 % of adult wedge-tailed shearwaters had ingested plastic. For both species, the frequency of plastic ingestion has increased since the 1980s with some evidence that the mass and the number of items ingested per bird have also increased. The color of plastic ingested by the shearwaters was assessed relative to beach-washed plastics by using Jaccard's index (where $J = 1$ complete similarity). The color ($J = 0.65$-0.68) of items ingested by both species, and the type ingested by wedge-tailed shearwaters ($J = 0.85$-0.87), overlapped with plastic available in the local environment indicating moderate selection for plastic color and type. This study has shown that the Hawaiian populations of shearwaters, like many seabird species, provide useful but worrying insights into plastic pollution and the health of our oceans.

Kairesalo, T. and S. Penttila (1990). "Effect of Light and Water Flow on the Spatial Distribution of Littoral Bosmina longispina Leydig (Cladocera)." Internationale Vereinigung fuer Theoretische und Angewandte Limnologie. Verhandlungen IVTLAP, Vol. 24, No. 1, p 682-687, September 1990. 5 fig, 17 ref.

The zooplankton community within the littoral macrophyte zone of lakes is often extremely patchy and subject to dramatic fluctuations in both abundance and species composition. Predation, food limitations and exploitative competition have been considered the key factors in influencing the spatial distribution of cladoceran zooplankton, but the importance of physical factors has seldom been evaluated. The response of Bosmina longispina to different flow velocities and light was investigated in the laboratory at room temperature (22 C) in flow-through tubes. Flow rates in the water were measured as the speed of small, light, submerged plastic particles. Field studies were carried out in the littoral zone of Lake Paajarvi. Diel fluctuations in the distribution and patchiness of Bosmina populations within the macrophytic vegetation was studied by taking water samples from 6 sampling points with a 100 ml plastic syringe connected to a 1 m wooden pole. In the aquarium , Bosmina moved towards a light spot of 10 to 20 microE/sq m/sec , but no distinct and stable swarm developed until the light intensity was 90 to 100 microE/sq m/sec. The Bosmina could resist flows up to 2 cm/sec, but when the flow exceeded 2.5 cm/sec all the animals were carried away by the throughflow water. Field experiments supported the hypothesis that light controls the swarming behavior of Bosmina in littoral water. Bright light enhances algal production and hence also increases food availability for cladocerans. Orientation towards light, together with enhanced grazing, can be understood as a behavioral adaptation for food seeking. The results suggest that diel and seasonal changes in the intensity and direction of light and ambient water flows may largely control the distribution of littoral Bosmina, and therefore, those environmental variables should be taken into consideration when designing a sampling program for littoral cladocerans, and when interpreting the results. (Brunone-PTT)

Kajiwara, H., et al. (2016). "Immobilized sialyltransferase fused to a fungal biotin-binding protein: Production, properties, and applications." Journal of Bioscience & Bioengineering **121**(4): 390-393.

A beta-galactoside alpha2,6-sialyltransferase (ST) from the marine bacterium Photobacterium sp. JT-ISH-224 with a broad acceptor substrate specificity was fused to a fungal biotin-binding protein tamavidin 2 (TM2) to produce immobilized enzyme. Specifically, a gene for the fusion protein, in which ST from Photobacterium sp. JT-ISH-224 and TM2 were connected via a peptide linker (ST-L-TM2) was constructed and expressed in Escherichia coli. The ST-L-TM2 was produced in the soluble form with a yield of approximately 15,000 unit/300 ml of the E. coli culture. The ST-L-TM2 was partially purified and part of it was immobilized onto biotin-bearing magnetic microbeads. The immobilized ST-L-TM2 onto microbeads could be used at least seven consecutive reaction cycles with no observed decrease in enzymatic activity. In addition, the optimum pH and temperature of the immobilized enzyme were changed compared to those of a free form of the ST. Considering these results, it was strongly expected that the immobilized ST-L-TM2 was a promising tool for the production of various kind of sialoligosaccharides.

Kakaei, K. and A. R. Bakhtiari (2018). "Investigating the impact of Hamedan landfill on groundwater and soil." Journal of Water and Soil Science **22**(1): e87-Pe96.

Landfill sites are one of the most important sources of contaminant entry to the environment. In this research, the concentrations of Cu, Pb, Ni, Cd, and organic compound BPA in Hamadan

landfill were evaluated to determine the status of its burial environment in 2014. Seven water samples (2 samples from spring and 5 samples from well), 2 leachate samples and 15 soil samples were collected from Hamadan landfill. Evaluation of the concentrations of Cu, Pb, Ni, Cd and the organic compound BPA was done by atomic absorption and gas chromatography with mass spectrometry. The concentrations of metals (Cu, Pb, Ni and Cd) in water samples (wells and springs) Pb < Cu < Cd < Ni, the leachate samples Cu < Pb < Ni < Cd and finally, the soil samples Cd < Cu < Pb < Ni, were obtained, respectively. Water samples (wells and springs), only in a 7W handheld water well sample (the nearest to the buried well) related to BPA 22.35 (micro g /l) composition, waste leachate samples for the concentrations of BPA, 103.3 (micro g /l), and soil samples for the combined concentration of BPA 5.52 (ng /g) were obtained. High concentrations of Ni, Pd and Cd and high concentrations of BPA in the samples of leachate composition, soil samples of landfill, and the 7W handheld water well samples were due to the high volume of electronic waste and plastic waste.

Kakutani, M., et al. (1999). "JTE-607, a novel inflammatory cytokine synthesis inhibitor without immunosuppression, protects from endotoxin shock in mice." Inflammation Research **48**(8): 461-468.

OBJECTIVE AND DESIGN: We investigated the effect of a novel N-benzoyl-L-phenylalanine derivative compound (JTE-607) on production of various cytokines and other immune responses in vitro and on endotoxin shock in vivo.

MATERIALS AND METHODS: Human, monkey, rabbit, mouse and rat peripheral blood mononuclear cells (PBMCs), and human fibroblasts, umbilical vein endothelial cells (HUVEC), mesangial cells and T cells were used in vitro. Endotoxin shock was induced by lipopolysaccharide (LPS) in Corynebacterium parvum (C. parvum) sensitized male C57BL/6 mice in vivo.

RESULTS: JTE-607 inhibited inflammatory cytokine production, including tumor necrosis factor (TNF)-alpha, interleukin (IL)-1beta, IL-6, IL-8 and IL-10, from LPS-stimulated human PBMCs, with IC50 values of 11, 5.9, 8.8, 7.3 and 9.1 nM, respectively. The inhibitory effects of JTE-607 were also seen in mRNA expression of those cytokines. The potency of JTE-607 on cytokine production from PBMCs of other species, and from other human cells were much lower than that on human PBMCs. JTE-607 did not affect either LPS-stimulated microbead phagocytosis or reactive oxygen species production at 1 microM in human PBMCs but slightly suppressed expression of major histocompatibility complex class II antigen at 1 microM, although it was 100-fold less active than it was as a cytokine inhibitor. JTE-607 (0.3-10 mg/kg, i.v.) showed dose dependent inhibition of mortality after LPS challenge in C. parvum sensitized mice in accordance with a decrease of plasma TNF-alpha.

CONCLUSIONS: These results suggest that JTE-607 is a multiple cytokine inhibitor specific for human PBMCs. This compound may be useful for the treatment of various cytokine mediated diseases such as septic shock without causing immunosuppression.

Kalanatarifard, A. and G. S. Yang (2012). "Identification of the Municipal Solid Waste Characteristics and Potential of Plastic Recovery at Bakri Landfill, Muar, Malaysia." Journal of Sustainable Development **5**(7): 11.

The objective of this study was to evaluate the composition and characteristics of the generated municipal solid waste (MSW) in order to obtain information about the quantity of recoverable plastic at Bukit Bakri landfill Muar, Malaysia. Solid waste sampling and laboratory analysis were carried out according to the random sampling method based on American Society of Testing and Materials (ASTM) standards to determine the waste compositions and proximate analysis (moisture content, volatile matter, ash content and fixed carbon). The total quantity of MSW generated at the site was 330 ton/day made up of 25 individual types of waste. The main

compositions of the generated waste were 39% food waste, 12% plastic waste and 16% paper which accounted for about 67% by weight. About 12% of disposed materials at Bakri landfill consisted of recoverable plastics of which 9% plastic film, 2% rigid plastic and 1% plastic foam. The average moisture content of the waste was between 50-58%. Although, there is significant volume of recoverable plastic at the disposal site (approximately 35 tons/day), this materials are still being land filled without any form of treatments. Based on the results obtained, this study has recommended the plastic recovery plan as a feasible MSW strategy to reduce the amount of disposed waste at Bakri landfill.

Kalcikova, G., et al. (2017). "Wastewater treatment plant effluents as source of cosmetic polyethylene microbeads to freshwater." Chemosphere **188**: 25-31.

Microplastics in the environment are either a product of the fractionation of larger plastic items or a consequence of the release of microbeads, which are ingredients of cosmetics, through wastewater treatment plant (WWTP) effluents. The aim of this study was to estimate the amount of microbeads that may be released by the latter pathways to surface waters using Ljubljana, Slovenia as a case study. For this purpose, microbeads contained in cosmetics were in a first step characterized for their physical properties and particle size distribution. Subsequently, daily emission of microbeads from consumers to the sewerage system, their fate in biological WWTPs and finally their release into surface waters were estimated for Ljubljana. Most of the particles found in cosmetic products were <100 mum. After application, microbeads are released into sewerage system at an average rate of 15.2 mg per person per day. Experiments using a lab-scale sequencing batch biological WWTP confirmed that on average 52% of microbeads are captured in activated sludge. Particle size analyses of the influent and effluent confirmed that smaller particles (up to 60-70 mum) are captured within activated sludge while bigger particles were detected in the effluent. Applying these data to the situation in Ljubljana indicates that about 112,500,000 particles may daily be released into the receiving river, resulting in a microbeads concentration of 21 particles/m³. Since polyethylene particles cannot be degraded and thus likely accumulate, the data raise concerns about potential effects in aquatic ecosystems in future.

Kalcikova, G., et al. (2017). "Impact of polyethylene microbeads on the floating freshwater plant duckweed Lemna minor." Environmental Pollution **230**: 1108-1115.

Microplastics (MP), small plastic particles below 5 mm, have become one of the central concerns of environmental risk assessment. Microplastics are continuously being released into the aquatic environment either directly through consumer products or indirectly through fragmentation of larger plastic materials. The aim of our study was to investigate the effect of polyethylene microbeads from cosmetic products on duckweed (Lemna minor), a freshwater floating plant. The effects of microbeads from two exfoliating products on the specific leaf growth rate, the chlorophyll a and b content in the leaves, root number, root length and root cell viability were assessed. At the same time, water leachates from microbeads were also prepared to exclude the contribution of cosmetic ingredients on the measured impacts. Specific leaf growth rate and content of photosynthetic pigments in duckweed leaves were not affected by polyethylene microbeads, but these microbeads significantly affected the root growth by mechanical blocking. Sharp particles also reduced the viability of root cells, while the impact of microbeads with a smooth surface was neglected. It was concluded that microbeads from cosmetic products can also have negative impacts on floating plants in freshwater ecosystems.

Kaleniecka, A. and P. K. Zarzycki (2019). "Degradation Studies of Selected Bisphenols in the Presence of

beta-Cyclodextrin and/or Duckweed Water Plant." Journal of AOAC International **23**: 23.

Background: This research reports a multivariate experiment enabling observation of the potential application of macrocyclic compound [beta-cyclodextrin (beta-CD)] and/or duckweed organisms as the active factors for elimination of selected bisphenols A, B, and S from water samples. Objective: Target bisphenols selection was based on observation that such components can be present in food or environmental samples (e.g., vegetable/fruit juices, milk, drinking water, or treated wastewater). Methods: Biological research was carried out using aquatic organisms containing chlorophyll, particularly duckweed (Lemna minor L), that may work as an active biomass for the elimination or extraction of bisphenols micropollutants from water. Using such a system, we studied the potential encapsulation effect and removal efficiency of nontoxic macrocyclic oligosaccharide (beta-cyclodextrin) acting as an encapsulation reagent to promote the removal of selected bisphenols from liquid phase both with and without the presence of duckweed biomass. Results: Experimental data have revealed that beta-CD or combined beta-CD/duckweed system has an effect on bisphenols elimination from water. The initial data set obtained from this preliminary experiment (and combined with supramolecular complex formation data calculated from chromatographic experiments, published previously) enables designing of further experiments focusing on the development of green chemistry technology. Conclusions: It is hoped that this may be used for the efficient removal of low-molecular-mass micropollutants using classical technological wastewater treatment processes modified by biomass and macrocyclic additives. This process needs to be optimized, but the results presented have revealed that such green chemistry technology, if successful, may be an interesting alternative for the selective removal of the micropollutants investigated from wastewater using classical adsorbents (e.g., carbons and carbon-related nanomaterials), particularly in terms of the worldwide problem with microplastic pollutants in the environment and food products.

Kaliyavaradhan, S. K., et al. (2019). "Waste resources recycling in controlled low-strength material (CLSM): A critical review on plastic properties." Journal of Environmental Management **241**: 383-396.

The exponential growth of waste generation is posing serious environmental issues and thus requires urgent management and recycling action to achieve green sustainable development. Controlled low-strength material (CLSM) is a highly flowable cementitious backfill material with self-consolidating properties. The CLSM efficiency during construction and final performance at the site depends on its plastic properties. Plastic properties are responsible for workability, pumpability, stability, and lateral pressure on adjacent soils. This paper presents a critical review to date on the use of waste materials and/or by-products and their impacts on the plastic properties of the CLSM. Extensive previous studies demonstrated that the basic properties and content of waste materials as well as the amount of water in the mix design, play a dominant role in determining the plastic properties of CLSM. The discussed plastic properties of CLSM include flowability, bleeding, segregation, and hardening time, which are found to be inter-related. Proper mix design adjustment to accommodate the use of waste materials is possible to produce sustainable CLSM with acceptable plastic properties. Additionally, the discussion and analysis presented in this paper could provide a basis for future research advances and the development of sustainable CLSM prepared with waste materials. Image 1 • A critical review to date on effects of waste materials on the plastic properties of CLSM is presented. • The discussed properties include flowability, bleeding, segregation and hardening time. • A large volume of waste materials can be utilized in the production of CLSM. • Utilization of waste materials in CLSM holds great potential for sustainable development. [ABSTRACT FROM AUTHOR]

Kaluevi, A., et al. (2012). Encapsulation of basil (Ocimum basilicum) essential oil. 6th Central European Congress on Food, CEFood 2012, May 23, 2012 - May 26, 2012, Novi Sad, Serbia, University of Novi Sad, Faculty of Technology.

Basil (Ocimum basilicum) is an aromatic plant widely used as a culinary herb, commonly added as fresh. There are many scientific studies that have confirmed health benefits of the basil oil. Bioactive compounds of the essential oils found in basil have antioxidant and antimicrobial properties. However, effectiveness of these compounds depends on preserving their stability, which can be increased by encapsulation. The aim of this study was to encapsulate the basil essential oil (EO) in alginate microbeads in order to protect and stabilize bioactive compounds in it. Calcium alginate microbeads entrapping the EO were produced by electrostatic extrusion technique. The obtained microbeads were characterized from the aspect of total phenol content, encapsulation efficiency and antioxidant capacity. Total polyphenol content (TPC) of microbeads was analyzed by the Folin-Ciocalteu reagent. Encapsulation efficiency was calculated as the ratio between the TPC in the citrate solution of dissolved microbeads and the TPC of the initial EO. The radical scavenging activity was determined as Trolox equivalent antioxidant capacity (TEAC) and by using stable free radical 1,1-diphenyl-2-picrylhydrazyl (DPPH). The rehydration properties of air dried calcium alginate gel microbeads were investigated in water and phosphate buffer solution. Also, samples were analyzed by optical microscopy (OM). Encapsulation efficiency was obtained to be approximately 60 %. The results of TEAC and DPPH tests indicate that antioxidant activity was preserved at a satisfactory level. The average diameters of fresh and dried microbeads were 860.844.9 and 416.037.2 m, respectively. The particles, with and without EO, rehydrated in buffer were highly swollen, from 5000 to 10000 %w/w. The results suggest that alginate microbeads encapsulating EO appeared to be suitable dosage forms. Thus, possible applications of these microbeads could be in the production of functional foods.

Kaluzova, M., et al. (2010). "Imaging, targeted therapy, and identification of candidate proteins of glioma stem cells. EGFRvIII antibody-conjugated magnetic nanoparticles inhibit formation and proliferation of GBM-derived neurospheres." Neuro-Oncology **4)**: iv125.

INTRODUCTION: Glioblastoma multiforme (GBM) is the most common and lethal malignant primary brain tumor in adults. EGFRvIII, a constitutively active truncated form of EGFR, is expressed in a subset of GBM with a particularly poor prognosis. Glioma stem cells (GSCs) have properties of self-renewal, pluripotency, and high tumorigenicity. Magnetic iron oxide nanoparticles (IONPs) have emerged as a potential multifunctional clinical tool that can provide cancer cell-targeted delivery of agents. In this study, we have examined differential activation of signaling pathways in purified CD133-positive GSCs in an effort to identify candidate proteins for the targeted imaging and therapy of GSC via magnetic nanoparticles. We have also studied the effect of IONPs conjugated with an EGFRvIII antibody on the formation and proliferation of GBM-derived neurospheres and apoptotic induction in neurospheres and GSCs. METHOD(S): Glioblastoma tumor specimens were used to isolate neurospheres in Neurobasal A-medium containing bFGF and EGF. Neurospheres of EGFRvIII-negative and EGFRvIII-positive GBM tumors were further enriched for CD133-positive cells using a CD133 MicroBeads kit or FACS analysis. Magnetic nanoparticles were conjugated with the EGFRvIII antibody using Ocean NanoTech kit and conjugation was verified by agarose gel. RESULTS AND CONCLUSION(S): We identified Nestin, wild-type (wt)-EGFR, EGFRvIII, PDGFRbeta, CAIX, and podoplanin as candidate proteins in CD133-positive GSCs. Hypoxia massively enhanced expression of the CD133 antigen in EGFRvIII-positive neurospheres. Antibodies against the candidate proteins, conjugated to magnetic nanoparticles, may form the basis of imaging and targeted therapy. IONPs conjugated to an antibody specific to the EGFRvIII deletion mutant inhibit proliferation and neuro-sphere formation and can promote apoptosis in CD133-positive GSC neuro-spheres, but also in CD133-negative neurospheres. In conclusion, a therapy in which GSCs are targeted with antibody-conjugated nanoparticles with high magnetic potential, followed by exposure to alternating magnetic fields to generate local hyperthermia, could have a strong therapeutic effect.

Kam, Y. W., et al. (2017). "Specific Biomarkers Associated With Neurological Complications and Congenital Central Nervous System Abnormalities From Zika Virus-Infected Patients in Brazil." Journal of Infectious Diseases **216**(2): 172-181.

Background: Zika virus (ZIKV) infections have been linked to different levels of clinical outcomes, ranging from mild rash and fever to severe neurological complications and congenital malformations.

Methods: We investigated the clinical and immunological response, focusing on the immune mediators profile in 95 acute ZIKV-infected adult patients from Campinas, Brazil. These patients included 6 pregnant women who later delivered during the course of this study. Clinical observations were recorded during hospitalization. Levels of 45 immune mediators were quantified using multiplex microbead-based immunoassays.

Results: Whereas 11.6% of patients had neurological complications, 88.4% displayed mild disease of rash and fever. Several immune mediators were specifically higher in ZIKV-infected patients, and levels of interleukin 10, interferon gamma-induced protein 10 (IP-10), and hepatocyte growth factor differentiated between patients with or without neurological complications. Interestingly, higher levels of interleukin 22, monocyte chemoattractant protein 1, TNF-alpha, and IP-10 were observed in ZIKV-infected pregnant women carrying fetuses with fetal growth-associated malformations. Notably, infants with congenital central nervous system deformities had significantly higher levels of interleukin 18 and IP-10 but lower levels of hepatocyte growth factor than those without such abnormalities born to ZIKV-infected mothers.

Conclusions: This study identified several key markers for the control of ZIKV pathogenesis. This will allow a better understanding of the molecular mechanisms of ZIKV infection in patients.

Kamaya, M., et al. (2011). "A Simple Bioassay Using Fluorescent Microbeads and Daphnia magna." Journal of Environmental Science and Engineering **5**(12): 1613-1616.

The amount of microbeads ingested by Daphnia magna decreases on exposure to toxic materials; this behavior was used to develop a toxicity test. To determine the toxicity of seven metals, D. magna were collected and homogenized, and the fluorescence intensity of the microbeads ingested by D. magna was measured. The amount of ingestion was determined from fluorescence intensity. The fluorescence intensity was half of that of the controls which was measured as the 30 min-FI50, and these data correlated well with those from an acute immobilization method (24 h-EC50). An advantage of the method using fluorescent beads is that an estimate of the 24 h-EC50 can be obtained.

Kamel, A., et al. (2010). "Cytokine production by graft cells in response to patient's antigens may predict the occurrence of acute graft versus host disease in allogeneic hematopoietic stem cell transplantation from a sibling." Haematologica **2)**: 443.

Background: Allogeneic hematopoietic stem cell (HSC) transplantation whether bone marrow (BM) or peripheral blood (PBSCT) is a widely used therapeutic modality. Graft vs. host disease (GVHD) continues to be the main concern of transplanters. There is substantial evidence to implicate that cytokines play a major role in GVHD induction and grade. GVHD was reported to be associated with increased production of IFNgamma and IL10. IL 10 cytokine level and gene polymorphism have been used as predictors of acute GVHD (aGVHD). IFNgamma was also reported to have a protective role if administered at the time of transplantation possibly via induction of T regulatory cells and immunological tolerance. Aims. The aim of this work was to develop an experimental setup to mimic the response of the immune cells of the graft to the host antigens expressed by cytokine production. The final aim was to correlate the cytokine pattern to the development of aGVHD and verify if this pattern could possibly predict the occurrence of aGVHD. Method(s): The study included 46 patients who received allogeneic PBSCT from an identical sibling. Under informed consent, a sample was obtained from the patient before conditioning, mononuclear cells separated and cryopreserved. On the day of transplant, the cryopreserved cells were thawed, mitomycin treated to serve as stimulators while the mononuclear cells of the graft served as the responders in a mixed lymphocyte culture setup. After 3 days culture, supernatant was collected and stored at -80 degree C till tested. IFNgamma and IL10 were measured by microbead array technology using luminex 200. Patients were followed up and development of aGVHD was recorded. Result(s): Of the 46 patients, 14 developed aGVHD. In the culture supernatant, cytokines were below the detection limit in 26/32 of cases that did not and in 3/14 of those who developed aGVHD. The level of cytokines in the other cases varied widely. Of the 11 cases that showed cytokine production, 4 produced IFNgamma only and one produced IL10 only. The other 6 cases produced both; IL10 was higher in one case; in the other 5 cases, IFNgamma was much higher. In the 6/32 cases without GVHD, IL10 only was detected in 3 cases; the other 3 cases showed much higher level of IL10 than IFNgamma. At a cutoff level of 15.9 pg/mL, IFNgamma was predictive of aGVHD with a sensitivity of 64.3%, specificity of 96.8% and a total accuracy of 80.4%. At a cutoff of 2.27pg/mL, IL10 showed a sensitivity of 50%, specificity of 80.6% and a total accuracy of 71.1%. At a cutoff of 1.13, IFNg/IL10 ratio showed a sensitivity of 85.7%, specificity of 83.3% and a total accuracy of 84.6%. Conclusion(s): In vitro cytokine production by graft immune cells in response to host antigens is extremely variable; it may serve as a surrogate system of the immune reaction following allogeneic stem cell transplantation. IFNgamma production apparently reflects potential development of aGVHD while IL10 production is apparently protective. When both are produced the IFNgamma/IL10 ratio is more informative than either alone.

Kamel, A. M., et al. (2012). "Interleukin 12 (IL12) and interferon gamma (IFN{gamma}) of donor origin not of patient origin may predict acute graft versus host disease after allogeneic hematopoietic stem cell transplantation (HSCT)." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

One persistent problem following allogeneic HSCT is acute graft versus host disease (GVHD). A major role of cytokines in the pathogenesis of GVHD has been acknowledged with a lot of controversial reports. This study aimed at the possible prediction of the occurrence of acute GVHD through studying the pattern of interleukin 12 (IL12) and interferon {gamma} (IFN{gamma}) production. We used two approaches: (i) In vitro cytokine production by graft cells in response to recipient antigens, in a mixed lymphocyte culture setup. (ii) Measurement of cytokines levels in the patient's plasma prior to transplant and during the aplastic phase representing cytokines of patient's origin as well as at engraftment representing cytokines of donor's origin. The work was performed according to Helsinki declaration, the protocol was approved by the IRB of the NCI, Cairo University and an informed consent was obtained from all subjects. The study comprised 45 patients who received fully matched allogeneic peripheral blood stem cell transplantation from a sibling donor in the period from November 2006 until May 2010 at Nasser Institute. They included 26 males and 19 females with an age range of 6-41 with a median of 22 years. The study cohort included 18 AML, 15 CML, 4 ALL, 4 aplastic anemia, 3 MDS and one patient with Fanconi's anemia. IL12 and IFN{gamma} were measured by microbead array technology using Luminex 200 and Flourokine MAP kit provided by R & D Company. Patients were followed up for at least one year. Fourteen/45 patients developed acute GVHD, 4 grade I, six grade II and 4 grade III. Seven patients developed chronic GVHD; 3 of them on top of acute GVHD. Patients who developed chronic GVHD showed no statistically significant differences in any of the tested parameters and will not be mentioned any more. Positive correlation between IL12 and IFN{gamma} of donor's origin was encountered in both culture supernatant (r = 0.75, P <0.001) and patient's plasma at engraftment (r = 0.57, P <0.001). In culture supernatant, IL12 was undetectable in 7/14 cases with acute GVHD. The other 7 cases showed a level of 2.0 - 463.5 with a median of 14.6 pg/ml. It was not detected in any of the 31 cases without GVHD (P <0.001). IFN{gamma} was undetectable in 4/14 cases with acute GVHD. The other 10 cases showed a level of 6.2 - 19.000 with a median of 133.5pg/ml. It was undetectable in 28/31 cases without GVHD. The other 3/31 cases showed a level of 1.1- 80.01 with a median of 8.1 pg/ml. (P <0.001). In patient's plasma at engraftment, IL12 was undetectable in 7/14 cases with acute GVHD; the other 7 cases showed a level of 3.89 - 608.5 with a median of 51.8 pg/ml. It was undetectable in 26/31 cases without GVHD; the other 5 cases showed a level of 2.0 - 6.88 with a median of 2.93 pg/ml. (P = 0.008). IFN {gamma} was undetectable in 3/14 cases with acute GVHD; the other 11cases showed a level of 11 - 427 with a median of 77.9 pg/ml. It was undetectable in 24/31 cases without GVHD; the other 7 cases showed a level of 0.27- 26.67 with a median of 15.8 pg/ml (P <0.001). At a cut off value of 15.9 pg/ml in either culture supernatant or patient's plasma at engraftment, IFN {gamma} showed a sensitivity of 64.3%, a specificity of 96.8 % and a total accuracy of 80.4%. Nine/10 cases that had a level >=the cutoff in the culture supernatant developed acute GVHD as compared to 5/35 with levels below the cutoff (p=0.001). While 9/12 cases that had a level >=the cutoff in patient's plasma at engraftment developed acute GVHD as compared to 5/33 with levels below the cutoff (p=0.001). At a cutoff value of 0.89 pg/ml, the level of IL12 in culture supernatant showed a sensitivity of 50.0%, absolute specificity of 100.0% and a total accuracy of 83.3%. All 7 cases that had a level >=the cutoff developed acute GVHD as compared to 7/38 with levels below the cutoff (p=0.000). At a cutoff value of 1.0 pg/ml, the level of IL12 at engraftment showed a sensitivity of 50.0%, a specificity of 83.9% and a total accuracy of 72.3%. Seven/12 cases that had a level >=the cutoff deve oped acute GVHD as compared to 7/33 with levels below the cutoff (p=0.023). On the other hand no significant difference was encountered in the levels of either cytokine of patient's origin between cases who developed and those who did not develop acute GVHD. In conclusion, IFN {gamma} and IL12 of donor but not of patient's origin might predict the occurrence of acute GVHD. IL12 in culture supernatant is a potential absolute positive but not negative predictor. A validation cohort is needed to verify these assumptions.

Kaminuma, T., et al. (2000). "[Distribution and origin of plastic resin pellets as environmental pollutants at the East China Sea area]." Kokuritsu Iyakuhin Shokuhin Eisei Kenkyusho Hokoku(118): 90-99.

Plastic debris are important marine pollutants. Plastic debris consist of resin pellets and waste plastics. We are particularly interested in resin pellets. We made field survey of resin pellets at nearly 400 sites in 200 beaches in Japan and neighboring countries. The pellets were found at all most all Japan coasts we surveyed and at some beaches of Macao, Hong Kong, Xiamen, the north of Taipei, and Cheju Island in Korea. The number of pellets was more than 1000 pieces per m2 on the most abundant beach in Japan. Through further analysis using GC/ECD, endocrine disrupting chemicals, PCBs, DDTs, HCHs and Nonylphenol were detected in selected samples. Biota such as Bryozoa were observed on the surface of pellets washed up on the beaches in subtropical areas. Pellets has been suspected to affect wildlife and human health, but we have no report on affection to human.

Kamiya, K., et al. (2010). "Detection of Spontaneous Combustion of Plastic Waste by Odor." Fire Science and Technology **29**(1): 1-14.

Accumulated plastic waste is concerned to cause a spontaneous combustion. It is extremely difficult to notice the minor signs indicating the start of combustion inside the accumulated material. Spontaneous combustion of plastic waste was simulated using a temperature-controlled furnace, and the temperature of the sample and the intensity as well as quality of odorous gases emitted were measured during the process of self-ignition. Mixed plastic waste consisting of various plastics of food wrapping was subjected to heating furnace experiment as a single specimen. The odors generated from this specimen and each single individual plastic were measured. The ratio of the similarity indices aldehyde/ammonia was found to increase during the ignition process due to the accumulated heat in the central part of accumulated material. Specimens of individual plastic was burnt and thermally decomposed using TG-DTA under the normal atmospheric condition, the odor also showed a similar tendency with that obtained in the experiment for the mixed specimen.

Kanangat, S., et al. (2010). "Painful family "memories"?" Human Immunology **1)**: S61.

Aim: To investigate two cases of acute renal transplant rejection despite total absence of HLA antibodies in recipients' pretransplant sera and negative T/B cell cross match prior to transplantation. Method(s): Patients/Donors: Two female living donor renal transplant recipients, a 62 year old female who received kidney from her child, and a 58 year old female who received kidney from her husband, both rejected the allograft shortly after transplantation. Alloimmune response analysis: Flow cytometry based HLA antibody screening, Luminex-Microbead array based Labscreen PRA, Flow Cytometry based T and B cell Cross match, and CDC-AHG Cross match were used for pretransplant HLA antibody detection. Post transplant HLA antibodies were detected by single antigen microbead array (One Lambda). Result(s): Pretransplant sera were negative for both Class I and Class II antibodies and both Flow Cytometry and CDC-AHG cross matches using T and B cells prior to transplant were also negative in both patients. Post transplant serum from both patients had significant levels of multiple DSA as detected by Single antigen bead assay. Conclusion(s): Both patients could have been exposed to their donor's HLA prior to their transplants. The recipient mother would have had exposure to the child's paternally derived HLA during gestation. Similarly, the patient who received kidney from her husband would have had exposure to his HLA through pregnancies. Although such exposure to foreign antigens during gestation could result in tolerization, it could also result in alloimmunization. Both patients may have had memory cells to their donor's HLA. Some long-lived plasma cells may not respond to certain immunosuppressants resulting in vigorous response upon contact with recall antigen after transplant. Therefore, a pretransplant negative cross do not completely rule out the possibilities of an undesired anamnestic alloimmune response.

Kandabashi, T., et al. (2003). "Evidence for Protein Kinase C-Mediated Activation of Rho-Kinase in a Porcine Model of Coronary Artery Spasm." Arteriosclerosis, Thrombosis, and Vascular Biology **23**(12): 2209-2214.

Objective-We have recently demonstrated that protein kinase C (PKC) and Rho-kinase play important roles in coronary vasospasm in a porcine model. However, it remains to be examined whether there is an interaction between the two molecules to cause the spasm. Methods and Results-A segment of left porcine coronary artery was chronically treated with IL-beta-bound microbeads in vivo. Two weeks after the operation, phorbol ester caused coronary spasm in vivo and coronary hypercontractions in vitro at the IL-beta-treated segment; both were significantly inhibited by hydroxyfasudil, a specific Rho-kinase inhibitor. Guanosine 5'-[gamma-thio] triphosphate (GTPgammaS), which activates Rho with a resultant activation of Rho-kinase, enhanced Ca²⁺ sensitization of permeabilized vascular smooth muscle cells, which were resistant to the blockade of PKC by calphostin C. The GTPgammaS-induced Ca²⁺ sensitization was greater in the spastic segment than in the control segment. Western blot analysis revealed that only PKCdelta isoform was activated during the hypercontraction. Conclusions-These results demonstrate that PKC and Rho-kinase coexist on the same intracellular signaling pathway, with PKC located upstream on Rho-kinase, and that among the PKC isoforms, only PKCdelta may be involved. Thus, the strategy to inhibit Rho-kinase rather than PKC may be a more specific and useful treatment for coronary spasm.

Kandasamy, S. P., et al. (2013). "Municipal solid waste management at Chennai in southern India - An occupational health perspective." International Journal of Health Promotion and Education **51**(1): 50-61.

The reasonable concern of India is the health of municipal solid waste (MSW) workers (rag pickers in particular) who scavenge recyclables. A study was conducted among the conservancy staff and rag pickers to examine the occupational health of MSW workers in India. A cross-sectional survey was conducted to collect data on the demographic and socio-economic characteristics of the rag pickers, conservancy staff and residents through a questionnaire survey. The health evaluation was performed using a combination of a detailed medical history, clinical examinations, blood investigations, pulmonary function tests, X-rays and serology on all associated workers. Pulmonary function test results were significantly lower than predicted for both male and female study groups, viz. residents, rag pickers and conservancy workers. Most significant among the findings were the high prevalence of eosinophilia and hepatitis B. Prevalence of 8% hepatitis B carriers among conservancy workers points to the imminent need for prophylactic immunizations within this group of conservancy workers. A high prevalence of eosinophilia is not surprising given the multitude of allergen exposures. As compared to permissible biological exposure indices (BEI) in blood (ACGIH 2005), levels of metals were higher than BEIs, viz. mercury in 10% of workers, lead in 15% of workers, chromium in 12% of workers and cadmium in 3% of workers. As a means of organizing MSW management, the role of informal sector in recycling resources was recognized in the latest Plastic Waste (Management and Handling) Rules, 2011 in India. © 2013 Institute of Health Promotion and Education.

Kanderova, V., et al. (2013). "Novel flow cytometry-based method of affinity proteomics revealing expression, post-translational modification and proteolysis in primary childhood acute Leukemias." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Leukemia is a complex disease pathologically manifested at the DNA, mRNA and protein level. Understanding leukemia pathogenesis is prevalently focused on mutations at the DNA (or mRNA) level, however the functional consequences of these changes on cellular machineries are

not fully clarified. Since proteome analysis provides link between gene sequence and cellular physiology, proteomics can contribute to elucidate mechanism of disease and response to treatment. Moreover some alterations are manifested only at the protein level including subcellular localisation, post-translational modification (e.g. phosphorylation), protein cleavage or protein-protein interactions. Performing large-scale protein analysis of primary leukemia samples requires the development of more effective proteomic approaches as well as new analytical strategies. Here, we present novel microsphere-based antibody array format with automatical analysis tool that can follow changes in expression and post-translational modification of leukemia associated proteins with regards to intracellular localisation and protein cleavage in primary childhood acute leukemia (AL). Size Exclusion Chromatography-Microsphere-based Affinity Proteomics (SEC-MAP) is a set of 1728 populations of fluorescently-labeled microbeads, each carrying an antibody against respective human protein. Native cellular proteins (and their complexes) are isolated using detergents, labeled with biotin and subjected to size exclusion chromatography to obtain 24 molecular weight fractions. The fractions are incubated with SEC-MAP microbeads and the antibody-protein binding is detected using fluorescently-labeled streptavidin by flow cytometry. Flow cytometer resolves color-code of each microbead population and reads the amount of bound protein. The signals from 24 size fractions are combined and protein binding is detected as protein reactivity peaks similar to bands on western blot. The analysis is performed using automatic software created in R. It allows for automatic processing of fcs files as well as advanced follow-up analysis including quality control, normalisation, protein peaks recognition and clustering of results We have examined the expression of cytoplasmic (n=980) and membrane (n=769) proteins in 69 primary samples of AL obtained at diagnosis according to the Institutional Ethics Committee Giudelines. For the normalisation of protein expression we have used Loess normalisation commonly used in mRNA profiling studies. Due to ability of SEC-MAP to separate proteins according their molecular weight we have identified not only the expression of proteins but also the size that corresponds to its monomeric or multimeric presence and furthermore could serve as a control of proteolysis. We have revealed the sensitivity to proteolysis of 4 standard house-keeping proteins (Akt, Abl, beta-actin and beta2-microglobulin). Abl and Akt proved to be better controls of proteolysis. Detected with SEC-MAP or western blot, beta-actin and beta2-microglobulin, unlike Abl and Akt, have not been found in their cleaved forms in the proteolytically digested samples. Thus we have identified proteolysis in 12 samples which have been subsequently excluded from the analysis. So far we have identified 44 proteins (including CD markers distinguishing lineage specificity e.g. CD22, CD3, CD33) which have been differentially expressed in different subtypes of AL (B-cell precursor acute lymphoblastic leukemia, BCP-ALL, n=35), T-cell acute lymphoblastic leukemia (T-ALL, n=9) and acute myeloid leukemia (AML, n=13) (Multiple Testing Procedures - Bioconductor Package multtest, $p<0.05$). We have verified the expression using flow cytometry or western blot. From non-CD markers, we have found e.g. BLNK, DBN1, PAX5, PTK2 overexpressed in BCP-ALL, EIF5A, LAT, SH2D1A, SSEA4 overexpressed in T-ALL and CEBPA, CTBP2, GLUD1, LCP(pY145) and PTPN6 overexpressed in AML. In summary, SEC-MAP proved to be strong proteomic tool capable of identifying leukemia phenotype as well as providing novel insights into the protein expression and post-translational modification of primary childhood AL. Moreover it can bring complementary information about proteolysis not captured by planar arrays (western blot) which can significantly affect proteomic results.

Kandil, S., et al. (2004). "Controlled release of 2-methyl-4-chlorophenoxy acetic acid herbicide from waste gelatin-based blends and composites." Journal of Applied Polymer Science **94**(4): 1420-1427.

The volume of plastic waste is becoming a serious problem for waste management. Waste management is based on four hierarchical approaches: reduction, reuse, recycling, and energy recovery. We now report on recycling of gelatin scraps that are derived during the production of pharmaceutical capsules, by using the gelatin scraps in the production of controlled-release systems. This may help to minimize the side effects that often accompany the conventional application of pesticides. More important, the gelatins themselves, when degraded, might be useful to soil solarization and crop growth. Using and recycling these waste materials in the proposed application would save natural resources and consequently would be economically useful. The synthesis of gelatin films, and composites incorporating 2-methyl-4-chlorophenoxy acetic acid (MCPA) as herbicide, will be described. Morphology and mechanical properties of the films were investigated by scanning electron microscopy and tensile tests, respectively. The release of the MCPA herbicide from the prepared blends and composites was investigated. The prepared formulation proved to be useful for agricultural applications.

Kandil, S., et al. (2004). "Recycling of Pharmaceutical Waste Gelatin for Controlled Release Applications II: A Tri-fluralin Based System." Polymer-Plastics Technology & Engineering **43**(6): 1695-1709.

During the latter half of last century, the production and consumption of synthetic plastics and fibers has vastly grown. The plastics wastes have continuously increased over recent decades. Concerns over this have now resulted in mandatory recycling laws and demands for degradable polymers. Management of plastic wastes cannot be treated as an individual problem; it must be considered as an integral part of the global waste management system. The development of recycling processes leading to higher quality recycled products would help the recycling economy. In this study, recycling of pharmaceutical gelatin scraps will be conducted by incorporating them in biodegradable mulching films. The formulation and preparation of these films is described and the effect of different additives on the rate of release of the bioactive agent (trifluralin) is reported. The results showed that the produced films have controlled release properties and the presence of cross-linked agent decreased the release rate of trifluralin. [ABSTRACT FROM AUTHOR]

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Kang, J. H., et al. (2013). "Clinical utility and analytical challenges in measurement of cerebrospinal fluid amyloid-beta(1-42) and tau proteins as Alzheimer disease biomarkers." Clinical Chemistry **59**(6): 903-916.

BACKGROUND: Over the past 2 decades, clinical studies have provided evidence that cerebrospinal fluid (CSF) amyloid beta(1-42) (Abeta(1-42)), total tau (t-tau), and tau phosphorylated at Thr181 (p-tau(181)) are reliable biochemical markers of Alzheimer disease (AD) neuropathology.

CONTENT: In this review, we summarize the clinical performance and describe the major challenges for the analytical performance of the most widely used immunoassay platforms [based on ELISA or microbead-based multianalyte profiling (xMAP) technology] for the measurement of CSF AD biomarkers (Abeta(1-42), t-tau, and p-tau(181)). With foundational immunoassay data providing the diagnostic and prognostic values of CSF AD biomarkers, the newly revised criteria for the diagnosis of AD include CSF AD biomarkers for use in research settings. In addition, it has been

suggested that the selection of AD patients at the predementia stage by use of CSF AD biomarkers can improve the statistical power of clinical trial design. Owing to the lack of a replenishable and commutable human CSF-based standardized reference material (SRM) and significant differences across different immunoassay platforms, the diagnostic-prognostic cutpoints of CSF AD biomarker concentrations are not universal at this time. These challenges can be effectively met in the future, however, through collaborative ongoing standardization efforts to minimize the sources of analytical variability and to develop reference methods and SRMs.

SUMMARY: Measurements of CSF Abeta(1-42), t-tau, and p-tau(181) with analytically qualified immunoassays reliably reflect the neuropathologic hallmarks of AD in patients at the early predementia stage of the disease and even in presymptomatic patients. Thus these CSF biomarker tests are useful for early diagnosis of AD, prediction of disease progression, and efficient design of drug intervention clinical trials.

Kang, J. H., et al. (2012). "A combined micromagnetic-microfluidic device for rapid capture and culture of rare circulating tumor cells." Lab on a Chip **12**(12): 2175-2181.

Here we describe a combined microfluidic-micromagnetic cell separation device that has been developed to isolate, detect and culture circulating tumor cells (CTCs) from whole blood, and demonstrate its utility using blood from mammary cancer-bearing mice. The device was fabricated from polydimethylsiloxane and contains a microfluidic architecture with a main channel and redundant 'double collection' channel lined by two rows of dead-end side chambers for tumor cell collection. The microdevice design was optimized using computational simulation to determine dimensions, magnetic forces and flow rates for cell isolation using epithelial cell adhesion molecule (EpCAM) antibody-coated magnetic microbeads (2.8 mum diameter). Using this device, isolation efficiencies increased in a linear manner and reached efficiencies close to 90% when only 2 to 80 breast cancer cells were spiked into a small volume (1.0 mL) of blood taken from wild type mice. The high sensitivity visualization capabilities of the device also allowed detection of a single cell within one of its dead-end side chambers. When blood was removed from FVB C3(1)-SV40 T-antigen mammary tumor-bearing transgenic mice at different stages of tumor progression, cells isolated in the device using anti-EpCAM-beads and magnetically collected within the dead-end side chambers, also stained positive for pan-cytokeratin-FITC and DAPI, negative for CD45-PerCP, and expressed SV40 large T antigen, thus confirming their identity as CTCs. Using this isolation approach, we detected a time-dependent rise in the number of CTCs in blood of female transgenic mice, with a dramatic increase in the numbers of metastatic tumor cells appearing in the blood after 20 weeks when tumors transition to invasive carcinoma and exhibit increased growth of metastases in this model. Importantly, in contrast to previously described CTC isolation methods, breast tumor cells collected from a small volume of blood removed from a breast tumor-bearing animal remain viable and they can be easily removed from these devices and expanded in culture for additional analytical studies or potential drug sensitivity testing.

Kang, J.-H., et al. (2013). "Clinical Utility and Analytical Challenges in Measurement of Cerebrospinal Fluid Amyloid-[Beta]^sub 1-42^ and [tau] Proteins as Alzheimer Disease Biomarkers." Clinical Chemistry **59**(6): 903-916.

Over the past 2 decades, clinical studies have provided evidence that cerebrospinal fluid (CSF) amyloid β^sub 1-42^ (Aβ^sub 1-42^), total τ (t-τ), and τ phosphorylated at Thr181 (p-τ^sub 181^) are reliable biochemical markers of Alzheimer disease (AD) neuropathology. In this review, we summarize the clinical performance and describe the major challenges for the analytical performance of the most widely used immunoassay platforms [based on ELISA or microbead-based multianalyte profiling (xMAP) technology] for the measurement of CSF AD biomarkers (Aβ^sub 1-42^, t-τ, and p-τ^sub 181^). With foundational immunoassay data providing the diagnostic and prognostic values of CSF AD biomarkers, the newly revised criteria for the diagnosis of AD include CSF AD biomarkers for use in research settings. In addition, it has been suggested that the selection of AD patients at the predementia stage by use of CSF AD biomarkers can improve the statistical power of clinical trial design. Owing to the lack of a replenishable and commutable human CSF-based standardized reference material (SRM) and significant differences across different immunoassay platforms, the diagnostic-prognostic cutpoints of CSF AD biomarker concentrations are not universal at this time. These challenges can be effectively met in the future, however, through collaborative ongoing standardization efforts to minimize the sources of analytical variability and to develop reference methods and SRMs. Measurements of CSF Aβ^sub 1-42^, t-τ, and p-τ^sub 181^ with analytically qualified immunoassays reliably reflect the neuropathologic hallmarks of AD in patients at the early predementia stage of the disease and even in presymptomatic patients. Thus these CSF biomarker tests are useful for early diagnosis of AD, prediction of disease progression, and efficient design of drug intervention clinical trials.

Kang, J.-H., et al. (2015). "Potential Threat of Microplastics to Zooplanktivores in the Surface Waters of the Southern Sea of Korea." Archives of Environmental Contamination & Toxicology **69**(3): 340-351.

The potential impact of microplastic to zooplanktivores was assessed by measuring a ratio of neustonic microplastics to zooplankton by abundance in the southern sea of Korea. Neustonic microplastics and zooplankton (0.33-2 mm) were collected using a 330-μm mesh Manta trawl in Geoje eastern Bay and Jinhae Bay before and after the rainy season in 2012 and 2013. The mean microplastic to zooplankton ratios were 0.086 (May) and 0.022 (July) in 2012, and 0.016 (June) and 0.004 (July) in 2013, indicating that zooplanktivores could be more likely to feed on microplastics than natural preys before the rainy season in 2012 and 2013. In particular, the relatively high ratio occurred in a semi-enclosed bay characterized by a shipyard and a beach resort in Geoje Bay, and at stations close to a wastewater treatment plant and an aquaculture facility in Jinhae Bay before the rainy season. Among dominant microplastics and zooplankton before the rainy season, meroplankton of macrobenthos could be confused with paint particles in Geoje Bay, 2012, whereas Styrofoam could be mistaken as immature copepods by predators in Jinhae Bay, 2013. These observations suggest that zooplanktivores could be more likely to feed on microplastics than natural preys around Geoje and Jinhae Bays before the rainy season. [ABSTRACT FROM AUTHOR]

Kannahi, M. and P. Sudha (2013). "Screening of polythene and plastic degrading microbes from Muthupet mangrove soil." Journal of Chemical and Pharmaceutical Research **5**(8): 122-127.

Polythene and plastic waste accumulating in the environment are posing an ever increasing ecological threat. Biodegradable plastics are environment friendly; they have an expanding range of potential application and are driven by the growing use of plastics in packaging. In this study, soil sample were collected from polythene and plastic dumped site waste in the area of

Muthupet Mangrove. The physico-chemical parameters of the soil were studied. The isolated microbial strains were identified based on their cultural morphological and biochemical study. Degradation of polythene bag and plastic cup were analyzed 35, 45 and 55days of incubation in liquid culture method. Pot culture of Vigna radiata was performed. The morphological parameters such as Germinating ability, root length, shoot length and chlorophyll content were analyzed. Waste management was the important process to protect the environment from pollution. Polythene and plastic cup waste materials cause serious environment problems, so the waste materials removed by using the microorganism. This method was cheap and effective, so that it can be used widely for the treatment of polythene and plastic cup.

Kantak, C., et al. (2012). "Utilizing microfluidics to synthesize polyethylene glycol microbeads for Forster resonance energy transfer based glucose sensing." Biomicrofluidics **6**(2): 22006-220069.

Here, we utilize microfluidic droplet technology to generate photopolymerizeable polyethylene glycol (PEG) hydrogel microbeads incorporating a fluorescence-based glucose bioassay. A microfluidic T-junction and multiphase flow of fluorescein isothiocyanate dextran, tetramethyl rhodamine isothiocyanate concanavalin A, and PEG in water were used to generate microdroplets in a continuous stream of hexadecane. The microdroplets were photopolymerized mid-stream with ultraviolet light exposure to form PEG microbeads and were collected at the outlet for further analysis. Devices were prototyped in PDMS and generated highly monodisperse 72 +/- 2 mum sized microbeads (measured after transfer into aqueous phase) at a continuous flow rate between 0.04 ml/h-0.06 ml/h. Scanning electron microscopy analysis was conducted to analyze and confirm microbead integrity and surface morphology. Glucose sensing was carried out using a Forster resonance energy transfer (FRET) based assay. A proportional fluorescence intensity increase was measured within a 1-10 mM glucose concentration range. Microfluidically synthesized microbeads encapsulating sensing biomolecules offer a quick and low cost method to generate monodisperse biosensors for a variety of applications including cell cultures systems, tissue engineering, etc.

Kaposi, K. L., et al. (2014). "Ingestion of Microplastic Has Limited Impact on a Marine Larva." Environmental Science & Technology **48**(3): 1638-1645.

There is increasing concern about the impacts of microplastics (<1 mm) on marine biota. Microplastics may be mistaken for food items and ingested by a wide variety of organisms. While the effects of ingesting microplastic have been explored for some adult organisms, there is poor understanding of the effects of microplastic ingestion on marine larvae. Here, we investigated the ingestion of polyethylene microspheres by larvae of the sea urchin,Tripneustes gratilla. Ingestion rates scaled with the concentration of microspheres. Ingestion rates were, however, reduced by biological fouling of microplastic and in the presence of phytoplankton food. T. gratilla larvae were able to egest microspheres from their stomach within hours of ingestion. A microsphere concentration far exceeding those recorded in the marine environment had a small nondose dependent effect on larval growth, but there was no significant effect on survival. In contrast, environmentally realistic concentrations appeared to have little effect. Overall, these results suggest that current levels of microplastic pollution in the oceans only pose a limited threat to T. gratilla and other marine invertebrate larvae, but further research is required on a broad range of species, trophic levels, and polymer types. [ABSTRACT FROM AUTHOR]

Kapp, K. J. and E. Yeatman (2018). "Microplastic hotspots in the Snake and Lower Columbia rivers: A journey from the Greater Yellowstone Ecosystem to the Pacific Ocean." Environmental Pollution **241**: 1082-1090.

It is widely understood that microplastics (MPs) are ubiquitous in the marine environment yet less is known about MP abundance in freshwater rivers, particularly those of the western United States. This study documents MP pollution along the Snake River (~1735 km) and from its confluence with the Columbia River to the Pacific Ocean. Grab and plankton net samples (mesh size 100 mum) were collected from the top 25 cm of surface water every 80.5 river km. MPs were identified if they met visual criteria and were verified with the hot needle test. A small representative subset of MPs from the net samples (16.7%) were selected based on appearance for micro-Raman spectroscopy in effort to provide examples of polymer types found in this study. Seventy-five percent of grab samples and 92.8% of net samples contained MPs, with concentrations ranging from 0 to 5.405 MP L⁻¹ and 0 to 0.014 MP L⁻¹ (0 to 13.7 MP m⁻³), respectively. The majority of fragments, films and beads were between 100 mum and 333 mum. This study identifies potential hotspots of MP pollution along the Snake and Lower Columbia rivers and prioritizes areas where more intensive sampling is needed. Sites with low flow or those further down river had higher numbers and the top two hotspots were located in areas with low population density but high agricultural use. Monitoring MP abundance in freshwater systems is important for establishing baseline levels of MP pollution and can direct laboratory toxicology studies in using more environmentally relevant concentrations for a better indication of how MP pollution affects ecosystems. This study documents microplastic (MP) pollution in the Snake River using two sampling methods and identifies MP hotspots as the river flows through multi-use landscapes.

Kappler, A., et al. (2016). "Analysis of environmental microplastics by vibrational microspectroscopy: FTIR, Raman or both?" Analytical & Bioanalytical Chemistry **408**(29): 8377-8391.

The contamination of aquatic ecosystems with microplastics has recently been reported through many studies, and negative impacts on the aquatic biota have been described. For the chemical identification of microplastics, mainly Fourier transform infrared (FTIR) and Raman spectroscopy are used. But up to now, a critical comparison and validation of both spectroscopic methods with respect to microplastics analysis is missing. To close this knowledge gap, we investigated environmental samples by both Raman and FTIR spectroscopy. Firstly, particles and fibres >500 mum extracted from beach sediment samples were analysed by Raman and FTIR microspectroscopic single measurements. Our results illustrate that both methods are in principle suitable to identify microplastics from the environment. However, in some cases, especially for coloured particles, a combination of both spectroscopic methods is necessary for a complete and reliable characterisation of the chemical composition. Secondly, a marine sample containing particles <400 mum was investigated by Raman imaging and FTIR transmission imaging. The results were compared regarding number, size and type of detectable microplastics as well as spectra quality, measurement time and handling. We show that FTIR imaging leads to significant underestimation (about 35 %) of microplastics compared to Raman imaging, especially in the size range <20 mum. However, the measurement time of Raman imaging is considerably higher compared to FTIR imaging. In summary, we propose a further size division within the smaller microplastics fraction into 500-50 mum (rapid and reliable analysis by

FTIR imaging) and into 50-1 mum (detailed and more time-consuming analysis by Raman imaging). Graphical Abstract Marine microplastic sample (fraction <400 mum) on a silicon filter (middle) with the corresponding Raman and IR images.

Kara, A. and E. Demirbel (2012). "Kinetic, Isotherm and Thermodynamic Analysis on Adsorption of Cr(VI) Ions from Aqueous Solutions by Synthesis and Characterization of Magnetic-Poly(divinylbenzene-vinylimidazole) Microbeads." Water, Air, & Soil Pollution **223**(5): 2387-2403.

The magnetic-poly(divinylbenzene-1-vinylimidazole) [m-poly(DVB-VIM)] microbeads (average diameter 53-212 mum) were synthesized and characterized; their use as adsorbent in removal of Cr(VI) ions from aqueous solutions was investigated. The m-poly(DVB-VIM) microbeads were prepared by copolymerizing of divinylbenzene (DVB) with 1-vinylimidazole (VIM). The m-poly(DVB-VIM) microbeads were characterized by N(2) adsorption/desorption isotherms, ESR, elemental analysis, scanning electron microscope (SEM) and swelling studies. At fixed solid/solution ratio the various factors affecting adsorption of Cr(VI) ions from aqueous solutions such as pH, initial concentration, contact time and temperature were analyzed. Langmuir, Freundlich and Dubinin-Radushkvich isotherms were used as the model adsorption equilibrium data. Langmuir isotherm model was the most adequate. The pseudo-first-order, pseudo-second-order, Ritch-second-order and intraparticle diffusion models were used to describe the adsorption kinetics. The apparent activation energy was found to be 5.024 kJ mol(-1), which is characteristic of a chemically controlled reaction. The experimental data fitted to pseudo-second-order kinetic. The study of temperature effect was quantified by calculating various thermodynamic parameters such as Gibbs free energy, enthalpy and entropy changes. The thermodynamic parameters obtained indicated the endothermic nature of adsorption of Cr(VI) ions. Morever, after the use in adsorption, the m-poly(DVB-VIM) microbeads with paramagnetic property were separeted via the applied magnetic force. The magnetic beads could be desorbed up to about 97% by treating with 1.0 M NaOH. These features make the m-poly(DVB-VIM) microbeads a potential candidate for support of Cr(VI) ions removal under magnetic field.

Karaca, H. and C. Koyunoğlu (2010). "Co-liquefaction of Elbistan Lignite and Biomass. Part I: The Effect of the Process Parameters on the Conversion of Liquefaction Products." Energy Sources Part A: Recovery, Utilization & Environmental Effects **32**(6): 495-511.

In this study, the liquefaction of Elbistan lignite and the co-liquefaction of Elbistan lignite with the biomass were examined. The biomass type used in this study consists of waste plastic, waste paper, waste mud, and molasses. The dissolution reactions were carried out in tetralin at 350-425°C under nitrogen atmosphere. Mo(CO)6, Cr(CO)6, Fe2O3, and MoO3 were used as the added catalysts. The particle size ranged from 0.25 mm to 1.5 mm, the isothermal extraction periods ranged from 30 to 150 min, and the solvent/lignite ratio ranged from 1/1 to 9/1. The results indicated that total conversion and oil + gas conversion obtained during the liquefaction largely changed according to catalyst type, biomass type, and reaction temperature. It is understood that other process parameters, such as particle size and solvent/solid ratio, did not have any important effects. According to the obtained results, optimum process parameters were determined as particle size of 1.5 mm, solvent/solid ratio of 3/1, reaction time of 90 min, and reaction temperature of 400°C. Fe2O3 was selected as the most suitable catalyst type and waste paper as biomass type. In order to reduce liquefaction cost in liquefaction operations, results of the experimental studies showed that using coal + biomass instead of coal, nitrogen instead of hydrogen, and recycled solvent instead of fresh solvent would be more suitable.

[ABSTRACT FROM AUTHOR]

Karamata, B., et al. (2004). "Spatially incoherent illumination as a mechanism for cross-talk suppression in wide-field optical coherence tomography." Optics Letters **29**(7): 736-738.

Comparison of two illumination modes for wide-field optical coherence tomography has revealed that spatially coherent illumination generates coherent cross talk, causing significant image degradation, and that spatially incoherent illumination, with an adequate interferometer design, provides an efficient mechanism for suppression of coherent cross talk. This is shown by comparison of a pulsed laser with a thermal light source for a U.S. Air Force resolution target covered with a scattering solution made from microbeads as well as for an ex vivo tooth.

Karami, A. (2017). "Gaps in aquatic toxicological studies of microplastics." Chemosphere **184**: 841-848.

The contamination of aquatic environments with microplastics (MPs) has spurred an unprecedented interest among scientific communities to investigate their impacts on biota. Despite the rapid growth in the number of studies on the aquatic toxicology of MPs, controversy over the fate and biological impacts of MPs is increasingly growing mainly due to the absence of standardized laboratory bioassays. Given the complex features of MPs, such as the diversity of constituent polymers, additives, shapes and sizes, as well as continuous changes in the particle buoyancy as a result of fouling and defouling processes, it is necessary to modify conventional bioassay protocols before employing them for MP toxicity testings. Moreover, several considerations including quantification of chemicals on/in the MP particles, choice of test organisms, approaches for renewing the test solution, aggregation prevention, stock solution preparation, and units used to report MP concentration in the test solution should be taken into account. This critical review suggests some important strategies to help conduct environmentally-relevant MP bioassays.

Karami, A., et al. (2017). "A high-performance protocol for extraction of microplastics in fish." Science of the Total Environment **578**: 485-494.

So far, several classes of digesting solutions have been employed to extract microplastics (MPs) from biological matrices. However, the performance of digesting solutions across different temperatures has never been systematically investigated. In the first phase of the present study, we measured the efficiency of different oxidative agents (NaClO or H 2 O 2), bases (NaOH or KOH), and acids [HCl or HNO 3 ; concentrated and diluted (5%)] in digesting fish tissues at room temperature (RT, 25 °C), 40, 50, or 60 °C. In the second phase, the treatments that were efficient in digesting the biological materials (> 95%) were evaluated for their compatibility with eight major plastic polymers (assessed through recovery rate, Raman spectroscopy analysis, and morphological changes). Among the tested solutions, NaClO, NaOH, and diluted acids did not result in a satisfactory digestion efficiency at any of the temperatures. The H 2 O 2 treatment at 50 °C efficiently digested the biological materials, although it decreased the recovery rate of nylon-6 (NY6) and nylon-66 (NY66) and altered the colour of polyethylene terephthalate (PET) fragments. Similarly, concentrated HCl and HNO 3 treatments at RT fully digested the fish tissues, but also fully dissolved NY6 and NY66, and reduced the recovery rate of most or all of

the polymers, respectively. Potassium hydroxide solution fully eliminated the biological matrices at all temperatures. However, at 50 and 60 °C, it degraded PET, reduced the recovery rate of PET and polyvinyl chloride (PVC), and changed the colour of NY66. According to our results, treating biological materials with a 10% KOH solution and incubating at 40 °C was both time and cost-effective, efficient in digesting biological materials, and had no impact on the integrity of the plastic polymers. Furthermore, coupling this treatment with NaI extraction created a promising protocol to isolate MPs from whole fish samples. [ABSTRACT FROM AUTHOR]
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Karami, A., et al. (2017). "The presence of microplastics in commercial salts from different countries." Scientific Reports **7**: 46173.
The occurrence of microplastics (MPs) in saltwater bodies is relatively well studied, but nothing is known about their presence in most of the commercial salts that are widely consumed by humans across the globe. Here, we extracted MP-like particles larger than 149 mum from 17 salt brands originating from 8 different countries followed by the identification of their polymer composition using micro-Raman spectroscopy. Microplastics were absent in one brand while others contained between 1 to 10 MPs/Kg of salt. Out of the 72 extracted particles, 41.6% were plastic polymers, 23.6% were pigments, 5.50% were amorphous carbon, and 29.1% remained unidentified. The particle size (mean +/- SD) was 515 +/- 171 mum. The most common plastic polymers were polypropylene (40.0%) and polyethylene (33.3%). Fragments were the primary form of MPs (63.8%) followed by filaments (25.6%) and films (10.6%). According to our results, the low level of anthropogenic particles intake from the salts (maximum 37 particles per individual per annum) warrants negligible health impacts. However, to better understand the health risks associated with salt consumption, further development in extraction protocols are needed to isolate anthropogenic particles smaller than 149 mum.

Karbalaei, S., et al. (2019). "Abundance and characteristics of microplastics in commercial marine fish from Malaysia." Marine Pollution Bulletin **148**: 5.
Plastic debris is widespread and ubiquitous in the marine environment and ingestion of plastic debris by marine organisms is well-documented. Viscera and gills of 110 individual marine fish from 11 commercial fish species collected from the marine fish market were examined for presence of plastic debris. Isolated particles were characterized by Raman spectroscopy, and elemental analysis was assessed using energy-dispersive X-ray spectroscopy (EDX). Nine (of 11) species contained plastic debris. Out of 56 isolated particles, 76.8% were plastic polymers, 5.4% were pigments, and 17.8% were unidentified. Extracted plastic particle sizes ranged from 200 to 34,900 μm (mean = 2600 μm ±7.0 SD). Hazardous material was undetected using inorganic elemental analysis of extracted plastic debris and pigment particles. The highest number of ingested microplastics was measured in Eleutheronema tridactylum and Clarias gariepinus, suggesting their potential as indicator species to monitor and study trends of ingested marine litter.

Karbalaei, S., et al. (2020). "Analysis and inorganic composition of microplastics in commercial Malaysian fish meals." Marine Pollution Bulletin **150**: 110687.

Presence of microplastics (MPs) in a broad range of wild and cultured marine organisms is well-documented, but transfer mechanisms by which cultured organisms are contaminated with MPs is poorly understood. MP loads in three Malaysian commercial brands of fish meal were investigated. Chemical composition of extracted MP-like particles was confirmed using micro-Raman spectroscopy. Inorganic composition of MPs and pigment particles were assessed through energy-dispersive X-ray spectroscopy (EDX). Out of 336 extracted particles, 64.3% were plastic polymers, 25% pigment particles, 4.2% non-plastic items, and 6.5% were unidentified. Fragments were the dominant form of MPs (78.2%) followed by filaments (13.4%) and films (8.4%). This study demonstrates that cultured organisms could be exposed to high levels of MPs via MP contaminated fish/shellfish used in fish meal production. Fish meal replacement with other sources of protein including meat meals and plant-based meals may mitigate MP exposure to cultured or farmed organisms.

Karbalaei, S., et al. (2018). "Occurrence, sources, human health impacts and mitigation of microplastic pollution." Environmental Science & Pollution Research **25**(36): 36046-36063.
The presence and accumulation of plastic and microplastic (MP) debris in the natural environment is of increasing concern and has become the focus of attention for many researchers. Plastic debris is a prolific, long-lived pollutant that is highly resistant to environmental degradation, readily adheres hydrophobic persistent organic pollutants and is linked to morbidity and mortality in numerous aquatic organisms. The prevalence of MPs within the natural environment is a symptom of continuous and rapid growth in synthetic plastic production and mismanagement of plastic waste. Many terrestrial and marine-based processes, including domestic and industrial drainage, maritime activities agricultural runoff and wastewater treatment plants (WWTPs) effluent, contribute to MP pollution in aquatic environments. MPs have been identified in food consumed by human and in air samples, and exposure to MPs via ingestion or inhalation could lead to adverse human health effects. Regulations in many countries have already been established or will soon be implemented to reduce MPs in aquatic environments. This review focuses on the occurrence, sources, and transport of MPs in terrestrial and aquatic environments to highlight potential human health effects, and applicable regulations to mitigate impacts of MPs. This study also highlights the importance of personality traits and cognitive ability in reducing the entry of MPs into the environment.

Karidis, A. (2019). "What Emerging Contaminants are on Whose Radar?" Waste360: N.PAG-N.PAG.
"Emerging contaminants of concern" is now a buzz term in the solid waste management arena. Three main leachate treatment technologies address the problems around emerging contaminants to a degree: reverse osmosis, activated carbon and ion exchange. "It means we will need to take steps to remove contaminants before they release to the environment ... And I think landfill owners need to look at whether leachate is a significant contributor to emerging contaminants entering wastewater treatment plants. [Extracted from the article]
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Karidis, A. (2019). "Why EFS-Plastics is on the Chase for Mixed Bales." Waste360: N.PAG-N.PAG.

The article discusses Elastic File System (EFS) plastics on looking for making mixed bales of plastics. Topics include views of Eadaoin Quinn, EFS-Plastics director of business development and procurement on looking for plastics which working with materials; company which makes and sells pellets for automotive, construction and agricultural commodities; and offer reusable bags with least 20 percent of post consumer content.

Karidis, A. (2020). "Manufacturer Hub Labels Becomes Landfill Free." Waste360: N.PAG-N.PAG.

The Hagerstown, Md.-based label manufacturer has become landfill free, despite its place in an industry notorious for generating high volumes of hard-to-recycle and impossible-to-recycle materials. These are materials the recycling market often no longer accepts as it [unlike SRF manufacturers] has no market for them, says Dyson. [Extracted from the article]

Karisathan Sundararajan, N. and A. R. B. Ammal (2018). "Improvement studies on emission and combustion characteristics of DICI engine fuelled with colloidal emulsion of diesel distillate of plastic oil, TiO₂ nanoparticles and water." Environmental Science & Pollution Research **25**(12): 11595-11613.

Experimentation was conducted on a single cylinder CI engine using processed colloidal emulsions of TiO₂ nanoparticle-water-diesel distillate of crude plastic diesel oil as test fuel. The test fuel was prepared with plastic diesel oil as the principal constituent by a novel blending technique with an aim to improve the working characteristics. The results obtained by the test fuel from the experiments were compared with that of commercial petro-diesel (CPD) fuel for same engine operating parameters. Plastic oil produced from high density polyethylene plastic waste by pyrolysis was subjected to fractional distillation for separating plastic diesel oil (PDO) that contains diesel range hydrocarbons. The blending process showed a little improvement in the field of fuel oil-water-nanometal oxide colloidal emulsion preparation due to the influence of surfactant in electrostatic stabilization, dielectric potential, and pH of the colloidal medium on the absolute value of zeta potential, a measure of colloidal stability. The engine tests with nano-emulsions of PDO showed an increase in ignition delay (23.43%), and decrease in EGT (6.05%), BSNO_x (7.13%), and BSCO (28.96%) relative to PDO at rated load. Combustion curve profiles, percentage distribution of compounds, and physical and chemical properties of test fuels ascertains these results. The combustion acceleration at diffused combustion phase was evidenced in TiO₂ emulsion fuels under study.

Karkanorachaki, K., et al. (2018). "Plastic pellets, meso- and microplastics on the coastline of Northern Crete: Distribution and organic pollution." Marine Pollution Bulletin **133**: 578-589.

Plastic pollution in the marine environment is one of the foremost environmental problems of our time, as it affects wildlife and human health both directly and indirectly through the effects of contaminants carried by microplastics. This study investigates the temporal and spatial distribution of plastic pellets and fragments in sandy beaches along the coastline of Northern Crete, during 2013. Their densities varied throughout the year in each beach, with highest densities during the summer and towards the upper parts of the beaches. The concentrations of 16 polycyclic aromatic hydrocarbons (PAHs) sorbed on microplastics sampled from nine sandy

beaches of Northern Crete was quantified using Gas chromatography - Ion Trap Mass Spectrometry (GC-ITMS). PAHs concentrations ranged from non-detectable levels to 1592ng/g and fluctuated between sampling periods. Based on the observed patterns of meso- and microplastics distribution, practical guidelines are proposed to minimize the entrance of microplastics into the seawater wherefrom they are exceptionally difficult to collect, if mitigation actions are to be applied.

Karlsson, T. M., et al. (2019). "Comparison between manta trawl and in situ pump filtration methods, and guidance for visual identification of microplastics in surface waters." Environmental Science & Pollution Research **18**: 18.

Owing to the development and adoption of a variety of methods for sampling and identifying microplastics, there is now data showing the presence of microplastics in surface waters from all over the world. The difference between the methods, however, hampers comparisons, and to date, most studies are qualitative rather than quantitative. In order to allow for a quantitative comparison of microplastics abundance, it is crucial to understand the differences between sampling methods. Therefore, a manta trawl and an in situ filtering pump were compared during realistic, but controlled, field tests. Identical microplastic analyses of all replicates allowed the differences between the methods with respect to (1) precision, (2) concentrations, and (3) composition to be assessed. The results show that the pump gave higher accuracy with respect to volume than the trawl. The trawl, however, sampled higher concentrations, which appeared to be due to a more efficient sampling of particles on the sea surface microlayer, such as expanded polystyrene and air-filled microspheres. The trawl also sampled a higher volume, which decreased statistical counting uncertainties. A key finding in this study was that, regardless of sampling method, it is critical that a sufficiently high volume is sampled to provide enough particles for statistical evaluation. Due to the patchiness of this type of contaminant, our data indicate that a minimum of 26 particles per sample should be recorded to allow for concentration comparisons and to avoid false null values. The necessary amount of replicates to detect temporal or spatial differences is also discussed. For compositional differences and size distributions, even higher particle counts would be necessary. Quantitative measurements and comparisons would also require an unbiased approach towards both visual and spectroscopic identification. To facilitate the development of such methods, a visual protocol that can be further developed to fit different needs is introduced and discussed. Some of the challenges encountered while using FTIR microspectroscopic particle identification are also critically discussed in relation to specific compositions found.

Karlsson, T. M., et al. (2017). "Screening for microplastics in sediment, water, marine invertebrates and fish: method development and microplastic accumulation." Marine Pollution Bulletin **122**(1/2): 403-408.

Measurements of microplastics in biota and abiotic matrices are key elements of exposure and risk assessments for this emerging environmental pollutant. We investigated the abundance of microplastics in field-collected biota, sediment and water. An improved sediment extraction method, based on density separation was developed. For analysis of microplastics in biota we found that an adapted enzymatic digestion protocol using proteinase K performed best, with a 97% recovery of spiked plastic particles and no observed degradation effects on the plastics in subsequent Raman analysis. Field analysis revealed that 8 of 9 tested invertebrate species from the North Sea and 68% of analyzed individuals of brown trout (Salmo trutta) from the Swedish West Coast had microplastics in them. Based on the number of plastic particles per kg d.w. the microplastic concentrations found in mussels were approximately a thousand-fold higher compared to those in sediment and surface water samples from the same location.

Karmana, E., et al. (1997). "The microsortation of high loadings of post-consumer mixed polyolefins using liquid carbon dioxide in a slightly agitated, batch apparatus." Resources, Conservation and Recycling **20**(3): 143-152.

The microsortation of clean, dry, mixed, shredded, post-consumer polyolefins can be accomplished using near-critical carbon dioxide as a float-sink medium. At high loadings of plastics, however, buoyant forces alone are not sufficient to break up the aggregates of interlocking shredded plastic particles. Therefore a close-clearance impeller must be used to agitate the mixed plastics during the batch separation. This slight agitation permits these irregularly shaped chips to either float or sink without being hindered by surrounding chips. The separation apparatus operates most efficiently when the plastics are charged to a level that corresponds to the top of the highest blade of a large-diameter multiple-pitched blade impeller that rotates at 15 rpm. A post-consumer flake mixture of 85% HDPE/15% PP can be sorted into HDPE and PP streams of 99 + % purity at loadings up to 56 volume per cent. In the absence of an impeller, high purity separations can be achieved at loadings of only two volume per cent. This dramatic increase in the loading reduces the estimated processing cost of mixed polyolefins to $ 0.03-0.05/lb, enhancing the economic feasibility of this high pressure, CO<inf>2</inf>-based microsortation process.

Karthick, T., et al. (2016). "Biodegradation of plastic by Bacillus subtilis isolated from polythene polluted soil." World Journal of Pharmaceutical Research **5**(4): 1148-1153.

Polyethylene is a commonly used raw material in manufacturing plastics, which are non-biodegradable substances that stay in the environment for an infinite period of time. According to the Central Pollution Control Board (CPCB), India generates nearly 56 lakh tonnes of plastic waste each year with only 60% of it being recycled and reused. The remaining 40% causes not just littering but it is hazardous to freshwater, marine and terrestrial ecosystems. Bacillus subtilis is the most efficient soil microbes which degrade polyethylene without the need of applying any external treatments and may provide an ecofriendly solution for management of plastic waste. Plastic degradation by microbes due to the activity of enzymes that cause cleavage of the polymer chains into monomers and oligomers. The degradation of plastic by Bacillus subtilis is analysed using liquid (shaker) culture method. Microbes degrade plastic more in 1 month period.

Karthik, R., et al. (2018). "Microplastics along the beaches of southeast coast of India." Science of the Total Environment **645**: 1388-1399.

Occurrence of microplastics (plastic debris <5mm) along the coast is a growing concern worldwide, due to increased input of discarded wastes from various sources. In order to evaluate the extent of microplastic pollution on the sandy beaches (25 locations) along Tamil Nadu coast (1076km), India, microplastic debris were quantified and categorized into four different size classes. The beaches were classified according to potential sources of pollution i.e. riverine, tourism and fisheries. Beach samples collected from the high tide line contained significantly higher abundance of microplastic than at the low tide line. Beaches adjacent to rivers exhibited relatively higher microplastic abundance compared to those influenced by tourism and fishing activities. Out of the total detected debris, plastic fragments were the maximum (47-50%), followed by line/fibres (24-27%) and foam (10-19%) materials. Fourier Transform Infrared Spectroscopy (FTIR) analysis revealed that polyethylene, polypropylene, and polystyrene were the main types of microplastics present in these beaches. Gut content analysis of commercially important fishes, collected from the coastal waters, revealed microplastics

ingestion in 10.1% of fishes. The results indicate that microplastics accumulation in the coastal environment, especially close to the river mouths, may be a serious concern, due to its ability to enter into the marine food web and highlights the necessity of microplastics screening from estuarine, coastal waters and other potential sources.

Karthik Raja, M., et al. (2012). "Formulation, characterization and evaluation of aceclofenac-alginate/potato starch micro beads." Indian Journal of Novel Drug Delivery **4**(2): 151-156.
Microencapsulation is a process by which very tiny droplets or particles of liquid or solid material are surrounded or coated with a continuous film of polymeric material. It means of converting liquids to solids, of altering colloidal and surface properties. The capsule protects the active ingredient from its surrounding environment until an appropriate time and material escapes through the capsule wall either by rupture, dissolution, melting or diffusion. In the view of converting the active pharmaceutical ingredients into dosage forms suitable for administration, the present study is an attempt to formulate a hydrogel bead of micron size by ionotrophic gelation technique using potato starch as a release retardant and thereby increasing the release time of the encapsulated drug and providing a delayed/controlled release formulation. It was observed that increase in polymer concentration, the drug release and particle size was gradually decreased. The formulation were investigated for various parameters life particle size, micrometric properties, surface morphology by SEM, incorporate efficiency and invitro release study. With the obtained results of mentioned parameter it reveals that microbeads with high potato starch concentration (F1 & F2) show delayed release of aceclofenac. Decrease in concentration of alginate results in reduced size of the microbeads along with high efficiency, thus satisfied the need of formulation of delayed release aceclofenac microbeads. © KESS All rights reserved.

Kase, J. A., et al. (2016). "Rapid identification of Shiga toxin-producing Escherichia coli O serogroups from fresh produce and raw milk enrichment cultures by Luminex bead-based suspension array." Journal of Food Protection **79**(9): 1623-1629.
The U.S. Food and Drug Administration's Bacteriological Analytical Manual (BAM) Chapter 4a describes a Luminex microbead-based suspension array used to screen colonies for 11 clinically relevant Shiga toxin-producing Escherichia coli (STEC) serogroups: O26, O45, O91, O103, O104, O111, O113, O121, O128, O145, and O157. We evaluated the usefulness of this method to identify STEC-positive enrichment samples before agar plating. Twelve E. coli strains were added to three types of fresh produce (bagged baby spinach, alfalfa sprouts, and cilantro) at levels near the detection limit of the test. A subset of these strains (six O serogroups) was similarly evaluated in raw milk. For comparison, portions of each of the 168 enrichment cultures were analyzed for serogroup by a real-time PCR assay and a Bio-Plex 200 assay with the bead-based suspensions. No falsepositive results were obtained. Of the 112 samples with a reported cycle threshold (C_T) value, 101 undiluted, diluted, or extracted enrichment cultures also produced ratios above 5.0 in the Bio-Plex assay. When PCR C_T values approached or were greater than 35, Bio-Plex detection became less reliable. Using undiluted or extracted enrichment cultures resulted in a significantly larger number of positive results. With the same enrichment material prepared for real-time PCR analysis as described in the BAM Chapter 4a, the STEC microbead-based suspension array can accurately screen food enrichment cultures.

Kasi, D., et al. (2017). "Cell-free translational screening of an expression sequence tag library of Clonorchis sinensis for novel antigen discovery." Biotechnology Progress **33**(3): 832-837.
The rapidly evolving cloning and sequencing technologies have enabled understanding of

genomic structure of parasite genomes, opening up new ways of combatting parasite-related diseases. To make the most of the exponentially accumulating genomic data, however, it is crucial to analyze the proteins encoded by these genomic sequences. In this study, we adopted an engineered cell-free protein synthesis system for large-scale expression screening of an expression sequence tag (EST) library of Clonorchis sinensis to identify potential antigens that can be used for diagnosis and treatment of clonorchiasis. To allow high-throughput expression and identification of individual genes comprising the library, a cell-free synthesis reaction was designed such that both the template DNA and the expressed proteins were co-immobilized on the same microbeads, leading to microbead-based linkage of the genotype and phenotype. This reaction configuration allowed streamlined expression, recovery, and analysis of proteins. This approach enabled us to identify 21 antigenic proteins. © 2017 American Institute of Chemical Engineers Biotechnol. Prog., 33:832-837, 2017

Kaske, M. and W. v. Engelhardt (1990). "The effect of size and density on mean retention time of particles in the gastrointestinal tract of sheep." British Journal of Nutrition **63**(3): 457-465.

The selective retention of particles in the reticulo-rumen and in the gastrointestinal tract distal to the reticulo-rumen was studied in fistulated sheep maintained on a roughage diet. Polyethylene glycol and plastic particles of different lengths (1 and 10 mm) and densities (0.92, 1.03, 1.22 and 1.44 g/ml) were given by mouth or into the omasum. The mean retention time in the reticulo-rumen (MRT_{RR}) of 1 mm long particles with a density of about 1.0 g/ml was about 67 h, that is eight times longer than the MRT_{RR} of fluid; the heavier particles were retained only 3 times longer than fluid. Particles with a length of 10 mm were retained in the reticulo-rumen 19 to 28 h longer than 1 mm long particles of the same density. Particles with a length of 10 mm were reduced to smaller particles (0.5 to 4 mm) due to rumination. Multiple regression analysis indicated that particle density and particle size accounted for 59 and 28% of the total variation of MRT_{RR}, respectively. The mean retention time distal to the reticulo-rumen of 1 and 10-mm long particles with a density near 1.0 g/ml was 18 to 19 h, similar to that of fluid (16 h). The heavier particles were retained about 3 to 8 h longer.

Kaske, M., et al. (1992). "The influence of density and size of particles on rumination and passage from the reticulo-rumen of sheep." British Journal of Nutrition **67**(2): 235-244.

Plastic particles with different densities (0.92, 1.03, 1.22 and 1.44 g/ml) and sizes (1, 10 and 20 mm) were introduced by cannula into the rumen of sheep fed on a roughage diet. The rumen was emptied 12 and 24 h after the introduction of particles, and the contents were replaced by the same amount of rumen contents without plastic particles. The proportions of particles which left the reticulo-rumen (RR) during the experimental period were estimated by collecting faeces during the following 5 days. Non-ruminated particles were separated from dried RR contents and faeces. Large particles were ruminated independently of particle size and density within the investigated range. After 12 and 24 h, 59 and 81%, respectively, of the particles initially introduced were comminuted due to rumination. During the 12 h period about 4 times as many particles with a density of 1.44 g/ml passed from the RR into the omasum compared with particles with a density of 0.92 or 1.03 g/ml. Three to 10 times more 1 mm particles were excreted than originally-large particles (10 and 20 mm). Particles introduced with an original size of 10 or 20 mm were recovered mostly comminuted in the faeces. In a further experiment the rumens of 8 sheep were emptied and filled with a buffer solution. Plastic particles (10 g) of each length (1, 5, 10 and 20 mm; all with a density of 1.03 g/ml) were introduced into the ventral rumen. Sedimentation of particles was prevented by gassing the solution in the RR. Of the initially introduced particles, 31.9, 25.4, 12.7 and 1.5% of the 1, 5, 10 and 20-mm long particles, respectively, left the RR within 4 h. It is concluded that rumination of particles is independent of particle density and size within the tested range. The probability of particles leaving the RR increases with the higher particle density and with the smaller size. If particle sedimentation is prevented in the RR even 10-mm long particles can leave the RR in considerable amounts.

Kaske, M. and A. Midasch (1997). "Effects of experimentally-impaired reticular contractions on digesta passage in sheep." British Journal of Nutrition **78**(1): 97-110.

Feed intake, mean retention time of luid and plastic particles in the reticulo-rumen, rumen fluid volume, forestomach motility and particle size distribution in the faeces were determined in 5 rumen-fistulated female Blackhead sheep fed on hay ad libitum (experiment 1). The same variables were determined when reticular movements were impaired for 10 days by introducing a silicone-covered lead weight (500 g) into the reticulum (experiment 2). As feed intake significantly decreased in experiment 2 by 27% compared with experiment 1, the sheep received in an additional experiment exactly the amount of feed which had been consumed during experiment 2 and measurements were repeated without impairing reticular movements (experiment 3). The introduction of the weight did not affect the frequency of A- or B-cycles, but elevation of the reticular floor in a cranio-dorsal direction during the biphasic contraction was significantly reduced. The pattern of marker excretion indicated a significantly changed composition of reticular outflow in experiment 2 compared with experiments 1 and 3. During experiment 2, rumen fluid volume was similar to that in experiment 1 but about 25% higher ($P<0.05$) than that in experiment 3; the amount of large feed particles in the faeces was increased ($P<0.05$) compared with experiment 1 (+49%) and experiment 3 (+7%). In at least 2 sheep, abomasal emptying was inhibited during experiment 2, as indicated by an enlarged impacted abomasum. It is concluded that the results emphasize the central role of reticular motility for the separation of particles in the forestomach, the outflow of digesta from the reticulo-rumen and transpyloric digesta flow.

Kaspersen, J. (2013). "One Word: Plastics." Stormwater **14**(8): 6-6.

The author expresses her concern over the growing problem of managing plastic trash. She describes how the nonbiodegradability of plastic enters the waters, gets ingested by animals and eventually by humans. She points out other sources of plastics such as microbeads in cosmetics. New suggestions include sifting the plastic residue by the stormwater management groups, imposing greater responsibility upon plastic producers and banning the use of plastic bags are included.

Kass, M. J. (2019). "Fishing for Plastic: EU Targets Marine Pollution." Natural Resources & Environment **34**(1): 58-59.

The article deals with the effort by the European Union (EU) to address plastic marine litter. The EU has made the move in response to the implications of plastics for the ocean environment, coastal biodiversity and human health. The European Commission's legislative proposal has been approved by the European Parliament to regulate common single-use plastic products.

Kass, W. (2004). "Geohydrological marking techniques. (Lehrbuch der Hydrogeologies Band 9) [German]." Geohydrologische Markierungstechnik **557**.

This book is divided into 5 chapters on definitions of artificial and natural markers (tracers); different tracers (such as paints, salts, smells, radio-active components, Lycopodium spores, fluorescent plastic particles, bacteria); preparation and implementation of tracer studies;

analysis of results. The last chapter provides many examples of the use of tracers in studies of groundwater, gletschers, surface water, deep water, infiltration, and drinking water.

Kassem, A. A., et al. (2015). "Development of mucoadhesive microbeads using thiolated sodium alginate for intrapocket delivery of resveratrol." International Journal of Pharmaceutics **487**(1-2): 305-313.

Resveratrol (Res), a polyphenolic phytoalexin, had shown a promising therapeutic efficacy towards treatment of periodontal disease in vitro. This work aims to develop Res microbeads with strong mucoadhesion using thiolated alginate (TA) for local treatment of periodontal pockets. TA was synthesized by conjugating sodium alginate (A) with thioglycolic acid. Product was evaluated by IR and DSC. Both A and A:TA Res microbeads with different ratios were prepared by ionotropic gelation method. Formulations were evaluated regarding their entrapment efficiency (%EE), swelling index (SI), in vitro drug release and kinetics. Selected formula was examined for its mucoadhesion by ex vivo wash-off method, surface morphology using scanning electron microscope (SEM) and stability against light. Clinical evaluation is running.Formation of TA was confirmed. %EE for all formulations ranged from 83.72 to 104.54%. Results revealed a significant lower SI for TA rich formulation (A/TA 1:1) along with slower release rate and zero-order kinetics, in addition to powerful mucoadhesion; 26% remaining of microbeads after 1 h, compared to 2% for A microbeads. SEM micrographs showed a rough surface with drug precipitation. The formula maintained its %EE after 5 h exposure to direct sunlight. A/TA 1:1 mucoadhesive Res microbeads could be exploited as a prolonged drug release devices for intrapocket application. Copyright © 2015 Published by Elsevier B.V.

Kassis, A. I., et al. (2019). "Immuno-genomic detection and prognostication of aggressive prostate cancer phenotypes by next-generation RNA sequencing." Cancer Research. Conference: American Association for Cancer Research Annual Meeting **79**(13 Supplement).

Prostate cancer (PC) is the most common non-cutaneous malignancy in men. The prediction of outcome based on multicore biopsy specimens is problematic, mainly due to tumor multifocality compounded by intratumoral heterogeneity. Since 1) cancer assays compare a patient's profile to that of individuals unknown to have PC, and 2) baseline signatures of the diseased man are specific to his genome while those of the controls are specific to theirs, such intrinsic inter-individual genomic differences have impeded valid disease signature identification. Thus, methods that filter out inter-individual "noise" not related to the disease should enhance the identification of a robust prognostic PC signature. OBJECTIVE(S): Assess the ability of a novel immuno-genomics blood-based RNA expression assay for PC prognosis. The method, which uses a proprietary algorithm to interrogate CD2 and CD14 cells, is a real-time surveillance of gene expression changes consequent to PC that filters out intrinsic inter-individual genomic signatures not related to PC. We expect this Subtraction-Normalized Expression of Phagocytes (SNEP) approach to be valuable in making apt clinical decisions and stratifying patients with aggressive PC (need life-saving treatments) from those with indolent disease (safe for active surveillance). PATIENTS: Men were eligible for enrollment if they 1) were determined by their physician to have a risk profile that warrants a prostate biopsy (Pre-Biopsy blood draw), 2) had a biopsy >90 d prior to but <1 yr of study entry and scheduled for but have not undergone therapy post biopsy blood draw, and 3) are on active surveillance such that a biopsy will be done within the next year. METHOD(S): Peripheral blood samples (n = 713) were collected in purpletop Vacutainer tubes. CD2 and CD14 cells were isolated 4 h later using Miltenyi's MACS Microbeads and mRNA was extracted using the Qiagen's miRNEasy Mini Kit. The raw (FASTQ) RNA-Seq data (Illumina) was trimmed (Trimmomatic), aligned (Bowtie2), and quantified (Express). Transcripts with quantifiable expression changes between samples from the two cell types were identified

following differential expression analysis using a linear model and cell type as endpoints. This resulted in the final set of 10,643 transcripts with <10% False Discovery Rate (FDR) and >1.5 absolute fold change. RESULT(S): We identified genomic signatures in biopsy-positive patients that are predictive of Gleason grade, Cores Positive (CP), Maximum Involvement (MI), and an Aggressiveness Index (AI - an aggregate of the 3 endpoints). The signature scores were significantly associated with GG (tau 0.427, p 1.3x10⁻²⁵), CP (tau 0.275, p3.3x10⁻¹¹), MI (tau 0.564, p 8.5x10⁻⁴⁴), and AI (tau 0.517, p 7.2x10³⁷). Interestingly, 1) certain transcripts were found to be specific to each endpoint (108 for GG, 88 for CP, 93 for MI, and 102 for AI), 2) some pairwise overlap was seen - highlighting the complementary of the three endpoints, and 3) no overall overlap was detected between all four endpoints. CONCLUSION(S): The multiple genomic signatures identified from CD2/CD14 RNA expression ratios - per SNEP assay - gives a prognostic summary that is comparable to prostate biopsy information including tumor grade, size/volume, and heterogeneity, and leads to the development of an aggressiveness signature that if validated will affect patient care decisions.

Kassouf, A., et al. (2014). "Rapid discrimination of plastic packaging materials using MIR spectroscopy coupled with independent components analysis (ICA)." Waste Management **34**(11): 2131-2138.

Plastic packaging wastes increased considerably in recent decades, raising a major and serious public concern on political, economical and environmental levels. Dealing with this kind of problems is generally done by landfilling and energy recovery. However, these two methods are becoming more and more expensive, hazardous to the public health and the environment. Therefore, recycling is gaining worldwide consideration as a solution to decrease the growing volume of plastic packaging wastes and simultaneously reduce the consumption of oil required to produce virgin resin. Nevertheless, a major shortage is encountered in recycling which is related to the sorting of plastic wastes. In this paper, a feasibility study was performed in order to test the potential of an innovative approach combining mid infrared (MIR) spectroscopy with independent components analysis (ICA), as a simple and fast approach which could achieve high separation rates. This approach (MIR-ICA) gave 100% discrimination rates in the separation of all studied plastics: polyethylene terephthalate (PET), polyethylene (PE), polypropylene (PP), polystyrene (PS) and polylactide (PLA). In addition, some more specific discriminations were obtained separating plastic materials belonging to the same polymer family e.g. high density polyethylene (HDPE) from low density polyethylene (LDPE). High discrimination rates were obtained despite the heterogeneity among samples especially differences in colors, thicknesses and surface textures. The reproducibility of the proposed approach was also tested using two spectrometers with considerable differences in their sensitivities. Discrimination rates were not affected proving that the developed approach could be extrapolated to different spectrometers. MIR combined with ICA is a promising tool for plastic waste separation that can help improve performance in this field; however further technological improvements and developments are required before it can be applied at an industrial level given that all tests presented here were performed under laboratory conditions.

Kataoka, T., et al. (2019). "Assessment of the sources and inflow processes of microplastics in the river environments of Japan." Environmental Pollution **244**: 958-965.

The numerical and mass concentrations of microplastics collected at 36 sites on the surfaces of 29 Japanese rivers were mapped and compared with four basin characteristics (basin area, population density, and urban and agricultural ratios) and six water quality parameters (pH, biochemical oxygen demand (BOD), suspended solids (SS), dissolved oxygen (DO), total nitrogen

(T-N), and total phosphorus (T-P)) in each river basin. Microplastics were found in 31 of the 36 sites, indicating that some plastics fragment into small pieces before reaching the ocean. The microplastic concentrations are significantly correlated with urbanisation and population density, indicating that the microplastic concentrations in the river depend on human activities in the river basin. Furthermore, we found a significant relationship between the numerical and mass concentrations and BOD, which is an environmental indicator of river pollution. This result demonstrates that microplastic pollution in river environments has progressed more in polluted rivers with poor water quality than in rivers with good water quality, leading to the conclusion that the sources and inflow processes of microplastics in river environments are similar to those of other pollutants. Our findings can help identify potential sources (i.e., point and non-point sources) of fragmented microplastics to improve waste management in Japan and model the transport fluxes of fragmented microplastics in Japanese rivers using water quality parameters and basin characteristics. Graphical abstract Image 1 Highlights • Microplastics (MPs) were collected at 36 sites on the surface of 29 Japanese rivers. • The concentrations of MPs in count and mass were investigated and mapped. • MPs concentrations are significantly correlated with biochemical oxygen demand (BOD). • The pollution by MPs has progressed in polluted rivers with poor water quality. • The outflow sources and processes of MPs are similar to those of pollutants. [ABSTRACT FROM AUTHOR]

Katare, R., et al. (2013). "Perivascular delivery of encapsulated mesenchymal stem cells improves postischemic angiogenesis via paracrine activation of VEGF-A." Arteriosclerosis, Thrombosis & Vascular Biology **33**(8): 1872-1880.

OBJECTIVE: To test the therapeutic activity of perivascular transplantation of encapsulated human mesenchymal stem cells (MSCs) in an immunocompetent mouse model of limb ischemia.

APPROACH AND RESULTS: CD1 mice underwent unilateral limb ischemia, followed by randomized treatment with vehicle, alginate microbeads (MBs), MB-encapsulated MSCs (MB-MSCs), or MB-MSCs engineered with glucagon-like peptide-1. Treatments were applied directly in the perivascular space around the femoral artery. Laser Doppler and fluorescent microsphere assessment of blood flow showed a marked improvement of perfusion in the MB-MSCs and MB-MSCs engineered with glucagon-like peptide-1 groups, which was associated with increased foot salvage particularly in MB-MSCs engineered with glucagon-like peptide-1-treated mice. Histological analysis revealed increased capillary and arteriole density in limb muscles of the 2 MSC groups. Furthermore, MB-MSCs engineered with glucagon-like peptide-1 and, to a lesser extent, MB-MSC treatment increased functional arterial collaterals alongside the femoral artery occlusion. Analysis of expressional changes in ischemic muscles showed that MB-MSC transplantation activates a proangiogenic signaling pathway centered on vascular endothelial growth factor A. In contrast, intramuscular MB-MSCs caused inflammatory reaction, but no improvement of reparative vascularization. Importantly, nonencapsulated MSCs were ineffective either by intramuscular or perivascular route.

CONCLUSIONS: Perivascular delivery of encapsulated MSCs helps postischemic reperfusion. This novel biological bypass method might be useful in patients not amenable to conventional revascularization approaches.

Katare, R., et al. (2012). "Perivascular delivery of microbead-encapsulated mesenchymal stem cells improves perfusion recovery after limb ischemia." Circulation. Conference: American Heart Association **126**(21 SUPPL. 1).

Objective: Stem cell therapy holds promise for the treatment of peripheral vascular disease. However, the optimal method for cell delivery to achieve maximum therapeutic effect, i.e. efficient collateralization, is still debated. We tested the feasibility and efficacy of perivascular application of mesenchymal stem cells (MSCs) as a novel method to bypass the artery blockage. Methods and Results: Ten week-old CD1 mice underwent unilateral limb ischemia by femoral artery occlusion, followed by randomized treatment with vehicle (V), microbead-encapsulated MSCs (MB-MSCs) or microbeads alone (MB) injected in the perivascular space around the femoral artery and vein (n=12 in each group) at the site of vascular occlusion. Laser Doppler showed a marked improvement of blood flow recovery in the MB-MSCs group (P<0.001 vs. V or MB, from day 7 to 21 after ischemia). Final measurement of muscular blood flow by fluorescent microspheres confirmed the improvement in MB-MSCs group (0.960.06 vs. 0.820.02 ml/gm of tissue in V and vs. 0.850.01 ml/gm in MB, P<0.001). Histological analysis at day 21 revealed increased capillary (88015 vs. 67316/mm2in V and vs. 73512/mm2in MB) and arteriole density (150.5 vs. 100.4/mm2 in V and vs. 100.3/mm2 in MB, P<0.001 for both comparisons). Whole mount IHC demonstrated numerous functional capillaries and arterioles bridging the space between MB-MSCs and the ischemic muscles at the site of femoral artery occlusion (Figure). These effects were absent in the group treated with microbeads alone. Cytometry bead array and RT-PCR profiler analysis showed activation of genes regulating angiogenesis pathway in the MB-MSCs group. Conclusion(s): We newly show the feasibility and efficacy of perivascular delivery of MSCs to enhance peri-occlusional collaterals and improve reperfusion following limb ischemia. This novel biological bypass method might be particularly useful in patients not amenable to conventional revascularization.

Katayama, M., et al. (2014). "Plasma pentraxin3 (PTX3) as a novel useful biomarker for infection in patients with rheumatoid arthritis (RA)." Annals of the Rheumatic Diseases. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **73**(SUPPL. 2).

Background Infection is a critical complication that occurs during the management of RA patients. High levels of serum C-reactive protein (CRP), is not easily distinguishable between the exacerbations of RA from infections. PTX3 is a novel biomarker which responds to local inflammation. The following study evaluates the diagnostic use of PTX3 in RA patients with high levels of CRP. Objectives To evaluate the diagnostic use of PTX3 in RA patients with high levels of CRP. Methods 18 RA patients with infections (infection RA: iRA), 20 with high disease activity of RA (flare RA: fRA) and 23 healthy controls (HC) were enrolled in this study. Patients whom pathogens were identified were designated as iRA (15 bacterial, 2 viral and 1 mycosis). We measured PTX3, CRP, procalcitonin (PCT) and neutrophil CD64 (nCD64), pre- and post-treatments (iRA and fRA) and at any time (HC). PTX3 levels were measured using an enzyme-linked immunoabsorbent assay (ELISA). mCD64 was measured by a quantitative flow cytometry using fluorescene microbeads. Levels of respective measurements at both pre- and post-treatment were analyzed using the Wilcoxon signed-rank test, and comparisons of levels within each group were analyzed using the Mann-Whitney's U-test. Results At pre-treatment, levels of PTX3 in iRA (15.1+/-20.7 ng/ml) are significantly higher compared with those in fRA (3.6+/-4.2 ng/ml). Both levels for iRA and fRA were significantly higher compared with those in HC (0.89+/-0.91 ng/ml). Additionally, levels of PCT (0.048+/-0.042 ng/ml) and nCD64 (1488+/-470 molecules per cell) at pre-treatment in fRA were <0.5 ng/ml and <2,000 molecules

per cell, respectively. After treatment, levels of PTX3 ($p<0.01$), CRP ($p<0.01$), PCT ($p<0.01$), nCD64 ($p<0.01$) were significantly decreased in iRA. In fRA, CRP ($p<0.01$), PCT ($p<0.01$), nCD64 ($p=0.02$) were significantly decreased after treatment, but PTX3 levels were not ($p=0.13$). Conclusions Plasma PTX3 levels may be a helpful tool in distinguishing worsening of RA from complications due to infection. (Table Presented).

Katija, K., et al. (2017). "From the surface to the seafloor: How giant larvaceans transport microplastics into the deep sea." Science Advances **3**(8): e1700715.

Plastic waste is a pervasive feature of marine environments, yet little is empirically known about the biological and physical processes that transport plastics through marine ecosystems. To address this need, we conducted in situ feeding studies of microplastic particles (10 to 600 mum in diameter) with the giant larvacean Bathochordaeus stygius. Larvaceans are abundant components of global zooplankton assemblages, regularly build mucus "houses" to filter particulate matter from the surrounding water, and later abandon these structures when clogged. By conducting in situ feeding experiments with remotely operated vehicles, we show that giant larvaceans are able to filter a range of microplastic particles from the water column, ingest, and then package microplastics into their fecal pellets. Microplastics also readily affix to their houses, which have been shown to sink quickly to the seafloor and deliver pulses of carbon to benthic ecosystems. Thus, giant larvaceans can contribute to the vertical flux of microplastics through the rapid sinking of fecal pellets and discarded houses. Larvaceans, and potentially other abundant pelagic filter feeders, may thus comprise a novel biological transport mechanism delivering microplastics from surface waters, through the water column, and to the seafloor. Our findings necessitate the development of tools and sampling methodologies to quantify concentrations and identify environmental microplastics throughout the water column.

Kato, K., et al. (2017). "Novel interferon-gamma enzyme-linked immunoSpot assay using activated cells for identifying hypersensitivity-inducing drug culprits." Journal of Dermatological Science **86**(3): 222-229.

BACKGROUND: The drug-induced lymphocyte stimulation test (DLST), also referred to as lymphocyte transformation test (LTT), is used to identify the culprit drug in cases of cutaneous adverse drug reactions (cADR). Although DLST is a widely used in vitro test, its sensitivity and specificity are unsatisfactory. Recent reports suggest that the detection of drug-induced interferon (IFN)-gamma production using enzyme-linked immunoSpot (ELISpot) assay (conventional IFN-gamma ELISpot) is useful for identifying culprit drugs in cADR cases.

OBJECTIVE: The aim of this study was to establish a novel method for identifying culprit drugs in patients with cADR by efficiently detecting drug-specific IFN-gamma production using activated cells.

METHODS: Sixteen patients with cADR, including drug-induced hypersensitivity syndrome, erythema multiforme-like eruption, maculopapular exanthema, Stevens-Johnson syndrome, and toxic epidermal necrolysis, caused by clinically convincing culprit drugs were enrolled in this study. In some cases, the blood samples were obtained at two or three different time points. Peripheral blood mononuclear cells (PBMCs) from total 20 samples were analyzed using both the DLST and drug-induced conventional IFN-gamma ELISpot. In addition, drug-induced IFN-gamma ELISpot was performed using PBMCs, which were stimulated with anti-cluster of differentiation (CD)-3/CD28 antibody-coated microbeads and interleukin (IL)-2 for 7 days before exposure to the culprit drugs (modified IFN-gamma ELISpot).

RESULTS: Among the culprit drugs tested in each patient, the modified IFN-gamma ELISpot was positive in 17 samples (13 patients) while DLST and conventional IFN-gamma ELISpot were positive in eight and four samples (six and three patients), respectively.

CONCLUSION: The modified IFN-gamma ELISpot using activated PBMCs was more sensitive than the conventional IFN-gamma ELISpot was for detecting drug-induced IFN-gamma production, which could be a useful in vitro tool for identifying culprit drugs in cADR cases.

Katodritou, E., et al. (2011). "Tumor-primed natural killer cells from patients with multiple myeloma lyse autologous, NK-resistant, bone marrow-derived malignant plasma cells." Haematologica **2)**: 119.

Background. Natural killer (NK) cells are cytotoxic lymphocytes able to kill tumor cells and virus-infected cells. Human resting NK cells can be activated by co-culture with NK-resistant CTV-1 cells. These tumoractivated cells (TaNK) are cytotoxic to a range of NK-resistant tumor cells in vitro. This potential, has not been explored in multiple myeloma (MM). Aim. The current study was design to assess the relative function in vitro of NK and TaNK cells from MM patients compared to normal controls in the lysis of tumor cell- lines and freshly isolated autologous and allogeneic MM cells. In addition we explored whether the ability to generate TaNK cells in vitro correlates with patients' characteristics, including the disease status and treatment, including novel agents. Methods. Freshly isolated CD56+ NK cells from normal donors and 21 MM patients, separated with CD56 immunomagnetic Microbeads were co-incubated with CTV-1 cells or lysates there from, overnight at 37oC, 5% CO2, to generate TaNK cells. For the cytotoxicity assay, the erythroleukemia cell-line K562 with known sensitivity to NK lysis was used as a positive control, the Burkitt's lymphoma cell-line Raji, known to be refractory to NK lysis was used as a negative control of NK killing. The Myeloma cell-line U266 as well as freshly isolated bone marrow (BM) autologous and allogeneic CD138+ plasma cells from MM patients were used to evaluate the sensitivity of plasma cells to MM patients' NK and TaNK lysis. Cytotoxicity was measured in a 4-h assay. Loss of membrane integrity was measured by ingress of To-Pro-3 iodide as determined by flow cytometry. Bone marrow plasma cells, were acquired after electronic gating on the CD138(+) cells, and the mean proportion of CD138 positive/To-Pro 3 iodide- positive cells from the samples was determined. Background. Target-cell death was determined from cells incubated in the absence of effector cells and the "percent lysis - CD138+"was calculated by subtraction of the background cell death. To determine the specificity of malignant plasma cell lysis, CD138-ve cells were gated in the same analysis and the "percent lysis - control cells"determined as above. This was subtracted from the "percent lysis - CD138+"to give a "percent specific lysis". Results. We have demonstrated that TaNK cells from MM patients lyse several myeloma targets, including autologous and allogeneic CD138+ myeloma cells whilst sparing CD138-ve BM cells. Myeloma patients' TaNK-induced lysis of the U266 cell-line was significantly higher compared to normal controls (median specific lysis 79.1% vs 69.5%) (p=0.003). In addition, TaNKs induced substantial lysis of autologous and allogeneic CD138+ myeloma cells (median specific lysis 52.5% and 37.4%, respectively). The percentage of specific lysis did not correlate with important disease characteristics, (ISS, age, high-risk cytogenetics), nor with the disease status and anti-myeloma treatment, including novel agents and dexamethasone. Summary/Conclusions. Tumorprimed NK cells are able to induce substantial lysis of myeloma targets including autologous and allogeneic CD138+ myeloma plasma cells and could be an additional therapeutic approach in MM, particularly in the era of novel agents.

Katsanevakis, S. and A. Katsarou (2004). "Influences on the Distribution of Marine Debris on the Seafloor of Shallow Coastal Areas in Greece (Eastern Mediterranean)." Water, Air & Soil Pollution **159**(1-4): 325-337.

The abundance and composition of marine benthic debris was investigated in shallow coastal areas of Greece (eastern Mediterranean). The mean total density of marine debris in the areas surveyed was 15 items per 1000 m2 and ranged from 0 to 251 items per 1000 m2, with plastics

dominating. Much higher marine debris densities were found in this study than those found in most studies surveying the continental shelf or the deep seafloor, indicating that pollution with marine debris is more intense in coastal areas. Greater abundance of marine debris was found in bays than in open areas. Artisanal fishing activities were found to significantly contribute to marine pollution with debris. In the Saronicos Gulf, a densely populated and highly industrialized area, the abundance of marine debris was higher than the rest of the Greek areas surveyed. [ABSTRACT FROM AUTHOR]
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Katsifis, G. E., et al. (2009). "Systemic and local interleukin-17 and linked cytokines associated with Sjogren's syndrome immunopathogenesis." American Journal of Pathology **175**(3): 1167-1177.
Recently recognized as a distinct CD4(+) T helper (Th) lineage, Th17 cells have been implicated in host responses to infections and in pathogenesis associated with autoimmune diseases. This cytokine is implicated in primary Sjogren's syndrome (pSS) immunopathology because of the increased levels of circulating interleukin (IL)-17 in pSS. Plasma and minor salivary glands (MSGs) from patients with pSS were therefore evaluated for CD4(+) T cells, T regulatory cells, IL-17, and supporting cytokines by immunohistochemistry, RT-PCR, and microbead assays. MSGs from pSS patients contain IL-17-expressing cells as a dominant population within inflammatory lesions. IL-17 protein expression progressively increased with higher biopsy focus scores (P < 0.0001), in parallel with detection by RT-PCR. Transforming growth factor-beta, IL-6 and IL-23, which are requisite promoters of Th17 differentiation, were found in abundance compared with the amounts in control tissues. Although transforming growth factor-beta is also a pivotal differentiation factor for immunosuppressive Foxp3(+) T regulatory cells (Tregs), an increase in Foxp3(+) Tregs was evident in biopsy specimens with mild and moderate inflammation but this increase was disproportionate to escalating pro-inflammatory Th17 populations in advanced disease. Furthermore, the Th17-centric cytokines IL-17, IL-6, IL-23, and IL-12 were significantly elevated in pSS plasma. These data identify a profusion of IL-17-generating cells and supporting cytokines within diseased pSS MSGs without a compensatory increase in immunomodulatory Tregs; this imbalance seems to foster a pathogenic milieu that may be causative and predictive of infiltrative injury and amenable to therapeutic intervention.

Kaur, H., et al. (2010). "Transportation of drug-(polystyrene bead) conjugate by actomyosin motor system." Journal of Biomedical Nanotechnology **6**(3): 279-286.
The Nanorobotics and cargo transportation application of molecular motors is of recent intent. The present study explores the transportation of Mesalamine/5-aminosalicylic acid/5-ASA drug by molecular motors. Mesalamine is an anti-inflammatory drug used to treat Crohn's disease and ulcerative colitis. Conjugate of mesalamine and polystyrene (Dia.: 3 microm) beads was prepared by amide linkage between amine (-NH2) group of drug and carboxyl (-COOH) group of the bead. In Fourier Transform Infrared spectra, peaks were observed at 3428.1 and 1654.0 cm(-1) for N-H and C=O stretching bond respectively confirming the amide bond formation between drug and microbeads. Quantification of 5-ASA attached to polystyrene bead was done by UV-vis spectroscopy and it was ascertained that 93% of 5-ASA was loaded on polystyrene beads. Conjugate of drug-polystyrene beads were then covalently attached to actin filaments.

Velocity of actin filaments attached to drug loaded beads in in-vitro motility assay reduced to 0.89 microm/s as compared to free actin velocity (4.64 microm/s). This further ascertains the microcomposites formation. The present study provides an insight into the actin-myosin based molecular motor systems for an efficient tool for drug transportation.

Kaushal, R. K. and A. K. Nema (2013). "Strategic Analysis of Computer Waste Management Options: Game-Theoretic Approach." Journal of Environmental Engineering **139**(2): 241-249.

Computer waste has emerged as a critical issue globally because of the growing quantity of waste and problems arising out of its toxic nature. In India, it is estimated that 480,000 t of electronic waste (e-waste) is generated annually. Computer waste includes plastics and metals that have a good potential for recycling; however, if not managed properly, the additives and chemicals in plastic waste and traces of heavy metals raise concern for human health and the environment. Efficient e-waste management will require a strategy that offers a win-win situation for all the involved stakeholders. This paper uses a game-theoretic approach for analyzing the strategies by identifying the equilibrium points for various scenarios that can help in deciding the incentives and penalties for deriving the self-propelling market-based mechanism for efficient management of e-waste. Results suggest that applying take-back schemes with some incentives to the consumers and penalty to those who do not follow the prescribed procedure for discarding e-waste could be very useful to discourage the land disposal of computer waste. Nash-equilibrium implies that the recycler would prefer to collect the computer waste directly from the consumer only if the incentive return to the consumer is less than 15% of the price of the computer, the recycling fee is less than 5% of the price of the computer, and the price of the recycled material is more than 15% of the price of the computer; otherwise collect it through the producer. Also, for the producer, it would be preferable to take an extra fee from the consumer for end-of-life management of the desktop computer as an advance recovery fee (apparent fee) only up to 4.0% of the cost of the computer. If the producer had to take an extra fee more than 4.0%, it should be taken as an extended producer responsibility fee (hidden fee combined in the cost) so that computer sales are not affected. [ABSTRACT FROM AUTHOR]

Kavakli, C., et al. (2002). "1,4,8,11-Tetraazacyclotetradecane bound to poly(p-chloromethylstyrene-ethylene glycol dimethacrylate) microbeads for selective gold uptake." Analytica Chimica Acta **464**(2): 313-322.

Poly(p-chloromethylstyrene-ethylene glycol dimethacrylate) (poly(p-CMS-EGDMA)) polymeric microbeads, with an average size of 186mum were synthesized by the suspension polymerization of p-CMS in an aqueous medium. To increase the rigidity of the polymeric microbeads EGDMA monomer was added to polymerization medium at 25% for cross-linking. 1,4,8,11-Tetraazacyclotetradecane (cyclam) was reacted with p-CMS under nitrogen atmosphere for 18h at 65degreeC. Fourier transform infrared (FT-IR) spectrophotometry, thermogravimetric analysis (TGA) and elemental analysis were used to characterize the plain and ligand-attached microbeads structures. The affinity of the cyclam-attached poly(p-CMS-EGDMA) microbeads for gold ions were used to test the adsorption/desorption behavior from aqueous media containing different concentrations of gold (0.05-10mM) at different pH values (2.5-5.0). The uptake of gold ions onto the poly(p-CMS-EGDMA) microbeads from solution was 6.18mmolg⁻¹. More than 95% of the adsorbed gold ion was desorbed over 48h in a desorption medium containing 0.8M thiourea in 3M HCl. Poly(p-CMS-EGDMA) co-polymeric microbeads containing the cyclam ligand were found to be suitable for repeated use without noticeable loss of adsorption capacity. The selective adsorption of gold onto the microbeads at pH 3.0 was very high compared to Cu(II), Ni(II), Co(II) and Zn(II). © 2002 Elsevier Science B.V. All rights reserved.

Kavet, R. I. and J. D. Brain (1977). "Phagocytosis: quantification of rates and intercellular heterogeneity." J.Appl.Physiol.Respir.Environ.Exercise Physiol **42**(3): 432-437.

The authors present a method which permits analysis of phagocytic behavior in small samples of macrophages. Both overall phagocytic kinetics and intercellular variability in particle uptake were measured. Macrophages lavaged from Syrian golden hamster lungs were incubated (5 min at 37degreeC) with 2 to 4 mum plastic particles at 4.6, 6.9, 9.1, and 16.0 x 10⁶ part./ml. Harvested macrophages ranged from 0.6 to 4.0 x 10⁶ cells per animal. To concentrate the cells and separate them from cell free substrate after termination of phagocytosis, 30 - 60% of each flask's contents were centrifuged (400 x g, 20 min) atop a Metrizamide subphase (34% wt/vol, p=1.18). Cells were collected from the interface, fixed, and visually scored for number of particles phagocytized. Phagocytic rates followed Michaelis Menten kinetics with Vmax= 0.63 +/- 0.18 (SEM) part./viable cell per min and Km= 8.5 +/- 2.7 (SEM) x 10⁶ part./ml. In every case (23/23 flasks from 6 animals) particle uptake exhibited greater (P<0.01) cell to cell variability in avidity for substrate than the Poisson distribution would predict from mean number of particles phagocytized per viable cell.

Kavitha, R., et al. (2014). "Biodegradation of low density polyethylene by bacteria isolated from oil contaminated soil." International Journal of Plant, Animal and Environmental Sciences **4**(3): 601-610.

Plastics are composed of petroleum based materials that are resistant to biodegradation. The widespread applications of plastics are not only due to their favourable mechanical and thermal properties but also mainly due to the stability and durability. The most commonly used non-degradable solid waste is polythene which is a linear hydrocarbon polymers consisting of long chains of the ethylene monomers. Most shopping bags are made from polyethylene a chemically inert compound consisting of carbon and hydrogen. Burning of this plastic waste and burying of the plastics releases harmful toxic material which is a major pollutant in environment. Degradation of waste plastics through microorganism use represents one of the alternatives to deal with such problems. The present study aims to investigate the biodegrading potentials of bacteria isolated from oil contaminated soil. The extents of biodegradability of the untreated low density polyethylene film by the isolated bacterial strains were assessed in vitro in the medium containing polyethylene film as the sole carbon source. After 30 days of incubation period, the biodegradation of the polyethylene film was measured in terms of weight loss and physicochemical analysis by scanning electron microscopy and Fourier transform infra red spectroscopy. The hydrophobicity of the bacterial isolates was evaluated by BATH test. The results depict that both the isolates were hydrophobic and were able to grow in a medium containing untreated polyethylene as a sole carbon source. Incubation of untreated polyethylene with bacterial isolate 1 and 2 (30 days, 37 degrees c) reduces its mass by 1.29% and 1.3% respectively. The smooth surface of the untreated polyethylene film became eroded as a result of biodegradation. The FTIR spectra showed changes in the chemical properties of the polyethylene film due to the biodegradation by the bacterial isolates.

Kawabe, K., et al. (2017). "Amphotericin B Increases Transglutaminase 2 Expression Associated with Upregulation of Endocytotic Activity in Mouse Microglial Cell Line BV-2." Neurochemical Research **42**(5): 1488-1495.

Amphotericin B (AmB), a polyene antibiotic, is reported to cause the microglial activation to induce nitric oxide (NO) production and proinflammatory cytokines expression, and change neurotrophic factors expression in cultured microglia (Motoyoshi et al. in Neurochem Int 52:1290-1296, 2008). On the other hand, tissue-type transglutaminase (TG2) is involved in connection to phagocytes with apoptotic cells. Engulfment of neurons by activated microglia is thought to cause neurodegenerative diseases but detail is unclear, and involvement of TG2 in phagocytosis has been reported in our previous study using lipopolysaccharide-stimulated BV-2 cells (Kawabe et al. in Neuroimmunomodulation 22(4):243-249, 2015). In the present study, we examined the changes of TG2 expression, phagocytosis and pinocytosis in BV-2 cells stimulated by AmB. AmB stimulation increased TG2 expression and TG activity. Phagocytosis of dead cells and pinocytosis of fluorescent microbeads were also up-regulated by AmB stimulation in BV-2 cells. Blockade of TG activity by cystamine, an inhibitor of TGs, suppressed AmB-enhanced TG2 expression, TG activity, NO production, phagocytosis and pinocytosis. Excessive NO production from microglia and/or facilitation of phagocytosis might be involved in neuronal death. To control TG activity might make possible to protect neurons and care for CNS diseases. Copyright © 2017, Springer Science+Business Media New York.

Kawakami, Y., et al. (1997). "Subcutaneous xenotransplantation of hybrid artificial pancreas encapsulating pancreatic B cell line (MIN6): functional and histological study." Cell Transplantation **6**(5): 541-545.

The biohybrid artificial pancreas is designed to enclose pancreatic tissues with a selectively permeable membrane that immunoisolates the graft from the host immune system, allowing those endocrine tissues to survive and control glucose metabolism for an extended period of time. The pancreatic B cell line MIN6 is established from a pancreas B cell tumor occurring in transgenic mice harbouring the human insulin promoter gene connected to the SV40 T-antigen hybrid gene. It has been proven that glucose-stimulated insulin secretion in MIN6 cells retains a concentration-dependent response similar to that of normal islets. In this study, we performed the histological and functional examination of three-layer microbeads employing MIN6 cells after subcutaneous xenotransplantation to evaluate this device as bioartificial pancreas. MIN6 cells were microencapsulated in three-layer microbeads formulated with agarose, polystyrene sulfonic acid, polybrene, and carboxymethyl cellulose. Microbeads were xenogenically implanted in the subcutaneous tissue of the back of Lewis rats with streptozotocin-induced diabetes. One week after implantation, microbeads were retrieved and cultured for 24 h before the static incubation. There was no evidence of adhesion to the graft and the fibrosis in the transplantation site as determined by gross visual inspection. Microscopic examination demonstrated that retrieved microbeads maintained normal shape, containing intact MIN6 cells. Histological study showed that these MIN6 cells in the microbeads appeared to be viable without cellular infiltration within or around the microbeads. Immunohistochemical analysis of the microbeads clearly revealed the intense staining of insulin in the cytoplasm of encapsulated MIN6 cells. Insulin productivity of MIN6 cells in the microbeads is strongly suggested to be preserved. In response to 16.7 mM glucose stimulation, static incubation of microbeads 1 wk after implantation caused the 2.3 times increase in insulin secretion seen after 3.3 mM glucose stimulation (84.3 +/- 10.0 vs. 37.4 +/- 10.7 microU/3 x 10(6) cells/hr, n = 5 each, p < 0.01). This study demonstrates that three-layer microbeads encapsulating MIN6 cells retain excellent biocompatibility and maintain good insulin secretion even after subcutaneous xenotransplantation, suggesting the possible future clinical application of this unique bioartificial pancreas to subcutaneous xenotransplantation.

Kawamoto, K. and H. Miyata (2015). "Dioxin formation and control in a gasification-melting plant." Environmental Science & Pollution Research **22**(19): 14621-14628.

We investigated dioxin formation and removal in a commercial thermal waste treatment plant employing a gasification and melting process that has become widespread in the last decade in Japan. The aim was to clarify the possibility of dioxin formation in a process operation at high temperatures and the applicability of catalytic decomposition of dioxins. Also, the possible use of dioxin surrogate compounds for plant monitoring was further evaluated. The main test parameter was the influence of changes in the amount and type of municipal solid waste (MSW) supplied to the thermal waste treatment plant which from day to day operation is a relevant parameter also from commercial perspective. Here especially, the plastic content on dioxin release was assessed. The following conclusions were reached: (1) disturbance of combustion by adding plastic waste above the capability of the system resulted in a considerable increase in dioxin content of the flue gas at the inlet of the bag house and (2) bag filter equipment incorporating a catalytic filter effectively reduced the gaseous dioxin content below the standard of 0.1 ng toxic equivalency (TEQ)/m(3) N, by decomposition and partly adsorption, as was revealed by total dioxin mass balance and an increased levels in the fly ash. Also, the possible use of organohalogen compounds as dioxin surrogate compounds for plant monitoring was further evaluated. The levels of these surrogates did not exceed values corresponding to 0.1 ng TEQ/m(3) N dioxins established from former tests. This further substantiated that surrogate measurement therefore can well reflect dioxin levels.

Kawamoto, T., et al. (2015). "Comparison of IgG against plastic resin in workers with and without chemical dermatitis." BMC Public Health **15**: 930.

BACKGROUND: There are many chemical sensitizers which cause allergy in the surrounding environment. However, the identification of substances causing allergy is difficult. We developed a new method to detect IgG which reacts against many kinds of chemical-human serum albumin (HSA) adducts at the same time. In this study, the diagnostic significance of the IgG was studied among workers of a company where a mass outbreak of chemical dermatitis had occurred after changing a plastic resin to a new one.

METHODS: Eleven workers who handled the new plastic resin and suffered from dermatitis (case) and 9 workers who also handled the same resin in the same company but were free from dermatitis (control) were the subjects. Immunological dot blotting was carried out to detect serum IgG using originally prepared diagnostic antigens, comprising a mixture of HSA and the plastic resin or its components under various conditions.

RESULTS: IgG against the plastic resin in use was detected in all workers who suffered from dermatitis. The prevalence of the IgG against the plastic resin was significantly higher in workers with than in those without dermatitis. On the other hand, IgG against its components (bisphenol A diglycidyl ether, m-xylylenediamine and butyl 2,3-epoxypropyl ether) was detected in a few workers with dermatitis.

DISCUSSION: This suggests that IgG against chemical-HSA adduct reflects not only exposure but also causative chemicals of dermatitis. Our method to use a material itself as a hapten is practical and useful in the occupational field.

CONCLUSION: It is suggested that IgG against chemicals is a useful marker of chemicals inducing dermatitis.

Kawamura, K. and C. M. Pavuluri (2010). "New Directions: Need for better understanding of plastic waste burning as inferred from high abundance of terephthalic acid in South Asian aerosols." Atmospheric Environment **44**(39): 5320-5321.

Kawase, Y. and N. Hashimoto (1996). "Gas hold-up and oxygen transfer in three-phase external-loop airlift bioreactors: Non-Newtonian fermentation broths." Journal of Chemical Technology and Biotechnology **65**(4): 325-334.

> The effects of solids loading on gas hold-up and oxygen transfer in external-loop airlift bioreactors with non-Newtonian fermentation media are discussed. Experiments were performed in two model external-loop airlift bioreactors with aqueous solutions of carboxymethyl cellulose (CMC) and xanthan gum representing non-Newtonian flows. Low-density plastic particles of 1030 and 1300 kg m⁻³ were used and the solids loading was varied in the range 0-20% (v/v). For the inelastic non-Newtonian CMC aqueous solutions, the presence of low-density solid particles slightly increased the riser gas hold-up, (gr), but decreased the volumetric mass transfer coefficient, k(L)a. On the other hand, (gr) decreased but k(L)a increased with solids loading in the viscoelastic non-Newtonian xanthan gum aqueous solution. The extent of these effects depended on non-Newtonian flow behavior. Theoretical models of riser gas hold-up and volumetric mass transfer coefficient have been developed. The capability of the proposed models was examined using the present experimental data obtained in the model external-loop airlift bioreactors and the available data in the literature. The data were successfully correlated by the proposed correlations except the results for k(L)a coefficient in the xanthan gum solution.

Kawecki, D. and B. Nowack (2019). "Polymer-Specific Modeling of the Environmental Emissions of Seven Commodity Plastics As Macro- and Microplastics." Environmental Science & Technology **53**(16): 9664-9676.

> Plastic has been identified as an emerging contaminant in aquatic and terrestrial ecosystems. Uncertainties remain concerning the amounts present in the environment and the main responsible sources. In this study, the emissions of macro- and microplastics have been mapped for seven polymers in Switzerland. The modeling is based on a complete analysis of the flows from production and use to end-of-life using probabilistic material flow analysis. We estimate that 94 +/- 34 g/capita/year of low-density polyethylene, 98 +/- 50 g/cap/a of high-density polyethylene, 126 +/- 43 g/cap/a of polypropylene, 24 +/- 13 g/cap/a of polystyrene, 16 +/- 12 g/cap/a of expanded polystyrene, 65 +/- 36 g/cap/a of polyvinyl chloride, and 200 +/- 120 g/cap/a of polyethylene terephthalate enter the Swiss environment. All polymers combined, 540 +/- 140 and 73 +/- 14 g/cap/a are emitted into soil as macroplastics and microplastics, respectively, and 13.3 +/- 4.9 and 1.8 +/- 1.1 g/cap/a are emitted into freshwater as macroplastics and microplastics, respectively. The leading emission pathway is littering for both terrestrial and aquatic environments. Construction, agriculture, and pre- and postconsumer processes cause important emissions of microplastics into soils, and postconsumer processes, textiles, and personal care products release most of the microplastics into waters. Because mass flows into soils are predicted to be 40 times larger than those into waters, more attention should be placed on this compartment. Our work also highlights the importance of referring to specific polymers instead of just "plastics".

Kay, P., et al. (2018). "Wastewater treatment plants as a source of microplastics in river catchments." Environmental Science & Pollution Research **25**(20): 20264-20267.

It is now well established that the oceans contain significant accumulations of plastic debris but only very recently have studies began to look at sources of microplastics (MPs) in river catchments. This work measured MPs up- and downstream of six wastewater treatment plants (WWTPs) in different catchments with varying characteristics and found that all led to an increase in MPs in rivers. Nevertheless, the data collected indicated that there were other important sources of MPs in the catchments studied and that these may include atmospheric deposition, agricultural land to which sewage sludge has been applied, and diffuse release of secondary MPs following the breakdown of larger plastic items. MPs were comprised mainly of fibres, fragments, and flakes with pellets and beads only dominating at one site. Variation in MP pollution occurred over time and this difference was greater at some sites than others. A key research need is the further study of MP sources in river catchments to facilitate management efforts to reduce their presence in freshwater and marine environments.

Kaynar, L., et al. (2016). "Immune recovery after transplantation of TCRalphabeta depleted allografts from haploidentical donors in adult patients." Bone Marrow Transplantation **1)**: S159.

Introduction: Haploidentical hematopoietic stem cell transplantation (HSCT) offers the advantage of being immediately applicable to virtually all patients who lack a HLA-matched donor. Graft manipulation with removal of all T lymphocyte subsets has been associated with an increased risk of lifethreatening infections and leukemia recurrence because of delayed immune reconstution. To improve the immune recovery, we have used a new T-cell depletion method that removes alphabeta+ T lymphocytes while retaining gammadelta+ T lymphocytes, NK cells and other cells in the graft. We report immune reconstitution data of acute leukemia patients transplanted with this approach. Material (or patients) and methods: We enrolled 34 acute leukemia patients. Median age was 28 years (range 18-60). The alphabeta+ T cells were depleted by using anti-TCRalphabeta- coated microbeads and the automated CliniMACS device (Miltenyi Biotec). B cell depletion was not performed. The conditioning regimen consisted of fludarabine (40 mg/m2, days -8 to -5), thiotepa (2 x 5 mg/kg, day -4) and melphalan (70 mg/m2, days -3, -2). Anti-thymocyte globulin (ATG-Fresenius) 15-30 mg/kg starting on days -12 to -9 was used to deplete remaining host T cells, avoiding graft rejection. Mycophenolate sodium was given as prophylactic immune suppression, if residual T cells in the graft exceeded 25 x104/ kg BW. Result(s): All patients received HSCT with alphabeta+ T cell depleted haploidentical grafts. The patients received a median number of ?12.69 x 106 CD 34+ progenitor cells per kg body weight (BW). In addition, grafts contained a median number of 4.58 x 10⁶ per kg BW gammadelta T cells. The median residual alphabeta T cells was 11.72 x 10³ cells per kg BW All but 3 patients engrafted with full donor chimerism and one of them died due to bacterial infection.The others were re-transplanted. Engraftment eventually occurred in 31 patients (91.2%). The median time to reach an absolute neutrophil count 40.5 x 10⁹/L and a platelet count >20 x 10⁹/L was 12 days (10-15) and 11 days (10-12). Five pts developed acute GVHD. Eleven pts (30%) experienced grade I-VI acute GVHD. Two pts developed gut and liver grade IV acute GVHD (6%). Only 2 pts developed chronic GVHD. Four pts died because of disease relapse 7 pts died due to transplantation related mortality. Median follow-up is 191 days (range 35-933). The immune reconstitution were given Table. All patients and donor were CMV seropositive. CMV reactivaiton was seen every patients but CMV disease or EBV related post transplant lymhpoproliferatif disease were not seen. Conclusion(s): These data indicate that a selective graft manipulation results into effective prevention of both acute and chronic GVHD, high engraphmant rates, rapid recovery of neutrophil and platelet counts and low TRM. The use of TCRalphabeta-depleted stem cells together with a melphalan-based regimen resulted in improving immune recovery. (Table

Presented).

Kazmiruk, T. N., et al. (2018). "Abundance and distribution of microplastics within surface sediments of a key shellfish growing region of Canada." PLoS ONE **13**(5).

The abundance and distribution of microplastics within 5 sediment size classes (>5000 micro m, 1000-5000 micro m, 250-1000 micro m, 250-0.63 micro m and <0.63 micro m) were determined for 16 sites within Lambert Channel and Baynes Sound, British Columbia, Canada. This region is Canada's premier growing area for the Pacific oyster (Crassostrea gigas). Microplastics were found at all sampling locations indicating widespread contamination of this region with these particles. Three types of microplastics were recovered: microbeads, which occurred in the greatest number (up to 25000/kg dry sediment) and microfibers and microfragments, which were much less in number compared with microbeads and occurred in similar amounts (100-300/kg dry sediment). Microbeads were recovered primarily in the <0.63 micro m and 250-0.63 micro m sediment size class, whereas microfragments and microfibers were generally identified in all 5 sediment size classes. Abundance and distribution of the three types of microplastics were spatially dependent with principal component analysis (PCA) indicating that 84 percent of the variation in abundance and distribution was due to the presence of high numbers of microbeads at three locations within the study region. At these sites, microbeads expressed as a percent component of the sediment by weight was similar to key geochemical components that govern trace metal behavior and availability to benthic organisms. Microbeads have been shown to accumulate metals from the aquatic environment, hence in addition to the traditional geochemical components such as silt and organic matter, microplastics also need to be considered as a sediment component that can influence trace metal geochemistry. Our findings have shown that BC's premier oyster growing region is highly contaminated with microplastics, notably microbeads. It would be prudent to assess the degree to which oysters from this region are ingesting microplastics. If so, it would have direct implications for Canada's oyster farming industry with respect to the health of the oyster and the quality of product that is being farmed and sets an example for other shellfish growing regions of the world.

Kazour, M. and R. Amara (2019). "Is blue mussel caging an efficient method for monitoring environmental microplastics pollution?" Science of the Total Environment: 135649.

The effectiveness of mussel caging for active microplastics (MPs) biomonitoring was investigated for the first time by comparing abundance and characteristics (shape, size, color and type of polymers) of MPs ingested by caged depurated blue mussels with those ingested by native mussels collected at the same sites and with those found in their surrounding environment (surface water and sediments). Mussels were exposed along a pollution gradient originating from a wastewater treatment plant discharge and near an abandoned coastal landfill. After 6 weeks of deployment, the majority (93%) of clean transplanted mussels had ingested MPs with a mean number of items ranging from 0.61 to 1.67 items/g. The occurrence, abundance and properties of MPs ingested by caged mussels were similar to those found in native mussels. Among the debris items detected in caged and native mussels, fragments were the most predominant type, consistent with the MPs found in their surrounding environment. MPs sizes were very similar whether in the water, sediments and both caged and native mussels, with a dominance of items <150 mum. Although some polymers were under-represented or totally absent in the caged mussels compared to overlying seawater or surrounding sediment, there was a good overlap in polymer types proportion being found between caged mussels and sediments (Morisita's index of similarity = 0.93) or seawater (0.86). Polystyrene dominated all samples in all the different matrices. Our study suggests that blue mussels caging may be a promising tool for MPs biomonitoring making monitoring more reliable with an accurate assessment of the biological effects of MPs over a predetermined exposure period. However, further methodological improvements should be considered to define a uniform protocol for blue mussels caging to allow spatial and temporal microplastics active biomonitoring.

Kazour, M., et al. (2018). "Juvenile fish caging as a tool for assessing microplastics contamination in estuarine fish nursery grounds." Environmental Science & Pollution Research **15**: 15.

Estuaries serve as nursery grounds for many marine fish species. However, increasing human activities within estuaries and surrounding areas lead to significant habitat quality degradation for the juveniles. In recent years, plastic pollution has become a global environmental issue as plastic debris are found in all aquatic environments with potential adverse impacts on marine biota. Given the important ecological role of estuaries and implications of microplastics (MP) in ecosystems, here we assess the occurrence, number, size, and polymer types of MP ingested by wild and caged juvenile European flounder (Platichthys flesus). We deployed caged fish for 1 month at five sites in three estuaries in the eastern English Channel. The Seine estuary, heavily impacted by manmade modifications and one of the most contaminated estuaries in Europe, was compared to two smaller estuaries (Canche and Liane) less impacted by industrial activities. We found that juvenile flounders (7-9 cm) were vulnerable to plastic ingestion. Seventy-five percent of caged fish and 58% of wild caught fish had the presence of MP items in their digestive tract. Fibers (69%) dominated in the fish's digestive tract at all sites. An average of 2.04 +/- 1.93 MP items were ingested by feral juvenile flounder and 1.67 +/- 1.43 by caged juvenile flounder. For the caged fish, the three sites impacted by wastewater treatment plant (Liane, Le Havre harbor, and Rouen) were those with the highest percentage of individuals that has ingested MP items. Most of the isolated items were fibers and blue in color. Polymers identified by micro Raman spectroscopy were polycaprolactam, polyethylene terephthalate, and polyurethane. Although other environmental factors may have affected caged fish condition and mortality, we found no significant correlation with the number of ingested MP. However, the high occurrence of MP ingested by juvenile fish on nursery grounds raises concerns on their potential negative effects for fish recruitment success and population renewal. Finally, this study describes, for the first time, the feasibility of using caged juvenile fish as an assessing tool of MP contamination in estuarine nursery grounds.

Kazour, M., et al. (2019). "Microplastics pollution along the Lebanese coast (Eastern Mediterranean Basin): Occurrence in surface water, sediments and biota samples." Science of the Total Environment **696**: 133933.

The Mediterranean Sea is the largest semi-enclosed sea and one of the worst affected regional seas with sub-basin scale heterogeneity in plastics concentration. Few studies on microplastics (MPs) pollution have been conducted in the Eastern part of the Mediterranean basin. This study aims to evaluate, for the first time, the MPs pollution of the Lebanese coast (Levantine Basin) as well as the most common polymers found, and to assess the potential role of coastal landfills in this pollution. Two important seafood species that are wholly consumed by the Lebanese community: the European anchovy, Engraulis encrasicolus, and the spiny oysters, Spondylus spinosus, were sampled in three different sites englobing the littoral (Tripoli, Beirut and Sidon). Sea water and sediment samples were also collected from the same sites.

Kazumi, K. K., et al. (2015). "High fidelity antibody immobilized microbead technology for blood typing." Vox Sanguinis **1)**: 267.

Background: Donated blood samples undergo blood typing, biochemical/infectious disease tests, and nucleic acid amplification tests at Japanese Red Cross Society Blood Centers before being provided to clinical institutions as blood products for transfusion. ABO and RhD typing is technologically based on agglutination of red cells by IgM antibodies, and generally performed by automated systems. However, testing for rare blood groups is difficult in obtaining those antibodies, forcing alternative use of IgG antibodies and the accompanied laborious manual processing. Aim(s): One of these rare blood groups is JR blood group. Jr antigen that belongs to JR blood group is high frequency in general population, and frequency of Jr antigen- negative in Japanese population is 1 in 1600. Since hemolytic transfusion reaction might occur to patients with anti- Jr if they are transfused with Jr antigenpositive blood, the Jr antigen-negative blood transfusion is crucial for these patients. Currently the Jr typing is performed on only a part of blood products, and an increased number of testing by a simpler, more accurate method is long sought. Method(s): We developed a simple method for testing Jr antigen using highly sensitive antibody-immobilized microbead technology. This system utilizes human monoclonal anti- Jr antibody (IgG) that were immobilized on the surface of micro-beads while maintaining its high antibody activity. The test result can be observed with or without agglutination of red cells by mixing a reagent including the microbeads and red cell suspension. This microbead reagent is able to be adapted to the automated blood typing analyzer PK7300 (Beckman Coulter); by pre-setting the reagent into a specialized bottle, and the Jr typing is determined in 30 min. Result(s): We validated the test performance using more than three thousand blood samples and confirmed accuracy, simultaneous reproducibility, and day-to-day reproducibility of this test. Our bead technology could accurately determine Jr type (positive, weak positive, negative). [IMAGE PRESENTED] Summary/Conclusions: We've developed a highly sensitive IgG antibody-immobilized micro-bead technology. By using the bead technology, we made the one step automate Jr blood typing possible. We are expecting this automate blood typing system is also applicable to other rare blood type determination tests and more.

Ke, A., et al. (2019). "Impacts of leachates from single-use polyethylene plastic bags on the early development of clam Meretrix meretrix (Bivalvia: Veneridae)." Marine Pollution Bulletin **142**: 54-57.

Plastic debris in the oceans is a major and growing problem in global environmental pollution. There are increasing concerns that plastic debris is a source of contaminant, either added during manufacturing or adsorbed from the environment. However, there is little information about the acute toxicity of leachates from plastic debris on marine organisms. In this study, we conducted experiments to evaluate the toxicity of leachates from two single-use polyethylene plastic bags (PB1 and PB2) with the embryo and larvae of the commercial clam Meretrix meretrix. Results showed that fertilization of the embryos was not affected by plastic leachates, but the developments of D-veliger larvae, including survival, deformity, and shell height, were significantly affected by plastic leachates from both PB1 and PB2 compared to the controls of filtered seawater. We speculate that compounds leaching from plastic bags are responsible for the observed toxicity. Therefore, leaching toxicity from plastic debris should be considered when assessing the risks of plastic pollution in the oceans.

Ke, T. and X. S. Sun (2003). "Starch, Poly(lactic acid), and Poly(vinyl alcohol) Blends." Journal of Polymers & the Environment **11**(1): 7-14.

Research on biodegradable materials has been stimulated due to concern regarding the persistence of plastic wastes. Blending starch with poly(lactic acid) (PLA) is one of the most promising efforts because starch is an abundant and cheap biopolymer and PLA is biodegradable with good mechanical properties. Poly(vinyl alcohol) (PVOH) contains unhydrolytic residual groups of poly(vinyl acetate) and also has good compatibility with starch. It was added to a starch and PLA blend (50:50, w/w) to enhance compatibility and improve mechanical properties. PVOH (MW 6,000) at 10%, 20%, 30%, 40%, 50% (by weight) based on the total weight of starch and PLA, and 30% PVOH at various molecular weights (MW 6,000, 25,000, 78,000, and 125,000 dalton) were added to starch/PLA blends. PVOH interacted with starch. At proportions greater than 30%, PVOH form a continuous phase with starch. Tensile strength of the starch/PLA blends increased as PVOH concentration increased up to 40% and decreased as PVOH molecular weight increased. The increasing molecular weight of PVOH slightly affected water absorption, but increasing PVOH concentration to 40% or 50% increased water absorption. Effects of moisture content on the starch/PLA/PVOH blend also were explored. The blend containing gelatinized starch had higher tensile strength. However, gelatinized starch also resulted in increased water absorption. [ABSTRACT FROM AUTHOR]

Keane, M. A. (2007). "Catalytic conversion of waste plastics: Focus on waste PVC." Journal of Chemical Technology and Biotechnology **82**(9): 787-795.

Effective waste management must address waste reduction, reuse, recovery/ recycling and, as the least progressive option, waste treatment. The increase in plastic waste production is a serious environmental issue. Plastics consumption continues to grow and while plastic recycling has seen a significant increase since the early 1990s, consumption still far exceeds recycling. Waste plastic can, however, serve as a potential resource and, with the correct treatment, can be reused or serve as hydrocarbon raw material or as a fuel. PVC, highly versatile with many applications, is non-biodegradable and has a high C1 content (56% of the total weight). Waste PVC incineration is highly energy demanding and can result in the formation of toxic chloro-emissions with adverse ecological, environmental and public health impacts. The Cl component must be removed from any waste PVC derived gas or oil before it can be used. An overview of the existing waste plastic treatment technologies is provided with an analysis of the available literature on thermal and catalytic PVC degradation. Thermal degradation results in random scissioning of the polymer chains generating products with varying molecular weights and uncontrolled Cl content. There is a dearth of literature dealing with the catalytic dechlorination of PVC. A case study is presented to illustrate the role heterogeneous catalysis can play in PVC waste treatment. The efficacy of Pd/Al<inf>2</inf>O<inf>3</inf> to promote PVC dechlorination is demonstrated, where a significant decrease (by up to a factor of 560) in the liquid fraction Cl content is recorded in addition to differences (relative to thermal degradation) in the gas phase product, i.e. higher C<inf>1</inf>-C<inf>4</inf> content with preferential alkane formation. © 2007 Society of Chemical Industry.

Keane, M. A. (2009). Catalytic processing of waste polymer composites, Elsevier Inc.**:** 122-151.

The increase in plastic waste represents a serious environmental issue. Plastics consumption continues to grow and while plastic recycle has seen a significant increase since the early 1990s, consumption still far exceeds recycle. Waste plastic can, however, serve as a potential resource and, with the correct treatment, can be reused or serve as hydrocarbon raw material or as a fuel. An overview of the existing waste plastic treatment technologies is provided with an analysis of the available literature on thermal degradation. Thermal pyrolysis results in a random scissioning of the polymer chains generating products with varying molecular weights. Catalytic degradation provides control over the product composition/distribution and serves to lower significantly the degradation temperature. Fundamental aspects of catalysis are presented with a discussion of the correlation of catalyst structure with performance, placing a particular emphasis on the role of zeolites as catalytic materials that have been widely used to promote polymer degradation. Polyvinyl chloride (PVC), highly versatile with manifold applications, is non-biodegradable and bears a high Cl content (56% of the total weight). Waste PVC incineration is very energy demanding and can result in the formation of toxic chloro-emissions with adverse ecological, environmental and public health impacts. The Cl component must be removed from any waste PVC-derived gas or oil before it can be used. The potential of a catalytic dechlorination unit operation to facilitate PVC recycle is discussed with reference to the pertinent, albeit limited, available literature. 2010 Woodhead Publishing Limited All rights reserved..

Keane, M. A. (2009). "Catalytic transformation of waste polymers to fuel oil." ChemSusChem **2**(3): 207-214.

Waste not, want not: The increase in waste polymer generation, which continues to exceed recycle, represents a critical environmental burden. However, plastic waste may be viewed as a potential resource and, with the correct treatment, can serve as hydrocarbon raw material or as fuel oil, as described in this Minireview.Effective waste management must address waste reduction, reuse, recovery, and recycle. The consumption of plastics continues to grow, and, while plastic recycle has seen a significant increase since the early 1990s, consumption still far exceeds recycle. However, waste plastic can be viewed as a potential resource and can serve, with the correct treatment, as hydrocarbon raw material or as fuel oil. This Minireview considers the role of catalysis in waste polymer reprocessing and provides a critical overview of the existing waste plastic treatment technologies. Thermal pyrolysis results in a random scissioning of the polymer chains, generating products with varying molecular weights. Catalytic degradation provides control over the product composition/distribution and serves to lower significantly the degradation temperature. Incineration of waste PVC is very energy demanding and can result in the formation of toxic chloro emissions. The efficacy of a catalytic transformation of PVC is also discussed. [References: 110]

Kearns, J., et al. (2011). "Discrepant reactivity of anti-dqa/dqb antibody with single antigen beads versus peripheral blood B cells: Implications for the assessment of donor specific antibody and donor selection." Human Immunology **72 (SUPPL.1)**: S43.

Aim: Factors that can affect anti-DQ antibody reactivity may include amino acid variability of the DQA1 and DQB1 alleles at surface exposed residues as well as structural variations secondary to the nature of the peptide displayed by the HLA DQA/DQB heterodimer molecules. In addition, cryptic epitopes may be displayed by the HLA-DQ coated microbeads used in Luminex Single Antigen bead (SAB) assay. We compared reactivity of anti-DQ antibodies using SAB assay to reactivity with B cells using flow cytometric analysis. Method(s): The reactivity of 12 anti-DQ specific sera were evaluated by SAB and flow cytometry using a cell panel of 21 unrelated donors who were typed for HLA class I and class II alleles using SSO methods. All sera were non reactive with other HLA class I or class II antigens. Result(s): We found that the correlation between the strength of antibody reactivity with DQ alleles assessed by Luminex beads versus reactivity with B cells varied significantly with different DQA/DQB allele combinations. The reactivity of 4 anti-DQ specific sera that reacted strongly with DQB1*05:01, DQA1*01:01 SAB was discrepant when compared with their reactivity with B cells from a single individual carrying the DQB1*05:01, DQA1*01:01 alleles. Despite a high level of expression of the DQB1*05:01 molecules on these cells (assessed by Serum AS, Table 1), one of these sera (TE) did not react with B cells; and serum AA reacted very weakly. (Table Presented) Conclusion(s): These results indicate that the level of reactivity of anti-DQ antibody with SAB do not consistently correlate with reactivity with B cells. The assessment of donor specific antibody and donor selection by Luminex SAB assays alone may be inadequate.

Keating, F. (2005). "PLASTIC FANTASTIC." Materials Recycling Week **186**(11): 64-64.
The article focuses on the recycling of waste plastics. With plastics taking up to 400 years to break down in a landfill, it is an area that needs urgent attention. Even more worryingly, it is a problem which is growing, with research by Great Britain's Department for Environment, Food and Rural Affairs finding that consumers use more than eight billion plastic carrier bags a year. However, an innovative solution by a North Yorkshire farmer could help address the problem of the mountains of plastic generated in Great Britain. John Gaskarth, a farmer, has developed a process which converts any type of waste plastic into a drainage system called Aquadyne.

Kedzierski, M., et al. (2016). "Microplastics elutriation from sandy sediments: A granulometric approach." Marine Pollution Bulletin **107**(1): 315-323.
Although relatively easy to extract in the marine environment, microplastics are very difficult to recover when they are trapped in sediments. The elutriation column is one of the best tools currently available for extracting plastics from sediment, but with a high sand recovery yield. This study aims to address the following questions: (i) is it possible to use a sedimentological approach to limit the sand recovery? (ii) does the extraction velocity of the sand and plastic particles vary according to density and granulometry? (iii) what is the relative recovery efficiency obtained for dense polymer particles mixed with marine sand? Based on a new granulometric classification, different plastic particle-size fractions are defined. Their extraction velocities are experimentally determined on particles of sediment and different plastics (PA, PVC). The particle recovery experiments indicate that it is possible to extract > 90% of dense plastic particles in cases of negligible sand recovery. Copyright © 2016 Elsevier Ltd.

Kedzierski, M., et al. (2017). "Microplastics elutriation system. Part A: Numerical modeling." Marine Pollution Bulletin **119**(2): 151-161.
The elutriation process has shown its efficiency to extract microplastics from sand and began to spread in the scientific community. This extraction technic requires knowing with accuracy the extraction velocities of particles. This study aims to test whether numerical modeling could help to calculate these velocities. From hydrodynamic equations, a numerical model has been developed and the outputs are compared to experimental extraction data. The results show, for the calculated velocities, the experimental plastic extraction yields will be higher than 90% for <10% of sand contamination. The model also allows determining that, with the actual protocol, the maximum plastic density which can be extracted is about 1450kg.m⁻³ whereas the detrimental resuspension, which may occur during the column filling step, is highlighted. From model calculations, it arises that changes in the column dimensioning and the protocol operations need to be considered.

Kedzierski, M., et al. (2019). "Microplastics in Mediterranean Sea: A protocol to robustly assess contamination characteristics." PLoS ONE [Electronic Resource] **14**(2): e0212088.
The study of microplastic pollution involves multidisciplinary analyses on a large number of microplastics. Therefore, providing an overview of plastic pollution is time consuming and,

despite high throughput analyses, remains a major challenge. The objective of this study is to propose a protocol to determine how many microplastics must be analyzed to give a representative view of the particle size distribution and chemical nature, and calculate the associated margin error. Based on microplastic data from Tara Mediterranean campaign, this approach is explained through different examples. In this particular case, the results show that only 3% of the collected microplastics need to be analyzed to give a precise view on the scale of the North West Mediterranean Basin (error <5%), and 17.7% to give an overview manta per manta (error <10%). This approach could be an important practical contribution to microplastic studies.

Keisling, C., et al. (2020). "Low concentrations and low spatial variability of marine microplastics in oysters (Crassostrea virginica) in a rural Georgia estuary." Marine Pollution Bulletin **150**: 110672.

Microplastics are an emerging concern for the health of marine ecosystems. In the southeastern US, the filter-feeding Eastern oyster, Crassostrea virginica, is susceptible to microplastic ingestion. We quantified the distribution of microplastics within adult oysters (harvestable size >7.5cm) from 28 reefs throughout a rural estuary with limited riverine inputs (St. Catherines Sound, Georgia). To determine which variables best predict microplastic concentration in oysters, we also quantified oyster recruitment, distance to ocean, fetch, and water body width. Oysters averaged 0.72 microplastic particles per individual (0.18 particles per gram wet mass); microfragments and microplastics were equally abundant. Although microplastic concentrations were low, multivariate models identified a positive effect of water body width on the site-level concentration of plastic microfibers; average microfragment length was affected by fetch. Our work informs a growing understanding of microplastic distribution in coastal estuaries, providing an important rural contrast to the urbanized estuaries that have been examined.

Keith, J. I. (2015). "A Taste of Plastic." Orion Magazine **34**(4): 12-13.

The article offers the author's insights on the effects of plastic garbages in mussels and oysters. Topics discussed include the effects of plastics in the health of humans, the study by researchers in Belgium at Ghent University which reveals that microplastics were found in foods consumed by humans, and the number of plastic particles that are consumed by some Europeans.

Kelkar, V. P., et al. (2019). "Chemical and physical changes of microplastics during sterilization by chlorination." Water Research **163**: 114871.

Wastewater treatment plants are known to release microplastics that have been detected in aquatic and terrestrial organisms constituting part of the human diet. Chlorination of wastewater-borne microplastics was hypothesized to induce chemical and physical changes detectable by Raman spectroscopy and differential scanning calorimetry (DSC). In the laboratory, virgin plastics (~0.05x2x2mm) were exposed to differing sterilization conditions representative of dosages used in the disinfection of drinking water, wastewater, and heavily contaminated surfaces. Polypropylene (PP) was most resistant to chlorination, followed by high density polyethylene (HDPE) and polystyrene (PS). Polystyrene showed degradation, indicated by changes in Raman peak widths, at concentration-time regimes (CT values) as low as 75mgmin/L, whereas HDPE and PP remained unaltered even at chlorine doses characteristic of wastewater disinfection (150mgmin/L). However, HDPE and PS were not completely resistant to oxidative attack by chlorination. Under extremely harsh conditions, shifts in Raman peaks and the formation of new bonds were observed. These results show that plastics commonly used in consumer products can be chemically altered, some even under conditions prevailing during wastewater treatment. Changes in polymer properties, observed for HDPE and PP under extreme exposure conditions only, are predicted to alter the risk microplastics pose to aquatic and terrestrial biota, since an increase in carbon-chlorine (C-Cl) bonds is known to increase toxicity, rendering the polymers more hydrophobic and thus more prone to adsorb, accumulate, and transport harmful persistent pollutants to biota in both aquatic and terrestrial environments.

Kellar, K. L. (2003). "Applications of Multiplexed Fluorescent Microsphere-Based Assays to Studies of Infectious Disease." Journal of Clinical Ligand Assay **26**(2): 76-86.

The study of infectious diseases has advanced as technology has developed beyond the use of culture and microscopy to detect pathologic organisms. Polymerase chain reaction (PCR) and immunoassay are currently the basis of most microbiologic procedures, but more rapid, sensitive, automated and high throughput methods are expanding the repertoire of techniques available to discover, diagnose and clinically manage the common and newly emerging infectious diseases that traverse the world today. Fluorescent microsphere-based assays take advantage of the multiparametric resolving power of flow cytometry and the surface-binding characteristics of microbeads. Multiplexed fluorescent microsphere arrays can replace the one sample, one analyte assay with a multiple sample, multiple analyte approach needed to unravel the complexity of biomolecular interactions and meet the requirements for rapid analysis platforms in the post-genomic era. These assays are applicable to any ligand-ligand binding format and have the potential to revolutionize the analytical methods that dominant laboratory protocols.

Keller, A. S., et al. (2020). "Transport of Nano- and Microplastic through Unsaturated Porous Media from Sewage Sludge Application." Environmental Science & Technology **09**: 09.

Wastewater treatment plants have been identified as important hubs for small particulate plastic, down to the nanometer scale, from urban areas to the environment. The reuse of sludge as fertilizer in agricultural practices can lead to accumulation of plastic in the soil. In this study, nanoplastic particles and microplastic fibers were synthesized with a passive inorganic tracer to aid in faster and more quantitative analysis using inductively coupled plasma mass spectrometry (ICP-MS). Using the anaerobic digestate of a pilot wastewater treatment plant spiked with metal-doped plastic, the excess sludge was dewatered, ensuring realistic associations between sludge and plastic. The resulting sludge cake was affixed atop an unsaturated porous-medium column of glass beads to assess: (i) the release of particulate plastic from the sludge, and (ii) the accumulation and mobility of plastic and organic matter through the column (analogous to a soil). A total of three particulate plastic treatments were assessed, in triplicate, where the plastic and mobile organic fractions were monitored for 14 pore water volumes. Due to size-limited transport, low deattachment from the sludge and reduced mobility through the column were found for microplastic fibers (>95% retention). However, cotransport between the mobile organic fraction and nanoplastic particles was observed, with 50% of both retained in the column. These results contribute to the understanding of the fate of particulate plastics and to assessing the associated environmental risks of particle mobility and percolation, particularly for nanoplastics.

Kelly, M. R., et al. (2019). "Importance of Water-Volume on the Release of Microplastic Fibers from Laundry." Environmental Science & Technology **53**(20): 11735-11744.

The influence of laundry washing parameters on the release of microfibers (MF) from polyester textiles was studied. These fibers are an important type of microplastic pollution. However, the factors which affect MF release during laundry are poorly understood and more rigorous

methods for quantifying this release are needed. A novel method was therefore developed using a tergotometer with eight 1000 mL washing vessels and the CIELab color space measure of lightness (L*). L* was related to the mass of released MFs by creating a calibration curve to quantify the amounts of MFs released from textiles during washing. This method was used to investigate the effect of water-volume, agitation, temperature, and duration of the wash on MF release. Counterintuitively, increased water-volume, characteristic of European "delicate" cycles, resulted in the greatest release of MFs. Full-scale testing was then carried out using domestic washing machines with real consumer cycles to determine the effect of cycle type on MF release. In the first wash, delicate wash cycles released 800 000 more MFs (94 mg/kg) per wash than a lower water-volume standard wash and also increased MF release in subsequent washing cycles ($P < 0.05$). These results indicate that a high water-volume-to-fabric ratio is the most influential factor for MF release, rather than agitation as previously thought. Therefore, consumers can reduce MF release by avoiding high water-volume washes (delicate cycles), transitioning to appliances that use a lower water-volume (North American high-efficiency washing machines), and ensuring that full wash loads are used.

Kendall, W. F., Jr., et al. (2004). "Effect of alginate composition and purity on alginate microspheres." Journal of Microencapsulation **21**(8): 821-828.

BACKGROUND: Alginate is commonly used to microencapsulate islets in experiments with islet allografts and xenografts for the treatment of Type I diabetes. The purpose of the present study is to determine the effects of alginate composition and purity on the morphology and size of microspheres.

METHODS: Microcapsules produced with the impure alginate types, medium-viscosity high-guluronic acid (IMVG), low-viscosity high-G (ILVG), low-viscosity high-mannuronic acid (ILVM) and medium-viscosity high-M (IMVM) were compared with one another and others generated with a highly purified LVM (HPLVM) alginate. Droplets of 1.5% alginate from an air-syringe pump were gelled in 1.1% CaCl2 solution. While leaving the alginate pressure and needle recess constant, the air-jacket pressure was varied between 9.5-10.5 PPSI to enhance stable microcapsule generation and different batches of microbeads were made from each alginate type.

RESULTS: The sizes of the high-guluronic acid alginate microbeads were consistently bigger than those of the corresponding high-mannuronic acid alginate beads at all air-jacket settings. At the optimal air-jacket pressure of 9.0 PPSI, the mean+SD diameter of the IMVG microbeads was 780 + 20 microm, while that of IMVM was 607 + 44 microm ($p < 0.0001$, $n=30$). Similarly, the mean ILVG microbead diameter was 816+28 microm compared to 656+26 microm for ILVM capsules ($p<0.0001$, $n=30$). Less polymorphism was found with the HPLVM microspheres than with the ILVM microbeads.

CONCLUSION: Highly purified high-mannuronic acid alginate will provide smaller, spherical microcapsules suitable for islet cell transplantation.

Kennedy, P. M., et al. (1992). "Intake and digestion in swamp buffaloes and cattle. 1. The digestion of rice straw (Oryza sativa)." Journal of Agricultural Science **119**(2): 227-242.

Swamp buffaloes and Bos indicus X B. taurus cattle, with ruminal and abomasal or duodenal fistulae were fed on rice straw with mineral supplements in 2 experiments. In experiment 1, the straw was supplemented with 5% of leaf of Leucaena leucocephala, and in experiment 2 with urea or urea with sunflower meal and rice grain. Intake of supplements of urea or urea/sunflower/rice respectively was 935 and 681 g/kg given to buffaloes and 566 and 789 in cattle. Buffaloes ruminated longer than cattle (experiment 1, 635 vs. 452; experiment 2, 626 vs. 466 min/day, $P<0.01$). In experiment 1, intake and frequency of 'A' sequence forestomach

contractions of both species was not different, but buffaloes had a greater (P<0.05) contraction force in the rumen and omasum, lower rate of 'B' sequence rumen contractions, and faster (P<0.001) rate of gastrointestinal passage than cattle. In experiment 2, intake of both species was similar, and concentrates did not affect voluntary roughage intake, nor in situ rate of digestion of rice straw. Digestion of dietary materials did not differ between species in experiment 1, despite lower concentrations of ammonia in rumen fluid in cattle than buffaloes; however in experiment 2, the rate of digestion of rice straw was higher (P<0.05) and predicted extent of digestion was 14-20% (P<0.05) lower in buffaloes. Digestibility of cell wall constituents was lower (P<0.05) in buffaloes than in cattle, but in experiment 2, concentrates reduced (P<0.01) the proportion of digestible cell wall constituents digested in the forestomach of buffaloes, but not of cattle. Plasma urea was higher (P<0.05) and transfer of urea to the rumen was higher (7.4 vs. 3.7 g N/day; P<0.10) in buffaloes. Faster fractional outflow rates of microbes and of small digesta particles from the rumen were seen in buffaloes in experiment 1. In experiment 1, more microbial N left the abomasum (35 vs. 30 g/kg organic matter apparently digested in the forestomach; P<0.05) of buffaloes than cattle, and in experiment 2 more non-ammonia N (43 vs. 31 g/kg organic matter apparently digested in the forestomach) flowed into the intestines of buffaloes. In experiment 1 microbial retention time was shorter (26 vs. 47 h; P<0.01) in the rumen of buffaloes. Appearance of plastic particles with time after dosing indicated faster escape from the rumen of buffaloes of non-chewed particles, and a greater proportion of particles subjected to ruminative chewing, than in cattle. Ruminative chewing of plastic particles in buffaloes was more efficient than in cattle with increasing particle length and decreasing specific gravity. Analysis of faecal particle distribution indicated buffaloes excreted smaller particles than cattle. It is concluded that the adaptive significance of faster digesta passage in the buffaloes appeared to derive from a more balanced supply of absorbed protein relative to digestible energy.

Kennedy, P. M., et al. (1992). "Influence of dietary particle size on intake, digestion, and passage rate of digesta in goats and sheep fed wheaten (Triticum aestivum) hay." Small Ruminant Research **9**(2): 125-138.

Castrated goats and Merino sheep about 1 year old and 26 and 35 kg liveweight, respectively, were fed on wheat hay diets, with urea and minerals. The diets were chopped (1 cm) hay, pellets, and 2 mixtures of chopped/pellets in the ratio 2:1 and 1:2. Goats selected more pellets from the mixed diets than did sheep. DM digestibility was similar in both species, but decreased with increasing pellet content. Feed intake and digestible DM intake per kilogram metabolic liveweight by goats were lower than for sheep. Reticulorumen fill increased from 166 g for goats fed on chopped or pelleted diets to 250-280 g/kg body weight (BW) when fed mixtures of chopped and pelleted diets. Fill in sheep was relatively constant at 221-237 g/kg BW for all diets. DM content of reticulorumen digesta was higher (P<0.01) in goats than in sheep (13.2 vs. 11.3%), whereas the mean particle size of digesta was smaller (P<0.01) in goats. Five varieties of plastic particles of defined length and specific gravity, were inserted into the reticulorumen via cannula, and unchewed plastic particles were recovered in faeces. Cumulative recovery of plastic particles over 120 h after dosing was greater for sheep. Kinetic analysis of the excretion patterns of the plastic particles indicated that in goats the rate of passage from the reticulorumen was lower, and the rate of reduction of particle size was higher, than in sheep. Apparent fractional passage rates of digesta from the reticulorumen and of small particles labelled with chromium, were also lower in goats than in sheep, but DM flows per volume of fluid were similar between species. The significant variability in degree of fill in the reticulorumen in goats appeared to be not to be due to particle size, and substantially contributed to lower rates of passage in goats.

Kent, S. (1996). "ENVIRONMENTAL HUSBANDRY." Recycling Textile & Plastic Waste: 173-178.
The article focuses on the attention given to pollution and environmental issues in Great Britain through the development of water laws and the demands of textile retailing chains that their suppliers be environmentally-friendly. Companies have to respond to the challenges of maintaining growth, improved flexibility and optimization of cost and efficiency and should find solutions to environmental issues. At Parkland Manufacturing, they address environmental issues by developing an environmental strategy where they find out what law requires, find a partner, assign a person who is responsible for such matters. Next, they start to examine all stages of the manufacturing process and identify the areas affected if solvent process will be eliminated and lastly, source reduction.

Kentin, E. and H. Kaarto (2018). "An EU ban on microplastics in cosmetic products and the right to regulate." Review of European Comparative & International Environmental Law **27**(3): 254-266.
In January 2018, the European Commission initiated a restriction procedure on microplastics in cosmetic products. This article deals with the legal implications of a European Union (EU) restriction under the Regulation on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) in relation to the right to regulate in the EU and in the context of the World Trade Organization (WTO). The article argues that in the aftermath of harmonization, the legal scope for EU Member States is dependent on the definition that will be adopted as regards microplastics under REACH: the wider the scope of the restriction, the more probable it is that Member States' action is restrained. In the context of WTO rules, similar considerations apply as regards the scope of the definition: the wider the scope of an EU ban, the more demanding it will be to satisfy the requirements under the Agreement on Technical Barriers to Trade. Providing scientific evidence is instrumental, as there is little room for the precautionary principle in both regimes. [ABSTRACT FROM AUTHOR]

Kerby, M. B., et al. (2006). "Measurements of kinetic parameters in a microfluidic reactor." Analytical Chemistry **78**(24): 8273-8280.
Continuous flow microfluidic reactors that use immobilized components of enzymatic reactions present special challenges in interpretation of kinetic data. This study evaluates the difference between mass-transfer effects and reduced efficiencies of an enzyme reaction. The kinetic properties of immobilized alkaline phosphatase (AP) were measured by the dephosphorylation of 6,8-difluoro-4-methylumbelliferyl/phosphate to a fluorescent 6,8-difluoro-4-methylumbelliferone. A glass microfluidic chip with an in-channel weir was created for the capture of solid silica microbeads functionalized with enzyme. The input substrate concentrations and flow rates across the bed were varied to probe the flow-dependent transport and kinetic properties of the reaction in the microreactor bed. Unlike previous reactors, substrate was titrated directly over the fixed enzyme bed by controlling the air pressure over the chip reservoirs. The reactor explored substrate conversions from near zero to 100%. The average bed porosity, residence time, and bed resistance were measured with dye

pulses. A simple criterion was derived to evaluate the importance of flow-dependent mass-transfer resistances when using microreactors for calculating kinetic rate constants. In the absence of mass-transfer resistances, the Michaelis-Menten kinetic parameters are shown to be flow independent and are appropriately predicted using low substrate conversion data. A comparison of the kinetic parameters with those obtained using solution-phase enzymatic reactions shows a significant decrease in enzyme activity in the immobilized conformation. The immobilized Km of AP is approximately 6 times greater while the kcat is reduced by approximately 28 times. Contradictions found in literature on the evaluation of Michaelis-Menten kinetic parameters for immobilized enzymes in microfluidic reactors are addressed. When product molecules occupy a significant number of enzymatic sites or modify the enzyme activity, the assumed Michaelis-Menten mechanism can no longer be valid. Under these conditions, the calculations of "apparent" kinetic rate constants, based on Michaelis-Menten kinetics, can superficially show a dependence on flow rate conditions even in the absence of mass-transfer resistances. High substrate conversions are shown to depend on flow rate. A kinetic model based on known mechanisms of the alkaline phosphatase enzyme reaction is tested to predict the measurements for high substrate conversion. The study provides a basis for appropriate use of mass-transfer and reaction arguments in successful application of enzymatic microreactors.

Keren, A., et al. (2018). "Innate lymphoid cells 3 induce psoriasis in xenotransplanted healthy human skin." Journal of Allergy and Clinical Immunology **142**(1): 305-308.e306.

To the Editor: Recent studies have demonstrated that the number of group 3 innate lymphoid cells (ILC3s) is increased in peripheral blood, lesional skin, and nonlesional skin of patients with psoriasis.1,E1,E2 However, definitive evidence is as yet entirely missing that these innate immunocytes, which produce IL-22 and IL-17, but not TNF-α or IFN-γ, and lack cytotoxic effectors,E2 are functionally involved in the induction of psoriatic lesions in human skin. [...]the present study aimed to determine whether human ILC3s (ie, CD3− RORγt+ NKp44+ cells)E1 suffice to induce psoriatic lesions in healthy human skin in vivo. Flow cytometric analysis documented the absence of γδ T cells and natural killer (NK) cells in the ILC3 preparation, while 5% γδ T cells and NK cells were present in the TH17/Tc17 cell cultures (Fig E2, D).6 The purified ILC3s were associated with the expected intracellular cytokine expression pattern5,7,E9: 78% of ILC3s showed IL-22 expression, and 10% ± 3% of these cells were double-positive for both IL-17 and IL-22 (Fig E3, B). Animal handling was in accordance with the national guidelines and approved by the Technion Animal Care and Use Committee.Culture of cells with IL2 and AhR agonist To obtain an enriched RORγt + cell culture, PBMCs from 8 normal volunteers were incubated with a high dose of IL-2 (100 U/mL) and AhR agonistE12,E13 200 nM (6-formylindolo carbazole, Enzo) for 14 days.E7Magnetic isolation of TH17-cell and ILC subsets from IL2+AhR-activated PBMC cultures Separation was performed using anti-CD3 antibodies conjugated to ferromagnetic microbeads (Miltenyi Biotec, Bergisch Gladbach, Germany) and directed through a cell separation column containing a magnetic field (Miltenyi Biotec).

Kergaravat, S. V., et al. (2012). "Biotin determination in food supplements by an electrochemical magneto biosensor." Talanta **97**: 484-490.

An electrochemical magneto biosensor for the rapid determination of biotin in food samples is reported. The affinity reaction was performed on streptavidin-modified magnetic microbeads as a solid support in a direct competitive format. The biotinylated horseradish peroxidase enzyme (biotin-HRP) competes with free biotin in the sample for the binding sites of streptavidin on the magnetic microbeads. The modified magnetic beads were then easily captured by a magneto

graphite-epoxy composite electrode and the electrochemical signal was based on the enzymatic activity of the HRP enzyme under the addition of H(2)O(2) as the substrate and o-phenilendiamine as cosubstrate. The response was electrochemically detected by square wave voltammetry. The limit of detection was 8.4x10(-8) mol L(--1) of biotin (20 mug L(--1)) with a dynamic range from 0.94 to 2.4x10(-7) mol L(--1). Biotin-fortified commercial dietary supplement and infant formula samples were evaluated obtaining good performances in the results. Total time of analysis was 40 min per 20 assays.

Kershaw, P. J. (2011). "BEWARE MERMAID'S TEARS." Our Planet **22**(1): 26-27.
The article discusses increasing marine pollution due to plastics. There are several types of plastics which are buoyant and very durable, and their debris is common on coastlines worldwide. Plastic particles are known to damage or block an animal's digestive tract or other organs, depending on its lifestyle and the quantities involved. Plastic pollution may gradually decline as a problem if waste is considered a valuable resource.

Keserue, H. A., et al. (2011). "Rapid detection and enumeration of Giardia lamblia cysts in water samples by immunomagnetic separation and flow cytometric analysis." Applied & Environmental Microbiology **77**(15): 5420-5427.
Giardia lamblia is an important waterborne pathogen and is among the most common intestinal parasites of humans worldwide. Its fecal-oral transmission leads to the presence of cysts of this pathogen in the environment, and so far, quantitative rapid screening methods are not available for various matrices, such as surface waters, wastewater, or food. Thus, it is necessary to establish methods that enable reliable rapid detection of a single cyst in 10 to 100 liters of drinking water. Conventional detection relies on cyst concentration, isolation, and confirmation by immunofluorescence microscopy (IFM), resulting in low recoveries and high detection limits. Many different immunomagnetic separation (IMS) procedures have been developed for separation and cyst purification, so far with variable but high losses of cysts. A method was developed that requires less than 100 min and consists of filtration, resuspension, IMS, and flow cytometric (FCM) detection. MACS MicroBeads were used for IMS, and a reliable flow cytometric detection approach was established employing 3 different parameters for discrimination from background signals, i.e., green and red fluorescence (resulting from the distinct pattern emitted by the fluorescein dye) and sideward scatter for size discrimination. With spiked samples, recoveries exceeding 90% were obtained, and false-positive results were never encountered for negative samples. Additionally, the method was applicable to naturally occurring cysts in wastewater and has the potential to be automated.

Kesimer, M. and J. K. Sheehan (2008). "Analyzing the functions of large glycoconjugates through the dissipative properties of their absorbed layers using the gel-forming mucin MUC5B as an example." Glycobiology **18**(6): 463-472.
Glyconjugates such as mucins, proteoglycans, and polysaccharides form the structural basis of protective cell-surface layers. In particular gel-forming mucins define a zone between the epithelial cell layer and the environment. Such molecules are of extreme molecular weight 5-100 x 10(6) and size (Rg 20-300 nm). On this account their biochemistry is inseparable from their physical biochemistry. Combining laser light scattering and quartz crystal mass balance with dissipation methods (QCM-D) we have investigated the properties of the MUC5B mucin and its cognate fragments when bound to a hydrophobic surface. MUC5B forms the basis of gels responsible for the protection of the oral cavity, lung, and cervical canal surfaces. Here we show, by analyzing dissipative interactions of hydrophobic, gold, and polystyrene surfaces, with the

intact MUC5B molecule, its reduced subunits, and glycosylated tryptic fragments (obtained after reduction), the formation of 40- to 100-nm-thick highly structured, hydrated interfaces. These interfaces are dominated in their geometry and dissipative properties by the negatively charged carbohydrate-rich domains of the molecule, the naked protein domains being responsible for attachment. These carbohydrate-rich surfaces have well-defined absorptive properties and permit the entry and entrapment of albumin-coated micro-beads into the absorbed layer at and below a size of 60 nm. However beads larger than 100 nm are completely excluded from the surfaces. These absorptive phenomena correlate with large changes in film dissipation and thus may not only be important in biological functions, e.g. binding viruses, but could also be informative to the surfaces (often ciliated) onto which such mucus films are attached.

Kessel, A., et al. (2005). "Increased plasma levels of matrix metalloproteinase-9 are associated with the severity of chronic urticaria." Clinical & Experimental Allergy **35**(2): 221-225.

BACKGROUND: Matrix metalloproteinase (MMP)-9 is produced by many inflammatory cells such as macrophages, neutrophils, mast cells, eosinophils and T lymphocytes. Activated T cells are capable, through cell-cell contact, of inducing MMP-9 expression in human mast cells.

OBJECTIVE: To investigate the activation status of peripheral CD4+ T cells and the level of MMP-9 in the plasma of patients with chronic urticaria (CU), and whether MMP-9 levels are in association with CU severity.

METHODS: Study subjects included 29 patients with CU and 30 healthy control subjects. At the time of assessment, patients were divided into subgroups according to urticarial severity. Plasma levels of total MMP-9 (free pro-MMP-9 and free MMP-9) were determined by ELISA. CD4+ lymphocytes were positively selected with magnetic microbeads. After 48 h of activation, CD4+ T cells were assayed for both nuclear factor-kappa B (NF-kappa B) expression and proliferation.

RESULTS: Plasma levels of MMP-9 were found to be significantly higher in 29 CU patients compared with 18 healthy controls (186 +/- 174 vs. 31 +/- 21 ng/mL, P<0.0001). We also found a significant correlation between MMP-9 levels and urticarial severity (r = 0.92, P<0.001). In addition, CD4+ T cells from CU patients expressed higher levels of NF-kappa B than CD4+ T cells from healthy controls (82 +/- 30 vs. 69 +/- 20 optical density, P = 0.007). Finally, as compared with seven healthy individuals, DNA synthesis in CD4+ T cells from seven CU patients was found to be significantly elevated (1000 +/- 240 vs. 751 +/- 166 counts per minute, P = 0.01).

CONCLUSION: Increased levels of MMP-9 are found in CU patients, and particularly among those with severe disease. We also demonstrated that CD4+ T cells from such patients are highly activated.

Keswani, A., et al. (2016). "Microbial hitchhikers on marine plastic debris: Human exposure risks at bathing waters and beach environments." Marine Environmental Research **118**: 10-19.

Marine plastic debris is well characterized in terms of its ability to negatively impact terrestrial and marine environments, endanger coastal wildlife, and interfere with navigation, tourism and commercial fisheries. However, the impacts of potentially harmful microorganisms and pathogens colonising plastic litter are not well understood. The hard surface of plastics provides an ideal environment for opportunistic microbial colonisers to form biofilms and might offer a protective niche capable of supporting a diversity of different microorganisms, known as the "Plastisphere". This biotope could act as an important vector for the persistence and spread of pathogens, faecal indicator organisms (FIOs) and harmful algal bloom species (HABs) across beach and bathing environments. This review will focus on the existent knowledge and research gaps, and identify the possible consequences of plastic-associated microbes on human health, the spread of infectious diseases and bathing water quality.

Kesy, K., et al. (2016). "Polystyrene influences bacterial assemblages in Arenicola marina-populated aquatic environments in vitro." Environmental Pollution **219**: 219-227.

Plastic is ubiquitous in global oceans and constitutes a newly available habitat for surface-associated bacterial assemblages. Microplastics (plastic particles <5 mm) are especially susceptible to ingestion by marine organisms, as the size of these particles makes them available also to lower trophic levels. Because many marine invertebrates harbour potential pathogens in their guts, we investigated whether bacterial assemblages on polystyrene are selectively modified during their passage through the gut of the lugworm Arenicola marina and are subsequently able to develop pathogenic biofilms. We also examined whether polystyrene acts as a vector for gut biofilm assemblages after subsequent incubation of the egested particles in seawater. Our results showed that after passage through the digestive tract of A. marina, the bacterial assemblages on polystyrene particles and reference glass beads became more similar, harbouring common sediment bacteria. By contrast, only in the presence of polystyrene the potential symbiont Amphritea atlantica was enriched in the investigated biofilms, faeces, and water. Thus, especially in areas of high polystyrene contamination, this polymer may impact the bacterial composition of different habitats, with as yet unknown consequences for the respective ecosystems.

Kettenmann, S. (2016). "Nationwide Ban on Plastic Microbeads in Cosmetics." Natural Resources & Environment **31**(1): 58-59.

The article examines the features of the U.S. Microbead-Free Waters Act of 2015 aimed to ban bans plastic microbeads that are produced for exfoliates in cosmetic consumer products and causing damage to marine environments, including rivers, lakes, and oceans.

Kettner, M. T., et al. (2019). "The Eukaryotic Life on Microplastics in Brackish Ecosystems." Frontiers in Microbiology **10**: 538.

Microplastics (MP) constitute a widespread contaminant all over the globe. Rivers and wastewater treatment plants (WWTP) transport annually several million tons of MP into freshwaters, estuaries and oceans, where they provide increasing artificial surfaces for microbial colonization. As knowledge on MP-attached communities is insufficient for brackish ecosystems, we conducted exposure experiments in the coastal Baltic Sea, an in-flowing river and a WWTP within the drainage basin. While reporting on prokaryotic and fungal communities from the same set-up previously, we focus here on the entire eukaryotic communities. Using high-throughput 18S rRNA gene sequencing, we analyzed the eukaryotes colonizing on two types of MP, polyethylene and polystyrene, and compared them to the ones in the surrounding water and on a natural surface (wood). More than 500 different taxa across almost all kingdoms of the eukaryotic tree of life were identified on MP, dominated by Alveolata, Metazoa, and Chloroplastida. The eukaryotic community composition on MP was significantly distinct from wood and the surrounding water, with overall lower diversity and the potentially harmful dinoflagellate Pfiesteria being enriched on MP. Co-occurrence networks, which include prokaryotic and eukaryotic taxa, hint at possibilities for dynamic microbial interactions on MP. This first report on total eukaryotic communities on MP in brackish environments highlights the complexity of MP-associated biofilms, potentially leading to altered microbial activities and hence changes in ecosystem functions.

Kettner, M. T., et al. (2017). "Microplastics alter composition of fungal communities in aquatic ecosystems." Environmental Microbiology **19**(11): 4447-4459.

Summary Despite increasing concerns about microplastic (MP) pollution in aquatic ecosystems, there is insufficient knowledge on how MP affect fungal communities. In this study, we explored the diversity and community composition of fungi attached to polyethylene (PE) and polystyrene (PS) particles incubated in different aquatic systems in north-east Germany: the Baltic Sea, the River Warnow and a wastewater treatment plant. Based on next generation 18S rRNA gene sequencing, 347 different operational taxonomic units assigned to 81 fungal taxa were identified on PE and PS. The MP-associated communities were distinct from fungal communities in the surrounding water and on the natural substrate wood. They also differed significantly among sampling locations, pointing towards a substrate and location specific fungal colonization. Members of Chytridiomycota, Cryptomycota and Ascomycota dominated the fungal assemblages, suggesting that both parasitic and saprophytic fungi thrive in MP biofilms. Thus, considering the worldwide increasing accumulation of plastic particles as well as the substantial vector potential of MP, especially these fungal taxa might benefit from MP pollution in the aquatic environment with yet unknown impacts on their worldwide distribution, as well as biodiversity and food web dynamics at large.

Khadijah Husna, A. H., et al. (2019). "Semi-refined carrageenan film incorporated with alpha -tocopherol: application in food model." Journal of Food Processing and Preservation **43**(5).

Semi-refined carrageenan (SRC) film plasticized with glycerol and incorporated with alpha -tocopherol was prepared for food packaging application. Functional characterization, thermal stability, and microstructure of SRC-based films were analyzed. The effects of antioxidant alpha -tocopherol from SRC-based film were studied based on thiobarbituric acid-reactive substance assay, metmyoglobin assay, and pH value in food model (meat patties) for 12 days of storage. The development of lipid oxidation was delayed in the meat patties wrapped with antioxidant films during the storage with the final value of 0.68-0.37 mg malondialdehyde/kg sample. A less than 50% brown color development (metmyoglobin) of the meat patties wrapped with antioxidant film was observed in the first nine days of storage. Hence, the incorporation of alpha -tocopherol into the SRC-based film could be an alternative way to prolong the shelf life of food product, reducing the use of synthetic preservative directly into food product. Practical applications: Recent strategy on the development of biodegradable film for food packaging is important as an alternative to the petrochemical-derived plastic that is harmful to the environment. SRC is one of the potential biopolymers that has the ability to form a strong gel and provides efficient barrier against gas, lipids, and oils, and addition of plasticizer glycerol into SRC enhanced mechanical and barrier properties of the films. The present study showed the potential of alpha -tocopherol within the SRC film plasticized with glycerol as active packaging on the film characteristics and increased the shelf life of meat patties. Hence, the active packaging film developed is not only contributes to reduce plastic waste discharged to environment but can be a potential substitute of synthetic preservative in food.

Khaiboullina, S., et al. (2017). "Zika virus infection activates proinflammatory cytokines and triggers monocyte differentiation." Blood. Conference: 59th Annual Meeting of the American Society of Hematology, ASH **130**(Supplement 1).

In 2015, Zika virus (ZIKV) outbreak in several countries of South America was linked to microcephaly in newborns. Microcephaly, a severe clinical presentation, was first diagnosed in association with ZIKV, which primarily considered self-limiting infection. From infected keratinocytes, virus disseminates crossing blood-tissue barriers and is detected in various tissues including brain, muscles and placenta. One of the mechanisms utilized by viruses to cross tissue barriers involves leukocytes, where monocytes are often identified as the carriers. Recently, circulating monocytes were shown to harbor ZIKV, suggesting that these leukocyte populations

could serve as vehicle to transport ZIKV to the fetus. We speculate that ZIKV infection could promote monocyte activation and release of cytokines causing tissue damage. However, little is known about monocyte susceptibility to ZIKV infection. Also, effect of ZIKV infection on transcriptional activation and production remains unclear. Materials and methods. Monocytes were isolated from cord blood buffy coats (University of Colorado Cord Blood Bank, Aurora) using Miltenyi magnetic bead separation kit (CD14 Microbeads; Miltenyi, Auburn, CA). Monocytes were infected with two ZIKV strains, PRVABC59 (South America) and IBH30656 (Nigeria), ATCC (Manassas, VA). Total RNA was extracted and used for Next generation Sequencing (Illustra RNAspin Mini kit (GE Healthcare, Marlborough, MA)). FastQ data generated by the MiSeq (Illumina, San Diego CA) was annotated and the sequence reads were analyzed by CLC workbench 9.0.1 (Qiagen, Germantown, MD) for the detection of viral and cellular genes. Differential expressions of cellular genes based on the Reads Per Kilobase of transcript per Million mapped reads were determined by comparing with mock-infected cells using RNA-seq analysis tool of CLC Workbench. Differentially regulated genes due to ZIKV infection, identified by CLC Workbench, were subjected for determining the deregulated pathways using IPA Ingenuity Pathways analysis tool (Qiagen Germantown, MD). Viral replication was determined by qPCR, Western blot and immunofluorescence. Cytokine activation was analyzed using Bio-Plex Pro Human Cytokine 27-plex Panel (Bio-Rad, Hercules, CA, USA) following manufacturer's instructions. Results. We have shown that South American and Nigerian strains of ZIKV can infect monocytes and actively replicate. Presence of capsid protein and accumulation of viral transcripts was demonstrated in vitro. Infection with PRVABC59 strain changes transcriptional activity of 332 cellular genes, while the Nigerian strain affected the transcription of 521 cellular genes compared to the mock-infected controls. Interestingly, 195 genes were commonly deregulated in cells infected with both strains. Analysis of these commonly affected genes identified multiple pathways including apoptosis, chemotaxis, cell proliferation, inflammation, acute phase response, mitochondria activation. The most amazing observation was upregulation of mitochondrial and inflammasome genes. Mitochondrial genes (MT-ND2, MT-ND5 and MT-ATP8) activated in ZIKV infected monocytes were shown to play a key role in pathogenesis of other neurodegenerative disease. Analysis of cytokine production revealed early activation of proinflammatory cytokines (IL-1beta, IL-6 and IL-8) (Table 1). Upregulation of IL-1beta by ZIKV infected monocytes is evident for inflammasome activation. Upregulation of IL-6, IL-10 and IL-17alpha suggested an activation of Th17 pathway in ZIKV infected monocytes. Besides only Nigerian ZIKV strain increased the production of IL-4 in monocytes. IL-4 together with IL-10 could promote Th2 type immune response to ZIKV. Finally, both strains increased production of FGF, while levels of VEGF were increased only in supernatants of PRVABC59 infected monocytes. Conclusion(s): Human monocytes are susceptible to infection with ZIKV strains, PRVABC59 and IBH30656 and support viral replication. ZIKV infection affects cellular pathways, including mitochondrial and inflammasome ones that could play significant role in pathogenesis. ZIKV infection of monocytes upregulates cytokine production, which can trigger inflammation and leukocyte migration. Analysis of cytokine production by ZIKV infected monocytes suggests activation of Th2 and Th17 leukocytes, supporting the role of this signaling in ZIKV pathogenesis.

Khajuria, D. K., et al. (2020). "Ionic Diffusion and Drug Release Behavior of Core-Shell-Functionalized Alginate-Chitosan-Based Hydrogel." ACS Omega **5**(1): 758-765.

This paper reports the core-shell structure effects in calcium alginate (CaALG) microbeads due to the threshold water level for phase transition and correlates these properties with respect to pH and electrical conductivity. Further, in this study, we used a novel microfluidic device for drug release testing to study the programmed release of risedronate (RIS-anti-osteoporotic drug) encapsulated in pH-responsive CaALG-chitosan (CHT) microbeads. Our microfluidic device contains a single straight microchannel containing a steplike barrier design used to restrict the mobility of the microbeads at the sample detection zone. For optical and fluorescence microscopy, single fluorescently labeled CaALG-CHT microbead containing RIS was placed in the sample detection zone by flowing through the inlet port with ultrapure water. The RIS release behavior from the microbeads at different pH (2.1, 4, 6.8, and 7.4) conditions was determined by using a spectrophotometer connected to the outlet port of the device.

Khalida, J., et al. (2018). "Effects of virgin microplastics on goldfish (Carassius auratus)." Chemosphere **213**: 323-332.

Microplastics (MPs) are abundant in freshwater and marine environments. They are diverse shape and size and are ingested by organisms. In this study, goldfish (Carassius auratus) were exposed via diet to three types of virgin MPs material types and shapes including fibers, fragments, and pellets. After six weeks of exposure, various sub-lethal effects, but no mortality, was observed. Fish exposed to plastic showed significant weight loss compared with the control. Fibers were found in the gills, gastrointestinal tract (GIT), and feces were not likely to accumulate in the GIT. Pronounced and severe alterations were found in the livers of fish exposed to fibers. The distal intestine showed more pronounced and severe changes compared to the proximal intestine, likely due to an intake of fibers. The ingestion of fibers caused the highest frequencies of progressive and inflammatory changes in the livers and intestines. This is in accordance with the higher organ index in these organs compared to other texa. Conversely, fragments and pellets were not ingested but chewed and expelled. Chewing process resulted in damages to the jaws as ranging from slight exfoliation to deep incisions. The highest frequency of regressive and circulatory (e.g., dilated sinusoids) changes was found in fish exposed to fragments, specifically in the upper and lower jaw, and in lower jaw and liver, respectively. Together, these results demonstrate that ingestion and chewing of MPs lead to damages in various organs and tissues of the gastrointestinal system, and suggest that different materials can have drastically different impacts on fish.

Khalik, W. M. A. W. M., et al. (2018). "Microplastics analysis in Malaysian marine waters: A field study of Kuala Nerus and Kuantan." Marine Pollution Bulletin **135**: 451-457.

The first report on the emergence of microplastic in Malaysian marine waters was documented in this study. Water samples were collected from two regions, namely Kuala Nerus and Kuantan port, as the representatives of different anthropogenic activities. Identification of microplastic was performed based on physical characteristics (colour, shape, density) and chemical characterisation (ATR-FTIR analysis) for a functional group of polymers. Fragment type, black or grey colour and high density (>1.02 g cm⁻³) of microplastic were the most prevalent characteristics found in both areas. Two principal components (density and colour) rendered explained about 95.3% (Kuantan) and 95.6% (Kuala Nerus) of the total variance. Six possible polymer materials were identified, namely polyester, polystyrene, polyamide, polyvinyl chloride, polypropylene, and polyethylene. The findings of the study provided good baseline information on marine debris issue in Malaysia. Copyright © 2018 Elsevier Ltd

Khaliq, A., et al. (2017). "Field evaluation of a blood based test for active tuberculosis in endemic settings." PLoS ONE **12 (4) (no pagination)**(e0173359).

Over 9 million new active tuberculosis (TB) cases emerge each year from an enormous pool of 2 billion individuals latently infected with Mycobacterium tuberculosis (M. tb.) worldwide. About

3 million new TB cases per year are unaccounted for, and 1.5 million die. TB, however, is generally curable if diagnosed correctly and in a timely manner. The current diagnostic methods for TB, including state-of-the-art molecular tests, have failed in delivering the capacity needed in endemic countries to curtail this ongoing pandemic. Efficient, cost effective and scalable diagnostic approaches are critically needed. We report a multiplex TB serology panel using microbead suspension array containing a combination of 11 M.tb. antigens that demonstrated overall sensitivity of 91% in serum/plasma samples from TB patients confirmed by culture. Group wise sensitivities for sputum smear positive and negative patients were 95%, and 88%, respectively. Specificity of the test was 96% in untreated COPD patients and 91% in general healthy population. The sensitivity of this test is superior to that of the frontline sputum smear test with a comparable specificity (30-70%, and 93- 99%, respectively). The multiplex serology test can be performed with scalability from 1 to 360 patients per day, and is amenable to automation for higher (1000s per day) throughput, thus enabling a scalable clinical work flow model for TB endemic countries. Taken together, the above results suggest that well defined antibody profiles in blood, analyzed by an appropriate technology platform, offer a valuable approach to TB diagnostics in endemic countries. Copyright © 2017 Khaliq et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Khamput, P. and K. Suweero (2014). "Using of Para-rubber to develop properties of concrete block mixed with Ethylene Vinyl Acetate plastic in masonry." International Journal of Environmental and Rural Development **5**(2): 86-92.

The aim of this research is to use Para-rubber (vulcanized latex) as an admixture for improving the properties of EVA plastic waste concrete block. In mix design, cement per EVA plastic waste per quarry dust per water ratio is 1:0.5:4:1.6 by weight, vulcanized latex per cement ratios are 0.00, 0.05, 0.10, 0.15, 0.20, 0.25, 0.30, 0.35, 0.40, and 0.45 respectively (by weight of cement), no charge surfactant is 4% (by weight of vulcanized latex). The suitable ratio of vulcanized latex per cement in this testing is 0.15 (by weight of cement). The properties are obtained as follows. (1) The average density in 14 days is 1,169.59 kg/m³. (2) The average water absorption in 14 days is 9.33%. (3) The average compressive strength in 28 days is 25.74 ksc. (4) The coefficient of thermal conductivity is 0.1527 W/m.K. (5). The sound absorption coefficient at 2,000 hertz is 0.38. (6) The noise reduction coefficient is 0.3. It can be seen that many properties are better than normal EVA plastic waste concrete blocks.

Khan, A. A., et al. (2009). "Human hepatic epithelial progenitor cell transplantation to the patients with end stage liver cirrhosis." Hepatology International **3 (1)**: 216.

A late stage of progressive hepatic fibrosis characterized by distortion of the hepatic architecture, necrosis of hepatocytes and the formation of regenerative nodules contributes to cirrhosis. Limitations like organ donors shortage, high cost, absence of proliferation in cultured hepatocytes, inherent risks of infection, rejection in xenogenic cells and other socio-economical complications emerges advanced regenerative Human hepatic stem cells(hHpSCs) transplantation. hHpSCs are located in the ductal plates in fetal and Canals of Hering in adult livers[Schmelzer et al.(2006)]. Hepatoblasts, in turn, give rise to the hepatocytic and biliary lineages, the hepatocytes and cholangiocytes[SchmelzerE etal(2006)].hHpSCs express CD326(EpCAM)marker. Scjelzer etal demonstrated that during embryogenesis 90% of the EpCAM positive cells had hepatoblast phenotype. In animal study, on transplantation of freshly isolated hHpSCs in SCID mice results in mature liver tissue expressing human-specific proteins.

Recently, we(Aleem etal 2008)have shown clinical improvement in study in patients with Crigler-Najjar syndrome, Biliary atresia using hHpSCs infusion. In the present study we transplanted hepatic progenitors to five subjects of end stage liver cirrhosis with MELD score >30. hHpSCs were sorted using MACS with CD326 antibody microbeads and infused through hepatic artery via femoral artery catheterization, a safe procedure provided portal pressure to monitor cell infusion route in order to prevent vascular thrombosis. All the patients showed improvement clinical and functional biochemical parameters after first month of cell infusion. Ascites was decreased and changed Encephalopathy grade into normal level was observed. MELD score system falling to normal level from >30 to <22 after infusion.

Khan, A. A., et al. (2000). "Dam-Break Surges with Floating Debris." Journal of Hydraulic Engineering **126**(5): 375-380.

The effect of floating debris on dam-break surges is studied experimentally. Hexahedron plastic particles having a specific gravity of 0.92 are used as debris. In addition to qualitative investigation of the surge behavior, the speed and height of the surges are plotted for various downstream to upstream depth ratios and debris concentration. The results are compared with the clear-water surges. Deceleration and the increase in height of the surge are more pronounced for smaller initial depths downstream of the gate. In general, the speed of the surge is found to be a function of downstream to upstream depth ratio, the ratio of the mass of the debris per unit surface area to the mass of the water per unit surface area upstream of the gate, and the particle size relative to the upstream depth. The wave height, on the other hand, is found to be a function of the depth and concentration ratios for smaller initial downstream depths. For higher initial downstream depths, the wave height is a function of the depth ratio only.

Khan, D., et al. (2016). "Impact of socioeconomic status on municipal solid waste generation rate." Waste Management **49**: 15-25.

The solid waste generation rate was expected to vary in different socioeconomic groups due to many environmental and social factors. This paper reports the assessment of solid waste generation based on different socioeconomic parameters like education, occupation, income of the family, number of family members etc. A questionnaire survey was conducted in the study area to identify the different socioeconomic groups that may affect the solid waste generation rate and composition. The average waste generated in the municipality is 0.41kg/capita/day in which the maximum waste was found to be generated by lower middle socioeconomic group (LMSEG) with average waste generation of 0.46kg/capita/day. Waste characterization indicated that there was no much difference in the composition of wastes among different socioeconomic groups except ash residue and plastic. Ash residue is found to increase as we move lower down the socioeconomic groups with maximum (31%) in lower socioeconomic group (LSEG). The study area is a coal based city hence application of coal and wood as fuel for cooking in the lower socioeconomic group is the reason for high amount of ash content. Plastic waste is maximum (15%) in higher socioeconomic group (HSEG) and minimum (1%) in LSEG. Food waste is a major component of generated waste in almost every socioeconomic group with maximum (38%) in case of HSEG and minimum (28%) in LSEG. This study provides new insights on the role of various socioeconomic parameters on generation of household wastes.

Khan, F., et al. (2019). "Understanding consumers' behavior intentions towards dealing with the plastic waste: Perspective of a developing country." Resources, Conservation and Recycling **142**: 49-58.

Plastic consumption has been increasing globally, creating large amount of litter and posing threat to the environment. The recycling of the plastic waste can help in reducing it and its environmental threat. The purpose of this paper is to identify the factors that influence the consumer's return/recycling intention regarding plastic waste. Moreover, recycling behavior of consumer was explored in detail. The theory of planned behavior was adapted and extended to measure the determinants of recycling behavior. Survey research design was employed whereas data includes valid 243 households, collected through survey questionnaire, by employing purposive sampling. PLS-SEM was applied on the collected data for hypotheses testing. The finding of this study indicates that subjective norms, awareness consequences and convenience are major predictors of return/recycling intention. Whereas, hypothesis for the attitude, perceived behavioral control and moral norms were rejected and they all have insignificant impact on return/recycling intention. Moreover, return intention have positive significant impact on resell, reuse, dispose and donate. Reuse was the most predicted by the return intention. This study enriches the literature of reverse logistics helping to understand the consumers' perspective. Provides the insights that will help government and organizations to understand consumers' return/recycling intention and formulate such strategies that will increase the involvement of consumers in recycling activities. Copyright © 2018 Elsevier B.V.

Khan, F., et al. (2019). "Managing plastic waste disposal by assessing consumers' recycling behavior: the case of a densely populated developing country." Environmental Science & Pollution Research **26**(32): 33054-33066.

The rapid increase in urbanization has given rise to the need of proper waste management. Within municipal waste, the plastic waste is a growing concern which is causing severe harm to our ecosystem. If ignored, this problem will have harmful effects on both human and wildlife. Therefore, this study aims to find out the factors that influence the recycling behavior patterns of consumers regarding plastic waste. The variables from the theory of planned behavior were adopted to study the behavior of consumers toward recycling plastic waste. The data was collected from 243 residents of Karachi-metropolitan city of Pakistan. The partial least square-structural equation modelling was applied to analyze the data. The findings of the current study reveal that different consumers' attributes and attitudes trigger different types of recycling behavior when it comes to waste disposal. Pressure from family and friends and perceived behavioral control trigger the behavior of reselling the waste plastic products while consumer's awareness of consequences and personal attitude toward proper waste disposal leads to reuse or donating that product to someone who can use that plastic product. The understanding of these consumer attributes may help to shape the behavioral outcomes in order to manage waste disposal. This study will be beneficial for business managers looking to improve reverse logistics as well as government/municipal policy makers and academics/researchers who are interested in a solution-oriented study.

Khan, F., et al. (2009). "Nasal epithelial cells of donor origin after allogeneic Hematopoietic Cell Transplantation (HCT): Result of cell fusion, transdifferentiation of hematopoietic stem cells or transfer of epithelial cell precursors with the graft?" Journal of Allergy and Clinical Immunology **1)**: S147.

RATIONALE: Epithelial cells (ECs) of respiratory mucosa are generally believed to originate from epithelial stem cells and not from hematopoietic stem cells (HSC). However, donor origin ECs have occasionally been detected in HCT recipients, suggesting an HSC origin. Transfer of ECs or their precursors with the graft, or epithelial-hematopoietic cell fusion may represent an alternative explanation. Here we evaluated the frequency of donor nasal epithelial cells in posttransplant patients, and the underlying mechanism. METHOD(S): We collected nasal scrapings and blood from 23 HCT survivors, early (2-3 months, n = 5) or late (4-22 years, n = 18) posttransplant. Nasal cells were cytospinned and stained with cytokeratin (CK) and CD45 antibodies. DNA extracted from laser-captured ECs (CK + CD45-) and blood leukocytes was PCR amplified for 16 short tandem repeat chimerism markers. FISH for two autosomes was performed in 8 patients to assess cell fusion. Magnetic separation using CD36-microbeads and CK staining was utilized to identify ECs in 3 PBSC graft specimens. RESULT(S): In all 23 HCT survivors, ECs of donor origin were identified; 2-12% nasal epithelial cells were of donor-type. The percentage of donor ECs was significantly higher in late (mean = 7%) compared to early (mean = 4%) posttransplants (p = 0.004). None of the nasal ECs in all HCT survivors studied exhibited cell fusion. CD36 + CK + ECs were identified in all graft specimens studied. CONCLUSION(S): Donor-origin nasal ECs can be found in all transplant recipients. This appears to be due to transdifferentiation of HSC into ECs or the transfer of ECs (or their precursors) with the graft, but not due to cell fusion.

Khan, F. R., et al. (2017). "Do polyethylene microplastic beads alter the intestinal uptake of Ag in rainbow trout (Oncorhynchus mykiss)? Analysis of the MP vector effect using in vitro gut sacs." Environmental Pollution **231**(Part 1): 200-206.

Microplastic (MP) vector effects have been well described in the literature but surprisingly little is in known about the impact of MPs on the intestinal uptake of contaminants. The present study aimed to determine whether the intestinal fate of Ag was affected by the presence of polyethylene MP beads. Ag (added as ^{110 m}Ag) was introduced into the lumen of rainbow trout (Oncorhynchus mykiss) anterior/mid-intestine gut sac preparations as Ag only, Ag and MPs (co-exposure) and Ag-incubated MPs (where Ag was adsorbed to the MP). Results show that after 3 h exposure the distribution of accumulated Ag between the four intestinal compartments (mucus layer, mucosal epithelium, muscle layer and serosal saline) was not affected by either MP condition when compared to Ag alone (p >0.05, One way ANOVA). Across all treatment groups mucus layer binding dominated (54.2-72.6%) whereas relatively little Ag was transported to the blood compartment (i.e. combined muscle layer and serosal saline compartments, 8.5-15.0%). Accompanying adsorption/desorption studies were performed in relevant media. Over 24 h, 60.6+or- 2.9% of the available Ag in artificial freshwater adhered to the surface of the PE MPs. In pH adjusted luminal fluids (pH 2.2, 4.1, 7.4 and 9.8) that span the range of conditions encountered within the rainbow trout digestive tract, there was almost complete dissociation at acidic pHs within 3 h (<2% remaining on MPs at both pH 2.2 and pH 4.1). Such pHs are typical of piscine stomach. Based on our finding we suggest that following the ingestion of MPs with adsorbed pollutants, desorption would occur prior to entering the site of uptake. The MPs themselves have no impact on the trans-epithelial transport of the contaminant, but the net result of the MP vector effect is to potentially introduce labile contaminant forms into the intestine.

Khan, F. R., et al. (2015). "Influence of polyethylene microplastic beads on the uptake and localization of silver in zebrafish (Danio rerio)." Environmental Pollution **206**: 73-79.

This study aimed to determine whether the uptake and localization of Ag in zebrafish was affected by the presence of polyethylene microplastic beads (PE MPBs). Zebrafish were exposed to 1 micro g Ag L⁻¹ (radiolabelled with ^{110 m}Ag) for 4 and 24 h in the presence or absence of PE MPBs (10, 100 or 1000 MPBs mL⁻¹), and one treatment in which MPBs (1000 MPBs mL⁻¹) were incubated with Ag to promote adsorption. The presence of MPBs, at any of the tested doses, had no effect on the uptake or localization of Ag. However, exposure to the Ag-incubated MPBs (~75% of the Ag bound to MPBs) significantly reduced Ag uptake at both time points and also significantly increased the proportion of

intestinal Ag. This study demonstrates that microplastics can alter the bioavailability and uptake route of a metal contaminant in a model fish species.

Khan, I. H., et al. (2005). "Simultaneous serodetection of 10 highly prevalent mouse infectious pathogens in a single reaction by multiplex analysis." Clinical and Diagnostic Laboratory Immunology **12**(4): 513-519.

Under current practices of mouse colony maintenance, sera from mice are analysed for antibodies against several widespread infectious pathogens by conventional immunoassays, generally enzyme-linked immunosorbent assay (ELISA). To test for multiple agents, these methods consume large volumes of mouse serum and are laborious and time-consuming. More efficient immunoassays, using small amounts of sample, are therefore needed. Accordingly, we have developed a novel multiplex diagnostic system that employs fluorescent microbeads, coated with purified antigens, for simultaneous serodetection of 10 mouse infectious agents. Individually identifiable, fluorescent microbeads were coated with antigens from Sendai virus, mouse hepatitis virus, Theiler's mouse encephalomyelitis virus/GDVII strain, mouse minute virus, mouse cytomegalovirus, respiratory enteric orphan virus (Reo-3 virus), mouse parvovirus, calf rotavirus for epizootic diarrhoea virus of infant mice, vaccinia virus for ectromelia virus, and Mycoplasma pulmonis. Standard sera, singly positive for antibodies to individual infectious agents, were generated by inoculation of BALB/cj and C57BL/6j mice. Sera from these experimentally infected mice, as well as sera from naturally infected mice, were analysed using a mixture of microbeads coated with antigens of the 10 infectious agents listed above. Results demonstrated that the multiplex assay was at least as sensitive and specific as ELISA for serodetection. Importantly, the multiplex assay required only 1 microliter of serum for simultaneous serodetection of the 10 mouse infectious agents in one reaction vessel. Thus, this multiplex microbead assay is a reliable, efficient, and cost-effective diagnostic modality that will impact serosurveillance of mice used in research.

Khan, I. H., et al. (2011). "Plasma antibody profiles as diagnostic biomarkers for tuberculosis." Clinical & Vaccine Immunology: CVI **18**(12): 2148-2153.

Two billion people are infected with Mycobacterium tuberculosis, the etiological agent of tuberculosis (TB), worldwide. Ten million to 20 million of the infected individuals develop disease per year. TB is a treatable disease, provided that it is diagnosed in a timely manner. The current TB diagnostic methods are subjective, inefficient, or not cost-effective. Antibody-based blood tests can be used efficiently and cost-effectively for TB diagnosis. A major challenge is that different TB patients generate antibodies against different antigens. Therefore, a multiplex immunoassay approach is needed. We have developed a multiplex panel of 28 M. tuberculosis antigen-coated microbeads. Plasma samples were obtained from over 300 pulmonary TB patients and healthy controls in a country where TB is endemic, Pakistan. Multiplex data were analyzed using computational tools by multivariate statistics, classification algorithms, and cluster analysis. The results of antibody profile-based detection, using 16 selected antigens, closely correlated with those of the sputum-based diagnostic methods (smear microscopy and culture) practiced in countries where TB is endemic. Multiplex microbead immunoassay had a sensitivity and specificity of approximately 90% and 80%, respectively. These antibody profiles could potentially be useful for the diagnosis of nonpulmonary TB, which accounts for approximately 20% of cases of disease. Since an automated, high-throughput version of this multiplex microbead immunoassay could analyze thousands of samples per day, it may be useful for the diagnosis of TB in millions of patients worldwide.

Khan, I. H., et al. (2008). "Profiling antibodies to Mycobacterium tuberculosis by multiplex microbead suspension arrays for serodiagnosis of tuberculosis." Clinical & Vaccine Immunology: CVI **15**(3): 433-438.
Tuberculosis (TB) is a serious global disease. The fatality rate attributed to TB is among the highest of infectious diseases, with approximately 2 million deaths occurring per year worldwide. Identification of individuals infected with Mycobacterium tuberculosis and screening of their immediate contacts is crucial for controlling the spread of TB. Current methods for detection of M. tuberculosis infection are not efficient, in particular, for testing large numbers of samples. We report a novel and efficient multiplex microbead immunoassay (MMIA), based on Luminex technology, for profiling antibodies to M. tuberculosis. Microbead sets identifiable by unique fluorescence were individually coated with each of several M. tuberculosis antigens and tested in multiplex format for antibody detection in the experimental nonhuman primate model of TB. Certain M. tuberculosis antigens, e.g., ESAT-6, CFP-10, and HspX, were included to enhance the specificity of the MMIA, because these antigens are absent in nontuberculous mycobacteria and the vaccine strain Mycobacterium bovis bacillus Calmette-Guerin. The MMIA enabled simultaneous detection of multiple M. tuberculosis plasma antibodies in several cohorts of macaques representing different stages of infection and/or disease. Antibody profiles were defined in early and latent/chronic infection. These proof-of-concept findings demonstrate the potential clinical use of the MMIA. In addition, the MMIA serodetection system has a potential for mining M. tuberculosis open reading frames (about 4,000) to discover novel target proteins for the development of more-comprehensive TB serodiagnostic tests.

Khan, I. U., et al. (2013). "Continuous-flow encapsulation of ketoprofen in copolymer microbeads via co-axial microfluidic device: influence of operating and material parameters on drug carrier properties." International Journal of Pharmaceutics **441**(1-2): 809-817.
Microchannels based microfluidic systems are able to obtain monodispersed microparticles but are limited by cost, time and channel clogging. We succeeded in on the fly encapsulation of high ketoprofen contents in acrylate-based copolymer microbeads by environment friendly UV induced free radical polymerization in off-the-shelf co-axial microfluidic device. FTIR shows complete polymerization of acrylate monomers and interaction between carboxylic group of ketoprofen and ester group of monomers. DSC and XRD confirm amorphous nature of drug in microbeads. Different comonomer content formulations show limited drug release at low pH, a helpful properties to avoid gastric irritating effect of ketoprofen associated with conventional dosage forms. At pH 6.8 microbeads release higher content of drug by a non-Fickian diffusion mechanism. Their drug release rate depends upon the weight content of ethyl acrylate in the formulation as well as their size, increasing by increasing the former and decreasing the later.

Khan, M. B. and R. S. Prezant (2018). "Microplastic abundances in a mussel bed and ingestion by the ribbed marsh mussel Geukensia demissa." Marine Pollution Bulletin **130**: 67-75.
Human activities have generated large quantities of microplastics that can be consumed by filter-feeding organisms as potential food sources. As a result, organisms may experience marked reductions in growth and/or health. To date there has been no investigations connecting microplastics (MPs) with the critically important ribbed mussel Geukensia demissa. Here we examined MP abundances within a bed of G. demissa in New Jersey.

Khan, M. S., et al. (2010). "Development and evaluation of pH-dependent micro beads for colon targeting." Indian Journal of Pharmaceutical Sciences **72**(1): 18-23.
The purpose of this research was to develop and evaluate multiparticulates of alginate and chitosan hydrogel beads exploiting pH sensitive property for colon-targeted delivery of

theophylline. Alginate and chitosan beads were prepared by ionotropic gelation method followed by enteric coating with Eudragit S100. All formulations were evaluated for particle size, encapsulation efficiency, swellability and in vitro drug release. In vitro dissolution studies performed following pH progression method demonstrated that the drug release from coated beads depends on coat weights applied and pH of dissolution media. Mechanism of drug release was found to be swelling and erosion-dependent. The studies showed that formulated alginate and chitosan beads can be used effectively for the delivery of drug to colon and a coat weight of 20% weight gain was sufficient to impart an excellent gastro resistant property to the beads for effective release of drug at higher pH values.

Khandagale, A. B., et al. (2012). "Neutrophil-dependent cleavage of Tissue Factor Pathway Inhibitor (TFPI) supports blood coagulation in arterial and microvessel thrombosis." Hamostaseologie **32 (1)**: A8.

Aim: Role of neutrophil elastase and cathepsin G in fibrin formation via cleavage of tissue factor pathway inhibitor (TFPI) , the physiological inhibitor of tissue factor. Method(s): We prepared human platelets and isolated human neutrophils using microbeads or Ficoll gradients. eNuc were prepared using nuclei of HeLa cells. We performed site-directed mutagenesis of human TFPI to get T87F/L89A mutant. Confocal imaging was used to detect arterial thrombi, externalised nucleosomes and neutrophils. TFPI degradation was anlysed using Western blot technique. Whole-blood coagulation was measured by thrombelastography. Result(s): We found that in suspension of human neutrophils and platelets, neutrophil elstase (NE) was exposed together with externalised nucleosomes (eNuc) on the surface of neutrophils. NE induced cleavage of the endogenous anticoagulant TFPI was enhanced by eNuc. which is resistant to cleavage by NE and cathepsin G (CG). T87F/L89A mutant reduced fibrin formation in human whole blood more effectively than native TFPI. An inhibitor of NE reduced fibrin formation to the same extend as the T87F/L89A mutant. Western blot analysis showed cleavage of TFPI by NE was increased more than 2-fold by e-Nuc. This effect could be inhibited with anti H2A-H2B-DNA antibody. In arterial thrombi recovered from wt mice, TFPI was strongly degraded. In contrast, TFPI remained largely intact in mice lacking NE and CG (NE^{-/-}/CG^{-/-}) supporting NE-dependent TFPI cleavage. In parallel, fibrin formation and thrombus sizes were reduced in the carotid artery (FeCl<inf>3</inf>) and in liver microvessels of NE^{-/-}/CG^{-/-} mice. The anti H2A-H2B-DNA antibody also diminished intravascular thrombus formation in the carotid artery and in liver microvessels. Conclusion(s): Our study shows that neutrophil serine proteases propagate and stabilize nascent thrombi in arterial vessels and microvessels by cleavge of TFPI an physiological inhibitor of coagulation activator.

Kharat, V. T., et al. (2017). "Studies on development of probiotic chocolate by using microencapsulated Lactobacillus strains." Trends in Biosciences **10**(20): 3832-3836.

The popularity of chocolate around the world combined with high level of health related awareness of the contemporary consumer, imposed the idea of enriching chocolate with probiotic bacterial strains. The main objective of this work was to obtain a potentially probiotic chocolate by using microencapsulated Lactobacillus strains. The Lactobacillus strains were encapsulated as micro-beads by using sodium alginate and guar gum and these beads were incorporated into chocolate suspension. This probiotic milk chocolate displayed the same sensory properties as the reference, probiotic-free chocolate. The number of live bacterial cells was maintained at the functional level of 107-109 Cfu/g after keeping for 4 weeks at 40 C. Neither the texture nor the total and volatile acidity of chocolate masses were changed by addition of the microencapsulated Lactobacillus cells.

Kharya, D. G., et al. (2015). "Haploidentical paternal TCRAB and CD 19 depleted stem cell transplant for severe combined immunodeficiency with pneumocystis jiroveci pneumonia." Bone Marrow Transplantation **1)**: S341.

Introduction: In haploidentical hematopoietic stem cell transplant (HSCT), in vitro T-cell depletion of the graft is effective at preventing graft versus host disease (GVHD). Various T-cell depletion strategies have been used over time to minimize GVHD and maximize sustained engraftment and early immune reconstitution in alternative donor transplants with variable success rates. Depletion of T cell receptor alpha and beta (TCRab) and CD 19+ cells, with selection of TCRgd T-cells is a new technique with promising results in haploidentical HSCT. We report a child with Severe Combined Immunodeficiency (SCID) with pneumocystis jiroveci pneumonia (PCP) treated successfully using this method. Materials (or patients) and methods: Five months old male baby with SCID (T-B-NK+) with PCP requiring ventilator support was shifted to BLK SSH for further management. PCP was managed with septran and clindamycin. In the absence of suitably matched family or unrelated donor he was taken up for haploidentical paternal HSCT. He was conditioned using Fludarabine 30 mg/m² (D-7 to D-3), Treosulfan 12gm/m² (D-7 to D-5), Thymoglobulin 2.5 mg/kg (D-9 to D-6). GVHD prophylaxis included cyclosporine. Stem cells were mobilized using GCSF and peripheral blood stem cells were harvested. In vitro TCRab T cells were depleted using bioitnylated anti ab antibody followed by antibiotin antibody conjugated to magnetic microbeads. B cells were depleted using CD19 conjugated microbeads. He received 8.5x10^8/kg total nucleated cells, 14.7x10^6/kg CD34 cells, 1.7x10^4/kg TCRab T cells (3.91 log reduction), 11.8x10^6/kg TCRgd T cells, 3.7x10^4 CD19 cells (3.07 log reduction). Result(s): Polymorphonuclear cell and platelet engraftment were seen on D+10 and D+12 respectively. Chimerism on day +15 showed 100% donor cells. There is no evidence of acute or chronic GVHD. He was discharged on D+28 in good clinical condition. He is currently D+75 post HSCT clinically well, on tapering doses of cyclosporine. His immune reconstitution assay shows he has good numbers of NK cells but T cells have yet not appeared. Conclusion(s): Successful Haploidentical Paternal TCRab and CD19 Depleted Stem Cell Transplant for SCID despite PCP Infection. This appears to be a promising technique in haploidentical or MMUD HSCT with early and sustained engraftment, early immune recovery and less risk of GVHD. This is the first reported case of haploidentical HSCT using this technique for primary immunodeficiency in India.

Khawaja, X. Z. (2007). "Development of a scintillation proximity assay for human insulin-like growth factor-binding protein 4 compatible with inhibitor high-throughput screening." Analytical Biochemistry **366**(1): 80-86.

The insulin-like growth factor-binding protein 4 (IGFBP-4), which exists in many different tissues and biological fluids, modulates insulin-like growth factor 1 (IGF-1) bioavailability in part by competitive sequestration and prevention of interaction with cell membrane IGF-1 receptors. Accordingly, small molecules that inhibit the ability of IGF-1 to associate with IGFBP-4 may have clinical utility as regulators of cellular proliferation, survival, and differentiation. Currently, a polyethylene glycol-based precipitation of [(125)I]IGF-1 bound to IGFBP-4 is used to quantify selective IGFBP-4 ligand interactions. We have developed a novel 96-well plate scintillation proximity assay (SPA) for measuring small molecule interactions at IGFBP-4 using a biotinylated form of IGFBP-4 coupled to streptavidin-coated polyvinyltoluene (PVT) SPA microbeads and using [(125)I]IGF-1 as the endogenous ligand. Dose-displacement curves with unlabeled IGF-1 exhibited a mean K(d) value of 0.46 nM. Parallel studies using the nonselective IGFBP inhibitor, NBI-31772, generated a K(i) value of 47 nM. Under optimized conditions, the IGFBP-4 SPA was stable for up to 24h at room temperature and was unaffected by dimethyl sulfoxide (DMSO,<0.5%). This homogeneous binding assay is simple, stable, sensitive, and amenable to automation. The good signal/noise ratio (10:1) and Z' factor (0.7-0.8) make it compatible with high-throughput screening platforms for the identification of IGFBP-4 inhibitors. The IGFBP-4 binding assay may be expanded to other IGFBP members, in biotinylated form, to provide a powerful tool amenable to drug screening and the design of therapeutics to treat a variety of IGF-responsive diseases.

Khim, J. S., et al. (2018). "A comparative review and analysis of tentative ecological quality objectives (EcoQOs) for protection of marine environments in Korea and China." Environmental Pollution **Part B. 242**: 2027-2039.

Ecological quality objectives (EcoQOs), as tools for implementing ecosystem approach, have long been acknowledged to protect the marine ecosystems and fisheries in regional seas through joint efforts by surrounding countries over the past decade. The present review analyzed the best available meta-data relating to the five ecosystem elements that were recently proposed by the Northwest Pacific Action Plan to evaluate the current status of coastal ecosystem health in marine environment of the Yellow Sea. We suggested the six tentative EcoQOs among five ecological quality elements including: 1) biological and habitat diversity; 2) invasive species; 3) eutrophication; 4) pollutants; and 5) marine litters. Environmental status was assessed, depending on the EcoQOs targets, by comparison to the world average values, existing environmental standards, or reported values of other regional seas. Results of analysis revealed that among the six tentative EcoQOs, two target objectives to marine biodiversity and concentrations of nutrients (viz., DIN and DIP) were met towards good environmental status. Whilst, three EcoQOs relating to hypoxia and red-tide, pollutants (persistent toxic substances and metals), and marine litters (including microplastics) did not meet and one relating to invasive species could not be judged due to insufficient data sets. The biggest weak point for developing suitable EcoQOs and assessing status of ecosystem health could be insufficient meta-data sets available and/or discrepancy in methodological details cross the data-sets or between the two targeted countries. Thus, the cooperation of neighboring countries, viz., Korea and China for the Yellow Sea, is necessary for the ecosystem based management of our regional sea in the future. Overall, this first time review for the assessment of target tentative EcoQOs in the Yellow Sea region encompassing coasts of Korea and China would provide a better understanding of the current status of environmental pollution and ecosystem health. "Six tentative EcoQOs developed to assess current status of ecosystem health in the marine environments of the Yellow Sea with comparative review and analysis for selected ecosystem elements". Copyright © 2018 Elsevier Ltd

Kholidah, N., et al. (2018). "Polystyrene plastic waste conversion into liquid fuel with catalytic cracking process using Al₂O₃ as catalyst." Science and Technology Indonesia **3**(1): 7-13.

The increase in energy consumption and an increase in plastic waste generation are two major problems that arise along with economic growth and the increase of population. Styrofoam is one type of polystyrene plastic waste that can be processed into liquid fuels by cracking process. In this study, the cracking process of polystyrene plastic waste into liquid fuel carried by the catalytic cracking process using Al₂O₃ as catalyst. This study aimed to determine the effect of the catalyst weight, length of cracking time and range of temperature in the catalytic cracking process of polystyrene plastic waste into liquid fuel toward the mass and characteristics of liquid fuels produced and to determine the composition of liquid fuels produced. The catalytic cracking process of polystyrene plastic waste with catalyst was done in

the fixed bed type reactor by heating the reactor with a heater, where the process took place at temperature of 150 degrees C, 200 degrees C, 250 degrees C and 300 degrees C and the length of the process was varied into 20, 40, and 60 minutes and the catalyst weight was also varied, which were 4%, 6% and 8%, while the styrofoam weight was 250 grams. From the research, the highest mass of liquid fuel derived from polystyrene catalytic cracking process was in the amount of 48.8 grams and liquid yield percentage of 19.5% at temperature of 250 degrees C, cracking time of 60 minutes and weight of 8% catalyst, while the characteristics of liquid fuel that were approaching the characteristics of gasoline was at temperatures of 250 degrees C, cracking time of 60 minutes and weight of 6% catalyst, in which each value of density of 0.763 g/ml, specific gravity of 0.778 and oAPI gravity of 50.2. While other liquid fuels obtained from the cracking of polystyrene were still within the tolerance range characteristic properties of gasoline. Liquid fuels produced from the catalytic cracking process was analyzed using a GC-MS, in which the analysis results indicated that liquid fuels were included into the gasoline fraction.

Khoramnejadian, S. (2011). "Converting non-biodegradable plastic to biodegradable by using natural polymer to help environment conservation." Journal of Food, Agriculture and Environment **9**(2): 477-479.

Plastic waste cause a problem for environmental conservation, plastic materials are resistant against degradation by microorganisms and remain in the environment for many years. Biodegradable polymers could solve this problem. In this article, biodegradability of Linear Low Density Polyethylene (LLDPE) with chitosan was studied. Polyethylene grafted maleic anhydride (PE-g-MA) was used as a compatibilizer. Samples with different levels of chitosan (3.7%, 7.4%, 10%, 15% and 20%) with constant amount of PE-g-MA were prepared. In all samples amount of compatibilizer was same. The biodegradation of blends was studied with soil burial and exposure to mould growth. Biodegradation was determined by weight loss, change in mechanical properties of the sheets, mould growth and SEM test. The results showed that with increasing chitosan content biodegradability of blends increased. Biodegradation of the samples due to soil burial after 11 months revealed that the weight of the blends was decreased by increasing the chitosan level.

Khordagui, H. K. and A. H. Abu-Hilal (1994). "Industrial plastic on the southern beaches of the Arabian Gulf and the western beaches of the Gulf of Oman." Environmental Pollution **84**(3): 325-327.

The increasing production and use of plastic in the Arabian Gulf combined with shipping and waste disposal practices, have increased the concentration of plastic particles on the sea's surface and beaches. The objective of this investigation was to provide an assessment of the abundance, distribution, potential sources and significance of industrial plastic on the western beaches of the United Arab Emirates on the Arabian Gulf and on the eastern beaches on the Gulf of Oman. The abundance of stranded plastic pellets was highly uneven. By early 1992 alarming levels of fresh plastic pellets were noticed on the Arabian Gulf beaches of the UAE. Large numbers of 25 kg sacks of white plastic spherules manufactured by (SABIC) in Jubail, Saudi Arabia were washed ashore. When compared to the west coast on the Arabian Gulf, the east coast on the Gulf of Oman exhibited much lower levels of plastic pellets. When compared to other parts of the world, the beaches of the UAE on the Arabian Gulf are considered to be heavily polluted with industrial plastic.

Khosrovyan, A. and A. Kahru (2019). "Evaluation of the hazard of irregularly-shaped co-polyamide microplastics on the freshwater non-biting midge Chironomus riparius through its life cycle." Chemosphere **244**: 125487.

Plastics pollution is increasingly attracting societal and political attention. However, despite extensive research effort recently dedicated to the hazard of plastics in the environment, the data obtained are often redundant and essential knowledge gaps exist: available freshwater ecotoxicity data mostly concern Daphnia magna and are derived from acute exposure to spherical particles. In this paper, we address this gap by exploring the biological effects of irregularly-shaped co-polyamide (PA, 10-180 mum) on Chironomus riparius - a very versatile organism that during its life-stages inhabits both sediment and water column - relevant compartments for microplastics (MP) pollution. C. riparius represents an important part of the freshwater food chain and is also a standard OECD test organism. Different toxicity endpoints along the life cycle of C. riparius (28 days) were used as described in OECD 218: emergence, time to emergence, sex ratio of imagoes and the number of egg clutches per female. Chironomid larvae were exposed to 100 mg PA kg⁻¹ (i.e., 10,100 particles kg⁻¹) sediment throughout. Soluble Zn-salt (1 mg Zn L⁻¹) was used as a positive control and as a co-pollutant in combination with PA. We demonstrated that the tested concentrations of PA and Zn alone as well in combination showed no adverse effects for C. riparius in chronic exposures. 100 mg PA kg⁻¹ also did not affect the life cycle traits of the offspring of PA-exposed parent Chironomids. The data obtained will be useful for environmental risk assessment of PA when actual environmental concentrations of PA will be available.

Khoury, H., et al. (2004). "Correlation between karyotype and quantitative immunophenotype in acute myelogenous leukemia with t(8;21)." Modern Pathology **17**(10): 1211-1216.

Acute myelogenous leukemia with t(8;21) is a distinct clinicopathologic entity in which the malignant myeloblasts display a characteristic pattern of surface antigen expression. Quantitative analysis of surface marker expression in patients with this chromosomal abnormality compared to acute myelogenous leukemia patients with a different karyotype has not been reported. From 305 consecutive newly diagnosed acute myelogenous leukemia patients underwent immunophenotyping and cytogenetic analysis at our center; 16 patients (5.2%) had a t(8;21). Fluorescence intensity values were obtained, using a set of reference microbeads, by conversion of mean channel fluorescence to molecular equivalent of soluble fluorochrome. Patients with t(8;21) displayed higher levels of CD34, HLA-DR and MPO expression ($P < 0.001$ for each) and lower levels of CD13 ($P = 0.03$) and CD33 ($P = 0.02$) expression. In order to study the sensitivity, specificity and predictive value of these markers, molecular equivalent of soluble fluorochrome thresholds were statistically determined. The statistically established threshold for each of the individual markers (CD34 > 60.5 x 10(3), HLA-DR > 176.1 x 10(3), MPO > 735.1 x 10(3), CD13 < 24.3 x 10(3) and CD33 < 17.3 x 10(3)) had a sensitivity of 100%, a specificity of 62-92% and a positive predictive value of 7-45%. In multivariate analysis, two quantitative patterns (CD34 > 60.5 x 10(3) and MPO > 176.1 x 10(3); CD33 < 17.3 x 10(3) and MPO > 176.1 x 10(3)) had a sensitivity, specificity and positive predictive value of 100%. These aberrant phenotypic patterns might help identify patients with t(8;21) at diagnosis and could be useful in minimal residual disease monitoring.

Khraishi, N. M. and Y. Tabaza (1997). "Recycling of plastic waste from protected agriculture into novel multilayered greenhouse covers." 14th International congress on plastics in agriculture, Tel Aviv, Israel, March.

The international and national activities of the Royal Scientific Society in the field of plastic waste management, in particular recycling of plastic waste from protected agriculture and its utilization in the development of multilayered greenhouse covers, are highlighted. Novel greenhouse polyethylene films were developed utilizing recycled degraded and weathered films.

The outdoor performance of these films was investigated in comparison with virgin traditional covers. The mechanical and physical properties of the films were monitored versus accelerated and natural aging. The results had excellent stability against weathering effects for films developed under very controlled processing conditions, blend composition, history of recycled waste and structure of the films. The cumulative fruit yield and plant growth under these covers was monitored over 2 growing seasons by examining 2 actual size greenhouses covered with the standard commercial film and the recycled film respectively. The developed film was as effective as the environmental requirements for a tomato crop.

Kikuchi, H. and T. Yajima (1992). "Correlation between water-holding capacity of different types of cellulose in vitro and gastrointestinal retention time in vivo of rats." Journal of the Science of Food and Agriculture **60**(2): 139-146.

Rats were fed on a fibre-free basal diet (BD) or basal diet including 7% of 1 of 3 indigestible and poorly fermentable food components: cellulose powder (CEL), microfibril cellulose (MCEL), or plastic particles (PLS). Faecal moisture was highest in MCEL and lowest in PLS rats. Mean gut retention times (MRT) of solid and liquid phases, respectively, were 9.4, 11.1, 13.6 and 17.8, and 12.9, 15.0, 14.2 and 13.9 h in MCEL, CEL, PLS and BD, respectively. There was an inverse relationship ($r = 0.74$, $P<0.01$) between MRT of solid phase and settling volume whereas MRT of liquid phase was not significantly affected by diet. Relationship between organic acid content and settling volume was significant ($r = 0.61$, $P<0.01$).

Kim, A. R., et al. (2013). "On-chip immunoassay of a cardiac biomarker in serum using a polyester-toner microchip." Talanta **109**: 20-25.

An on-chip immunoassay to detect C-reactive protein (CRP) was performed using a polyester-toner (PT) microchip. CRP is a highly conserved plasma protein responding to inflammation and is used for clinical purposes to diagnose an inflammatory state. For rapid analysis and specific interactions in immunoassays, extensive studies using microfluidic chips have been carried out. Recently, a simple technique to fabricate a disposable PT microchip by a direct printing process was developed and several applications were introduced. One major drawback of the PT microchip, however, is the poor separation performance due to the quality of the microfluidic structures. This problem for a PT microchip can be overcome using a cleavable tag immunoassay, which requires minimal separation performance. After analytes are conjugated onto antibodies which are immobilized on the surface of microbeads placed on the PT microchip, a second group of fluorescently tagged antibodies are added and complexed with the analytes. The tag is then cleaved and the solution containing the cleaved tag is analyzed by electrophoresis. The time needed for the complete analysis to be carried out on a PT microchip was less than 35 min. The dynamic range of the CRP in 10-fold diluted serum was 0.3-100 mg/L and the limit of detection was 0.3 mg/L, which demonstrated the possibility of a quantitative analysis of CRP in serum in clinical trials.

Kim, B. J., et al. (2015). "Control of Microbial Growth in Alginate/Polydopamine Core/Shell Microbeads." Chemistry, An Asian Journal **10**(10): 2130-2133.

Microbial microencapsulation not only protects microorganisms from harmful environments by physically isolating them from the outside media but also has the potential to tailor the release profile of the encapsulated cells. However, the microbial release has not yet been controlled tightly, leading to undesired detrimental exposure of microorganisms to the outside. In this work, we suggest a simple method for controlling the cell release by suppressing the microbial growth in the microbeads. Alginate microbeads, encapsulating yeast cells, were coated with

ultrathin but robust polydopamine shells, and the resulting core/shell structures effectively reduced the growth rate, while maintaining the cell viability.

Kim, C., et al. (2012). "Microarray-based mutation detection and phenotypic characterization in Korean patients with retinitis pigmentosa." Molecular Vision **18**: 2398-2410.

PURPOSE: To evaluate microarray-based genotyping technology for the detection of mutations responsible for retinitis pigmentosa (RP) and to perform phenotypic characterization of patients with pathogenic mutations.

METHODS: DNA from 336 patients with RP and 360 controls was analyzed using the GoldenGate assay with microbeads containing 95 previously reported disease-associated mutations from 28 RP genes. Mutations identified by microarray-based genotyping were confirmed by direct sequencing. Segregation analysis and phenotypic characterization were performed in patients with mutations. The disease severity was assessed by visual acuity, electroretinography, optical coherence tomography, and kinetic perimetry.

RESULTS: Ten RP-related mutations of five RP genes (PRP3 pre-mRNA processing factor 3 homolog [PRPF3], rhodopsin [RHO], phosphodiesterase 6B [PDE6B], peripherin 2 [PRPH2], and retinitis pigmentosa 1 [RP1]) were identified in 26 of the 336 patients (7.7%) and in six of the 360 controls (1.7%). The p.H557Y mutation in PDE6B, which was homozygous in four patients and heterozygous in nine patients, was the most frequent mutation (2.5%). Mutation segregation was assessed in four families. Among the patients with missense mutations, the most severe phenotype occurred in patients with p.D984G in RP1; less severe phenotypes occurred in patients with p.R135W in RHO; a relatively moderate phenotype occurred in patients with p.T494M in PRPF3, p.H557Y in PDE6B, or p.W316G in PRPH2; and a mild phenotype was seen in a patient with p.D190N in RHO.

CONCLUSIONS: The results reveal that the GoldenGate assay may not be an efficient method for molecular diagnosis in RP patients with rare mutations, although it has proven to be reliable and efficient for high-throughput genotyping of single-nucleotide polymorphisms. The clinical features varied according to the mutations. Continuous effort to identify novel RP genes and mutations in a population is needed to improve the efficiency and accuracy of the genetic diagnosis of RP.

Kim, D., et al. (2017). "Mixture Toxicity of Nickel and Microplastics with Different Functional Groups on Daphnia magna." Environmental Science & Technology **51**(21): 12852-12858.

In recent years, discarded plastic has become an increasingly prevalent pollutant in aquatic ecosystems. These plastic wastes decompose into microplastics, which pose not only a direct threat to aquatic organisms but also an indirect threat via adsorption of other aquatic pollutants. In this study, we investigated the toxicities of variable and fixed combinations of two types of microplastics [one coated with a carboxyl group (PS-COOH) and the other lacking this functional group (PS)] with the heavy metal nickel (Ni) on Daphnia magna and calculated mixture toxicity using a toxic unit model. We found that toxicity of Ni in combination with cither of the two microplastics differed from that of Ni alone. Furthermore, in general, we observed that immobilization ofD. magna exposed to Ni combined with PS-COOH was higher than that of D. magna exposed to Ni combined with PS. Collectively, the results of our study indicate that the toxic effects of microplastics and pollutants may vary depending on the specific properties of the pollutant and microplastic functional groups, and further research on the mixture toxicity of various combinations of microplastics and pollutants is warranted. [ABSTRACT FROM AUTHOR]

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Kim, D., et al. (2002). "Waste plastics as supplemental fuel in the blast furnace process: Improving combustion efficiencies." Journal of Hazardous Materials **94**(3): 213-222.

The possibility of using waste plastics as a source of secondary fuel in a blast furnace has been of recent interest. The success of this process, however, will be critically dependent upon the optimization of operating systems. For instance, the supply of waste plastics must be reliable as well as economically attractive compared with conventional secondary fuels such as heavy oil, natural gas and pulverized coal. In this work, we put special importance on the improvement of the combustibility of waste plastics as a way to enhance energy efficiency in a blast furnace. As experimental variables to approach this target, the effects of plastic particle size, blast temperature, and the level of oxygen enrichment were investigated using a custom-made blast model designed to simulate a real furnace. Lastly, the combustion efficiency of the mixture of waste plastics and pulverized coal was tested. The observations made from these experiments led us to the conclusion that with the increase of both blast temperature and the level of oxygen enrichment, and with a decrease in particle size, the combustibility of waste polyethylene could be improved at a given distance from the tuyere. Also it was found that the efficiency of coal combustion decreased with the addition of plastics; however, the combustion efficiency of mixture could be comparable at a longer distance from the tuyere. © 2002 Elsevier Science B.V. All rights reserved.

Kim, D.-H., et al. (2016). "Microbead-based immunoassay using the outer membrane layer of Escherichia coli combined with autodisplayed Z-domains." Applied Surface Science **362**: 146-153.

The Z-domain has the potential to control the orientation of immobilized antibodies because of its binding affinity to the F c regions of antibodies (IgGs). In this work, Z-domains were autodisplayed on the outer membrane (OM) of Escherichia coli. OM particles were isolated and coated onto microbeads with positive, neutral, or negative surface charges. Other conditions such as incubation time and initial OM concentration were also optimized for the OM coating to obtain maximum antibody-binding. Using three kinds of model proteins with different isoelectric points (pI), streptavidin (pI=5, negative charge at pH 7), horseradish peroxidase (pI=7, neutral charge at pH 7), and avidin (pI=10, positive charge at pH 7), protein immobilization onto the microbeads was carried out through physical adsorption and electrostatic interactions. Using fluorescently labeled antibodies and fluorescence-activated cell sorting, it was determined that the neutral and the positively charged microbeads effectively bound antibodies while minimizing non-specific protein binding. The OM-coated microbeads with autodisplayed Z-domains were applied to C-reactive protein immunoassay. This immunoassay achieved 5-fold improved sensitivity compared to conventional immunoassay based on physical adsorption of antibodies at the cutoff concentration of medical diagnosis of inflammatory diseases (1000ng/ml) and cardiovascular diseases (200ng/ml).

Kim, D. N., et al. (2009). "Fabrication of microfluidic devices incorporating bead-based reaction and microarray-based detection system for enzymatic assay." Sensors and Actuators B: Chemical **137**(1): 305-312.

In this study, we developed a novel microfluidic device for enzyme-based assays that incorporates heterogeneous reaction and microarray-based detection systems. The microfluidic device had two serial chambers connected through microchannels; one for the reaction between analytes and enzymes, and the other for the quantitative detection of analytes. The reaction chamber was filled with glass microbeads covalently bound to enzymes via aminopropyltriethoxysilane (APTES). Enzyme-immobilized microbeads 70km in diameter were retained within the reaction chamber using a microfilter composed of micropillars with 30km interspaces. In the detection chamber, a poly(ethylene glycol)-based hydrogel microarray was fabricated using photolithography, which could immobilize other protein molecules or fluorescent dyes for the optical analysis of enzyme-catalyzed reaction. Different concentrations of glucose were detected within the microfluidic system where the reaction chamber was filled with glucose oxidase (GOX)-immobilizing glass microbeads, and a horseradish peroxidase (POD)-entrapping hydrogel microarray was placed in the detection chamber. A sequential bienzymatic reaction resulted in the conversion of non-fluorescent Amplex Red into fluorescent resorufin within the hydrogel microarray and glucose concentrations ranging from 1 to 10mM were successfully detected by measuring the change of emission intensity of resorufin inside the hydrogel microarray.

Kim, H. and J. Kim (2014). "A microfluidic-based dynamic microarray system with single-layer pneumatic valves for immobilization and selective retrieval of single microbeads." Microfluidics and Nanofluidics **16**(4): 623-633.

A simple yet effective dynamic bead-based microarray is necessary for multiplexed high-throughput screening applications in the fields of biology and chemistry. This paper introduces a microfluidic-based dynamic microbead array system using pneumatically driven elastomeric valves integrated with a microchannel in a single polydimethylsiloxane (PDMS) layer that performs the following functions: single-microbead arraying with loading and trapping efficiencies of 100 %, sequential microbead release for selective retrieval of microbeads of interest, and rapid microarray resettability (<1 s). The key feature is the utilization of an elastomeric membrane as a valve for trapping and releasing single microbeads; this membrane is deformable depending on the applied pneumatic pressure, thereby simply providing a dual trap-and-release function. We propose an effective single-microbead-trapping mechanism based on a dynamic flow-change network and a mathematical model as the design criterion of a trapping site. A sequential microbead release technique via a multistep "release-retrap-and-repeat" method was developed for the selective retrieval of trapped microbeads with a simple configuration consisting of a single PDMS layer and a simple macro-to-micro connection. The proposed dynamic microbead array could be a powerful tool for high-throughput multiplex bead-based drug screening or disease diagnosis.

Kim, H., et al. (2019). "Uptake of nanopolystyrene particles induces distinct metabolic profiles and toxic effects in Caenorhabditis elegans." Environmental Pollution **246**: 578-586.

Nanoplastics are widely used in modern life, for example, in cosmetics and daily use products, and are attracting concern due to their potential toxic effects on environments. In this study, the uptake of nanopolystyrene particles by Caenorhabditis elegans (C. elegans) and their toxic effects were evaluated. Nanopolystyrene particles with sizes of 50 and 200 nm were prepared, and the L4 stage of C. elegans was exposed to these particles for 24 h. Their uptake was monitored by confocal microscopy, and various phenotypic alterations of the exposed nematode such as locomotion, reproduction and oxidative stress were measured. In addition, a metabolomics study was performed to determine the significantly affected metabolites in the exposed C. elegans group. Exposure to nanopolystyrene particles caused the perturbation of metabolites related to energy metabolism, such as TCA cycle intermediates, glucose and lactic acid. Nanopolystyrene also resulted in toxic effect including induction of oxidative stress and reduction of locomotion and reproduction. Collectively, these findings provide new insights into the toxic effects of nanopolystyrene particles.

Kim, H., et al. (2004). "Quantitative analysis of the number of antigens immobilized on a glass surface by AFM." Ultramicroscopy **100**(3-4): 203-210.
To develop force measurements using an atomic force microscope (AFM) in a quantitative manner, it is necessary to estimate the number density of target molecules on a sample surface, and for this, the sensitivity of detection should be known. In this study, the AFM was used as a mechanical detector and an antigen and its antibody were used as a model to evaluate the sensitivity of detection. Antigens were immobilized on a glass surface and number density was estimated by monitoring optical absorbance due to product formation by the reaction of crosslinkers. The concentration of antigen was controlled by mixing control peptides. A microbead was used as a probe and antibodies were immobilized on the bead. AFM force measurements were then made for a range of number densities in the order of 10-10(6) antigen molecules per square micrometer of surface and were compared to evaluate the sensitivity of detection. Our result establishes the reliability of estimating a number of molecules like receptors on the cell surface, and indicates that the AFM is useful as a mechanical detector with high sensitivity.

Kim, I.-S., et al. (2015). "Factors Influencing the Spatial Variation of Microplastics on High-Tidal Coastal Beaches in Korea." Archives of Environmental Contamination & Toxicology **69**(3): 299-309.
The presence and distribution characteristics of microplastics become a big issue due to the adverse effects on marine organisms caused by not only microplastics but any incorporated and/or adsorbed pollutants. Distribution of microplastics (50- to 5000-µm size) was determined for three sandy beaches on an isolated island in a high-tidal costal region to elucidate spatial distributions in relation to beach locations. The abundances of microplastics (n = 21) measured were 56-285,673 (46,334 ± 71,291) particles/m corresponding to the highest level globally. Out of observed polymer types, expanded polystyrene was overwhelmingly dominant. Although lying toward the estuary of the largest river in the country, the north-side beach contained a 100-fold lower abundance than two south-side beaches that faced southerly wind and currents that were prevalent throughout the study season. In addition, distinct differences between the beaches on either side were also present in terms of size distribution and spatial homogeneity of microplastics on the same beach. Winds and currents are therefore considered to be the driving forces in the distribution of microplastics. [ABSTRACT FROM AUTHOR]
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Kim, J., et al. (2006). "Hybridization of DNA to bead-immobilized probes confined within a microfluidic channel." Langmuir **22**(24): 10130-10134.
We report the factors influencing the capture of DNA by DNA-modified microbeads confined within a microfluidic channel. Quantitative correlation of target capture efficiency to probe surface concentration, solution flow rate, and target concentration are discussed. The results indicate that the microfluidic system exhibits a limit of detection of approximately 10(-10) M

(approximately 10(-16) mol) DNA and a selectivity factor of approximately 8 x 10(3). Typical hybridization times are on the order of minutes.

Kim, J., et al. (2012). Electrokinetically integrated isolation and amplification of protein-binding nucleic acids on a microchip. Proceedings of the 16th International Conference on Miniaturized Systems for Chemistry and Life Sciences, MicroTAS 2012.

This paper presents a microchip that integrates the isolation and amplification of target-binding DNA strands in a randomized DNA mixture. Target-binding strands are isolated in the chip via binding with human immunoglobulin E (IgE) immobilized on microbeads, electrophoretically transported through a gel-filled microchannel, captured onto microbead-tethered reverse primers, and amplified using polymerase chain reaction (PCR). Integration of isolation and amplification is achieved using electrophoretic transport through the gel-filled microchannel, which prevents contamination of buffers or reactants while transferring the desired target-binding DNA. Experimental results show that our microchip can isolate and amplify target-binding DNA strands with increased binding affinity to IgE protein.

Kim, J., et al. (2013). "Potentiometric multichannel cytometer microchip for high-throughput microdispersion analysis." Analytical Chemistry **85**(1): 362-368.

The parallelization of microfluidic cytometry is expected to lead to considerably enhanced throughput enabling point-of-care diagnosis. In this article, the development of a microfluidic potentiometric multichannel cytometer is presented. Parallelized microfluidic channels sharing a fluid path inevitably suffer from interchannel signal crosstalk that results from electrical coupling within the microfluidic channel network. By employing three planar electrodes within a single detection channel, we electrically decoupled each channel unit, thereby enabling parallel analysis by using a single cytometer microchip with multiple microfluidic channels. The triple-electrode configuration is validated by analyzing the size and concentration of polystyrene microbeads (diameters: 1.99, 2.58, 3, and 3.68 mum; concentration range: ~2 x 10(5) mL(-1) to ~1 x 10(7) mL(-1)) and bacterial microdispersion samples (Bacillus subtilis, concentration range: ~4 x 10(5) CFU mL(-1) to ~3 x 10(6) CFU mL(-1)). Crosstalk-free parallelized analysis is then demonstrated using a 16-channel potentiometric cytometer (maximum cross-correlation coefficients

r

: < 0.13 in all channel combinations). A detection throughput of ~48,000 s(-1) was achieved; the throughout can be easily increased with the degree of parallelism of a single microchip without additional technical complexities. Therefore, this methodology should enable high-throughput and low-cost cytometry.

Kim, J., et al. (2016). "Integrated Microfluidic Isolation of Aptamers Using Electrophoretic Oligonucleotide Manipulation." Scientific Reports **6**: 26139.

We present a microfluidic approach to integrated isolation of DNA aptamers via systematic evolution of ligands by exponential enrichment (SELEX). The approach employs a microbead-based protocol for the processes of affinity selection and amplification of target-binding oligonucleotides, and an electrophoretic DNA manipulation scheme for the coupling of these processes, which are required to occur in different buffers. This achieves the full microfluidic integration of SELEX, thereby enabling highly efficient isolation of aptamers in drastically reduced times and with minimized consumption of biological material. The approach as such also offers broad target applicability by allowing selection of aptamers with respect to targets that are either surface-immobilized or solution-borne, potentially allowing aptamers to be developed as readily available affinity reagents for a wide range of targets. We demonstrate the utility of this approach on two different procedures, respectively for isolating aptamers against a surface-immobilized protein (immunoglobulin E) and a solution-phase small molecule (bisboronic acid in the presence of glucose). In both cases aptamer candidates were isolated in three rounds of SELEX within a total process time of approximately 10 hours.

Kim, J., et al. (2018). "CD14+CD16+ monocyte subpopulation is dominant in the inflammation of osteoarthritis synovial fluid." Annals of the Rheumatic Diseases **77 (Supplement 2)**: 896.

Background: In osteoarthritis (OA), the activation of inflammation response involving the interaction of cartilage and synovial hyperplasia may contribute to disease progression. However, inflammatory cells in OA synovial fluid (OASF) have been rarely studied. Objective(s): To investigate the phenotype of CD14 +cells and the secretion of proinflammatory cytokines by these cells Methods: Immunohistochemistry staining in OA synovium was performed using anti-CD14, anti-CD16 and anti-CD56 antibody. The OASF was obtained through arthrocentesis. Mononuclear cells from OASFs were stained with anti-CD3, anti- CD4, anti-CD14, anti-CD16, anti-TLR4 or anti-TLR2 and analysed using flow cytometry. CD14 +CD16+and CD14+CD16 mononuclear cells in OASF were selected with magnetic microbeads. In the supernatant of these cells culture, the concentration of IL-1beta, IL-6, IL-8, TNFalpha, MMP-1,-3 were measured by Luminex. Result(s): In OA synovium, CD14 or CD16 was stained, but CD56 was not expressed. In OASF, there was a substantial number of CD14 +cells (36.6% +/-25.2%), CD3 +cells (37.4%+/-12.9%), with a rarity of CD90 +cells (1.7%+/-1.3%). The proportion of CD14 +cells was increased significantly in recurred synovial fluid, compared with the proportion in initial synovial fluid. Among CD14 +cells in OASF, CD14 +CD16+monocyte subpopulation (21.2%+/-21.8%) was more abundant than CD14 +CD16- monocyte subpopulation (10.9%+/-10.0%). TLR4 and TLR2 expressions were higher in CD14 +CD16+cells than in CD14 +CD16- cells. The concentration of IL-8 and MMP-3 was more increased in the supernatant of CD14 +CD16+cells than in that of CD14 +CD16- cells. Conclusion(s): In OASF, the proportion of CD14 +cells was increased in recurred synovial effusion. Compared to CD14 +CD16- monocyte subpopulation, CD14 +CD16+monocyte subpopulation released more cytokine such as IL-8 and MMP-3, and had higher expressions of TLR4 and TLR2.

Kim, J. H. K., et al. (2013). "Characterizations of the energy balance and circulating inflammation makers in a polygenic mouse model of obesity and type 2 diabetes." Obesity Facts **1)**: 49.

Introduction: TALLYHO/JngJ (TH) mice are a polygenic model for type 2 diabetes characterized by obesity, hyperlipidemia, hyperinsulinemia, impaired glucose uptake and tolerance, and hyperglycemia. In this study, we characterized the energy balance and circulating cytokine/ chemokine profile in TH mice. Method(s): To investigate energy balance, Comprehensive Laboratory Animal Monitoring System was used to measure heat production, respiratory exchange ratio (RER), locomotor activity, food intake, and water drinking in TH mice and non-obese and non-diabetic C57BL/6J (B6) mice at young (6-10 week) and old (16-25 week) ages. Plasma cytokine/chemokine profile was examined using multiplex fluorescent microbead immunoassay in 22-plex set up consisting of Eotaxin, GCSF, GM-CSF, IFNgamma, IL-10, IL-12(p70), IL-13, IL-17, IL-1alpha, IL-1beta, IL-2, IL-5, IL-6, IP-10, KC, KIX, M-CSF, MCP-1, MIG, MIP-1alpha, RANTES, and TNFalpha. Result(s): A significant hypoactivity was observed in TH mice during the dark period at both ages compared to B6 mice. However, energy expenditure, assessed by heat production (kcal/hour) calculated from VO2, was largely increased in TH mice with age. So did water drinking. Fuel source preference, as RER, or food intake (g consumed/day) was not significantly different between TH and B6 mice. Compared with B6, the

levels of plasma IL-1alpha and IL-6 concentrations exhibited a significant rise in TH mice at young and old, respectively. There was a significant reduction in circulating G-CSF levels in TH mice at both ages. Conclusion(s): Our data revealed the metabolic characteristics and alterations of circulating inflammatory cytokines in TH mice that encompass many aspects of polygenic human diabetes and obesity.

Kim, J.-S., et al. (2018). "Global Pattern of Microplastics (MPs) in Commercial Food-Grade Salts: Sea Salt as an Indicator of Seawater MP Pollution." Environmental Science & Technology **52**(21): 12819.

Previous studies have identified microplastics (MPs) in commercial table salts but could not exactly address the origin of the MPs because of several limitations. The present study is based on the hypothesis that commercial sea salts can act as an indicator of MP pollution in the surrounding environment unless the MPs are filtered out during the manufacturing process. A total of 39 different salt brands produced at geospatially different sites, including 28 sea salt brands from 16 countries/regions on six continents, were investigated. A wide range of MP content (in number of MPs per kg of salt; n/kg) was found: 0–1674 n/kg (excluding one outlier of 13 629 n/kg) in sea salts, 0–148 n/kg in rock salt, and 28–462 n/kg in lake salt. Relatively high MP content was identified in sea salts produced in Asian countries/regions. The abundance of MPs in unrefined sea salts (n = 25) exhibited significant linear correlations with plastic emissions from worldwide rivers (r^2= 0.33; p = 0.003) and with the MP pollution levels in surrounding seawater (r^2= 0.46; p = 0.021) in the published literature. The results indicate that not only is Asia a hot spot of global plastic pollution, as previous studies have suggested, but also that sea salt can be a good indicator of the magnitude of MP pollution in the surrounding marine environment.

Kim, K. B., et al. (2009). Microfluidic chip based hematoanalyzer using polyelectrolytic gel electrodes. Progress in Biomedical Optics and Imaging - Proceedings of SPIE.

We reports on a novel microfluidic chip with polyelectrolytic gel electrodes (PGEs) used to rapidly count the number of red blood cells in diluted whole blood. The number and amplitude of dc impedance peaks provide the information about the number and size of red blood cells, respectively. This system features a low-voltage dc detection method and noncontact condition between cells and metal electrodes. The performance of this PGEs-based system was evaluated in three steps. First, in order to observe the size-only dependence of the impedance signal, three different sizes of fluorescent microbeads were used in the experiment. Second, the cell counting performance was evaluated by using 7.2 µm fluorescent microbeads, similar in size to red blood cells, in various concentrations and comparing the results with an animal hematoanalyzer. Finally, in human blood sample tests, intravenously collected whole blood was just diluted in a phosphate buffered saline without centrifuge or other pretreatments. The PGEs-based system produced almost identical numbers of red blood cells in over 800-fold diluted samples to the results from a commercialized human hematoanalyzer. © 2009 SPIE.

Kim, K. H., et al. (1995). "Seasonal differences of feed digestibility and particulate passage rate in gastro-intestinal tract of sika deer." Korean Journal of Animal Science **37**(4): 371-378.

Digestibility of nutrients and rate of passage of digesta were estimated in sika deer [Cervus nippon] in summer and winter. The diet given to deer included a commercial concentrate feed, lucerne hay cubes, oak leaves and mixed feeds. Digestibilities of organic matter, DM, CP and NDF were slightly higher in summer than in winter. Faecal excretion of chromium-mordanted fibre did not differ between seasons. Recovery of plastic particles (PP) of density 0.91 to 2.10 g/ml and given by mouth did not differ between seasons, but was critically dependent on

gravity. At 0.91 g/ml density, PP decreased rate of passage through the digestive tract by about 6%; at density of 1.2 or 1.55 g/ml, gravity was less important. With PP at density above 2.10 g/ml, particle recovery rate was 75%. As gravity of PP increased, rumination frequency decreased and digesta passage was faster.

Kim, K. J., et al. (2018). "Subtyping of Magnetically Isolated Breast Cancer Cells Using Magnetic Force Microscopy." Biotechnology Journal **13**(6): e1700625.

Circulating tumor cell (CTC) which recently arisen as potential sources for monitoring and characterizing non-haematologic cancers and their metastatic derivatives. Immunomagnetic microbeads and magnetic nanoparticles (MNPs) have been extensively explored to isolate CTCs from blood samples. However, MNPs attached on the membrane protein are interrupted further analysis to distinguish the cancer subtype by consumption or blocking the target surface marker. Here, an MNP-mediated analysis method for surface marker expression profile by magnetic force microscopy (MFM) is described. Two MNPs, zinc ferrite and iron oxide, are showed distinct phase shift (-16.5degree and -3.7degree, respectively) signal on the MFM images. The antibody conjugated MNPs are successfully isolated target cells without giving damage to the cell. The MFM image of MNP decorated cells show clear differences between two breast cancer cell lines, MCF-7 and SK-BR-3, which proof the cancer subtyping property using MFM method. To confirmation of the surface marker consumption during the cell isolation, antibody-conjugated quantum dots and drug-loaded oleosome are treated on the cells, thereby MNP decorated cells are survived. This newly developed MFM analysis method provides a new direction to utilize the MNP for the surface marker expression phenotypes.

Kim, K. S. and J. K. Park (2005). "Magnetic force-based multiplexed immunoassay using superparamagnetic nanoparticles in microfluidic channel." Lab on a Chip **5**(6): 657-664.

This paper describes a novel microfluidic immunoassay utilizing binding of superparamagnetic nanoparticles to beads and deflection of these beads in a magnetic field as the signal for measuring the presence of analyte. The superparamagnetic 50 nm nanoparticles and fluorescent 1 mum polystyrene beads are immobilized with specific antibodies. When target analytes react with the polystyrene beads and superparamagnetic nanoparticles simultaneously, the superparamagnetic nanoparticles can be attached onto the microbeads by the antigen-antibody complex. In the poly(dimethylsiloxane) (PDMS) microfluidic channel, only the microbeads conjugated with superparamagnetic nanoparticles by analytes consequently move to the high gradient magnetic fields under the specific applied magnetic field. In this study, the magnetic force-based microfluidic immunoassay is successfully applied to detect the rabbit IgG and mouse IgG as model analytes. The lowest concentration of rabbit IgG and mouse IgG measured over the background is 244 pg mL⁻¹ and 15.6 ng mL ⁻¹, respectively. The velocities of microbeads conjugated with superparamagnetic nanoparticles are demonstrated by magnetic field gradients in microfluidic channels and compared with the calculated magnetic field gradients. Moreover, dual analyte detection in a single reaction is also performed by the fluorescent encoded microbeads in the microfluidic device. Detection range and lower detection limit can be controlled by the microbeads concentration and the higher magnetic field gradient. © The Royal Society of Chemistry 2005.

Kim, M., et al. (2015). "Estimation of the Environmental Load of High- and Low-Density Polyethylene From South Korea Using a Mass Balance Approach." Archives of Environmental Contamination & Toxicology **69**(3): 367-373.

The accumulation of marine plastic debris is one of the main emerging environmental issues of the twenty first century. Numerous studies in recent decades have reported the level of plastic particles on the beaches and in oceans worldwide. However, it is still unclear how much plastic debris remains in the marine environment because the sampling methods for identifying and quantifying plastics from the environment have not been standardized; moreover, the methods are not guaranteed to find all of the plastics that do remain. The level of identified marine plastic debris may explain only the small portion of remaining plastics. To perform a quantitative estimation of remaining plastics, a mass balance analysis was performed for high- and low-density PE within the borders of South Korea during 1995-2012. Disposal methods such as incineration, land disposal, and recycling accounted for only approximately 40 % of PE use, whereas 60 % remained unaccounted for. The total unaccounted mass of high- and low-density PE to the marine environment during the evaluation period was 28 million tons. The corresponding contribution to marine plastic debris would be approximately 25,000 tons and 70 g km of the world oceans assuming that the fraction entering the marine environment is 0.001 and that the degradation half-life is 50 years in seawater. Because the observed concentrations of plastics worldwide were much lower than the range expected by extrapolation from this mass balance study, it is considered that there probably is still a huge mass of unidentified plastic debris. Further research is therefore needed to fill this gap between the mass balance approximation and the identified marine plastics including a better estimation of the mass flux to the marine environment. [ABSTRACT FROM AUTHOR]

Kim, M. K., et al. (2017). "Calcium-Triggered Pulsatile Delivery of Parathyroid Hormone from Microbeads for Osteoporosis Treatment." Biomacromolecules **18**(10): 3099-3105.

Recombinant human parathyroid hormone 1-34 (rhPTH 1-34) is the most potent anabolic drug recommended for patients with osteoporosis who do not respond to conventional treatment. However, subcutaneous intermittent injection is the only effective regimen due to its unusual action of mechanism. This regimen is inconvenient and is a big hurdle in clinical applications. In this study, we designed polyelectrolyte microbeads that can deliver rhPTH 1-34 in response to Ca²⁺ concentration, which indicates the osteoporotic status. Dextran photopolymer was synthesized, mixed with anionic monoacrylate, and photopolymerized by passing through capillary microfluidics to obtain the microbeads. The anionic property of microbeads was confirmed by toluidine blue staining. One microbead, loaded with a 1 day dose of rhPTH 1-34 (23.4 +/- 0.9 mug), released rhPTH 1-34 in a triggered manner following the addition of Ca²⁺ ion. In vitro cell study demonstrated that rhPTH 1-34 released in a pulsatile manner from the microbeads induced osteogenic markers (ALP, RUNX2, and OPN) and precipitated mineral disposition more effectively. Copyright © 2017 American Chemical Society.

Kim, R., et al. (2019). "Generation of phenotype-stable alveolar epithelial type ii cell from human induced pluripotent stem cells." American Journal of Respiratory and Critical Care Medicine. Conference **199**(9).

Alveolar epithelial type II cells (AECIIs) are resident stem cells that can proliferate and are able to differentiate into alveolar epithelial type I cells. The turnover time of AECIIs is very slow in a normal lung but is accelerated after experimental pneumonectomy in otherwise a healthy lung.

However, the regeneration capacity of AECIIs seems to be impaired in injured lung conditions. Induced pluripotent stem cells (iPSCs) are directly derived from adult somatic tissues. Once reprogrammed to pluripotency, iPSCs can be differentiated into specific target cells. iPSCs have been previously shown to differentiate into lung lineage cells. However, their long-term phenotypes and behaviors are yet to be examined as a reliable cell source for lung regeneration. We aimed to optimize published differentiation protocols to achieve iPSC-derived AECIIs and maintain their phenotypes for future in vivo application. iPSC lines, HDF-SV and HDF-mRNA were first cultured and differentiated into definitive endoderm, then specified into the anterior foregut endoderm fate, and finally differentiated into lung progenitor cells as identified by the expression of NK2 homeobox 1 and forkhead box protein A2 using immunocytochemistry approach. The lung progenitors were then matured to transform into AECIIs expressing prosurfactant protein C (ProSPC) and epithelial adhesion molecule (EpCAM) by using small molecules and growth factors including a WNT activator, fibroblast growth factors, a phosphodiesterase inhibitor and etc. The AECIIs were purified by undergoing immunomagnetic enrichment using anti-EpCAM microbeads and then passaged at 80% confluency every 5 -7 days for up to 7 passages. Doubling time of the AECIIs was about 4 days, and approximately ~94% of the cells were positive for EpCAM and ~98% positive for ProSPC at the 7th passage. Functional assessment of the AECIIs is underway. Our results suggest the plausibility of generating stable AECIIs from iPSCs serving as a powerful tool for regenerative research in lung injury.

Kim, S. and Y. An (2019). "Soil microplastics inhibit the movement of springtail species." Environment International **126**: 699-706.

Previous studies have indicated the means by which micro-sized plastic particles may affect the soil environment, and this could be linked to the behavior of plastics in the soil system and how these particles are influenced by biological responses. Soil-dwelling organisms play a key role in modifying the soil system by constructing bio-pores, and these structural changes are potentially related to the behavior of plastic particles. In this study, we found that micro-sized plastic particles moved into bio-pores within seconds, and that this influx disrupted the movement of springtails (Lobella sokamensis). The springtails moved to avoid becoming trapped, and this behavior created bio-pores in the soil system. The influx of plastic particles into these cavities subsequently immobilized the springtails within. This phenomenon was observed at low a concentration of plastic particles (8 mg/kg), and it likely occurs in actual soil environments. The findings of this study indicate that the behavior of plastic particles in the soil not only disrupts the movement of springtails but also has wider implications for effective management of soils.

Kim, S., et al. (2019). "Zebrafish can recognize microplastics as inedible materials: quantitative evidence of ingestion behavior." Science of the Total Environment **649**: 156-162.

This study investigated the ingestion behavior of zebrafish exposed to microplastic particles (MPs) at different concentrations, presented alone or in a mix with food particles. Zebrafish showed spitting behavior after ingesting micro-sized (247.5 micro m) polyethylene particles (i.e., MPs), with prey-capture time increasing when food and MPs were supplied simultaneously. Fish were compelled to ingest MPs with food, and the accumulation percentage (ingested particles/supplied particles) was quantified as 0.5 to 9.4% with increasing food volume. However, the accumulation percentage was determined as 0.0 to 1.0% under exposure to MPs only, and as 3.8 to 4.3% at high MP concentrations when the food concentration was fixed. Overall, these results demonstrate that small freshwater organisms can recognize that MPs are not food items. Under laboratory conditions, zebrafish rarely discriminate between food and MPs when both are presented together, and the indiscriminate feeding behavior becomes

clearer as more food is available.

Kim, S., et al. (2018). "Dietary uptake, biodistribution, and depuration of microplastics in the freshwater diving beetle Cybister japonicus: effects on predacious behavior." Environmental Pollution **242**(Part A): 839-844.

Microplastics (MPs) have adverse effects on aquatic organisms in marine environments; however, there is a lack of information on freshwater environments. This study investigated the dietary uptake, and biodistribution and depuration of MPs in the freshwater diving beetle Cybister japonicus (Coleoptera: Dytiscidae) after consumption of zebrafish (Danio rerio) exposed to MPs. The transfer of MPs in diving beetles after consumption of zebrafish was assessed to determine whether the presence of MPs affected diving beetle behavior and predation. We found that diving beetles that consumed MP-exposed fish had a significantly lower ingestion rate than the control. In addition, the trophic transfer rate of MPs was 13-18%. However, MPs were found only in the crop and proventriculus of the beetles, and all particles were depurated within 48 h, likely via regurgitation. As diving beetle is a top predator in freshwater ecosystems and could facilitate transfer from aquatic to terrestrial ecosystems via predation, its behavior towards indigestible MPs in its digestive organs (i.e., filtering and vomiting) could represent a meaningful phenomenon as a potential vector for MP transport. This is the first report of the trophic transfer of MPs from fish to dytiscid species, which helps clarify the effects and mechanisms of MPs in freshwater systems.

Kim, S., et al. (2019). "Fluorescence Enhancement from Nitro-Compound-Sensitive Bacteria within Spherical Hydrogel Scaffolds." Acs Applied Materials & Interfaces **11**(15): 14354-14361.

For the safety of both production and life, it is a very significant issue to detect explosive nitro compounds in a remote way or over a long distance. Here, we report that nitro compounds were detected by the bacterial sensor based on hydrogel microbeads as a platform. Green fluorescent protein-producing Escherichia coli, which was genetically engineered to be sensitive to nitro compounds, was loaded within poly(2-hydroxyethyl methacrylate) [poly(HEMA)]-based hydrogel beads, in which fluorescent signals from bacteria were concentrated and strong enough to be easily detected. For efficient loading of negatively charged bacteria, the surface charge of poly(HEMA)-based beads was controlled by copolymerization with 2-(methacryloyloxy)ethyltrimethylammonium chloride (MAETC) as a cationic monomer. With the addition of MAETC, the cell affinity was nine times enhanced by the interaction between the positively charged poly(HEMA- co-MAETC) beads and negatively charged bacteria. The increased cell affinity resulted in an enhancement of a sensing signal. After exposure to 2,4,6-trinitrotoluene, a typical explosive nitro compound, the fluorescence intensity of bacterial sensors using poly(HEMA- co-MAETC) beads having 80 wt % MAETC was five times increased compared to those based on poly(HEMA) beads. This amplification of the fluorescent signal enables easier detection of explosives efficiently by a remote detection, even over a long distance.

Kim, S. J., et al. (2013). "Optical immunosensor for quantifying C-telopeptide fragments of type II collagen as an osteoarthritis biomarker in urine." Biochip Journal **7**(4): 399-407.

A fluorescence-based biosensor for measuring the quantity of C-telopeptide fragments of type II collagen (CTX-II) was developed as an osteoarthritis biomarker in urine. During osteoarthritis progression, joint components such as cartilage collagen are degraded by collagenase-protease and secreted into the serum as CTX-II. To detect CTX-II in urine (uCTX-II) having structural heterogeneity, conventional sandwich format assay does not provide sufficient accuracy. As an alternative, a competitive immunoassay was developed for the quantification of uCTX-II, which uses antibody-conjugated fluoro-microbeads to generate an optical signal. After preparing the biosensing surface, the uCTX-II sample and antibody-optical probe conjugates were reacted on the PEG<inf>4</inf>-EKGPDP exposed biosensing surface. The optical probes competed with the uCTX-II in the sample for binding to the immobilized PEG<inf>4</inf>-EKGPDP. This assay was able to detect uCTX-II concentrations between 200 ng/mmol (corrected value vs. creatinine) and 1,400 ng/mmol, encompassing the clinical detection ranges required for osteoarthritis diagnosis. The competitive immunoassay developed for uCTX-II detection was rapid and exhibited good correlation with conventional ELISA methods. This novel competition assay is a promising tool for the diagnosis and monitoring of osteoarthritis using urine samples. © 2013 The Korean BioChip Society and Springer-Verlag Berlin Heidelberg.

Kim, S. M., et al. (2010). "Exposure to environmental toxins in mothers of children with autism spectrum disorder." Psychiatry Investigation **7**(2): 122-127.

Objective: Environmental pollutants, especially environmental toxins (ET), may have the potential to disrupt neurodevelopmental pathways during early brain development. This study was designed to test our hypothesis that mothers with autism spectrum disorder (ASD) children would have less knowledge about ET and more chance to be exposed to ET than mothers with healthy children (MHC). Methods: One hundred and six biologic mothers with ASD children (MASD) and three hundred twenty four biologic mothers with healthy children MHC were assessed using two questionnaires asking about ET. Results: The total score in response to questions related to knowledge about ET in MHC was higher than that in MASD. The possibility of exposure to ET was higher in MASD than MHC. MASD showed higher sub-scale scores in terms of exposures to canned food, plastics, waste incinerators, old electronics, microwavable food, and textiles. Conclusion: The current results show that reduced knowledge about ET and greater exposure to ET may be associated with autism spectrum disorder. Copyright © 2010 Korean Neuropsychiatric Association.

Kim, S. M., et al. (2018). "Genetic characteristics of senescent CD8 T cells in the peripheral blood mononuclear cells of Behcet's disease patients." Clinical and Experimental Rheumatology **36 (6 Supplement 115)**: S160-S161.

Introduction. Behcet's disease (BD) is a chronic inflammatory disease characterized by recurrent mucocutaneous ulceration and complications such as blindness and large vessel inflammation. Immunosenescence, aging of the immune system, is related to increased susceptibility to infectious diseases, vaccine failure, and chronic low-grade systemic inflammation. Our previous study showed an increased frequency of immunosenescent cells in the peripheral blood of patients with BD. Aims. The aim of this study was to investigate the differences in RNA expression in immunosenescent cells in the peripheral blood of BD patients and controls, and to find its role in autoimmune/autoinflammatory pathogenesis of BD. Methods. Peripheral blood mononuclear cells (PBMCs) were extracted from BD patients (n=18) and healthy controls (HC, n=18). CD8⁺ T cells were isolated through CD8 microbeads, and those were labeled with conjugated monoclonal antibodies as follows: FITC anti-CD8, allophycocyanin (APC)-H7 anti-CD27 and APC anti-CD28. Using fluorescence-activated cell sorting (FACS), senescent CD8⁺ T cells (CD8⁺ CD27-CD28-cells) and non-senescent CD8⁺ T cells (CD8⁺ CD27⁺ CD28⁺ cells) were sorted. After sorting, each group of cells was pooled together and cultured in medium (RPMI 1640). Cells were stimulated with anti-CD3 (500ng/ml, clone OKT3) for 72 hours. Total RNA was extracted from anti-CD3-stimulated cells with the RNA isolation kit. We performed

transcriptome analysis on those RNA samples and analyzed the differentially expressed genes from the four different groups (BD patients vs. controls, senescent CD8⁺ T cells (CD8⁺ CD27-CD28-) vs. non-senescent CD8⁺ T cells (CD8⁺ CD27⁺ CD28⁺)). Results. A large number of differentially expressed genes of each group were found out through total RNA transcriptome analysis. Gene Ontology (http://geneontology.org/) was used for the significant differentially expressed genes to conduct the gene set enrichment analysis according to gene ontology's functional classifications, biological process (BP), molecular function(MF), and cellular component(CC). As a result of the analysis, it was found that that the gene set list, which showed the significance, appears differently for each categories. Conclusion. Through next-generation sequencing, we could find that the gene expression of the senescent CD8⁺ T cells differs from that of nonsenescent CD8⁺ T cells. These differentially expressed genes of senescent immune cells can be thought of as having an effect on the occurrence and activation of the disease. Therefore, functional changes in cells caused by immunosenescence are likely to be responsible for the pathogenesis of BD.

Kim, S. W. and Y.-J. An (2019). "A simple and efficient method for separation of low-density polyethylene films into different micro-sized groups for laboratory investigation." Science of the Total Environment **668**: 84-89.

Microplastics are abundant in both aquatic and terrestrial environments. While they have received much recent attention because of their effects on ecosystems, their true impact on natural environments remains difficult to assess because of the problems associated with processing them in the laboratory. In this study, we designed and implemented a new, vacuum-based method of separating different sizes of low-density polyethylene films. Using multiple sieve sizes, we achieved consistent recovery of the desired size fractions using this method. The vacuum suction (VS) system consisted of two differently sized cylindrical sieves of 500 μm (or 200 μm) and 65 μm, allowing film samples between 65 and –500 μm and 65–200 μm to be collected. The VS systems successfully separated microplastic film samples into small area ranges of 0.015–0.065 mm2, and the film areas showed different distributions for each sample from the different VS systems. This system provided an easy, rapid, and low-labor means of processing different sizes of microplastics via an innovative method. Further research into the effects of microplastics on natural environments is critically needed, and the laboratory separation of different size fractions of microplastics facilitates such endeavors. Graphical abstract Unlabelled Image Highlights • The vacuum suction (VS) system is developed to prepare microplastic films. • The method can separate microplastic films into different size groups. • The desired size fractions using the method can be recovered. • The method can improve the efficiency of microplastic film processing. [ABSTRACT FROM AUTHOR]

Kim, S. W., et al. (2019). "Size-dependent effects of polystyrene plastic particles on the nematode Caenorhabditis elegans as related to soil physicochemical properties." Environmental Pollution **258**: 113740.

Plastic polymers are widely used in various applications and are thus prevalent in the environment. Over time, these polymers are slowly degraded into nano- and micro-scale particles. In this study, the free-living nematode, Caenorhabditis elegans, was exposed to polystyrene particles of two different sizes (42 and 530 nm) in both liquid and soil media. The number of offspring significantly (p < 0.05) decreased at polystyrene concentrations of 100 mg/L and 10 mg/kg in liquid and soil media, respectively. In soil media, but not liquid media, C. elegans was more sensitive to the larger particles (530 nm) than the smaller particles (42 nm), and the median effective concentration (EC₅₀) values of the 42 and 530 nm-sized particles were found to be > 100 and 14.23 (8.91-22.72) mg/kg, respectively. We performed the same toxicity bioassay on five different field-soil samples with different physicochemical properties and found that the size-dependent effects were intensified in clay-rich soil samples. A principal component analysis showed that the bulk density, cation exchange capacity, clay content, and sand content were the dominant factors influencing the toxicity of the 530 nm-sized polystyrene particles. Therefore, we conclude that the soil composition has a significant effect on the toxicity induced by these 530 nm-sized polystyrene particles.

Kim, T. G., et al. (2018). "Hydrometallurgical recycling of surface-coated metals from automobile-discarded ABS plastic waste." Waste Management **80**: 414-422.

The ammoniacal leaching of surface-coated metals from automobile-discarded ABS plastics followed by their recovery through solvent extraction has been investigated. The leaching of ABS (typically containing 4.1% Cu, 1.3% Ni, and 0.03% Cr) could efficiently dissolve the ammine complexes of Cu and Ni, leaving Cr unleached as fine particles. The optimization studies for achieving the maximum efficiency revealed that the leaching of metal ions in different ammoniacal solutions follows the order CO₃²⁻>Cl⁻>SO₄²⁻. The leaching carried out in a carbonate medium by maintaining the total NH₃ concentration 5.0M at a NH₄OH/(NH₄)₂CO₃ ratio of 4:1, pulp density of 200g/L, agitation speed of 400rpm, temperature of 20degreeC, and time of 120min yielded the optimum efficiency of >99% Cu and Ni (i.e., 8.14g/L and 2.57g/L, respectively, in the leach liquor). Subsequently, the solvent extraction of metals from ammoniacal leach liquor as a function of extractant (LIX 84-I) concentration and organic-to-aqueous (O:A) phase ratio was examined. Based on the extraction data, a three-stage counter-current extraction at O:A=1:1 was validated using 0.8M LIX 84-I, yielding the quantitative extraction of both metals into the organic phase. Thereafter, the stripping of metals in acid solutions indicated that 0.5M H₂SO₄ could quantitatively strip Ni from the loaded organic phase; however, ~27% Cu was also co-stripped. The rest of Cu from the Ni-depleted organic phase was separately stripped with 1.0M H₂SO₄ that can be directly sent to the electrowinning process. On the other hand, the co-stripped metals from the acidic solution can be easily separated, again using LIX 84-I as the extractant, by adopting the pH-swing method. Finally, a process has been proposed for the hydrometallurgical recovery of surface-coated metals from waste ABS plastics; that does not affect the physicochemical characteristics of the polymer substances for their reuse.

Kim, Y., et al. (2019). "Identification of adverse outcome pathway related to high-density polyethylene microplastics exposure: Caenorhabditis elegans transcription factor RNAi screening and zebrafish study." Journal of Hazardous Materials: 121725.

To gain insight into the human health implications of microplastics, in this study, we investigated the possible mechanisms affecting the toxicity of high-density polyethylene (HDPE) in the

nematode Caenorhabditis elegans using RNAi screening and a bioinformatics-based unbiased approach. The candidate pathways identified from C. elegans study were also confirmed using vertebrate model, zebrafish, Danio rerio and human relevance was then inferred using Comparative Toxicogenomics Database (CTD) analysis. Prior to evaluating the toxicity, label-free Raman mapping was conducted to investigate whether or not the organisms could uptake HDPE. C. elegans transcription factor RNAi screening results showed that the nucleotide excision repair (NER) and transforming growth factor-beta (TGF-beta) signaling pathways were significantly associated with HDPE exposure, which was also confirmed in zebrafish model. Gene-disease interaction analysis using the CTD revealed the possible human health implications of microplastics. Finally, based on this finding, related AOPs were identified from AOP Wiki (http://aopwiki.org), which are "Peroxisome proliferator-activated receptors gamma inactivation leading to lung fibrosis" and "AFB1: Mutagenic Mode-of-Action leading to Hepatocellular Carcinoma". Further studies are needed for the validation of these AOPs with various microplastics.

Kim, Y. J., et al. (2014). "A microchip filter device incorporating slit arrays and 3-D flow for detection of circulating tumor cells using CAV1-EpCAM conjugated microbeads." Biomaterials **35**(26): 7501-7510.
Circulating tumor cells (CTCs) are rare cells and the presence of these cells may indicate a poor prognosis and a high potential for metastasis. Despite highly promising clinical applications, CTCs have not been investigated thoroughly, due to many technical limitations faced in their isolation and identification. Current CTC detection techniques mostly take the epithelial marker epithelial cell adhesion molecule (EpCAM), however, accumulating evidence suggests that CTCs show heterogeneous EpCAM expression due to the epithelial-to-mesenchymal transition (EMT). In this study, we report that a microchip filter device incorporating slit arrays and 3-dimensional flow that can separate heterogeneous population of cells with marker for CTCs. To select target we cultured breast cancer cells under prolonged mammosphere culture conditions which induced EMT phenotype. Under these conditions, cells show upregulation of caveolin1 (CAV1) but down-regulation of EpCAM expression. The proposed device which contains CAV1-EpCAM conjugated bead has several tens of times increased throughput. More importantly, this platform enables the enhanced capture yield from metastatic breast cancer patients and obtained cells that expressed various EMT markers. Further understanding of these EMT-related phenotypes will lead to improved detection techniques and may provide an opportunity to develop therapeutic strategies for effective treatment and prevention of cancer metastasis. © 2014 Elsevier Ltd.

Kim, Y. S., et al. (2010). "Investigation of thermodynamic parameters in the thermal decomposition of plastic waste-waste lube oil compounds." Environmental Science & Technology **44**(13): 5313-5317.
Thermal decomposition properties of plastic waste-waste lube oil compounds were investigated under nonisothermal conditions. Polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyethylene terephthalate (PET) were selected as representative household plastic wastes. A plastic waste mixture (PWM) and waste lube oil (WLO) were mixed with mixing ratios of 33, 50, and 67 (w/w) % on a PWM weight basis, and thermogravimetric (TG) experiments were performed from 25 to 600 degrees C. The Flynn-Wall method and the Ozawa-Flynn-Wall method were used for analyses of thermodynamic parameters. In this study, activation energies of PWM/WLO compounds ranged from 73.4 to 229.6 kJ/mol between 0.2 and 0.8 of normalized mass conversions, and the 50% PWM/WLO compound had lower activation energies and enthalpies among the PWM/WLO samples at each mass conversion. At the point of maximum differential mass conversion, the analyzed activation energies, enthalpies, entropies, and Gibbs

free energies indicated that mixing PWM and WLO has advantages in reducing energy to decrease the degree of disorder. However, no difference in overall energy that would require overcoming both thermal decomposition reactions and degree of disorder was observed among PWM/WLO compounds under these experimental conditions.

Kinjo, A., et al. (2019). "Size-dependent elimination of ingested microplastics in the Mediterranean mussel Mytilus galloprovincialis." Marine Pollution Bulletin **149**: 110512.

Filter feeding organisms have been reported to ingest microplastics (MP) in marine environments. However, information regarding how long the ingested MPs are retained in their digestive tracts remains limited. Here, we report the gut retention time (GRT₉₀) and the long-term egestion time of three different sized polystyrene microspheres (1, 10, and 90mum) in the Mediterranean mussel Mytilus galloprovincialis. We found significant differences in GRT₉₀ with respect to MP size. With respect to the long-term egestion of MPs, most of the smaller MPs were excreted immediately, although some were detected intermittently until day 40. In comparison, larger MPs were slowly excreted in bulk, after which they were not detected. The results indicate that different sized MPs are retained differently in the digestive tract of mussels. The size-dependent effects of MPs should thus be considered when evaluating the effects of MPs in mussels.

Kinman, R. N., et al. (1990). "Analysis of 20-Year-Old Refuse from the Mallard North Landfill in Chicago, Illinois." Proceedings of the 44th Purdue Industrial Waste Conference. May 9-11 1989, Purdue Univ., West Lafayette, Indiana. CRC Press, Inc., Boca Raton, Florida. 1990. p 527-536, 5 fig, 9 tab, 4 ref.

A dig was performed in 1988 by the University of Arizona Anthropology Department with the aim of finding 20-yr old garbage in the Mallard North Landfill in Chicago, Illinois. Using newspapers and other sources, the age of the waste recovered was confirmed as at least 17, 18, or 19 yr old. Moisture is a key environmental variable affecting degradation. Many artifacts, including paper, plastics, metal, wood, garden, food, and other items were easily identified. Paper was the main component (32.7% by weight). All materials, including paper, plastics, metal, wood, garden, food, and other materials, were observed to be under different degrees of attack by microorganisms. Microorganism levels were within the range found in other landfill studies; most organisms ranged from 10,000 to 10 billion MPN/100 g. The presence of methane bacteria was confirmed. No viruses were recovered from any samples. Moisture and pH were observed to influence the microorganisms in the landfill. Many pieces of plastic waste showed signs of deterioration. Twenty-eight of 30 polyethylene samples tested by bomb calorimetry showed significant deterioration. The percent degradation of polyethylene plastics, as calculated from bomb calorimetry, ranged from 0.19 to 54.28%. (See also W90-10965) (Rochester-PTT)

Kirby, D., et al. (2015). "Rapid and cost-efficient enumeration of rare cancer cells from whole blood by low-loss centrifugo-magnetophoretic purification under stopped-flow conditions." Cytometry Part A **87**(1): 74-80.

We present a substantially improved design and functionality of a centrifugo-magnetophoretic platform which integrates direct immunoseparation and cost-efficient, bright-field detection of cancer cells in whole blood. All liquid handling takes place in a disposable cartridge with geometry akin to a conventional compact disc (CD). The instrumentation required to process such a "lab-on-a-disc" cartridge can be as simple and cost-efficient as the rotor on a common optical disc drive. In a first step, target cells in a blood sample are specifically bound to paramagnetic microbeads. The sample is then placed into the disc cartridge and spun. In the second step, magnetically tagged target cells are separated by a co-rotating, essentially lateral magnetic field from the background population of abundant blood cells, and also from unbound magnetic beads. A stream of target cells centrifugally sediments through a stagnant liquid phase into a designated detection chamber. The continuous, multiforce immunoseparation proceeds very gently, i.e. the mechanical and hydrodynamic stress to the target cells is minimized to mitigate the risk of cell loss by collective entrapment in the background cells or vigorous snapping against a wall. We successfully demonstrate the extraction of MCF7 cancer cells at concentrations as low as 1 target cell per mu l from a background of whole blood, with capture efficiencies of up to 88%. Its short time-to-answer is a notable characteristic of this system, with 10% of target cells collected in the first minute after their loading to the system and the remainder captured within the following 10 min. All the above-mentioned factors synergetically combine to leverage the development of a prospective point-of-care device for CTC detection. copyright 2014 International Society for Advancement of Cytometry

Kirschbaum, M., et al. (2009). "Correlating short-term Ca(2+) responses with long-term protein expression after activation of single T cells." Lab on a Chip **9**(24): 3517-3525.

In order to elucidate the dynamics of cellular processes that are induced in context with intercellular communication, defined events along the signal transduction cascade and subsequent activation steps have to be analyzed on the level of individual cells and correlated with each other. Here we present an approach that allows the initiation of cell-cell or cell-particle interactions and the analysis of cellular reactions within various regimes while the identity of each individual cell is preserved. It utilizes dielectrophoresis (DEP) and microfluidics in a lab-on-chip system. With high spatial and temporal precision we contacted single T cells with functionalized microbeads and monitored their immediate cytosolic Ca(2+) response. After this, the cells were released from the chip system and cultivated further. Expression of the activation marker molecule CD69 was analyzed the next day and correlated with the previously recorded Ca(2+) signal for each individual cell. We found a significant difference in the patterns of Ca(2+) traces between activated and non-activated cells, which shows that Ca(2+) signals in T cells can provide early information about a later reaction of the cell. Although T cells are non-excitable cells, we also observed irregular Ca(2+) transients upon exposure to the DEP field only. These Ca(2+) signals depended on exposure time, electric field strength and field frequency. By minimizing their occurrence rate, we could identify experimental conditions that caused the least interference with the physiology of the cell.

Kirstein, I. V., et al. (2016). "Dangerous hitchhikers? Evidence for potentially pathogenic Vibrio spp. on microplastic particles." Marine Environmental Research **120**: 1-8.

The taxonomic composition of biofilms on marine microplastics is widely unknown. Recent sequencing results indicate that potentially pathogenic Vibrio spp. might be present on floating microplastics. Hence, these particles might function as vectors for the dispersal of pathogens. Microplastics and water samples collected in the North and Baltic Sea were subjected to selective enrichment for pathogenic Vibrio species. Bacterial colonies were isolated from CHROMagar^{TM}Vibrio and assigned to Vibrio spp. on the species level by MALDI-TOF MS (Matrix Assisted Laser Desorption/Ionisation-Time of Flight Mass Spectrometry). Respective polymers were identified by ATR FT-IR (Attenuated Total Reflectance Fourier Transform-Infrared Spectroscopy). We discovered potentially pathogenic Vibrio parahaemolyticus on a number of microplastic particles, e.g. polyethylene, polypropylene and polystyrene from North/Baltic Sea. This study confirms the indicated occurrence of potentially pathogenic bacteria on marine microplastics and highlights the urgent need for detailed biogeographical analyses of marine microplastics.

Kisley, L., et al. (2014). "High ionic strength narrows the population of sites participating in protein ion-exchange adsorption: a single-molecule study." Journal of Chromatography. A **1343**: 135-142.

The retention and elution of proteins in ion-exchange chromatography is routinely controlled by adjusting the mobile phase salt concentration. It has repeatedly been observed, as judged from adsorption isotherms, that the apparent heterogeneity of adsorption is lower at more-eluting, higher ionic strength. Here, we present an investigation into the mechanism of this phenomenon using a single-molecule, super-resolution imaging technique called motion-blur Points Accumulation for Imaging in Nanoscale Topography (mbPAINT). We observed that the number of functional adsorption sites was smaller at high ionic strength and that these sites had reduced desorption kinetic heterogeneity, and thus narrower predicted elution profiles, for the anion-exchange adsorption of alpha-lactalbumin on an agarose-supported, clustered-charge ligand stationary phase. Explanations for the narrowing of the functional population such as inter-protein interactions and protein or support structural changes were investigated through kinetic analysis, circular dichroism spectroscopy, and microscopy of agarose microbeads, respectively. The results suggest the reduction of heterogeneity is due to both electrostatic screening between the protein and ligand and tuning the steric availability within the agarose support. Overall, we have shown that single molecule spectroscopy can aid in understanding the influence of ionic strength on the population of functional adsorbent sites participating in the ion-exchange chromatographic separation of proteins.

Kitamoto, H., et al. (2018). "Enzymatic degradation of poly-butylene succinate-co-adipate film in rice husks by yeast Pseudozyma antarctica in indoor conditions." Journal of Bioscience & Bioengineering **125**(2): 199-204.

Agricultural mulch films made from biodegradable polymers (BP) have been used to decrease the burden of plastic waste recovery and recycling. However, their degradations depend largely on environmental conditions and sometimes do not proceed as desired. Yeast strains of Pseudozyma antarctica often isolated from rice husks were found to secrete an esterase to degrade BP films. Poly-butylene succinate-co-adipate (PBSA) films buried in unsterilized rice husks with 60% (w/w) moisture degraded rapidly compared to that buried in field soil. The type strain of P. antarctica JCM 10317 added as cell suspension onto sterilized rice husks with PBSA film grew rapidly forming filamentous growth on the surface of rice husks and films. BP-degrading enzyme secreted by the growing cells was adsorbed on the surface of film and decomposed the film. Addition of rice husk-derived P. antarctica strains also showed BP film degradation activity in sterilized rice husks. In the light of these findings, we suggest that techniques for disposal of used BPs which combine plastics with unutilized residual plant materials piled at the side of agricultural fields be developed.

Kitani, T., et al. (2014). "Direct human mitochondrial transfer: a novel concept based on the endosymbiotic theory." Transplantation Proceedings **46**(4): 1233-1236.

Mitochondria play an essential role in eukaryotes, and mitochondrial dysfunction is implicated in several diseases. Therefore, intercellular mitochondrial transfer has been proposed as a mechanism for cell-based therapy. In addition, internalization of isolated mitochondria cells by simple coincubation was reported to improve mitochondrial function in the recipient cells. However, substantial evidence for internalization of isolated mitochondria is still lacking, and its precise mechanism remains elusive. We tested whether enriched mitochondria can be internalized into cultured human cells by simple coincubation using fluorescence microscopy and flow cytometry. Mitochondria were isolated from endometrial gland-derived mesenchymal

cells (EMCs) or EMCs stably expressing mitochondrial-targeted red fluorescent protein (EMCs-DsRed-mito), and enriched by anti-mitochondrial antibody-conjugated microbeads. They were coincubated with isogeneic EMCs stably expressing green fluorescent protein (GFP). Live fluorescence imaging clearly showed that DsRed-labeled mitochondria accumulated in the cytoplasm of EMCs stably expressing GFP around the nucleus. Flow cytometry confirmed the presence of a distinct population of GFP and DsRed double-positive cells within the recipient cells. In addition, transfer efficiency depended on mitochondrial concentration, indicating that human cells may possess the inherent ability to internalize mitochondria. Therefore, this study supports the application of direct transfer of isogeneic mitochondria as a novel approach for the treatment of diseases associated with mitochondrial dysfunction.

Kitsongsermthon, J., et al. (2017). "In vivo cleansing efficacy of biodegradable exfoliating beads assessed by skin bioengineering techniques." Skin Research & Technology **23**(4): 525-530.

BACKGROUND/PURPOSE: The plastic microbeads, used in many cleansers, will be banned in cosmetic and personal care products within 2017 since they are non-degradable and can disturb the living organisms in water reservoirs. Various choices of biodegradable beads are commercially available, but their efficacy has not been proven yet. This study aimed to compare the cleansing efficacy in dirt and sebum removal aspects of three types of exfoliating beads.

METHODS: The gel scrubs with polyethylene (PE) beads, mannan beads or wax beads, were formulated and evaluated for their stability. The in vivo evaluation was done in 38 healthy volunteers and the skin irritation, efficacy for dirt and sebum removal were measured by Mexameter , Colorimeter , and Sebumeter , respectively.

RESULTS: The selected gel scrubs did not cause an irritation in any volunteers. The differences in dirt residues between before and after scrubbing were not statistically significant among three gel scrubs and the similar result was also reported in the sebum removal study.

CONCLUSION: All gel scrubs demonstrated the comparable cleansing efficacy in term of dirt and sebum removal. Thus, mannan beads and wax beads may be replaced non-biodegradable PE beads to achieve the similar cleansing effect.

Kitsongsermthon, J., et al. (2018). "In vivo exfoliating efficacy of biodegradable beads and the correlation with user's satisfaction." Skin Research & Technology **24**(1): 26-30.

BACKGROUND/PURPOSE: By the end of 2017, non-biodegradable microbeads will be prohibited in USA, UK and Europe, due to their environmental issue. There are biodegradable beads available, but their effect on skin desquamation has not been evaluated yet. This study aimed to understand the skin renewal time, moisturizing effect and user's satisfaction of gel scrubs containing different exfoliating beads.

METHODS: Gel scrubs, containing polyethylene, mannan or wax beads, were used in this study. The stratum corneum turnover time (SCTT) and skin hydration were evaluated by dansyl chloride staining technique and Corneometer , respectively. The self-assessment was also performed after a 3-week home use trial.

RESULTS: The SCTTs of three different gel scrubs were not significantly different. A numerical increase in the skin hydration level was found in all groups. Satisfaction scores for the appearance and usability attributes were similar, but scores for improvement in the skin hydration and skin smoothness were higher in the gel scrubs with mannan or wax beads.

CONCLUSION: All three gel scrubs provided a similar effect on the SCTT and skin hydration, but gel scrubs with mannan or wax beads were more favorable. Thus, these two biodegradable exfoliating beads may be good substitutes in scrubbing products.

Klaeger, F., et al. (2019). "Residual Monomer Content Affects the Interpretation of Plastic Degradation." Scientific Reports **9**(1): 2120.

Plastic degradation rates in the marine environment are essential to understand. This study demonstrates that in plastic-microbial interaction experiments, residual monomeric and oligomeric content of PA6 significantly influences the development of dissolved organic carbon. While it is well recognized that additives in plastics should be considered during the inception of plastic-exposure experiments, residual monomers have yet to be prominently considered in the same light. As such, in degradation studies where residual contents of monomers and/or oligomers are not considered, degradation of synthetic polymers could be significantly overestimated. The substantial conversion of these monomeric and oligomeric leachates also has implications for plastic-biofilm development studies and microplastic-biota-based ingestion experiments.

Klason, C. and J. Kubat (1987). "Improving the homogeneity and mechanical properties of plastics waste contaminated by paper using a hydrolytic treatment." Conservation & Recycling **10**(2/3): 169.

Klein, M. and E. K. Fischer (2019). "Microplastic abundance in atmospheric deposition within the Metropolitan area of Hamburg, Germany." Science of the Total Environment **685**: 96-103.

Only few studies investigated the input of microplastic particles via the atmosphere, so far. Here, we present results on microplastic concentrations in the atmospheric deposition in the metropolitan region of Hamburg. In total, six investigation sites were equipped with three bulk precipitation samplers each and sampled biweekly over 12weeks (12/17-03/18). Three sites were located in a rural area south of Hamburg comprising one open field site and two throughfall sites under beech/oak and Douglas fir forest canopy, respectively. Three further sites were selected within the city following a transect from north to south representing urban sites of varying degrees concerning population, traffic and industrial pressures. Particles and fibers were counted under UV light within a photo box and under a fluorescence microscope (Axio Lab A.1, Zeiss).

Kleinteich, J., et al. (2018). "Microplastics Reduce Short-Term Effects of Environmental Contaminants. Part II: Polyethylene Particles Decrease the Effect of Polycyclic Aromatic Hydrocarbons on Microorganisms." International Journal of Environmental Research & Public Health [Electronic Resource] **15**(2): 07.

Microplastic particles in terrestrial and aquatic ecosystems are currently discussed as an emerging persistent organic pollutant and as acting as a vector for hydrophobic chemicals. Microplastic particles may ultimately deposit and accumulate in soil as well as marine and freshwater sediments where they can be harmful to organisms. In this study, we tested the sensitivity of natural freshwater sediment bacterial communities (by genetic fingerprint) to exposure to microplastics (polyethylene, 2 and 20 mg/g sediment) and microplastics loaded with polycyclic aromatic hydrocarbons (PAHs, phenanthrene and anthracene), using a laboratory-based approach. After two weeks of incubation, the bacterial community composition from an unpolluted river section was altered by high concentrations of microplastics, whereas the community downstream of a wastewater treatment plant remained unchanged. Low microplastic concentrations loaded with phenanthrene or anthracene induced a less pronounced response in the sediment communities compared to the same total amount of phenanthrene or anthracene alone. In addition, biodegradation of the PAHs was reduced. This study shows, that microplastic can affect bacterial community composition in unpolluted freshwater sediments. Moreover, the results indicate that microplastics can serve as a vehicle

for hydrophobic pollutants but bioavailability of the latter is reduced by the sorption to microplastics.

Klener Jr, P., et al. (2012). "Mouse models of human mantle cell lymphoma for the study of disease biology and for pre-clinical assessment of experimental treatment approaches." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Mantle cell lymphoma (MCL) is an aggressive type of B-cell non-Hodgkin lymphoma associated with poor prognosis. MCL animal models for the study of disease biology and for the testing of novel agents are scarce. We established and characterized various in vivo models of metastatic blastoid human MCL by tail vein injection of five MCL cell lines (Jeko-1, HBL-2, Mino, Rec-1, Granta-519) into the NOD.Cg-Prkdcscid Il2rgtm1Wjl/SzJ immunodeficient mice. Untreated animals were then observed to evaluate differences in the pattern of lymphoma growth and overall survival (OS) between different cell lines. We analyzed infiltration of selected murine organs (i.e. bone marrow [BM], spleen, liver, brain, kidneys, and enlarged lymph nodes [LN]) by immunohistochemistry (IHC) (CD20, Ki-67) at four different time-points related to OS. Extent of organ infiltration with human MCL cells was estimated using the Image-Pro Plus 5.1 software within 20 samples from different organ areas. Subsequently, we analyzed gene expression of Jeko-1 and Mino cells obtained from the xenografted animals (in vivo growing cells) compared to the cells cultured in vitro (controls).MCL cells isolated from various murine organs (the BM, liver, spleen, and LN) or in vitro cultured cells were magnetically sorted by CD45-microbeads. Gene expression analyses were carried out using Illumina BeadChips, and the data were functionally clustered with DAVID Bioinformatics tool. In addition, differences in surface expression of selected antigens were compared between in vivo vs. in vitro grown MCL cells by flow cytometry. Finally, we evaluated the anti-tumor activity of single-agent chemotherapy agents (cytarabine, fludarabine, bendamustine, and cisplatin), monoclonal antibodies (rituximab, ofatumumab, bevacizumab) or targeted agents (bortezomib, temsirolimus) in Jeko-1 and Mino bearing mice. Tumor engraftment was achieved in all the cell lines tested. The median overall survival (OS) of mice xenografted with 1-10x10⁶ MCL cells ranged from 22 to 55 days depending on the cell line used. The principal site of engraftment and proliferation niche for all MCL cell lines was the bone marrow. MCL cells disseminated to other murine organs including the spleen, liver and brain. Development of enlarged lymph nodes (peripheral, intraabdominal) and/or extranodal MCL masses (subcutaneous tumors) were associated with Mino, while infiltration of the ovaries was inconstant finding in Jeko-1 xenografted mice. Mice xenografted with Jeko-1, HBL-2 and Granta-519 showed leukemization of peripheral blood before death. Gene expression studies of Jeko-1 and Mino in vivo growing cells revealed that the genes from the "B-cell receptor signaling" and the "oxidative-phosphorylation" pathways were the most upregulated or downregulated, respectively. In vivo growing Jeko-1 cells showed upregulation of CD31/PECAM, CD37, CD38, CD44, CD164, and downregulation of podoplanin and CXCR4. In vivo growing Mino cells had upregulation of CD23, but downregulation of CD37, CD40, CD44, CD54, CD138, CXCR4, CCR7 and podoplanin. Both Jeko-1 and Mino cells isolated from the BM (but not from the spleen, liver or LN) were significantly more sensitive to cytarabine (2-4 fold) and cisplatin (2 fold) than in vitro growing controls. Single-agent therapy of Jeko-1 and Mino bearing mice with either a chemotherapy agent, monoclonal antibody, or targeted agent resulted in significant prolongation of OS compared to untreated controls. Treatment of Jeko-1 and HBL2 bearing mice with single-agent cisplatin, single-agent cytarabine or combination of both agents revealed that the therapy with single-agent cisplatin was associated with the longest prolongation of OS. Moreover, IHC analyses of the BM, spleen and liver of the treated animals confirmed the most profound suppression of both MCL infiltration

(CD20) and proliferation rate (Ki-67) in the single-agent cisplatin cohort compared to the other cohorts. In summary, the mouse models can be used for the study of MCL biology, as well as for preclinical assessment of experi ental therapy of MCL including agents that cannot be properly tested in vitro (e.g. monoclonal antibodies, pro-drugs, anti-angiogenic agents, inhibitors of B-cell receptor signaling etc.).

Klika, K. D. (2013). "Waste Plastic and Pharmaceuticals, Could an Integrated Solution Help?" Environmental Science & Technology **47**(18): 10111-10112.

The article focuses on the use of plastic waste in removing pharmaceutical and personal care products (PPCP) from wastewater. It states that low concentrations of PPCPs can result in behavioral changes and physiological effects and comments on the use of adsorbents such as porous boron nitride nanosheets in removing pollutants. It speculates on the use of plastics in absorbing toxins and PPCPs from wastewater which could then be disposed of through incineration.

Klingberg, F., et al. (2014). "Prestress in the extracellular matrix sensitizes latent TGF-beta1 for activation." Journal of Cell Biology **207**(2): 283-297.

Integrin-mediated force application induces a conformational change in latent TGF-beta1 that leads to the release of the active form of the growth factor from the extracellular matrix (ECM). Mechanical activation of TGF-beta1 is currently understood as an acute process that depends on the contractile force of cells. However, we show that ECM remodeling, preceding the activation step, mechanically primes latent TGF-beta1 akin to loading a mechanical spring. Cell-based assays and unique strain devices were used to produce a cell-derived ECM of controlled organization and prestrain. Mechanically conditioned ECM served as a substrate to measure the efficacy of TGF-beta1 activation after cell contraction or direct force application using magnetic microbeads. The release of active TGF-beta1 was always higher from prestrained ECM as compared with unorganized and/or relaxed ECM. The finding that ECM prestrain regulates the bioavailability of TGF-beta1 is important to understand the context of diseases that involve excessive ECM remodeling, such as fibrosis or cancer.

Klocker, N., et al. (2018). "From troublesome materials to fluid technologies: Making and playing with plastic-bag footballs." Cultural Geographies **25**(2): 301-318.

The material recalcitrance of plastic bags – evident in their refusal to decompose and their capacity to evade neat disposal – is a widespread source of environmental concern and frustration. Yet throughout the Majority (developing) World, the incessant materiality of plastic affords boys and young men an opportunity to make footballs (soccer balls) out of waste. Made in situ, plasticbag footballs are uniquely suited to local contexts and landscapes – a resourceful technology assembled from otherwise troublesome materials. Plastic-bag footballs are also fluid: perpetually in-the-making and characterized by diverse states of working order. Insights garnered from discussions with young Tanzanian football-makers and players position plastic-bag footballs against neocolonial discourses of poverty and precarity. Meanwhile attentiveness to the socio-material relations of plastic-bag footballs makes plain that they are not inferior technologies. Plastic-bag footballs invite consideration of how humans live, materially, in the Anthropocene. Plastic bags typify the ecological crises of throwaway consumerism and malignant toxicity. Yet, we ask: could it be that plastic-bag footballs exemplify the material resourcefulness, skill, care for things – and even playfulness – needed to cope with these very crises?. © The Author(s) 2017.

Klockner, P., et al. (2019). "Tire and road wear particles in road environment - Quantification and assessment of particle dynamics by Zn determination after density separation." Chemosphere **222**: 714-721.

In this study, a method for the determination of tire and road wear particle (TRWP) contents in particulate samples from road environment was developed. Zn was identified as the most suitable elemental marker for TRWP, due to its high concentration in tire tread and the possibility of separation from other Zn sources. The mean concentration of 21 tire samples was 8.7 +/- 2.0 mg Zn/g. Before quantification in samples from road environment, TRWP were separated from the particulate matrix by density separation. Method development was conducted using shredded tread particles (TP) as a surrogate for TRWP. Recovery of TP from spiked sediment was 95 +/- 17% in a concentration range of 2 - 200 mg TP/g. TP determination was not affected by other Zn containing solids or spiked Zn-salts. By adjusting the density of the separation solution to 1.9 g/cm3, more than 90% of total TRWP were separated from the sample matrix. TRWP concentrations in particulate matter collected in two road runoff treatment systems ranged from 0.38 to 150 mg TRWP/g. Differences in quantified TRWP contents of the two systems indicate changes in particle dynamics due to ageing and aggregation processes. The developed method allows TRWP determination in road runoff and in environments that are influenced by road traffic. The validated separation procedure can also be applied for TRWP characterization in future studies.

Klöckner, P., et al. (2019). "Tire and road wear particles in road environment – Quantification and assessment of particle dynamics by Zn determination after density separation." Chemosphere **222**: 714-721.

[ABSTRACT FROM AUTHOR]

Klonoff, D. C. (2012). "Overview of fluorescence glucose sensing: a technology with a bright future." Journal of Diabetes Science & Technology **6**(6): 1242-1250.

Fluorescence represents a promising alternative technology to electrochemistry and spectroscopy for accurate analysis of glucose in diabetes; however, no implanted fluorescence glucose assay is currently commercially available. The method depends on the principle of fluorescence, which is the emission of light by a substance after absorbing light. A fluorophore is a molecule that will absorb energy of a specific wavelength and reemit energy at a different wavelength. A fluorescence glucose-sensing molecule can be constructed to increase or decrease in fluorescence from baseline according to the ambient concentration of glucose. A quantum dot is a semiconductor crystal that can serve as a sensor by fluorescing at a desired wavelength or color, depending on the crystal size and materials used. If receptor molecules for glucose can be adsorbed to single-wall carbon nanotubules, then the resulting binding of glucose to these receptors will alter the nanotubes' fluorescence. Fluorescence glucose sensors can provide a continuous glucose reading by being embedded into removable wire-shaped subcutaneous or intravenous catheters as well as other types of implanted structures, such as capsules, microcapsules, microbeads, nano-optodes, or capillary tubes. Fluorescence glucose-sensing methods, which are under development, offer four potential advantages over commercially used continuous glucose monitoring technologies: (1) greater sensitivity to low concentrations of glucose, (2) the possibility of constructing sensors that operate most accurately in the hypoglycemic range by using binding proteins with disassociation constants in this range, (3) less need to recalibrate in response to local tissue reactions around the sensor, and (4) no need to implant either a transmitter or a power source for wireless communication of glucose data. Fluorescence glucose sensors also have four significant disadvantages compared with commercially used continuous glucose monitoring technologies: (1) a damaging foreign body response; (2) a sensitivity to local pH and/or oxygen, which can affect the dye response; (3) potential toxicity of implanted dyes, especially if the implanted fluorophore cannot be fully removed; and (4) the necessity of always carrying a dedicated light source to interrogate the implanted sensor. Fluorescence sensing is a promising method for measuring glucose continuously, especially in the hypoglycemic range. If currently vexing technical and engineering and biocompatibility problems can be overcome, then this approach could lead to a new family of continuous glucose monitors.

Klotoe, B. J., et al. (2020). "NTF-RINT, a new method for the epidemiological surveillance of MDR Mycobacterium tuberculosis L2/Beijing strains." Tuberculosis **120 (no pagination)**(101894).

The most widely discussed antibiotic-resistant tuberculosis strains ("W" and "B0/W148", "CAO") belong to L2/Beijing Lineage and are characterized by IS6110 insertion sequences at the NTF locus. We present a high-throughput, microbead-based method, called NTF-RINT for detection of IS in NTF and Rifampicin and Isoniazid Typing. This method provides tuberculosis diagnostic confirmation, screens for the so-called modern L2/Beijing sublineage and detects mutations involved in resistance to Rifampicin (RIF) and Isoniazid (INH). Copyright © 2019

Klyuchnikov, E., et al. (2011). "CD34+-selected stem cell boost for poor graft function after allogeneic haematopoietic stem cell transplantation." Bone Marrow Transplantation **1)**: S338.

About 5-27% of patients (pts) experience a poor graft function (PGF) defined as hemoglobin (Hb) <10.0 g/dL and/or neutrophils (Neu) <1,500/muL and/or plateletes (Plt) <30,000/muL with complete donor chimerism on day 30 after HSCT. This complication is associated with considerable morbidity and mortality due to infections and hemorrhagic complications. Some reports showed the potential of CD34+-selected stem cell boost (SCB) in this setting. However, this approach might also exacerbate GvHD. To further assess the safety and efficacy of this approach, 28 patients (m/21, f/7; median age, 49 y; 34 - 64) with PGF received SCB without conditioning at University Medical Center Hamburg and at Institut Paoli Calmettes, Marseille. Pts were transplanted (related, n=11; unrelated: matched, n=12; mismatched, n=5) initially for myelofibrosis (n=11), AML/MDS (n=3), CML (n=3), ALL (n=2), NHL (n=3), multiple myeloma (n=2), or aplastic anemia (n=4). At the time of the SCB (median 5 mo (1-228) post-transplant) the median numbers of Neu and Plt for evaluable pts were 945/ mkl (840 - 4,160) and 16,000/mkl (10,000 - 94,000), respectively. The 17/25 (68%) pts required red blood (n=10), platelet (n=1) transfusions or both (n=6); 22/28 (79%) pts experienced PGF in 2, while 6 (21%) in 3 hematopoietic lines. The pts received a median of 3.3x10⁶ CD34+/kg bw (1-14) and of 8x10³ CD3+/kg bw (2-70). All SCBs were performed by MicroBeads-based cell selection (Miltenyi Biotec). At a median follow-up of 25 mo (10-107) from SCB 11 pts (39%) had expired (relapse, n=3; GvHD, n=4; severe infection, n=3; severe hemorrhage, n=1). GvHD after SCB developed in 6/28 pts (acute, 21%) and 8/27 pts (chronic, 30%), respectively. Of those, 4 pts already had GvHD after HSCT. We have not observed any significant correlations between the GvHD rate and CD3+ cell count. Also, there was no significant difference in GvHD rates between pts who received SCB before a median of 5 mo (6/11, 55%) and after it (8/17, 47%). The 20/24 evaluable pts (83%) resolved from PGF at day 30 after SCB (25% increase in Neu/Plt counts and/or transfusionindependence). Of 17 alive pts, 12 (71%) were in CR, 4 (24%) in PR, and 1 (5%) had progressive disease. The 2-year overall survival after SCB for all 28 pts was 60%. In conclusion, SCB represents an effective strategy to improve the function of graft in cases of PGF, however, despite the T-depleted approach, there is still a risk of GvHD.

Klyuchnikov, E., et al. (2011). "CD34+-selected stem cell boost without further conditioning for poor graft function after allogeneic hematopoietic stem cell transplantation." Onkologie **6)**: 280-281.

Introduction: About 5 - 27% of patients (pts) experience a poor graft function (PGF) defined as Hb< 10.0 g/dL and/or Neu< 1,500/muL and/or Plt< 30,000/muL with complete donor chimerism after allogeneic hematopoietic stem cell transplantation (HSCT). This complication is associated with considerable morbidity and mortality due to infections and hemorrhagic complications. Some reports showed the potential of CD34+-selected stem cell boost (SCB) in this setting. However, this approach might also exacerbate graftversus-host disease (GvHD). Patients and Methods: To further assess the safety and efficacy of this approach, 28 patients (m/21, f/7; median age, 49 y; 34 - 64) with PGF received SCB without further conditioning at University Medical Center Hamburg and at Institut Paoli Calmettes, Marseille. Pts were transplanted (related, n=11; unrelated: HLA-matched, n=12; HLA-mismatched, n=5) initially for myelofibrosis (n=11), AML/MDS (n=3), CML (n=3), ALL (n=2), NHL (n=3), multiple myeloma (n=2), or severe aplastic anemia (n=4). At the time of the SCB (median 5 month (mo; range, 1-228) post-transplant) the median numbers of Neu and Plt for evaluable pts were 945/muL (range, 840 - 4,160) and 16,000/muL (range, 10,000 - 94,000), respectively. The 17/25 (68%) pts required red blood (n=10), platelet (n=1) transfusions or both (n=6); 22/28 (79%) pts experienced PGF in 2, while 6 (21%) in 3 hematopoietic lines. The pts received a median of 3.3x106 CD34+/kg bw (1-14) and of 8.0x103 CD3⁺/kg bw (2-70). All SCBs were performed by MACS MicroBeads-based cell selection (Miltenyi). Result(s): At a median follow-up of 25 mo (range, 2-107) from SCB 11 pts (39%) had expired (relapse, n=3; GvHD, n=3; severe infection, n=4; severe hemorrhage, n=1). GvHD after SCB developed in 3/28 pts (7%; Grade II, n=1; Grade III, n=1; Grade IV, n=1), one of whom had died. All those pts initially experienced GvHD post-transplant. We have not observed any significant correlations between the GvHD rate and CD3⁺ cell count. The 24/28 pts (86%) resolved from PGF after SCB (at least 25% increase in Neu/Plt count and/or transfusion-independence). The 2-year overall survival after SCB for all 28 pts was 60%. Conclusion(s): SCB represents an effective strategy to improve the graft function in PGF cases. However, options to reduce the toxicity of this approach (e.g. decrease of interval between HSCT and SCB, adequate anti-infectious and GvHD prophylaxis) need to be further investigated.

Knapp, J., et al. (2017). "Methods to estimate the transfer of contaminants into recycling products - A case study from Austria." Waste Management **69**: 88-100.

Recycling of waste materials is desirable to reduce the consumption of limited primary resources, but also includes the risk of recycling unwanted, hazardous substances. In Austria, the legal framework demands secondary products must not present a higher risk than comparable products derived from primary resources. However, the act provides no definition on how to assess this risk potential. This paper describes the development of different quantitative and qualitative methods to estimate the transfer of contaminants in recycling processes. The quantitative methods comprise the comparison of concentrations of harmful substances in recycling products to corresponding primary products and to existing limit values. The developed evaluation matrix, which considers further aspects, allows for the assessment of

the qualitative risk potential. The results show that, depending on the assessed waste fraction, particular contaminants can be critical. Their concentrations were higher than in comparable primary materials and did not comply with existing limit values. On the other hand, the results show that a long-term, well-established quality control system can assure compliance with the limit values. The results of the qualitative assessment obtained with the evaluation matrix support the results of the quantitative assessment. Therefore, the evaluation matrix can be suitable to quickly screen waste streams used for recycling to estimate their potential environmental and health risks. To prevent the transfer of contaminants into product cycles, improved data of relevant substances in secondary resources are necessary. In addition, regulations for material recycling are required to assure adequate quality control measures, including limit values.

Knappich, F., et al. (2018). "A new approach to metal- and polymer-recovery from metallized plastic waste using mechanical treatment and subcritical solvents." The Journal of Material Cycles and Waste Management **20**(3): 1541-1552.

Galvanized or “chromium-plated” plastics are well known to the consumer from the automotive sector and sanitary area. Polymers such as acrylonitrile butadiene styrene (ABS) are typically coated with a layer system of chromium, nickel and copper to obtain the characteristic optical surface and resistance properties. Due to the complex manufacturing process and high quality requirements, the production of these plastic metal composites generates 10–30% of rejects. We, therefore, developed an innovative process cascade for the recovery of both components (metal and polymer) applying established technologies (mechanical pre-treatment, classification, melt filtration, CreaSolv® Process) and were able to obtain ABS regranulate having excellent properties regarding the characteristic values for strength but slight compromises in impact characteristics. Blends with different amounts of virgin ABS, virgin PC and recycled ABS material as well as the pure cases were successfully re-metallized, all of them passing adhesion test, thermal shock resistance and CASS test. The high purity of the recovered materials led to increased redemption prices for metal and polymer by a factor of 6 and 2.5, respectively. Thus, the value added of metallized plastic waste is maximized, revealing a highly positive economic prognosis of a commercial implementation of the developed process—even at moderate scale.

Knezevic-Jugovic, Z. D., et al. (2016). "An approach for the improved immobilization of penicillin G acylase onto macroporous poly(glycidyl methacrylate-co-ethylene glycol dimethacrylate) as a potential industrial biocatalyst." Biotechnology Progress **32**(1): 43-53.

The use of penicillin G acylase (PGA) covalently linked to insoluble carrier is expected to produce major advances in pharmaceutical processing industry and the enzyme stability enhancement is still a significant challenge. The objective of this study was to improve catalytic performance of the covalently immobilized PGA on a potential industrial carrier, macroporous poly(glycidyl methacrylate-co-ethylene glycol dimethacrylate) [poly(GMA-co-EGDMA)], by optimizing the copolymerization process and the enzyme attachment procedure. This synthetic copolymer could be a very promising alternative for the development of low-cost, easy-to-prepare, and stable biocatalyst compared to expensive commercially available epoxy carriers such as Eupergit or Sepabeads. The PGA immobilized on poly(GMA-co-EGDMA) in the shape of microbeads obtained by suspension copolymerization appeared to have higher activity yield compared to copolymerization in a cast. Optimal conditions for the immobilization of PGA on poly(GMA-co-EGDMA) microbeads were 1 mg/mL of PGA in 0.75 mol/L phosphate buffer pH 6.0 at 25degreeC for 24 h, leading to the active biocatalyst with the specific activity of 252.7 U/g dry beads. Chemical amination of the immobilized PGA could contribute to the enhanced stability of the biocatalyst by inducing secondary interactions between the enzyme and the carrier, ensuring multipoint attachment. The best balance between the activity yield (51.5%), enzyme loading (25.6 mg/g), and stability (stabilization factor 22.2) was achieved for the partially modified PGA.

Kniess, C. T. and D. d. M. Conti (2019). "SUSTAINABILITY RESEARCH: THEMES AND METHODS." Revista de Gestão Ambiental e Sustentabilidade **8**(3): 406-407.

The Journal of Environmental Management & Sustainability (GeAS Journal) is a scientific Brazilian publishing which the mission is to contribute to the dissemination of the Environmental Management & Sustainability knowledge and it's three dimensions (environmental, social and economic). Since 2012, twenty-one editions of the journal have been published. The works that are present here speak of other relevant themes for sustainable development, as methods to manage plastic waste on the Commodity Chain, geophysic methodologies in the investigation of underground contamination and, also, a work that speaks of applied research to increase the production of biogas for the fortifi cation of renewable energy mix. The solutions for sustainable development go through innovation and the capacity for planning ahead. [...]this edition shares a work about patents, which contribute to the propagation of studies and applications of network theory for interorganizational innovations.

Kniggendorf, A. K., et al. (2019). "Microplastics Detection in Streaming Tap Water with Raman Spectroscopy." Sensors **19**(8): 18.

Microplastic particles have been found in drinking water sources worldwide and, thus, also in our food and beverages. Especially small microplastics, with sizes of 1 mm and less, cannot be identified reliably without spectroscopic means such as Fourier transform infrared spectroscopy (FTIR) or Raman spectroscopy, usually applied to the particles extracted from the samples. However, for drinking and tap water, with its comparatively low biological loads, direct observation may be possible and allows a point-of-entry monitoring for beverages and food to ensure uncontaminated drinking water is being used. In a proof of concept, we apply Raman spectroscopy to observe individual microplastic particles in tap water with added particulate and fluorescent contaminants streaming with 1 L/h through a custom-made flow cell. We evaluated several tubing materials for compatibility with microplastic suspensions containing three different polymers widely found in microplastic surveys worldwide. The experiment promises the monitoring of streaming tap water and even clear surface waters for microplastics smaller than 0.1 mm.

Knoll, S., et al. (2017). "Microplastics: Minuscule particles with big consequences?. [Dutch]." Vlaams Diergeneeskundig Tijdschrift **86**(4): 203-212.

Since the mass production of plastics, contamination of the marine environment with these persistent synthetic materials has become an ever-increasing problem. Lately, it has become clear that microplastics play a big part in this. These small plastic particles (< 5mm) are ubiquitous in seawater and sediments. There are various entryways, such as fragmentation of macroplastics and drainage of primary microplastic via wastewater. Recent studies have shown that microplastics may be ingested by numerous marine organisms. This could result in diverse health effects, including mechanical injury and cellular toxicity. Adverse effects of microplastics are possibly enhanced by the contamination of these plastic particles with toxic chemicals. Furthermore, microplastics and microplastic contaminants could accumulate in the food chain, eventually affecting humans. Despite the growing number of publications on microplastics, there are still many unanswered questions regarding this topic. In this article, the contemporary knowledge of microplastics in the marine environment is provided.

Knopper, M. (2008). "Bottled water backlash: environmental concerns are sending people back to their taps." E: The Environmental Magazine **19**(3): 36-39.

Call it reverse snob appeal. These days, it's the tap water enthusiasts, concerned about the growing mountains of plastic waste, who get to act self-righteous.

Knor, S., et al. (2008). "Efficient factor VIII affinity purification using a small synthetic ligand." Journal of Thrombosis & Haemostasis **6**(3): 470-477.

BACKGROUND: Hemophilia A is currently treated by infusions of the coagulation factor (F) VIII, of which production and purification remain a challenging task. Current purification procedures using immunoaffinity chromatography are cumbersome, expensive, and suffer from the instability of the applied antibody ligands, which elute along with the product and contaminate it. Recently, FVIII was purified using octapeptide ligands, but their use is limited due to the low resistance to proteases.

OBJECTIVE: Our goal was to develop and evaluate a novel ligand for FVIII purification, overcoming the drawbacks of current procedures.

METHODS: Peptide ligands were screened for binding of (125)I-plasma-derived-FVIII (pdFVIII) in a microbead assay. A selected ligand-coated Toyopearl resin was then used for pdFVIII purification from cell-conditioned Delbucco's modified Eagle's medium (DMEM) containing fetal bovine serum. The proteolytic stability of ligand was measured by incubating with human serum and proteinase K, and its cytotoxicity towards human OV-MZ-6 cells was assayed.

RESULTS: A high-affinity octapeptidic FVIII ligand was modified into the small, highly stable and non-toxic peptidomimetic ligand L4 by rational and combinatorial design without affecting its affinity for FVIII. Using ligand L4-coated Toyopearl resin, pdFVIII was isolated from cell-conditioned medium with high purity and 89% column retention after elution with a mild buffer containing 0.6 m NaCl at pH 6.8.

CONCLUSIONS: Ligand L4 offers a valuable alternative to antibody-based procedures for laboratory and industrial production. Its synthesis by established solid-phase procedures is straightforward and considerably cheaper than the biotechnological production of antibodies, and safety concerns associated with the use of biological material are overcome.

Knutter, I., et al. (2013). "Aklides-a highly versatile imaging platform for detection of ANCA." Presse Medicale **42 (4 PART 2)**: 686.

Introduction.- Here we describe a highly versatile microscopy platform - Aklides - (A) for the automated pattern analysis of ANCA with neutrophils combined with (B) multiplex microbead-based detection of Proteinase 3 (PR3), Myeloperoxidase (MPO), and glomerular basement membrane (GBM) autoantibodies (aab). The manual interpretation of ANCA patterns is very subjective and prone to high variability. EIA results are objective but EIA have their limit in multiplex detection of specific ANCA such as PR3 and MPO. Methods.- (A) ANCA were automatically analysed with ethanol (ethN) or formalin (formN) fixed neutrophils. Sera from 342 patients with AAV and other systemic rheumatic and infectious diseases were tested for ANCA patterns with Aklides and results were compared to those of conventional fluorescence microscopy. (B) Overall, n = 214 patient sera with prefindings for PR3 aab, n = 222 for MPO aab, and n = 65 for GBM aab were analyzed with microbead-based immunoassay (Aklides ANCA BA) and results were compared to those of conventional routine ELISA. Results.- (A) An interpretation software employing pattern recognition algorithms was developed enabling positive/negative discrimination and classification of cytoplasmic ANCA (C-ANCA) and

perinuclear ANCA (P-ANCA) pattern. Comparison of visual reading with automated interpretation revealed Cohens's kappa (kappa) values of 0.955 on ethN and 0.929 on formN for positive/negative discrimination. Analysis of the set with regard to the pattern discrimination showed a high agreement for ethN (k = 0.746) and formN (k = 0.847). There was no significant difference between visual and automated interpretation (P > 0.05). (B) For Aklides ANCA BA the following relative sensitivities and specificities were determined: anti-PR3 (98%; 95%), anti-MPO (97%; 99%), and anti-GBM (90%; 100%). Conclusion.-Aklides is suitable for automated ANCA pattern analysis and detection of PR3, MPO, and GBM aab and shows a high concordance to results of conventional fluorescence microscopy and routine ELISA.

Ko, C., et al. (1995). "In vitro slow release profile of endothelial cell growth factor immobilized within calcium alginate microbeads." Artificial Cells, Blood Substitutes, & Immobilization Biotechnology **23**(2): 143-151.

Although a variety of angiogenic growth factors have been isolated, its appropriate in vivo delivery remains problematic due to nonspecific, uncontrolled delivery by conventional methods. We have investigated calcium alginate microbeads as a vehicle for the controlled slow-release of endothelial cell growth factor (ECGF). Three different microbead compositions, dependent on ECGF amount and alginate percentage were studied. Microbeads were incubated in a 1.5% calcium chloride solution and release of ECGF into solution was measured spectrophotometrically at specific timepoints. Our results show release rate and amount released after the first 2 hours are dependent on initial quick delivery of ECGF in the first 2 hours after which a sustained controlled release occurred for 4-5 days. Beyond this point, release at a slower rate was noted for at least approximately 2 weeks. Calcium alginate microbeads demonstrated a controlled and predictable rate of release and that the amount of ECGF delivered can be varied by varying the initial concentration of ECGF in the microbeads. Based on these observations we conclude that calcium alginate microbeads are a convenient and practical vehicle for sustained ECGF delivery.

Ko, C. Y., et al. (2001). "Alginate microbead release assay of angiogenesis." Methods in Molecular Medicine **46**: 53-57.

Recently, the acceleration (and retardation) of blood vessel growth has been an increasingly frequent subject of study. With its potential application to a wide range of clinical disease processes, investigation certainly remains essential and promising. While in vitro investigation is traditional, well-controlled, and objective, studying angiogenesis in vivo can be quite difficult for a number of reasons. One major reason is the inherent tissue differences associated with blood vessel growth. Because all tissues are different, certain tissues tend to be inherently more vascular than others. As such, the growth (and concentration) of blood vessels occurs at different rates and proportions depending on that specific tissue. In the past several years, most in vivo angiogenesis work has been performed in the sclera as it allows for relatively easy access and the possibility of repeated observation. The sites to which investigation of angiogenesis might be applied, however, are invariably quite different and therefore additional tissues such as solid organs, fascia, muscle, and skin need to be studied as well. How can this be performed?

Ko, Y. J., et al. (2008). "Real-time immunoassay with a PDMS-glass hybrid microfilter electro-immunosensing chip using nanogold particles and silver enhancement." Sensors and Actuators B: Chemical **132**(1): 327-333.

This paper presents the development of a PDMS-glass hybrid electro-immunosensing chip for real-time measurement of an antigen-antibody reaction through an electrical signal. Using a microfilter and microbeads, the antigen was easily immobilized in the detection zone where the microelectrodes were located. The immuno-reaction was detected by measuring the electrical resistance between microelectrodes using gold nanoparticles with silver enhancement. An immunoassay test with the developed chip was performed for the antigen of protein A, the specific first antibody of anti-protein A, the nonspecific first antibody of HBsAg monoclonal IgG, and the second antibody anti-rabbit IgG. The electro-immunosensing chip reduced the antigen-antibody reaction time to 10min, thus reducing the overall assay time to about 1h. The electrical resistance varied according to the concentration of the specific first antibody, the detection limit of which was 10ng /ml. Compared to conventional enzyme-linked immunosorbent assays (ELISAs), the process of performing an immunoassay using the electro-immunosensing chip was relatively simple and required less time to complete. In addition, the electro-immunosensing chip required less sample volume.

Kochupurakkal, N., et al. (2012). "Trophoblast cells can induce regulatory T cells." Journal of Reproductive Immunology **94 (1)**: 11.

BACKGROUND: Fetomaternal tolerance consists of several mechanisms to protect the developing embryo/fetus from the maternal immune system, as it is considered part foreign. One of the mechanisms in place is the higher numbers of regulatory T cells (Treg cells) found in a pregnantwoman, especially in the uterus, where approximately 25% of all CD4+ T cells are Tregs. Trophoblast cells are developing from the outer layer of the blastocyst and are connecting the embryo to the uterus of the mother. Here we investigate if trophoblast cells play a role in inducing naive T cells at the fetomaternal interface into Tregs. MATERIALS AND METHODS: Mouse cell line and spleen cell preparation: We used the mouse trophoblast cell line TSras2 (a kind gift of A.Erlebacher, NYU), which was cultured in DMEM:F12 supplemented with 15mMHepes, 20% FCS, glutamine, Penicillin/Streptomycin, 2-bME. TSras2 originated from FVB mice and is expressing H2Kq. CD4+ T cells and dendritic cells were isolated from collagenasedigested spleens of C57BL6/J female mice aged 6-12 weeks (Jackson, Bar Harbor, Maine). Cells were magnetically separated using CD4 microbeads and CD11c microbeads (Miltenyi) respectively, cells were isolated with LS columns 2 times to ensure high purity. Purity of isolated cells was analyzed byflowcytometry and was >95%. For experiments with CD4+ CD25- T cells, CD25+ cells were depleted with anti-CD25 hybridoma supernatant and rabbit complement. Co-culture: One million CD4+ T cells were co-cultured with varying amounts of DCs and/or trophoblast cells in 96- well plates at 37 degreeC in a humidified incubator with 5% CO2, with RPMI 1640-10% FCS complete medium. Trophoblast cells were irradiated with 3000 rad from a Cs-137 source when stated. Recombinant TNF-a, recombinant mouse IFNg and recombinant human IL-2 were used at the 10 ng/ml, 100 ng/ml and 50 units/ml respectively (from Peprotech). Recombinant human TGF-b (Miltenyi) was used at a concentration of 1 ng/ml. Flow Cytometry: Cells were stained with CD4, CD25 and FoxP3 by using the Mouse Regulatory T cell staining kit from ebioscience according to the manufacturers instructions. RESULT(S): Mouse trophoblast cells upregulate PD-L1 upon in vitro stimulation with TNFa and IFNg, while PD-L2 and other costimulatory molecules (CD80, CD86, ICOS-L) are not expressed by these cells (data not shown). By co-culturing naive CD4+ CD25- T cells with trophoblast cells in the presence of TGF-b and IL-2, a population of CD4+ CD25+ FoxP3+ regulatory T cells emerges, similar in percentage to regulatory T cells induced by co-culture with DCs. By absolute cell numbers the trophoblast induced cells are approx. 50% less than Treg induced by DCs, which is due to an overall decrease in viability and less CD25 upregulation in the trophoblast cocultured CD4. CONCLUSION(S): We have shown here for the first time that naive T cells co-cultured with a trophoblast cell line can be induced into regulatory T cells. The mechanism by which this

conversion occurs and if the induced Tregs are functional, is currently under investigation.

Kocincova, A. S., et al. (2007). "Fiber-optic microsensors for simultaneous sensing of oxygen and pH, and of oxygen and temperature." Analytical Chemistry **79**(22): 8486-8493.

Fiber-optic microsensors with a tip diameter of approximately 140 microm have been developed that enable simultaneous measurement of dissolved oxygen (DO) and pH, and of DO and temperature (T), respectively. The tip of the optical fiber was covered with sensor compositions based on luminescent microbeads that respond to the respective parameters by a change in the decay time, intensity of their luminescence, or both. The use of microbeads enables the ratio of the signals to be easily varied, reduces the risk of fluorescence energy transfer between indicator dyes, and reduces the adverse effect of singlet oxygen that is produced in the oxygen-sensitive beads. The sensor chemistry for DO/pH was modified.

Kocincova, A. S., et al. (2008). "Multiplex bacterial growth monitoring in 24-well microplates using a dual optical sensor for dissolved oxygen and pH." Biotechnology & Bioengineering **100**(3): 430-438.

Non-invasive, simultaneous optical monitoring of oxygen and pH during bacterial cultivation in 24-well microplates is presented using an integrated dual sensor for dissolved oxygen and pH values. The dual sensor is based on oxygen-sensitive organosilica microparticles and pH-sensitive microbeads from a polymethacrylate derivative embedded into a polyurethane hydrogel. The readout is based on a phase-domain fluorescence lifetime-based method referred to as modified frequency domain dual lifetime referencing using a commercially available detector system for 24-well microplates. The sensor was used for monitoring the growth of Pseudomonas putida bacterial cultures. The method is suitable for parallelized, miniaturized bioprocessing, and cell-based high-throughput screening applications.

Kodama, Y. and M. Fujishima (2012). "Characteristics of the digestive vacuole membrane of the alga-bearing ciliate Paramecium bursaria." Protist **163**(4): 658-670.

Cells of the ciliate Paramecium bursaria harbor symbiotic Chlorella spp. in their cytoplasm. To establish endosymbiosis with alga-free P. bursaria, symbiotic algae must leave the digestive vacuole (DV) to appear in the cytoplasm by budding of the DV membrane. This budding was induced not only by intact algae but also by boiled or fixed algae. However, this budding was not induced when food bacteria or India ink were ingested into the DVs. These results raise the possibility that P. bursaria can recognize sizes of the contents in the DVs. To elucidate this possibility, microbeads with various diameters were mixed with alga-free P. bursaria and traced their fate. Microbeads with 0.20mum diameter did not induce budding of the DVs. Microbeads with 0.80mum diameter produced DVs of 5-10mum diameter at 3min after mixing; then the DVs fragmented and became vacuoles of 2-5mum diameter until 3h after mixing. Each microbead with a diameter larger than 3.00mum induced budding similarly to symbiotic Chlorella. These observations reveal that induction of DV budding depends on the size of the contents in the DVs. Dynasore, a dynamin inhibitor, greatly inhibited DV budding, suggesting that dynamin might be involved in DV budding.

Koelmans, A. A., et al. (2016). "Microplastic as a Vector for Chemicals in the Aquatic Environment: Critical Review and Model-Supported Reinterpretation of Empirical Studies." Environmental Science and Technology **50**(7): 3315-3326.

The hypothesis that 'microplastic will transfer hazardous hydrophobic organic chemicals (HOC) to marine animals' has been central to the perceived hazard and risk of plastic in the marine environment. The hypothesis is often cited and has gained momentum, turning it into paradigm status. We provide a critical evaluation of the scientific literature regarding this hypothesis. Using new calculations based on published studies, we explain the sometimes contrasting views and unify them in one interpretive framework. One explanation for the contrasting views among studies is that they test different hypotheses. When reframed in the context of the above hypothesis, the available data become consistent. We show that HOC microplastic-water partitioning can be assumed to be at equilibrium for most microplastic residing in the oceans. We calculate the fraction of total HOC sorbed by plastics to be small compared to that sorbed by other media in the ocean. We further demonstrate consistency among (a) measured HOC transfer from microplastic to organisms in the laboratory, (b) measured HOC desorption rates for polymers in artificial gut fluids (c) simulations by plastic-inclusive bioaccumulation models and (d) HOC desorption rates for polymers inferred from first principles. We conclude that overall the flux of HOCs bioaccumulated from natural prey overwhelms the flux from ingested microplastic for most habitats, which implies that microplastic ingestion is not likely to increase the exposure to and thus risks of HOCs in the marine environment. (Figure Presented). Copyright © 2016 American Chemical Society.

Koelmans, A. A., et al. (2017). "Risks of Plastic Debris: Unravelling Fact, Opinion, Perception, and Belief." Environmental Science & Technology **51**(20): 11513-11519.

Researcher and media alarms have caused plastic debris to be perceived as a major threat to humans and animals. However, although the waste of plastic in the environment is clearly undesirable for aesthetic and economic reasons, the actual environmental risks of different plastics and their associated chemicals remain largely unknown. Here we show how a systematic assessment of adverse outcome pathways based on ecologically relevant metrics for exposure and effect can bring risk assessment within reach. Results of such an assessment will help to respond to the current public worry in a balanced way and allow policy makers to take measures for scientifically sound reasons. [ABSTRACT FROM AUTHOR]

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Koelmans, A. A., et al. (2014). "Leaching of plastic additives to marine organisms." Environmental Pollution **187**: 49-54.

It is often assumed that ingestion of microplastics by aquatic species leads to increased exposure to plastic additives. However, experimental data or model based evidence is lacking. Here we assess the potential of leaching of nonylphenol (NP) and bisphenol A (BPA) in the intestinal tracts of Arenicola marina (lugworm) and Gadus morhua (North Sea cod). We use a biodynamic model that allows calculations of the relative contribution of plastic ingestion to total exposure of aquatic species to chemicals residing in the ingested plastic. Uncertainty in the most crucial parameters is accounted for by probabilistic modeling. Our conservative analysis shows that plastic ingestion by the lugworm yields NP and BPA concentrations that stay below the lower ends of global NP and BPA concentration ranges, and therefore are not likely to constitute a relevant exposure pathway. For cod, plastic ingestion appears to be a negligible pathway for exposure to NP and BPA.

Koelmans, A. A., et al. (2013). "Plastic as a carrier of POPs to aquatic organisms: a model analysis."

Environmental Science & Technology **47**(14): 7812-7820.

It has been hypothesized that persistent organic pollutants (POPs) in microplastic may pose a risk to aquatic organisms. Here we develop and analyze a conceptual model that simulates the effects of plastic on bioaccumulation of POPs. The model accounts for dilution of exposure concentration by sorption of POPs to plastic (POP "dilution"), increased bioaccumulation by ingestion of plastic-containing POPs ("carrier"), and decreased bioaccumulation by ingestion of clean plastic ("cleaning"). The model is parametrized for the lugworm Arenicola marina and evaluated against recently published bioaccumulation data for this species from laboratory bioassays with polystyrene microplastic. Further scenarios include polyethylene microplastic, nanosized plastic, and open marine systems. Model analysis shows that plastic with low affinity for POPs such as polystyrene will have a marginal decreasing effect on bioaccumulation, governed by dilution. For stronger sorbents such as polyethylene, the dilution, carrier, and cleaning mechanism are more substantial. In closed laboratory bioassay systems, dilution and cleaning dominate, leading to decreased bioaccumulation. Also in open marine systems a decrease is predicted due to a cleaning mechanism that counteracts biomagnification. However, the differences are considered too small to be relevant from a risk assessment perspective.

Koelmans, A. A., et al. (2014). "Plastics in the marine environment." Environmental Toxicology & Chemistry **33**(1): 5-10.

The authors discuss the risks associated with the presence of plastic in the marine environment and its affect on marine populations and ecosystem. They discussed topics including lack of standardization associated with the quantification of plastics in the environment, impact of plastic debris on marine population. and plastics as a vector for persistent bioaccumulative and toxic (PBT) chemical. The authors further discuss toxicological implications of microplastic particle ingestion.

Koelmans, A. A., et al. (2019). "Microplastics in freshwaters and drinking water: Critical review and assessment of data quality." Water Research **155**: 410-422.

Microplastics have recently been detected in drinking water as well as in drinking water sources. This presence has triggered discussions on possible implications for human health. However, there have been questions regarding the quality of these occurrence studies since there are no standard sampling, extraction and identification methods for microplastics. Accordingly, we assessed the quality of fifty studies researching microplastics in drinking water and in its major freshwater sources. This includes an assessment of microplastic occurrence data from river and lake water, groundwater, tap water and bottled drinking water. Studies of occurrence in wastewater were also reviewed. We review and propose best practices to sample, extract and detect microplastics and provide a quantitative quality assessment of studies reporting microplastic concentrations. Further, we summarize the findings related to microplastic concentrations, polymer types and particle shapes. Microplastics are frequently present in freshwaters and drinking water, and number concentrations spanned ten orders of magnitude (1x10⁻² to 10⁸ #/m³) across individual samples and water types. However, only four out of 50 studies received positive scores for all proposed quality criteria, implying there is a significant need to improve quality assurance of microplastic sampling and analysis in water samples. The order in globally detected polymers in these studies is PE=PP>PS>PVC>PET, which probably reflects the global plastic demand and a higher tendency for PVC and PET to settle as a result of their higher densities. Fragments, fibres, film, foam and pellets were the most frequently reported shapes. We conclude that more high quality data is needed on the occurrence of microplastics in drinking water, to better understand potential

exposure and to inform human health risk assessments.

Koenig, M., et al. (2015). "Erratum to: Combined QCM-D/GE as a tool to characterize stimuli-responsive swelling of and protein adsorption on polymer brushes grafted onto 3D-nanostructures." Analytical and bioanalytical chemistry **407**(4): 1275-1276.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis

Kogel, T., et al. (2019). "Micro- and nanoplastic toxicity on aquatic life: Determining factors." Science of the Total Environment **709**: 136050.

Plastic pollution has become a major environmental concern due to its omnipresence and degradation to smaller particles. The potential toxicological effects of micro- and nanoplastic on biota have been investigated in a growing number of exposure studies. We have performed a comprehensive review of the main determining factors for plastic particle toxicity in the relevant exposure systems, from publications until including the year 2018. For a focused scope, effects of additives or other pollutants accumulated by the plastic particles are not included. In summary, current literature suggests that plastic particle toxicity depends on concentration, particle size, exposure time, particle condition, shape and polymer type. Furthermore, contaminant background, food availability, species, developmental stage and sex have major influence on the outcome of plastic particles exposures. Frequently reported effects were on body and population growth, energy metabolism, feeding, movement activity, physiological stress, oxidative stress, inflammation, the immune system, hormonal regulation, aberrant development, cell death, general toxicity and altered lipid metabolism. Several times reported were increased growth and food consumption, neuro-, liver- or kidney pathology and intestinal damage. Photosynthesis disruption was reported in studies investigating effects on phytoplankton. For the currently unquantified plastic particles below 10mum, more toxic effects were reported in all aquatic life, as compared to plastic particles of larger size.

Koh, H. W., et al. (2018). "Advanced Recycled Polyethylene Terephthalate Aerogels from Plastic Waste for Acoustic and Thermal Insulation Applications." Gels **4**(2): 17.

This work presents for the first time, a simple, practical and scalable approach to fabricating recycled polyethylene terephthalate (rPET) aerogels for thermal and acoustic insulation applications. The rPET aerogels were successfully developed from recycled PET fibers and polyvinyl alcohol (PVA) and glutaraldehyde (GA) cross-linkers using a freeze-drying process. The effects of various PET fiber concentrations (0.5, 1.0 and 2.0 by wt.%), fiber deniers (3D, 7D and 15D) and fiber lengths (32 mm and 64 mm) on the rPET aerogel structures and multi-properties were comprehensively investigated. The developed rPET aerogels showed a highly porous network structure (98.3-99.5%), ultra-low densities (0.007-0.026 g/cm3), hydrophobicity with water contact angles of 120.7-149.8degree, and high elasticity with low compressive Young's modulus (1.16-2.87 kPa). They exhibited superior thermal insulation capability with low thermal conductivities of 0.035-0.038 W/m.K, which are highly competitive with recycled cellulose and silica-cellulose aerogels and better than mineral wool and polystyrene. The acoustic absorption results were also found to outperform a commercial acoustic foam absorber across a range of frequencies.

Kojima, S., et al. (2008). "Implementation of HACCP in the risk management of medical waste generated from endoscopy." Journal of Risk Research **11**(7): 925-936.

Medical waste poses health hazards, increases the environmental load and is costly to dispose of. To solve the above problems, we applied the hazard analysis and critical control point system (HACCP) to the management of wastes generated from endoscopy. First, the wastes in three hospitals were quantified. The number and weight of waste per case differed significantly among the three hospitals. Second, HACCP was applied to the endoscopy unit of Hospital X for a year. Wastes were segregated into five types and weighed. We found that 25.8% of 'infectious waste' was in fact 'non-infectious waste' and 'non-infectious plastic waste'. The numbers of needles and needle caps did not correspond in two occasions (needle-loss rate: 0.42%). Bacterial counts of the waste container were determined to investigate infection hazard. The counts were 0 cfu/cm super(2) in all examinations except one occasion. The waste control manifests were reviewed, and all entries were consistent with the waste sent for disposal. In Hospital X where implementation of HACCP was attempted, reduction of environmental load and cutting of disposal cost are anticipated by changing the categories of waste segregation. The results suggest that hospital wastes should be managed more safely by HACCP.

Kokalj, A. J., et al. (2018). "Plastic bag and facial cleanser derived microplastic do not affect feeding behaviour and energy reserves of terrestrial isopods." Science of the Total Environment **615**: 761-766.

Current data regarding the effects of microplastic (MP) on terrestrial organisms are very scarce. Isopods play an important role in plant litter decomposition processes and are commonly used test species in terrestrial ecotoxicity studies. Their altered feeding behaviour and energy reserves are established biomarkers of adverse effects upon stressor exposure. For this study we assessed the effects of MP derived from plastic bag film (mean size 183+or-93 micro m) and particles from a facial cleanser (mean size 137+or-51 micro m) on the terrestrial isopod, Porcellio scaber. Isopods were exposed to MP via feeding on food pellets (4 mg g⁻¹ dry weight; 0.4% w w⁻¹) for 14 days under laboratory conditions. A control group was exposed to food pellets with no MP added. In line with previously suggested modes of MP action on animal ingestion, we assessed the food ingestion rate, defecation rate, food assimilation rate and efficiency, body mass change, mortality and energy reserves (proteins, carbohydrates, and triglycerides) in the digestive glands (hepatopancreas) of individual isopods. Contrary to our expectations, no effects on either end-point were observed under the given exposure conditions. Further work should be carried out to investigate the potential longer-term effects of such exposure. We conclude that 14 days exposure to plastic bag and facial cleanser MP is not severely hazardous to isopods.

Kokalj, A. J., et al. (2018). "Screening study of four environmentally relevant microplastic pollutants: uptake and effects on Daphnia magna and Artemia franciscana." Chemosphere **208**: 522-529.

This study investigated four different environmentally relevant microplastic (MP) pollutants which were derived from two facial cleansers, a plastic bag and polyethylene textile fleece. The mean size range of the particles (according to number distribution) was 20-250 micro m when measured as a powder and 0.02-200 micro m in suspension. In all MP exposures, plastic particles were found inside the guts of D. magna and A. franciscana, but only in the case of daphnids a clear exponential correlation between MP uptake in the gut and the size of the MP was identified. Exposure tests in which the majority of the MP particles were below 100 micro m in size also had higher numbers of daphnids displaying evidence of MP ingestion. As the average MP particle size increased, the percentage of daphnids which had MP in their gut decreased. Using a number distribution value to measure particle size when in a suspension is more experimentally relevant as it provides a more realistic particle size than when samples are measured as a powder. Generally, artemias had fewer MP particles in the gut, than the

daphnids, which could be explained by their different food size preferences. No acute effects on D. magna were found, but the growth of A. franciscana was affected. We conclude that zooplankton crustacean can ingest various MPs but none of the exposures tested were highly acutely hazardous to the test species. In addition, no delayed lethal effects in a 24 h post-exposure period were found.

Kolandhasamy, P., et al. (2018). "Adherence of microplastics to soft tissue of mussels: a novel way to uptake microplastics beyond ingestion." Science of the Total Environment **610**(611): 635-640.

Microplastic pollution is recognized as an emerging threat to aquatic ecosystems. One of the main environmental risks associated with microplastics is their bioavailability to marine organisms. Up to date, ingestion has been widely accepted as the sole way for the animals to uptake microplastics. Nevertheless, microplastics have also been found in some organs which are not involved in the process of ingestion. We hypothesize that the animal might uptake microplastics through adherence in addition to ingestion. To test this hypothesis, we collected mussels from the fishery farms, conducted exposure/clearance experiments and analyzed the accumulation of microplastics in specific organ of mussels. Our studies clearly showed the uptake of microplastic in multiple organs of mussels. In the field investigations, we found that the abundance of microplastic by weight but not by individual showed significant difference among organs, and the intestine contained the highest level of microplastics (9.2 items/g). In the uptake and clearance experiment, the accumulation and retention of microfibers could also be observed in all tested organs of mussels including foot and mantle. Our results strongly suggest that adherence rather than ingestion led to the accumulation of microplastics in those organs which are not involved in ingestion process. To our best knowledge, it is the first time to propose that adherence is a novel way for animals to uptake microplastics beyond ingestion. This new finding makes us rethink about the bioavailability, accumulation and toxicity of microplastics to aquatic animals.

Kolatorova, L., et al. (2018). "Endocrine disruptors." Diabetologie Metabolismus Endokrinologie Vyziva **21**(3): 142-149.

The increasing evidence of hormonal and endocrine diseases observed over the last decade has been linked to the occurrence of chemicals in the environment and the food chain. Many chemicals have the ability to disrupt the endocrine system and have been named endocrine disruptors (EDs). Actually, thousands of substances are considered as EDs, which, like hormones, can act in very small amounts. The human organism is exposed to the simultaneous action of various EDs that can interact with each other, have an antagonistic, additive or even synergistic effect. One of the well-known EDs is estrogen active bisphenol A (BPA), released from plastics, resins or cash receipts. Its use is regulated and even prohibited in some countries. Instead of BPA, however, the manufacturers use so-called alternative bisphenols, the use of which is not regulated yet. Parabens used as preservatives in the manufacture of cosmetics and pharmaceuticals or phthalates used as plasticizers of PVC plastics are another widespread ones. EDs also include natural substances, such as phytoestrogens estrogen active plant substances predominately found in soybeans. In addition to its positive effects, global soybean spread has also begun to increase knowledge about the role of phytoestrogens such as EDs. Due to the major estrogen activity od EDs, their effect on reproductive function is of interest. Current topics also include the effect of EDs on obesity, diabetes mellitus, bone metabolism and others. Investigating EDs and their effects on the human organism is currently one of the hot topics of the European Commission or the European Endocrine Society. © 2018 TIGIS Spol. s.r.o. All rights reserved.

Kole, P. J., et al. (2017). "Wear and Tear of Tyres: A Stealthy Source of Microplastics in the Environment." International Journal of Environmental Research & Public Health [Electronic Resource] **14**(10): 20.

Wear and tear from tyres significantly contributes to the flow of (micro-)plastics into the environment. This paper compiles the fragmented knowledge on tyre wear and tear characteristics, amounts of particles emitted, pathways in the environment, and the possible effects on humans. The estimated per capita emission ranges from 0.23 to 4.7 kg/year, with a global average of 0.81 kg/year. The emissions from car tyres (100%) are substantially higher than those of other sources of microplastics, e.g., airplane tyres (2%), artificial turf (12-50%), brake wear (8%) and road markings (5%). Emissions and pathways depend on local factors like road type or sewage systems. The relative contribution of tyre wear and tear to the total global amount of plastics ending up in our oceans is estimated to be 5-10%. In air, 3-7% of the particulate matter (PM_{2.5}) is estimated to consist of tyre wear and tear, indicating that it may contribute to the global health burden of air pollution which has been projected by the World Health Organization (WHO) at 3 million deaths in 2012. The wear and tear also enters our food chain, but further research is needed to assess human health risks. It is concluded here that tyre wear and tear is a stealthy source of microplastics in our environment, which can only be addressed effectively if awareness increases, knowledge gaps on quantities and effects are being closed, and creative technical solutions are being sought. This requires a global effort from all stakeholders; consumers, regulators, industry and researchers alike.

Kolle, W. (2017). "Water analyses - correctly assessed: basics, parameters, sources, and contents." Wasseranalysen richtig beurteilt: Grundlagen, Parameter, Wassertypen, Inhaltsstoffe **4**(500).

For a safe and sustainable drinking water supply, the quality of drinking water as well as of raw water must be constantly monitored by means of increasingly complex water analyses. Based on numerous sample analyses, this book once again offers a comprehensive overview of the fundamentals of water chemistry, the relevance of different parameters for the different types of water, the occurrence of natural and anthropogenic water constituents, as well as practical tips on how to use this completely revised and updated drinking water regulation calculation and analysis of data. The limit values in Germany and in the EU in accordance with the Drinking Water Ordinance and the European Drinking Water Directive are taken into account throughout. Numerous parameters have been added, such as drugs, construction chemicals, sweeteners, phthalates and microplastics. Special attention is paid to calcite saturation and its importance for the use of drinking water and its calculation according to the recast DIN standard. The associated website offers the reader with extensive supplementary image material to the reactants of water in aquifers, for water treatment, biofilms, corrosion products and asbestos. This book will be an indispensable and well-proven guide for anyone working professionally in monitoring water quality.

Komatsu, M., et al. (2015). "Maturation of human iPS cell-derived dopamine neuron precursors in alginate-Ca(2+) hydrogel." Biochimica et Biophysica Acta **1850**(9): 1669-1675.

BACKGROUND: Pluripotent stem cells (embryonic stem/induced pluripotent stem cells) have been widely studied as a potential cell source for cell transplantation therapy of Parkinson's disease. However, some difficulties remain to be overcome. These include the need to prepare a large number of dopamine (DA) neurons for clinical use and to culture the cells for a long period to allow their functional maturation and the removal of undifferentiated cells.

METHODS: In this study, aggregates of DA neuron precursors were enclosed in alginate-Ca(2+) microbeads, and the encapsulated aggregates were cultured for 25days to induce cell

maturation.
RESULTS: More than 60% of cells in the aggregates differentiated into tyrosine hydroxylase-positive DA neurons. The aggregates could release DA at the same level as aggregates maintained on culture dishes without encapsulation. In addition, by exposure to a citrate solution, the alginate-Ca(2+) gel layer could be easily removed from aggregates without damaging the DA neurons. When the aggregates were transplanted into rat brain, viable cells were found in the graft at one week post-transplantation, with cells extending neurites into the host tissue.
CONCLUSIONS: Cell aggregates encapsulated in alginate-Ca(2+) beads successfully differentiated into mature DA neurons.
GENERAL SIGNIFICANCE: The alginate-Ca(2+) microbead is suitable for maintaining DA precursor aggregates for a long period to allow their functional maturation.

Konagaya, S. and H. Iwata (2015). "Microencapsulation of dopamine neurons derived from human induced pluripotent stem cells." Biochimica et Biophysica Acta **1850**(1): 22-32.
BACKGROUND: Dopamine neurons derived from induced pluripotent stem cells have been widely studied for the treatment of Parkinson's disease. However, various difficulties remain to be overcome, such as tumor formation, fragility of dopamine neurons, difficulty in handling large numbers of dopamine neurons, and immune reactions. In this study, human induced pluripotent stem cell-derived precursors of dopamine neurons were encapsulated in agarose microbeads. Dopamine neurons in microbeads could be handled without specific protocols, because the microbeads protected the fragile dopamine neurons from mechanical stress.
METHODS: hiPS cells were seeded on a Matrigel-coated dish and cultured to induce differentiation into a dopamine neuronal linage. On day 18 of culture, cells were collected from the culture dishes and seeded into U-bottom 96-well plates to induce cell aggregate formation. After 5 days, cell aggregates were collected from the plates and microencapsulated in agarose microbeads. The microencapsulated aggregates were cultured for an additional 45 days to induce maturation of dopamine neurons.
RESULTS: Approximately 60% of all cells differentiated into tyrosine hydroxylase-positive neurons in agarose microbeads. The cells released dopamine for more than 40 days. In addition, microbeads containing cells could be cryopreserved.
CONCLUSION: hiPS cells were successfully differentiated into dopamine neurons in agarose microbeads.
GENERAL SIGNIFICANCE: Agarose microencapsulation provides a good supporting environment for the preparation and storage of dopamine neurons.

Kong, X. and A. A. Koelmans (2019). "Modeling Decreased Resilience of Shallow Lake Ecosystems toward Eutrophication due to Microplastic Ingestion across the Food Web." Environmental Science and Technology **53**(23): 13822-13831.
The discovery of microplastic (MP) being present in freshwaters has stimulated research on the impacts of MP on freshwater organisms. To date, research has focused on primary effects, leaving questions with respect to secondary effects at the level of freshwater food webs unanswered. Here, we use a theoretical modeling approach to investigate the hypothesis that MP imposes negative impacts on the level of freshwater shallow lake food webs. We find that increasing MP levels have the potential to affect the critical phosphorus loading (CPL), which is defined as the threshold for regime shifts between clear and turbid states of the water column. The possible occurrence of catastrophic cascades due to MP pollution is predominantly driven by the negative effects of MP on zooplankton. We explore the possible states of the food web by scenario analysis and show that the secondary effects of MP at current concentrations are likely to be negligible. However, at the current rate of MP production, a 20-40% reduction in the

CPL would occur by the end of this century, suggesting a loss of resilience in shallow lakes that would be subject to abrupt changes in the food web under lower nutrient loading. Copyright © 2019 American Chemical Society.

Konigsberg, R., et al. (2010). "Circulating tumor cells in metastatic colorectal cancer: efficacy and feasibility of different enrichment methods." Cancer Letters **293**(1): 117-123.

Comprehensive in vitro and in vivo studies comparing EpCAM-based methods with other cytometric CTC enrichment technologies in metastatic colorectal cancer (mCRC) patients are lacking. We compare four manual cytometric methods to detect CTCs in vitro and in mCRC patients. The EpCAM-based technology, MACS HEA MicroBeads((R)), showed a significant better tumor cell recovery rate compared to other cytometric methods (p-value<0.0001). CTCs of 38 mCRC patients were enriched with MACS HEA MicroBeads(R). Progression-free survival did significantly differ between mCRC patients without detectable and with >or= 1 CTCs (p=0.007). CTC enrichment with EpCAM coupled antibodies is superior to other cytometric methods and is a feasible method for CTC detection in mCRC patients.

Kontrick, A. V. (2018). "Microplastics and Human Health: Our Great Future to Think About Now." Journal of Medical Toxicology: Official Journal of the American College of Medical Toxicology **14**(2): 117-119.

Kooi, M., et al. (2017). "Ups and Downs in the Ocean: Effects of Biofouling on Vertical Transport of Microplastics." Environmental Science & Technology **51**(14): 7963-7971.

Recent studies suggest size-selective removal of small plastic particles from the ocean surface, an observation that remains unexplained. We studied one of the hypotheses regarding this size-selective removal: the formation of a biofilm on the microplastics (biofouling). We developed the first theoretical model that is capable of simulating the effect of biofouling on the fate of microplastic. The model is based on settling, biofilm growth, and ocean depth profiles for light, water density, temperature, salinity, and viscosity. Using realistic parameters, the model simulates the vertical transport of small microplastic particles over time, and predicts that the particles either float, sink to the ocean floor, or oscillate vertically, depending on the size and density of the particle. The predicted size-dependent vertical movement of microplastic particles results in a maximum concentration at intermediate depths. Consequently, relatively low abundances of small particles are predicted at the ocean surface, while at the same time these small particles may never reach the ocean floor. Our results hint at the fate of "lost" plastic in the ocean, and provide a start for predicting risks of exposure to microplastics for potentially vulnerable species living at these depths.

Koongolla, J. B., et al. (2019). "Occurrence of microplastics in gastrointestinal tracts and gills of fish from Beibu Gulf, South China Sea." Environmental Pollution **258**: 113734.

Microplastics are widespread across the global oceans, yet the potential risks of the ubiquitous environmental contaminant to marine organisms has been less known. Accumulation of microplastics and associated contaminants in marine fish, may pose adverse impacts to human health via seafood consumption. This study evaluated microplastic contamination in 24 fish species collected from Beibu Gulf, one of the world's largest fishing grounds in South China Sea. Microplastics were detected in 12 fish species at an abundance of 0.027-1.000 items individual⁻¹ and found in fish stomach, intestines and gills with the count percentage of 57.7%, 34.6% and 7.7%, respectively. Transparent fibers were observed as the predominant microplastics, which might be ingested accidently by fish or transferred through other animals at lower trophic levels. Majority of microplastics were identified as polyester

(44%) and nylon (38%), whereas polypropylene (6%), polyethylene (6%), and acrylics (6%) were also found. Relatively, higher microplastic abundances were found in demersal fish compared to the pelagic species. Overall, the abundance of microplastics was documented as relatively low in the commercial fish collected from the open water of Beibu Gulf, South China Sea.

Koongolla, J. B., et al. (2020). "Occurrence of microplastics in gastrointestinal tracts and gills of fish from Beibu Gulf, South China Sea." Environmental Pollution **258**.

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Kor, K. and A. Mehdinia (2020). "Neustonic microplastic pollution in the Persian Gulf." Marine Pollution Bulletin **150**: 110665.

Currently, microplastics are a major challenge threatening marine environment. Given little information on their prevalence in the Persian Gulf, the present study as the first comprehensive study was conducted to evaluate microplastics abundance in surface waters. Neustonic samples were collected from 15 stations along the Persian Gulf. Visually separated microplastics were categorized according to their size, shape, and color. ATR-FTIR method was used to identify the composition of polymers. Microplastics were found in all sampling stations and their density varied from 1.5x10³ to 4.6x10⁴ particle.km⁻² with a mean density of 1.8x10⁴ particle.km⁻². Fibers were the most dominant shape of microplastics (44.1%). Approximately 76% of the analyzed microplastics were polyethylene and polypropylene and the predominant colors of the microplastics were white and blue.

Kord, S. and A. Naji (2019). "Study of micro-plastic contamination in five species of prevailing fishes of Chabahar Bay, (Sistan and Baluchestan Province)." Iranian Scientific Fisheries Journal **28**(3): 113-123.

The global demand for plastics is increasing due to its wide applications. Approximately 60 to 80 percent of the waste in the marine environment are plastics. There is a lack of information and research on the presence of plastic and micro-plastic contamination in aquatic animals. The present study, therefore examined the frequency, distribution, size, colour and type of micro-plastic (MPS) in the gastrointestinal tract of 5 species (n= 10) from the coasts of the Chabahar Bay, the Oman Sea, in spring. The total number of MPS found in the studied species varied and highest percentage of MPS in the gastrointestinal tract of the fish were fibre (55%), fragments (26%) and pellets (18%). The results of the Fourier transform infrared spectroscopy (FT-IR) analysis from suspect samples shown microplastics. The most commonly detected polymers were polyethylene (PE), polyethylene terephthalate (PET) and nylon. The results

showed that all fish sampled from Chabahar Bay contained MPS. Considering the importance of MPS pollution, it is suggested that monitoring the release of plastics on the shores with tourism and fishing in the Bay of Chabahar, can be a subject of future studies.

Korez, S., et al. (2019). "Feeding and digestion of the marine isopod Idotea emarginata challenged by poor food quality and microplastics." Comparative Biochemistry & Physiology **Toxicology & Pharmacology**: Cbp. 226:108586.

Ingestion of microplastics can impair nutrition of marine invertebrates. In a laboratory study, we tested whether microplastics affect ingestion rates and gastrointestinal enzyme activities in the marine isopod Idotea emarginata. Isopods were fed for eight days with one out of four different food formulations: natural food (the brown alga Fucus vesiculosus) or synthetic diet consisting of freeze-dried algal powder embedded in agarose, both, with or without microplastic particles (fluorescent polymethyl methacrylate, 10-100mum) at a concentration of 40 items per mg of food. The isopods accepted both types of food but consumed significantly more (average 3.1-fold) of the agar based synthetic food. I. emarginata responded to the reduced content of digestible organic matter in the synthetic food by a compensatory adjustment of the ingestion rates. Addition of microplastics had no effect on ingestion rates in natural food whereas the feeding rates for synthetic food varied in response to microplastics. Similarly, activity patterns of digestive enzymes, particularly those of esterases, changed significantly in the treatment with synthetic food. Isopods fed with synthetic food alone showed elevated esterase activities in the gut while those isopods fed with synthetic food and microplastics showed elevated esterase activities in the midgut gland but not in the gut. Apparently, not the exposure to microplastic alone, but the combined effects of reduced nutrient availability and microplastic ingestion caused considerable biochemical reactions in the digestive organs of the isopods.

Koroleva, A. V., et al. (2013). "LDPE COMPOSITES WITH WOOD FLOUR AND RUBBER." Advances in Sustainable Petroleum Engineering Science **5**(3): 141-145.

Currently the world's consumption of plastics is growing in this regard there are difficulties in disposing of large amounts of household plastic waste. The solution is to develop biodegradable polymers with a specific expiration date. This work is dedicated to the creation of biodegradable composite material based on LDPE, wood flour and rubbers of different nature.

Koroneos, C. J. and E. A. Nanaki (2012). "Integrated solid waste management and energy production - a life cycle assessment approach: the case study of the city of Thessaloniki." Journal of Cleaner Production **27**: 141-150.

Innovative strategies are needed to deal with the waste we produce today to prevent it from causing problems for future generations. As waste management issues gain public awareness, concern has risen about the appropriateness of various disposal methods. The objective of this work is the environmental assessment of different municipal solid waste treatment strategies for the city of Thessaloniki, within the methodological frameworks of Life Cycle Assessment (LCA) and the Integrated Solid Waste Management strategy, taking into account social, environmental and economic effects. The waste management methods in this study include: landfill of all waste fractions, recycling of paper, and anaerobic digestion of food waste in a biological treatment plant. The waste fractions considered are the total amount of food, paper and plastic waste produced in Thessaloniki during the period of one year. Environmental impacts are decreased when the solid waste management methods include some kind of recovery from waste. The results of this work indicate that paper recycling and anaerobic digestion of food waste is preferable compared to landfilling. It is also shown that landfilling of food waste utilizing the biocells method is more attractive than anaerobic digestion in a separate plant; nevertheless, energy recovery is about 45% lower.

Kosmider, B., et al. (2017). "DNA damage in human alveolar type II cells in emphysema." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **195**(no pagination).

Rationale Emphysema is caused by the destruction of alveolar wall septa. The major risk factor for this disease is cigarette smoke and effective therapies are very limited. Alveolar type II (ATII) cells are in the gas exchange portion of the lung. They make and secrete pulmonary surfactant, and proliferate to restore the epithelium after damage to the more sensitive alveolar type I cells. Methods Control ATII cells were isolated from deidentified control non-smoker and smoker organ donors whose lungs were not suitable for transplantation and donated for medical research. Furthermore, as a unique approach, we have developed a new method on how to isolate ATII cells from excess tissue from lung transplants obtained from patients with emphysema using magnetic microbeads. We determined DNA damage, DNA repair, oxidative stress, injury, and inflammation in human primary ATII cells isolated from these individuals in comparison with controls. Results Our data indicates high oxidative stress in human ATII cells induced by cigarette smoke extract in vitro as measured by 4-HNE staining by immunocytofluorescence. We also observed DNA double strand breaks, high DNA damage, and low DNA repair in these cells. Moreover, we found greater proinflammatory response as determined by IL-8 and IL-6 levels by ELISA. Furthermore, ATII cells obtained from patients with emphysema had greater injury compared to cells obtained from control non-smokers and smokers. Conclusion Our results indicate oxidative ATII cell damage induced by cigarette smoke and in emphysema. Observed DNA damage/repair imbalance may contribute to cell death in this disease. The study of ATII cell injury may improve our knowledge on this disease pathogenesis and may lead to novel therapeutic strategies to slow the progression of emphysema.

Kosmider, B., et al. (2017). "Impairment of DNA double strand break repair in human primary alveolar type II cells in emphysema." Cancer Research. Conference: American Association for Cancer Research Annual Meeting **77**(13 Supplement 1).

Rationale Emphysema is caused by the destruction of alveolar wall septa. The major risk factor for this disease is cigarette smoke and effective therapies are very limited. Alveolar type II (ATII) cells are in the gas exchange portion of the lung. They make and secrete pulmonary surfactant, and proliferate to restore the epithelium after damage to the more sensitive alveolar type I cells. Methods Control ATII cells were isolated from deidentified control non-smoker and smoker organ donors whose lungs were not suitable for transplantation and donated for medical research. Furthermore, as a unique approach, we have developed a new method on how to isolate ATII cells from excess tissue from lung transplants obtained from patients with emphysema using magnetic microbeads. We determined DNA damage, DNA repair, oxidative stress, injury, and inflammation in human primary ATII cells isolated from these individuals in comparison with controls. Results Our data indicates high oxidative stress in human ATII cells induced by cigarette smoke extract in vitro as measured by 4-HNE staining by immunocytofluorescence. We also observed DNA double strand breaks, high DNA damage, and low DNA repair in these cells. Moreover, we found greater proinflammatory response as determined by IL-8 and IL-6 levels by ELISA. Furthermore, ATII cells obtained from patients with emphysema had greater injury compared to cells obtained from control non-smokers and smokers. Conclusion Our results indicate oxidative ATII cell damage induced by cigarette smoke and in emphysema. Observed DNA damage/repair imbalance may contribute to cell death in this disease. The study of ATII cell injury may improve our knowledge on this disease pathogenesis and may lead to novel therapeutic strategies to slow the progression of emphysema.

Kosore, C., et al. (2018). "Occurrence and ingestion of microplastics by zooplankton in Kenya's marine environment: first documented evidence." African Journal of Marine Science **40**(3): 225-234.

Microplastics can be ingested by marine organisms and may lead to negative impacts at the base of marine food chains. This study investigated the occurrence and composition of microplastics in the sea-surface water and sought evidence of ingestion by zooplankton. Surface seawater was collected using a stainless-steel bucket and sieved directly through a stainless-steel sieve (250-µm mesh), while a 500-µm mesh net was towed horizontally to collect zooplankton, at 11 georeferenced stations off the Kenyan coast in February 2017, on board the national research vessel RV Mtafiti. Microplastic particles were sorted and characterised using an Optika dissecting microscope. Polymer types were identified using an ALPHA Platinum attenuated total reflection-Fourier-transform infrared (ATR-FTIR) spectrometer. A total of 149 microplastic particles, with an average abundance of 110 particles m-3, were found in the surface seawater. A total of 129 particles were found ingested by zooplankton groups, where Chaetognatha, Copepoda, Amphipoda and fish larvae ingested 0.46, 0.33, 0.22 and 0.16 particles ind.-1, respectively. Filaments dominated both the surface-water microplastics and the ingested microplastics, contributing 76% and 97% to those compositions, respectively. White particles were prevalent in the water (51%), whereas black was the colour found most commonly (42%) across the zooplankton groups. The sizes of particles that were in the water were in the range of 0.25-2.4 mm, and those ingested ranged between 0.01 and 1.6 mm. Polypropylene was predominant in the surface water, whereas low-density polyethylene was the most-ingested polymer type. The results provide the first documented evidence of the occurrence, composition and ingestion of microplastics by zooplankton in Kenya's marine environment, indicating that microplastics have the potential to enter pelagic food webs and cause pollution in the study area.

Kostic, D., et al. (2019). "Multifunctional ternary composite films based on PLA and Ag/alginate microbeads: Physical characterization and silver release kinetics." Materials Science & Engineering. C, Materials for Biological Applications **98**: 1159-1168.

Novel multifunctional composite poly(lactic acid) (PLA) films with alginate microbeads containing silver nanoparticles (AgNPs) were developed for potential antimicrobial food packaging applications. AgNPs, 10-20nm in size, were synthesized in a Na-alginate solution by a hydrothermal method yielding a sterile, pH neutral colloid solution of low viscosity that was electrostatically extruded to produce Ag/alginate microbeads (190mum in size) with retained AgNPs. Dried microbeads were uniformly dispersed in PLA films with retained AgNPs as confirmed by UV-Vis spectroscopy and scanning electron microscopy. The films were characterized regarding thermal and mechanical properties as well as silver release in different food simulants.

Kosuth, M., et al. (2018). "Anthropogenic contamination of tap water, beer, and sea salt." PLoS ONE [Electronic Resource] **13**(4): e0194970.

Plastic pollution has been well documented in natural environments, including the open waters and sediments within lakes and rivers, the open ocean and even the air, but less attention has been paid to synthetic polymers in human consumables. Since multiple toxicity studies indicate

risks to human health when plastic particles are ingested, more needs to be known about the presence and abundance of anthropogenic particles in human foods and beverages. This study investigates the presence of anthropogenic particles in 159 samples of globally sourced tap water, 12 brands of Laurentian Great Lakes beer, and 12 brands of commercial sea salt. Of the tap water samples analyzed, 81% were found to contain anthropogenic particles. The majority of these particles were fibers (98.3%) between 0.1-5 mm in length. The range was 0 to 61 particles/L, with an overall mean of 5.45 particles/L. Anthropogenic debris was found in each brand of beer and salt. Of the extracted particles, over 99% were fibers. After adjusting for particles found in lab blanks for both salt and beer, the average number of particles found in beer was 4.05 particles/L with a range of 0 to 14.3 particles/L and the average number of particles found in each brand of salt was 212 particles/kg with a range of 46.7 to 806 particles/kg. Based on consumer guidelines, our results indicate the average person ingests over 5,800 particles of synthetic debris from these three sources annually, with the largest contribution coming from tap water (88%).

Kotaskova, J., et al. (2017). "Treatment with BCR inhibitors increases ROR1 expression in CLL cells." Haematologica **102 (Supplement 2)**: 414.

Background: Receptor Tyrosine Kinase-Like Orphan Receptor-1 (ROR1) expression on malignant B-cells is considered a promising target for therapy of CLL and other lymphoproliferative disorders. Recently published data suggest that combination of BCR inhibitor ibrutinib with ROR1 antibody cirmtuzumab can enhance treatment efficacy in CLL. Nevertheless, the variability in ROR1 expression during disease progression, therapy administration and relapse remains unknown. Aim(s): In our study we aimed to i) detect ROR1 in CLL cells during different stages of the disease using flow cytometry and qRT-PCR with focus on patients undergoing therapy; ii) analyse changes in ROR1 expression within individual patients during the disease course. Method(s): CLL cohort consisted of 96 CLL patients (152 samples): 23 patients with stable disease, 16 patients with active disease prior first therapy intervention, 6 patients during first therapy, 13 patients in progression before second line treatment, 3 patients in complete remission, 10 refractory patients, 9 patients treated with ibrutinib, 16 patients treated with idelalisib. To monitor changes in ROR1 expression we tested serial samples from 5 CLL patients (median follow up 76 months (66-131), median number of sampling points 12 (5-18)). For surface ROR1 protein analysis we used 8-colour flow cytometry (modified MRD protocol: CD45/CD3/CD19/CD5/CD81/CD79b/CD22/ROR1) in all samples. To quantify ROR1 mRNA expression changes within individual patients we performed qRT-PCR in separated CLL cells (>95% CD19+CD5+). CLL cells from samples in remission were separated immunomagneticaly (Whole Blood Anti-ROR1 MicroBead Kit, Miltenyi Biotec). Result(s): Using multicolour flow cytometry we confirmed ROR1 antigen/protein presence on CLL cells in each analysed sample. The ROR1 antigen was detectable on residual CLL cells during disease remission with the ability to distinguish malignant population from healthy B-cells. Using qRT-PCR we detected significantly higher levels of ROR1 mRNA in samples of treated patients ($p<0.01$). This observation was supported by analysis of ROR1 mRNA expression in five patients tested consecutively in several time-points. We detected ROR1 mRNA expression increase in disease progression before therapy and further increase during therapy administration. In case of remission induction we observed decrease of ROR1 mRNA level. In patients treated with ibrutinib or idelalisib we observed steep increase of ROR1 expression compared to patients treated with FCR regimen. Summary/Conclusions: ROR1 protein remains detectable on CLL cells during disease course even in complete remission. ROR1 mRNA levels are highly influenced by therapy administration especially in the case of treatment with BcR inhibitors.

Kottaridis, P., et al. (2011). "Results of a phase 1 clinical trial of allogeneic tumor-primed natural killer cells in AML." Blood. Conference: 53rd Annual Meeting of the American Society of Hematology, ASH **118**(21).

We have previously reported that resting human NK cells can be primed to lyse NK-resistant tumor cells, including AML, by co-incubation with membrane preparations from the leukemia cell line CTV-1. Tumor-primed NK cells can be cryopreserved and remain in a primed state when thawed. Following translation of this production method to GMP-compliance we designed a phase 1 trial for AML patients. PROTOCOL: AML patients meeting the inclusion criteria were enrolled and they and their children HLA-typed and screened for medical suitability for apheresis. KIR mismatched donors in the GvL direction were preferred when available. PATIENT INCLUSION CRITERIA: >60 years in PR (blasts >5<20% in BM) after 2nd course of induction chemotherapy; >60 years in CR2 after re-induction chemotherapy; >60 years in PR or CR after 2 courses of chemotherapy with poor risk disease by conventional cytogenetic criteria; <60 years beyond CR2 but unsuitable for transplantation. CONDITIONING: Fludarabine 25mg/m2/day for 3 days plus a single fraction (2Gy) TBI on day 4. MANUFACTURE OF Tumor-primed NK: T-pNK cells were generated from single 2hr apheresis from haploidentical related donors in 14 cases; 1 donor declined and the patient was not treated. NK cells were isolated with anti-CD56 microbeads (CliniMACS, Miltenyi Biotec) with (n=2) or without (n=12) prior depletion of CD3+ cells. Purified NK cells were co-incubated with a lysate of CTV-1 cells (DSMZ repository) overnight. Lysate was removed by density gradient separation on day 2 and cells were cryopreserved in dosed aliquots and released for infusion within 15 days of manufacture. TREATMENT: Three groups of 5 patients were to receive 1x10^6/kg, 5x10^6/kg or 1x10^7/kg haploidentical related donor T-pNK as a single i.v. infusion 24 hours after completion of TBI. RESULT(S): 15 patients were enrolled between July 2008 and Dec 2009-Table 1. Mean donor T-pNK yield was 6.73x10^9 and CD56 purity 99.3%. T cell contamination was <10^4/kg. All products achieved QC release criteria. Median time from enrolment to product release was 46 days. 8/15 patients received the T-pNK therapy; 7 untreated due to relapse during product manufacture or failure to remit (6) and donor refusal (1). No infusional toxicity was observed. 7/8 patients experienced profound bone marrow suppression with median time of neutrophil recovery 55 days (19-101). Two patients who previously had an allogeneic transplant were salvaged with a CD34+ top up stem cell transfusion from their original donors. All experienced neutropenic fevers requiring antibiotic support with 2 of them requiring ICU admission. Due to the toxicities observed the dose escalation was abandoned and all treated patients received 1x10^6 cell/kg. The median duration of CR post T-pNK was 222 days (55-845) compared to previous CR median of 47 days (0-90)-Table 1. 7/8 patients experienced a longer CR post T-pNK than their previous CR; median increase in duration of CR was 242 days (range 54-815). CONCLUSION(S): T-pNK can be easily generated and administered with acceptable toxicity which was easily managed. In this non-controlled trial there was evidence of clinical efficacy but delays in donor screening and processing led to 40% attrition of enrolled patients prior to drug administration. [Table Presented].

Kottke, B. A. and N. D. Bren (1994). "A particle concentration fluorescence immunoassay for Lp(a)." Chemistry & Physics of Lipids **67-68**: 249-256.

The quantitation of Lp(a) by immunoassay presents a major technical problem, because the molecular mass of the (a) protein of Lp(a) can vary between 419,000 and 838,000 Da (Gaubatz et al. (1990) J. Lipid Res. 31, 603-612), and this variability is determined by at least 24 alleles of the (a) gene. In an attempt to overcome this problem, we have developed an assay that is independent of variation of the size of (a). The assay utilizes a mixture of monoclonal antibodies to (a) which do not react to plasminogen or to apolipoprotein (apo) B. These antibodies are bound to inert microscopic beads to capture the Lp(a) particles. Subsequently, a fluorescein-labeled monoclonal antibody to apo B is used for detection and quantitation. The assay is done with special microtiter plates containing filters so that the particles can be thoroughly washed after capture on the microbeads. Because Lp(a) particles contain only one apo B particle and the molecular weight of apo B is constant, the assay is not affected by variation in the size of apo(a). By binding the mixture of monoclonal antibodies to inert beads, it is possible to greatly increase the amount of antibody bound to an exposed surface and thus increase the sensitivity of the assay. A mixture of monoclonal antibodies can be used to increase the affinity of the capture step of the assay. The assay can be completed in 4 h and has a wide working range.(ABSTRACT TRUNCATED AT 250 WORDS)

Kousaiti, A., et al. (2019). "Assessment of tetrabromobisphenol-A (TBBPA) content in plastic waste recovered from WEEE." Journal of Hazardous Materials: 121641.

Due to the variability of additives and polymer types used in electrical and electronic equipment (EEE), and in accordance with the European Directive 2012/19/EU, an implementation of sound management practices is necessary. This work focuses on assessing the content of tetrabromobisphenol-A (TBBPA) in acrylonitrile-butadiene-styrene (ABS), polypropylene (PP), polycarbonate (PC) and their polymer blends (i.e. PC/ABS). A total of 36 plastic housing samples originating from microwave ovens, electric irons, vacuum cleaners and DVD/CD players were subjected to microwave-assisted-extraction (MAE) and/or ultrasound-assisted-extraction (UAE). Maximum mean concentration values of TBBPA measured in DVD/CD players and vacuum cleaners ranged between 754-1146mug/kg, and varied per polymer type, as follows: 510-2515mug/kg in ABS and 55-3109mug/kg in PP. The results indicated that MAE was more sufficient than UAE in the extraction of TBBPA from ABS. To optimize the UAE procedure, various solvents were tested. Higher amounts of TBBPA were obtained from ABS and PP using a binary mixture of a polar-non-polar solvent, isopropanol:n-hexane (1:1), whereas the sole use of isopropanol exhibited incomplete extraction.

Kowalski, K., et al. (1972). "Stimulatory effects of induced phagocytosis on the function of isolated thyroid cells." Journal of Clinical Investigation **51**(11): 2808-2819.

Stimulation of endocytosis is a very early effect of thyrotropin on thyroid. However, the relationship of the endocytotic process to the many other thyrotropin effects on thyroid is not clearly defined. Since phagocytosis in isolated thyroid cells is a presumed model for in vivo endocytosis of colloid, phagocytosis was induced in isolated thyroid cells by incubating them at 37C with 0.109 mu diameter polystyrene microbeads; phagocytosis was confirmed in each experiment by electron microscopy and/or spectrophotometric analysis of dioxane cell extracts. Cells incubated with 50-100 mu diameter polystyrene macrobeads (too large to ingest) served as controls. Microbead induced phagocytosis in isolated thyroid cells was consistently accompanied by increases in: (a) cyclic 3,5 adenosine monophosphate 14C formation from adenine 8 14C (661/); (b) iodide I trapping (40i); (c) protein and RNA synthesis (30'i); (d) phospholipogenesis (50V); (e) a aminoisobutyric acid 1 14C uptake (15t). 50 to 100 p diameter polystyrene macrobeads did not influence cell function in any of these experiments. Aminotriazole, 5 x 10 3 M, a peroxidase inhibitor, blocked the stimulatory effect of microbead induced phagocytosis on phospholipogenesis only. These studies indicate that in isolated thyroid cells the phagocytotic process, per se, may alter activity of the membrane bound adenyl cyclase enzyme. The resultant increase in cyclic 3,5 adenosine monophosphate may be a triggering

mechanism for (some) subsequent metabolic changes occurring during phagocytosis. Since these changes mimic those induced by thyrotropin, it is suggested that a variety of thyrotropin effects on thyroid may be secondary to stimulation of colloid resorption and hormone secretion.

Kozlowska, J., et al. (2019). "Microparticles based on natural and synthetic polymers for cosmetic applications." International Journal of Biological Macromolecules **129**: 952-956.

Most peeling products (exfoliators) available on the market, used in cosmetic and aesthetic dermatology applications, contain synthetic microbeads as abrasive agents. After being released into the natural environment, these non-biodegradable microparticles have an adverse impact on it, especially on aquatic ecosystems. Cosmetics consisting of solid plastic particles will be prohibited in the European Union from 2020. Therefore, there is a great need to develop effective abrasive substances for cosmetic industry. An alternative to synthetic beads may be beads based on biopolymers. Spherical microparticles of sodium alginate and mixture of sodium alginate and starch were obtained using encapsulator BUCHI B-395 Pro. The obtained microparticles were added to the developed peeling formulation. Subsequently, the evaluation of skin condition after application of peelings with alginate, alginate-starch and synthetic microparticles was made, including topography, skin's barrier quality, hydration, colour, and the level of sebum. The peeling containing sodium alginate and sodium alginate with starch beads does not irritate the skin - redness of skin, itching and dryness did not appear. Microparticles of sodium alginate and sodium alginate with starch act on the skin as effectively as commercial synthetic particles, therefore they may be successfully used as abrasive ingredients in the developed recipe.

Kraines, S., et al. (2003). "A system tradeoff model for processing options for household plastic waste." Clean Technologies and Environmental Policy **4**(4): 204-216.

With the "Containers and Packaging Recycling Law", Japan has shown a firm conviction towards the promotion of recycling. Waste can be "recycled", i.e. resource value of waste material can be recovered, in many ways, from material recycling to energy recycling. Alternatively, waste can be reduced or disposed of in landfills. A system tradeoff model is developed from component process technology models of six different recycling and disposal options for household plastic waste processing: plastic pellet production, refuse derived fuel production, oil production, waste incineration to produce electricity, use of waste plastic as a coke substitute, and incineration for volume reduction. These technologies are compared with the case where all waste plastic is land filled. Models based on plant data, laboratory experiments, and theoretical considerations of scale effects and mass balances are developed to calculate the cost, energy consumption, CO 2 emission, and land fill occupancy. The models also calculate the valued products of each technology and convert them into cost, energy, CO 2 , and landfill occupancy using life cycle inventory data. These values are subtracted from the outputs of the waste processing models to obtain overall performances for each technology. The overall tradeoff system model is then used to evaluate several scenarios of plastic recycling and disposal technologies in Tokyo. [PUBLICATION ABSTRACT]

Kraines, S. B., et al. (2004). "Development of an internet-based collaboration platform and application to household waste plastic processing." International Journal of Technology Transfer and Commercialisation **3**(2): 129-146.

Object-based model integration using the internet combines aspects of modularisation and network technology approaches to address large-scale, complex, multi-disciplinary system problems. As a prototype application of this approach to holistic system analysis of

environmental sustainability issues, we are developing a decision support system that uses an object-based modeling framework for examining the various trade offs between costs, pollution emissions, resource consumption, and land fill use for different recycling and disposal options. The framework is applied to household plastic waste processing. The overall system of plastic waste processing is divided into three stages: generation of waste plastic from households, collection using different kinds of garbage collection vehicles and plant processing for recycling or disposal. The framework is used to examine several scenarios for different combinations of waste plastic recycling and disposal technologies in Tokyo, Japan. Plans are outlined for implementing the framework using network modelling technologies so that the trade off modelling system can be accessed over the internet by stakeholders and decision makers.

Kraitchman, D., et al. (2012). "In vivo biocompatibility and efficacy of an x-ray-visible, uniform, alginate microsphere for embolic therapy." Molecular Imaging and Biology **1)**: S1858.

Introduction Embolization is a minimally invasive approach frequently used in combination with X-ray angiography to deploy small particles to block or occlude vessels feeding tumors. The majority of embolic particles are composed of polymers that are radiolucent. Thus, embolic microsphere visibility is enhanced by co-injection with radiopaque contrast agent. We have recently developed a method to create highly uniform, X-ray-visible, alginate-based embolic beads (XEB) and sought to test the effectiveness and biocompatibility of this new embolic device. Method(s): Using a pressure-controlled, microfluidic device, barium sulfate impregnated alginate microbeads were crosslinked in a calcium-rich, oleic acid solution and further separated and crosslinked in a calcium-rich, isopropyl alcohol solution to generate XEBs with optimal 50 mum diameters. Radiopacity of the XEBs was determined in phantoms on an X-ray flat-panel angiographic system (Axiom Artis dFA, Siemens). In vivo imaging visibility, handling characteristics, and biocompatibility was evaluated in normal, anesthetized swine (n=5 acute; n=2 chronic). Using a femoral artery approach, a baseline aortic digital subtraction angiogram (DSA, hand contrast injection, 3 frames/s) was obtained followed by a non-contrast c-arm CT (8s DR Body DynaCT preset, Artis Zee, Siemens). Superselective catheterization of the kidney pole was then performed followed by a DSA during hand injection of contrast. XEBs were then injected intra-arterially, without the addition of iodinated contrast, into the selected kidney pole during suspended respiration while acquiring a DSA (3 frames/second). C-arm CTs were obtained to document XEB visibility and retention. Serial c-arm CTs were obtained in chronic animals. Endotoxin assays of XEBs were performed in all chronic studies. Histopathology was performed on the kidneys in all animals. Result(s): Radiopacity in the phantom on c-arm CT was equivalent to bone for 5 mul XEB (2774 +/- 1595 HU), 50 mul XEB (2809 +/- 1208 HU), and 10% iohexal (1482+/-354 HU) (Fig 1a). Transarterial delivery of XEBs was visualized by DSA in all pigs with total occlusion achieved after 0.05-0.1 ml of XEBs. Reflux or retrograde flow of XEBs was seen in 28% of the studies. The volume of radiopacity created by the XEBs on c-arm CT was reduced at 1 week follow-up with minimal presence of radiopacity at 3 weeks post-administration (Fig 1b-d). XEBs were intact acutely and at three weeks post injection with minimal inflammatory infiltrate and fibrosis consistent with renal infarction by XEBs (Fig 1e). All XEB samples were negative for endotoxin. Conclusion(s): X-ray-visible, uniform embolic beads allow confirmation of delivery success using conventional X-ray imaging systems without the addition of iodinated contrast agents. Biocompatibility of XEBs was high with no noted toxicities or adverse events. XEBs also offer the ability to see reflux of embolic nanoparticles to non-target locations. (Figure presented) .

Krakowska, B., et al. (2015). "Detection of discoloration in diesel fuel based on gas chromatographic

fingerprints." Analytical and bioanalytical chemistry **407**(4): 1159-1170.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis In the countries of the European Community, diesel fuel samples are spiked with Solvent Yellow 124 and either Solvent Red 19 or Solvent Red 164. Their presence at a given concentration indicates the specific tax rate and determines the usage of fuel. The removal of these so-called excise duty components, which is known as fuel "laundering", is an illegal action that causes a substantial loss in a government's budget. The aim of our study was to prove that genuine diesel fuel samples and their counterfeit variants (obtained from a simulated sorption process) can be differentiated by using their gas chromatographic fingerprints that are registered with a flame ionization detector. To achieve this aim, a discriminant partial least squares analysis, PLS-DA, for the genuine and counterfeit oil fingerprints after a baseline correction and the alignment of peaks was constructed and validated. Uninformative variables elimination (UVE), variable importance in projection (VIP), and selectivity ratio (SR), which were coupled with a bootstrap procedure, were adapted in PLS-DA in order to limit the possibility of model overfitting. Several major chemical components within the regions that are relevant to the discriminant problem were suggested as being the most influential. We also found that the bootstrap variants of UVE-PLS-DA and SR-PLS-DA have excellent predictive abilities for a limited number of gas chromatographic features, 14 and 16, respectively. This conclusion was also supported by the unitary values that were obtained for the area under the receiver operating curve (AUC) independently for the model and test sets.

Kramm, J., et al. (2018). "Superficial or Substantial: Why Care about Microplastics in the Anthropocene?" Environmental Science and Technology **52**(6): 3336-3337.

Kratina, P., et al. (2019). "Interactive effects of warming and microplastics on metabolism but not feeding rates of a key freshwater detritivore." Environmental Pollution **255**(Part 2).

Microplastics are an emerging pollutant of high concern, with their prevalence in the environment linked to adverse impacts on aquatic organisms. However, our knowledge of these impacts on freshwater species is rudimentary, and there is almost no research directly testing how these effects can change under ongoing and future climate warming. Given the potential for multiple stressors to interact in nature, research on the combined impacts of microplastics and environmental temperature requires urgent attention. Thus, we experimentally manipulated environmentally realistic concentrations of microplastics and temperature to partition their independent and combined impacts on metabolic and feeding rates of a model freshwater detritivore. There was a significant increase in metabolic and feeding rates with increasing body mass and temperature, in line with metabolic and foraging theory. Experimental warming altered the effect of microplastics on metabolic rate, which increased with microplastic concentration at the lowest temperature, but decreased at the higher temperatures. The microplastics had no effect on the amount of litter consumed by the detritivores, therefore, did not result in altered feeding rates. These results show that the metabolism of important freshwater detritivores could be altered by short-term exposure to microplastics, with greater inhibition of metabolic rates at higher temperatures. The consequences of these metabolic changes may take longer to manifest than the duration of our experiments, requiring further investigation. Our results suggest little short-term impact of microplastics on litter breakdown by gammarid amphipods and highlight the importance of environmental context for a better understanding of microplastic pollution in freshwater ecosystems.

Krebs, C. R., et al. (2015). "A portable blood plasma clot micro-elastometry device based on resonant acoustic spectroscopy." Review of Scientific Instruments **86**(7): 075005.

Abnormal blood clot stiffness is an important indicator of coagulation disorders arising from a variety of cardiovascular diseases and drug treatments. Here, we present a portable instrument for elastometry of microliter volume blood samples based upon the principle of resonant acoustic spectroscopy, where a sample of well-defined dimensions exhibits a fundamental longitudinal resonance mode proportional to the square root of the Young's modulus. In contrast to commercial thromboelastography, the resonant acoustic method offers improved repeatability and accuracy due to the high signal-to-noise ratio of the resonant vibration. We review the measurement principles and the design of a magnetically actuated microbead force transducer applying between 23 pN and 6.7 nN, providing a wide dynamic range of elastic moduli (3 Pa-27 kPa) appropriate for measurement of clot elastic modulus (CEM). An automated and portable device, the CEMport, is introduced and implemented using a 2 nm resolution displacement sensor with demonstrated accuracy and precision of 3% and 2%, respectively, of CEM in biogels. Importantly, the small strains (<0.13%) and low strain rates (<1/s) employed by the CEMport maintain a linear stress-to-strain relationship which provides a perturbative measurement of the Young's modulus. Measurements of blood plasma CEM versus heparin concentration show that CEMport is sensitive to heparin levels below 0.050 U/ml, which suggests future applications in sensing heparin levels of post-surgical cardiopulmonary bypass patients. The portability, high accuracy, and high precision of this device enable new clinical and animal studies for associating CEM with blood coagulation disorders, potentially leading to improved diagnostics and therapeutic monitoring.

Krejcova, L., et al. (2012). "Paramagnetic particles coupled with an automated flow injection analysis as a tool for influenza viral protein detection." Electrophoresis **33**(21): 3195-3204.

Currently, the influenza virus infects millions of individuals every year. Since the influenza virus represents one of the greatest threats, it is necessary to develop a diagnostic technique that can quickly, inexpensively, and accurately detect the virus to effectively treat and control seasonal and pandemic strains. This study presents an alternative to current detection methods. The flow-injection analysis-based biosensor, which can rapidly and economically analyze a wide panel of influenza virus strains by using paramagnetic particles modified with glycan, can selectively bind to specific viral A/H5N1/Vietnam/1203/2004 protein-labeled quantum dots. Optimized detection of cadmium sulfide quantum dots (CdS QDs)-protein complexes connected to paramagnetic microbeads was performed using differential pulse voltammetry on the surface of a hanging mercury drop electrode (HMDE) and/or glassy carbon electrode (GCE). Detection limit (3 S/N) estimations based on cadmium(II) ions quantification were 0.1 micro g/mL or 10 micro g/mL viral protein at HMDE or GCE, respectively. Viral protein detection was directly determined using differential pulse voltammetry Brdicka reaction. The limit detection (3 S/N) of viral protein was estimated as 0.1 micro g/mL. Streptavidin-modified paramagnetic particles were mixed with biotinylated selective glycan to modify their surfaces. Under optimized conditions (250 micro g/mL of glycan, 30-min long interaction with viral protein, 25 degrees C and 400 rpm), the viral protein labeled with quantum dots was selectively isolated and its cadmium(II) content was determined. Cadmium was present in detectable amounts of 10 ng per mg of protein. Using this method, submicrogram concentrations of viral proteins can be identified.

Kresnawaty, I., et al. (2014). "Characterization of PHA from Pseudomonas aeruginosa and Bacillus subtilis inoculated in palm oil mill effluent media." Menara Perkebunan **82**(2): 57-63.

The difficulties in processing of petroleum-based plastic waste have encouraged the development of biodegradable plastics polyhydroxyalkanoate (PHA). Researchers isolated the PHA-producing microorganisms from various sources to obtain new species with high PHA production capability. In addition, the high cost of PHA production might be overcome by using carbon-rich waste, such as palm oil mill effluent (POME). This research conducted characterization of produced PHA and optimization of PHA production in POME. In previous research, three potential isolates were obtained, which are one Pseudomonas aeruginosa isolate and two Bacillus subtilis isolates. Analysis of Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) showed the presence of PHA accumulation within the bacterial cell. The results of Spectra of Fourier Transform Infra Red Spectroscopy (FT-IR) revealed differences in C-C and C-H alipathic regions of PHA produced by Pseudomonas aeruginosa and Bacillus subtilis. Optimum production of PHA was obtained using POME at concentration of 50-25% during 6 days of incubation time in an enriched media pretreatment.

Kretzschmar, S. (2019). "Bringing the Workplace to the Classroom." Resource: Engineering & Technology for a Sustainable World **26**(5): 11-11.

Krishhan, V. V., et al. (2009). "Multiplexed microbead immunoassays by flow cytometry for molecular profiling: Basic concepts and proteomics applications." Critical Reviews in Biotechnology **29**(1): 29-43.

Flow cytometry was originally established as an automated method for measuring optical or fluorescence characteristics of cells or particles in suspension. With the enormous increase in development of reliable electronics, lasers, micro-fluidics, as well as many advances in immunology and other fields, flow cytometers have become user-friendlier, less-expensive instruments with an increasing importance for both basic research and clinical applications. Conventional uses of flow cytometry include immunophenotyping of blood cells and the analysis of the cell cycle. Importantly, methods for labeling microbeads with unique combinations of fluorescent spectral signatures have made multiplex analysis of soluble analytes (i.e. the ability to detect multiple targets in a single test sample) feasible by flow cytometry. The result is a rapid, high-throughput, sensitive, and reproducible detection technology for a wide range of biomedical applications requiring detection of proteins (in cells and biofluids) and nucleic acids. Thus, novel methods of flow cytometry are becoming important for diagnostic purposes (e.g. identifying multiple clinical biomarkers for a wide range of diseases) as well as for developing novel therapies (e.g. elucidating drug mechanisms and potential toxicities). In addition, flow cytometry for multiplex analysis, coupled with automated sample handling devices, has the potential to significantly enhance proteomics research, particularly analysis of post-translational modifications of proteins, on a large scale. Inherently, flow cytometry methods are strongly rooted in the laws of the physics of optics, fluidics, and electromagnetism. This review article describes principles and early sources of flow cytometry, provides an introduction to the multiplex microbead technology, and discusses its applications and advantages in comparison to other methods. Anticipated future directions, particularly for translational research in medicine, are also discussed. [References: 173]

Krishnakumar, S., et al. (2018). "A preliminary study on coastal debris in Nallathanni Island, Gulf of Mannar Biosphere Reserve, Southeast coast of India." Marine Pollution Bulletin **131**(Pt A): 547-551.

Nine sampling stations were fixed to carry out the preliminary investigation on coastal debris from Nallathanni island, Gulf of Mannar Biosphere Reserve, Southeast coast of India. The coastal debris were separated and identified using hand picking, visual identification and microscopic studies. The coastal areas of the study region were less dominated by micro plastic contamination. The coastal debris was dominated by polyethylene bottles and fibrous fishnet materials. The distribution of the coastal debris along the coastal region is chiefly controlled by winnowing action of sea waves and Aeolian action along the berm region.

Krishnan, A., et al. (2016). "Overexpression of Soluble Fas Ligand following Adeno-Associated Virus Gene Therapy Prevents Retinal Ganglion Cell Death in Chronic and Acute Murine Models of Glaucoma." Journal of Immunology **197**(12): 4626-4638.

Glaucoma is a multifactorial disease resulting in the death of retinal ganglion cells (RGCs) and irreversible blindness. Glaucoma-associated RGC death depends on the proapoptotic and proinflammatory activity of membrane-bound Fas ligand (mFasL). In contrast to mFasL, the natural cleavage product, soluble Fas ligand (sFasL) inhibits mFasL-mediated apoptosis and inflammation and, therefore, is an mFasL antagonist. DBA/2J mice spontaneously develop glaucoma and, predictably, RGC destruction is exacerbated by expression of a mutated membrane-only FasL gene that lacks the extracellular cleavage site. Remarkably, one-time intraocular adeno-associated virus-mediated gene delivery of sFasL provides complete and sustained neuroprotection in the chronic DBA/2J and acute microbead-induced models of glaucoma, even in the presence of elevated intraocular pressure. This protection correlated with inhibition of glial activation, reduced production of TNF-alpha, and decreased apoptosis of RGCs and loss of axons. These data indicate that cleavage of FasL under homeostatic conditions, and the ensuing release of sFasL, normally limits the neurodestructive activity of FasL. The data further support the notion that sFasL, and not mFasL, contributes to the immune-privileged status of the eye.

Krishnan, A., et al. (2019). "A small peptide antagonist of the Fas receptor inhibits neuroinflammation and prevents axon degeneration and retinal ganglion cell death in an inducible mouse model of glaucoma." Journal of Neuroinflammation **16**(1): 184.

BACKGROUND: Glaucoma is a complex, multifactorial disease where apoptosis, microglia activation, and inflammation have been linked to the death of retinal ganglion cells (RGCs) and axon degeneration. We demonstrated previously that FasL-Fas signaling was required for axon degeneration and death of RGCs in chronic and inducible mouse models of glaucoma and that Fas activation triggered RGC apoptosis, glial activation, and inflammation. Here, we investigated whether targeting the Fas receptor with a small peptide antagonist, ONL1204, has anti-inflammatory and neuroprotective effects in a microbead-induced mouse model of glaucoma.

METHODS: Intracameral injection of microbeads was used to elevate intraocular pressure (IOP) in Fas-deficient (Fas^{lpr}) mice and WT C57BL/6J mice that received an intravitreal injection of the Fas inhibitor, ONL1204 (2 mug/1 mul) (or vehicle only), on day 0 or day 7 after microbead injection. The IOP was monitored by rebound tonometry, and at 28 days post-microbead injection, Brn3a-stained RGCs and paraphenylenediamine (PPD)-stained axons were analyzed. The effects of ONL1204 on retinal microglia activation and the expression of inflammatory genes were analyzed by immunostaining of retinal flatmounts and quantitative PCR (qPCR).

RESULTS: Rebound tonometry showed equivalent elevation of IOP in all groups of microbead-injected mice. At 28 days post-microbead injection, the RGC and axon counts from microbead-injected Fas^{lpr} mice were equivalent to saline-injected (no IOP elevation) controls. Treatment with ONL1204 also significantly reduced RGC death and loss of axons in microbead-injected WT mice when compared to vehicle-treated controls, even when

administered after IOP elevation. Confocal analysis of Iba1-stained retinal flatmounts and qPCR demonstrated that ONL1204 also abrogated microglia activation and inhibited the induction of multiple genes implicated in glaucoma, including cytokines and chemokines (GFAP, Caspase-8, TNFalpha, IL-1beta, IL-6, IL-18, MIP-1alpha, MIP-1beta, MIP-2, MCPI, and IP10), components of the complement cascade (C3, C1Q), Toll-like receptor pathway (TLR4), and inflammasome pathway (NLRP3).

CONCLUSIONS: These results serve as proof-of-principal that the small peptide inhibitor of the Fas receptor, ONL1204, can provide robust neuroprotection in an inducible mouse model of glaucoma, even when administered after IOP elevation. Moreover, Fas signaling contributes to the pathogenesis of glaucoma through activation of both apoptotic and inflammatory pathways.

Krishnan, V. V., et al. (2014). "Multiplexed measurements of immunomodulator levels in peripheral blood of healthy subjects: Effects of analytical variables based on anticoagulants, age, and gender." Cytometry Part B, Clinical Cytometry **86**(6): 426-435.

Multiplex microbead immunoassay (MMIA) is a powerful technology for a wide range of biomedical and clinical applications. It is important to study the normal concentration ranges of immunomodulators under different sample preparation conditions and age groups of subjects in order to more precisely determine their reference values for use in assessing alterations of their levels in disease. The aim of this study was to determine the plasma concentrations of immunomodulators (cytokines, chemokines, and growth factors) in the peripheral blood from healthy subjects by the use of a large multiplex panel, and to determine the effects of different anticoagulants, age, and gender on the immunomodulator levels. In addition, the assay precision for these biomarker analytes was determined. Plasma samples from 107 healthy subjects, aged 18 to 85 years, were collected in three different anticoagulants (sodium citrate, EDTA, Heparin); corresponding serum samples were also obtained. Multiplex microbead immunoassays were performed for measuring a total of 23 analytes including chemokines, cytokines, and growth factors (IL-1beta, IL-1ra, IL-2, IL-6, IL-7, IL-8, IL-12 p70, IL-17, IFN-gamma, IP-10, MCP-1, PDGF-BB, RANTES, TNF-alpha, IL-1a, IL-16, HGF, MIG, TNF-beta, PDGF-ABBB, EGF, Flt-3 Ligand, VEGF). For these analytes, our results showed that the anticoagulant affected the concentration measurements and the coefficients of variation. However, the relative levels of the analytes (profiles) of samples collected in a particular anticoagulant are consistent. The analytes IL-1beta, IL-7, Flt-3 Ligand, and IL-12p70 show the largest variation (up to fourfold) between the age groups. In addition, no statistically significant differences in the level of the analytes were found between the sexes.

Krishnan, V. V., et al. (2018). "Proteomic profiles by multiplex microsphere suspension array." Journal of Immunological Methods **461**: 1-14.

Advances in high-throughput proteomic approaches have provided substantial momentum to novel disease-biomarker discovery research and have augmented the quality of clinical studies. Applications based on multiplexed microsphere suspension array technology are making strong in-roads into the clinical diagnostic/prognostic practice. Conventional proteomic approaches are designed to discover a broad set of proteins that are associated with a specific medical condition. In comparison, multiplex microsphere immunoassays use quantitative measurements of selected set(s) of specific/particular molecular markers such as cytokines, chemokines, pathway signaling or disease-specific markers for detection, metabolic disorders, cancer, and infectious agents causing human, plant and animal diseases. This article provides a foundation to the multiplexed microsphere suspension array technology, with an emphasis on the improvements in the technology, data analysis approaches, and applications to translational and

clinical research with implications for personalized and precision medicine.

Kritz, G. and T. Khaled (1995). "Method for measuring air space and moisture content at different pot depths." Acta Horticulturae **401**: 107-114.

A method was developed to characterize air and moisture distributions at different depths in pots using a PVC cylinder, 10 cm (height) and 15 cm (inner diameter). The lower part (height 8 cm; 12-20 cm from the top) comprised a solid phase above which, at 2 cm, was a secondary base perforated with holes to allow for passage of water which can be removed via a hose connection. This secondary base was covered with a filter of sintered polyethylene plastic particles. The upper part consisted of six consecutive detachable rings (each of height 2 cm). The substrate in the cylinder could be saturated and drained (to a depth 12 cm) by means of an adjustable water table connected to the base of the cylinder via a hose. During the first saturating and draining cycle, an extension collar (height 8 cm) was placed on the cylinder, but during the second similar cycle no collar was used. Bulk density, porosity, air space and moisture content were determined in each ring layer. The results showed that the air space decreased with an increase in pot depth and the degree of decomposition of the peat. The cylinder is now being used with Time Domain Reflectometry probes and mini-tensiometers to measure moisture content and pressure heads, respectively.

Kronekova, Z., et al. (2018). "Structural changes in alginate-based microspheres exposed to in vivo environment as revealed by confocal Raman microscopy." Scientific Reports **8**(1): 1637.

A next-generation cure for type 1 diabetes relies on immunoprotection of insulin-producing cells, which can be achieved by their encapsulation in microspheres made of non-covalently crosslinked hydrogels. Treatment success is directly related to the microsphere structure that is characterized by the localization of the polymers constituting the hydrogel material. However, due to the lack of a suitable analytical method, it is presently unknown how the microsphere structure changes in vivo, which complicates evaluation of different encapsulation approaches. Here, confocal Raman microscopy (CRM) imaging was tailored to serve as a powerful new tool for tracking structural changes in two major encapsulation designs, alginate-based microbeads and multi-component microcapsules. CRM analyses before implantation and after explantation from a mouse model revealed complete loss of the original heterogeneous structure in the alginate microbeads, making the intentionally high initial heterogeneity a questionable design choice. On the other hand, the structural heterogeneity was conserved in the microcapsules, which indicates that this design will better retain its immunoprotective properties in vivo. In another application, CRM was used for quantitative mapping of the alginate concentration throughout the microbead volume. Such data provide invaluable information about the microenvironment cells would encounter upon their encapsulation in alginate microbeads.

Kroon, F., et al. (2018). "A workflow for improving estimates of microplastic contamination in marine waters: A case study from North-Western Australia." Environmental Pollution **238**: 26-38.

Plastic pollution is ubiquitous throughout the marine environment, with microplastic (i.e. <5mm) contamination a global issue of emerging concern. The lack of universally accepted methods for quantifying microplastic contamination, including consistent application of microscopy, photography, an spectroscopy and photography, may result in unrealistic contamination estimates. Here, we present and apply an analysis workflow tailored to quantifying microplastic contamination in marine waters, incorporating stereomicroscopic visual sorting, microscopic photography and attenuated total reflectance (ATR) Fourier transform infrared (FTIR) spectroscopy. The workflow outlines step-by-step processing and associated decision making, thereby reducing bias in plastic identification and improving confidence in contamination estimates. Specific processing steps include (i) the use of a commercial algorithm-based comparison of particle spectra against an extensive commercially curated spectral library, followed by spectral interpretation to establish the chemical composition, (ii) a comparison against a customised contaminant spectral library to eliminate procedural contaminants, and (iii) final assignment of particles as either natural- or anthropogenic-derived materials, based on chemical type, a compare analysis of each particle against other particle spectra, and physical characteristics of particles. Applying this workflow to 54 tow samples collected in marine waters of North-Western Australia visually identified 248 potential anthropogenic particles. Subsequent ATR-FTIR spectroscopy, chemical assignment and visual re-inspection of photographs established 144 (58%) particles to be of anthropogenic origin. Of the original 248 particles, 97 (39%) were ultimately confirmed to be plastics, with 85 of these (34%) classified as microplastics, demonstrating that over 60% of particles may be misidentified as plastics if visual identification is not complemented by spectroscopy. Combined, this tailored analysis workflow outlines a consistent and sequential process to quantify contamination by microplastics and other anthropogenic microparticles in marine waters. Importantly, its application will contribute to more realistic estimates of microplastic contamination in marine waters, informing both ecological risk assessments and experimental concentrations in effect studies.

Kroon, F. J., et al. (2018). "Classification of marine microdebris: a review and case study on fish from the Great Barrier Reef, Australia." Scientific Reports **8**(1).

Marine debris, and in particular plastic pollution, is ubiquitous throughout global marine environments. Here, we present a classification of marine microdebris (i.e. debris between 0.1 micro m and <5 mm) tailored to represent synthetic, semi-synthetic and naturally-derived items. The specific aim of this classification is to introduce a level of consistency in the higher-level characterisation of marine microdebris, thereby improving the overall reporting on marine microdebris contamination. We first conducted an extensive literature review on the accumulation of ingested debris in fish to identify discrepancies in marine microdebris reporting as a basis for the new classification. The review reveals the diverse nature of ingested marine microdebris, including items that are non-plastic but often incorrectly reported on as microplastics. We then applied our classification to a case study on wild-caught juvenile coral trout, Plectropomus spp., from the Great Barrier Reef World Heritage Area, Australia. This first report on accumulation of ingested marine debris in commercial fish on the reef demonstrates a high frequency of occurrence and a prevalence of semi-synthetic and naturally-derived fibres. Based on our findings, we offer recommendations on potential improvements for the classification presented, ultimately contributing to a more realistic assessment of the ecological risks of marine microdebris.

Kubo, I., et al. (2014). Microfluidic device for enzyme-linked immunosorbent assay (ELISA) and its application to bisphenol a sensing, M Y U Scientific Publishing Division.

Bisphenol A (BPA) is a commonly used material made of polycarbonate, which is used in food containers. BPA is known to be an endocrine disruptor. To investigate the effect of BPA on health, animal experiments are necessary. To determine the intake of BPA in food or drink by animals, a BPA-sensing system that can detect a small amount of BPA in biological samples within a short reaction time is needed. We have developed a disc-shaped microfluidic device for enzyme linked immunosorbent assay (ELISA) with 32 microchannels and chambers. In order to establish a rapid and sensitive assay system for BPA in biological samples, in this study, anti-BPA

antibody was immobilized on microbeads and introduced into microchambers on the microchannels in the device. A competitive immunoassay was performed using horse radish peroxidase (HRP)-conjugated BPA with a small amount of sample solution within 20 min. After the immune reaction, the HRP activity in each microchamber was detected by chemiluminescence. BPA could be determined on the microfluidic disk at a concentration range between 3.9 and 250 ng/ml. BPA-spiked rat serum was also determined on the disk.

Kubowicz, S. and A. M. Booth (2017). "Biodegradability of Plastics: Challenges and Misconceptions." Environmental Science and Technology **51**(21): 12058-12060.

Plastics are one of the most widely used materials and, in most cases, they are designed to have long life times. Thus, plastics contain a complex blend of stabilizers that prevent them from degrading too quickly. Unfortunately, many of the most advantageous properties of plastics such as their chemical, physical and biological inertness and durability present challenges when plastic is released into the environment. Common plastics such as polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyethylene terephthalate (PET) are extremely persistent in the environment, where they undergo very slow fragmentation (projected to take centuries) into small particles through photo-, physical, and biological degradation processes¹. The fragmentation of the material into increasingly smaller pieces is an unavoidable stage of the degradation process. Ultimately, plastic materials degrade to micron-sized particles (microplastics), which are persistent in the environment and present a potential source of harm for organisms. Copyright © 2017 American Chemical Society.

Kudo, K., et al. (2018). "ESTIMATION OF TEMPORAL VARIATIONS AND ANNUAL FLUX OF MICROPLASTICS IN RIVERS UNDER LOW- AND HIGH-FLOW CONDITIONS." Doboku Gakkai Ronbunshu. B1, Suikogaku = Journal of Japan Society of Civil Engineers. Ser. B1, Hydraulic Engineering **74**(4).

Numerical and mass concentrations of microplastics in sizes < 5mm were investigated based on in-situ surveys on the surface of two rivers (Edo River and Ohori River), and annual flux of floating microplastics of Edo River were estimated by using a statistically significant relationship of the concentrations with river discharge. Good correlation between MP flux and discharge (i.e., L-Q relation) was also found in Edo River. Annual flux of numerical (mass) MP concentrations on the Edo River was 1.5×1010 pieces (2.42 ton). The ratio of numerical (mass) MP flux under high flow conditions was 73.5% (84.1%) in the total flux. These results indicate that the high ratio of MP flux in flooding conditions was similar to that of macro debris flux in rivers.

Kuhn, K. R., et al. (2019). "Production of whey protein isolate - gellan microbeads for encapsulation and release of flaxseed bioactive compounds." Journal of Food Engineering **247**: 104-114.

Production of 1.5% (w/v) whey protein isolate (WPI) - 0.1, 0.3 or 0.5% (w/v) gellan gum microbeads from extrusion of the oil-in-water (O/W) emulsions into a 0.56% (w/v) calcium chloride (CaCl₂) solution was evaluated to encapsulate flaxseed oil (15% v/v) and protein hydrolysate (FPH) (0, 0.25 or 0.5% w/v). Microgels resistance and controlled release of oil and FPH were also investigated. Microscopic images showed few free oil droplets and a prevailing presence of gellan on the external surface of the microbeads, indicating that oil and FPH were encapsulated. Microbeads produced at higher gellan concentrations (0.3 or 0.5% w/v) showed a more regular and spherical morphology. However a significant decrease in microbeads size (from ~55 micro m to ~50 micro m) and an increase in the polydispersity were observed with the FPH addition, which can be a consequence of the formation of a more dense biopolymers network. FPH presence (0.25% w/v) decreased the viscosity and shear thinning behavior of microbeads suspensions (10-90% w/v), which could be partly attributed to the smaller size of particles. The microbeads suspensions were stable at different salt concentrations (0.56, 1.11 or 2.22% w/v) regarding their shape, not releasing the encapsulated oil. 1.5% (w/v) WPI - 0.3% (w/v) gellan microbeads were resistant to simulated gastric conditions, but did not resist to intestinal conditions. Our results show that these microgels are adequate to encapsulate bioactive compounds to be released in the small intestine, passing intact in the stomach, which makes the process attractive in order to maintain the bioavailability and functionality of such compounds.

Kuhn, S. and J. A. v. Franeker (2012). "Plastic ingestion by the northern fulmar (Fulmarus glacialis) in Iceland." Marine Pollution Bulletin **64**(6): 1252-1254.

In 2011, northern fulmars (Fulmarus glacialis) from Iceland were used to test the hypothesis that plastic debris decreases at northern latitudes in the Atlantic when moving away from major human centres of coastal and marine activities. Stomach analyses of Icelandic fulmars confirm that plastic pollution levels in the North Atlantic tend to decrease towards higher latitudes. Levels of pollution thus appear to link to regions of intense human coastal and marine activities, suggesting substantial current inputs in those areas.

Kühn, S., et al. (2018). "Plastic ingestion by juvenile polar cod (<i>Boreogadus saida</i>) in the Arctic Ocean." Polar Biology **41**(6): 1269-1278.

One of the recently recognised stressors in Arctic ecosystems concerns plastic litter. In this study, juvenile polar cod (Boreogadus saida) were investigated for the presence of plastics in their stomachs. Polar cod is considered a key species in the Arctic ecosystem. The fish were collected both directly from underneath the sea ice in the Eurasian Basin and in open waters around Svalbard. We analysed the stomachs of 72 individuals under a stereo microscope. Two stomachs contained non-fibrous microplastic particles. According to µFTIR analysis, the particles consisted of epoxy resin and a mix of Kaolin with polymethylmethacrylate (PMMA). Fibrous objects were excluded from this analysis to avoid bias due to contamination with airborne micro-fibres. A systematic investigation of the risk for secondary micro-fibre contamination during analytical procedures showed that precautionary measures in all procedural steps are critical. Based on the two non-fibrous objects found in polar cod stomachs, our results show that ingestion of microplastic particles by this ecologically important fish species is possible. With increasing human activity, plastic ingestion may act as an increasing stressor on polar cod in combination with ocean warming and sea-ice decline in peripheral regions of the Arctic Ocean. To fully assess the significance of this stressor and its spatial and temporal variability, future studies must apply a rigorous approach to avoid secondary pollution.

Kuhn, S., et al. (2018). "Plastic ingestion by juvenile polar cod (Boreogadus saida) in the Arctic Ocean." Polar Biology **41**(6): 1269-1278.

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Kuhn, S., et al. (2019). "Details of plastic ingestion and fibre contamination in North Sea fishes." Environmental Pollution: 113569.

This study combines published datasets with unpublished data on plastic ingestion in several North Sea fish species. The combined dataset of 4389 individuals from 15 species allows the analysis of spatial distribution and temporal variability of plastic uptake in fish. Airborne fibre contamination was observed to be the main contributor to fibres encountered in the samples. The number of fibres in samples was strongly related to the time needed to process a sample, not to the number of individual fishes in the sample. Accurate correction for secondary fibre contamination was not possible, but corrections required would be similar to fibre numbers observed in the samples. Consequently, all fibres were omitted from further analysis. The frequency of occurrence and the average number of plastics in fish is generally low (1.8% and 0.022 pieces per organism respectively), with only cod having a higher prevalence (12.3%). While latitude of catch locations influences plastic uptake in fish, no correlation with the distance to the coast was found. Slightly less plastics were ingested in winter, and a decrease in plastics ingested was observed between 2009 and 2018. These factors should be considered when fish species, catch location and time are discussed as indicators for plastic pollution in the European Marine Strategy Framework Directive. We recommend considering demersal cod and pelagic sprat as two species suitable for monitoring plastic ingestion in biota, both on the seafloor and in the water column.

Kuhn, S., et al. (2018). "Marine microplastic: Preparation of relevant test materials for laboratory assessment of ecosystem impacts." Chemosphere **213**: 103-113.

Studies investigating the effects of plastic litter on marine biota have almost exclusively utilised pristine plastic materials that are homogeneous in polymer type, size, shape and chemical composition. This is particularly the case for microplastics (<5mm), where collecting sufficient quantities from the marine environment for use in laboratory impacts studies is simply not feasible. Weathered plastics collected from the marine environment show considerable physical and chemical differences to pristine and post-production consumer plastics. For this study, macroplastic litter was collected on a Dutch beach and cryo-milled to create a microplastic mixture for environmental impact assessments. The sample composition followed proportions of marine plastic litter types observed in an earlier large beach clean-up. Polymer composition of the sample was assessed by infrared spectroscopy (ATR-FTIR) and differential scanning calorimetry analysis (DSC). The particle size distribution of the cryo-milled microplastics showed that particles 0.5-2.0mm represented 68% of mass, but smaller sizes (<2mm) strongly dominated numerically. Inductively coupled plasma spectroscopy (ICP-MS and ICP-OES) analysis of the microplastic mixture revealed a broad range of metals and other elements (e.g. Al, Cd, Cr, Fe, Mg, Pb, S and Zn), representing common inorganic additives used as colorants, fillers and stabilisers. GC-MS analysis identified a broad range of organic plasticisers, stabilisers, antioxidants and flame retardants. Comparison of different analytical approaches showed that creation of a homogeneous microplastic mixture is possible, representing a first step in closing the gap between laboratory studies with pristine materials and realistic scenarios with weathered microplastic.

Kuhn, S., et al. (2017). "The use of potassium hydroxide (KOH) solution as a suitable approach to isolate plastics ingested by marine organisms." Marine Pollution Bulletin **115**(1-2): 86-90.

In studies of plastic ingestion by marine wildlife, visual separation of plastic particles from gastrointestinal tracts or their dietary content can be challenging. Earlier studies have used solutions to dissolve organic materials leaving synthetic particles unaffected. However, insufficient tests have been conducted to ensure that different categories of consumer products partly degraded in the environment and/or in gastrointestinal tracts were not affected. In this study 63 synthetic materials and 11 other dietary items and non-plastic marine debris were tested. Irrespective of shape or preceding environmental history, most polymers resisted potassium hydroxide (KOH) solution, with the exceptions of cellulose acetate from cigarette filters, some biodegradable plastics and a single polyethylene sheet. Exposure of hard diet components and other marine debris showed variable results. In conclusion, the results confirm that usage of KOH solutions can be a useful approach in general quantitative studies of plastic ingestion by marine wildlife.

Kukulka, T. and K. Brunner (2015). "Passive buoyant tracers in the ocean surface boundary layer: 1. Influence of equilibrium wind-waves on vertical distributions." Journal of Geophysical Research: Oceans **120**(5): 3837-3858.

This paper is the first of a two part series that investigates passive buoyant tracers in the ocean surface boundary layer. The first part examines the influence of equilibrium wind-waves on vertical tracer distributions, based on large eddy simulations (LES) of the wave-averaged Navier-Stokes equation. The second part applies the model to investigate observations of buoyant microplastic marine debris, which has emerged as a major ocean pollutant. The LES model captures both Langmuir turbulence (LT) and enhanced turbulent kinetic energy input due to breaking waves (BW) by imposing equilibrium wind-wave statistics for a range of wind and wave conditions. Concentration profiles of LES agree well with analytic solutions obtained for an eddy diffusivity profile that is constant near the surface and transitions into the K-Profile Parameterization (KPP) profile shape at greater depth. For a range of wind and wave conditions, the eddy diffusivity normalized by the product of water-side friction velocity and mixed layer depth, h, mainly depends on a single nondimensional parameter, the peak wavelength (which is related to Stokes drift decay depth) normalized by h. For smaller wave ages, BW critically enhances near-surface mixing, while LT effects are relatively small. For greater wave ages, both BW and LT contribute to elevated near-surface mixing, and LT significantly increases turbulent transport at greater depth. We identify a range of realistic wind and wave conditions for which only Langmuir (and not BW or shear driven) turbulence is capable of deeply submerging buoyant tracers. Key Points: * Langmuir (and not breaking wave) turbulence deeply submerges buoyant tracers * For young seas, breaking waves critically enhance near-surface mixing * Stokes drift decay length is a key for parameterizing wave-driven turbulence

Kulkarni, R. V., et al. "Novel interpenetrated polymer network microbeads of natural polysaccharides for modified release of water soluble drug: In-vitro and in-vivo evaluation." Journal of Pharmacy and Pharmacology.

Objectives The objective of this work was to prepare novel interpenetrating polymer network (IPN) microbeads of tamarind seed polysaccharide and sodium alginate for controlled release of the water soluble drug, diltiazem hydrochloride. Methods The diltiazem-Indion 254

(a cation exchange resin) complex was prepared and the resulting complex was entrapped within IPN microbeads prepared by ionotropic gelation and covalent crosslinking. Microbeads were characterized by scanning electron microscopy, differential scanning calorimetry, thermogravimetric analysis, X-ray diffraction and Fourier transform infrared spectroscopy (FTIR) analyses, and evaluated for swelling, in-vitro release and preclinical pharmacokinetics. Key findings The unformulated drug showed complete dissolution within 60min, while drug release from diltiazem-ion-exchange resin complex was extended for 2.5h but IPN microbeads extended the release for longer period. The ionically crosslinked microbeads released the drug for 6h, while dual crosslinked microbeads extended the release for 9h. The microbeads containing a higher amount of glutaraldehyde released the drug very slowly. The results of in-vivo pharmacokinetics of pure drug and drug-loaded IPN microbeads showed that the microbeads demonstrated prolonged release supporting the findings of in-vitro studies. Conclusions Prepared IPN microbeads showed prolonged in-vitro and in-vivo release for diltiazem, indicating that this IPN would be a versatile delivery system for water soluble drugs. © 2011 The Authors. JPP © 2011 Royal Pharmaceutical Society.

Kumachev, A., et al. (2011). "High-throughput generation of hydrogel microbeads with varying elasticity for cell encapsulation." Biomaterials **32**(6): 1477-1483.

Elasticity of cellular microenvironments strongly influences cell motility, phagocytosis, growth and differentiation. Currently, the relationship between the cell behaviour and matrix stiffness is being studied for cells seeded on planar substrates, however in three-dimensional (3D) microenvironments cells may experience mechanical signalling that is distinct from that on a two-dimensional matrix. We report a microfluidic approach for high-throughput generation of 3D microenvironments with different elasticity for studies of cell fate. The generation of agarose microgels with different elastic moduli was achieved by (i) introducing into a microfluidic droplet generator two streams of agarose solutions, one with a high concentration of agarose and the other one with a low concentration of agarose, at varying relative volumetric flow rate ratios of the two streams, and (ii) on-chip gelation of the precursor droplets. At 37 degreeC, the method enabled a ~35-fold variation of the shear elastic modulus of the agarose gels. The application of the method was demonstrated by encapsulating two mouse embryonic stem cell lines within the agarose microgels. This work establishes a foundation for the high-throughput generation of combinatorial microenvironments with different mechanical properties for cell studies. © 2010.

Kumagai, Y., et al. (2017). "Low-density neutrophils (LDN) in circulating blood of postoperative patients may participate in the development of distant recurrence through the production of neutrophil extracellular traps (NETs)." Cancer Immunology Research. Conference **6**(9 Supplement).

Background: Low density neutrophils (LDN) which are co-purified with mononuclear cells by Ficoll-Hypaque density gradient preparations, have been reported to be increased in circulating blood in patients with autoimmune diseases, sepsis and cancer. Recent studies have suggested the LDN contributes to lupus pathogenesis as well as the development of organ damage in sepsis. Method(s): In patients who underwent curative surgery for gastrointestinal malignancy, peripheral blood was obtained at the timing of laparotomy (preoperative) and just before wound closure (postoperative) and the ratios of LDN were evaluated with flowcytometry. The LDN and mononuclear cells (MNC) in postoperative samples were separated using CD66b microbeads and MACS column and the proliferation of T cells were evaluated by in vitro culture on anti-CD3 coated plate using CFSE dilution method. The LDN were cultured for 2 hours and neutrophil extracellular traps (NETs) were observed with the addition of SYTOX green, dye for extracellular double strand (ds)-DNA. In adhesion experiments, human colon cancer, DLD-1,

were stained by PKH-26 and added on the cultured LDN for 5 min. After gentle washing, the remaining cells were counted under fluorescein microscope. Result(s): 1. Ratios of CD66b(+) LDG in CD45(+) leukocytes were markedly increased in postoperative as compared with preoperative blood samples. 2. Division of CD3(+) T cells were significantly suppressed by the addition autologous CD66b(+) LDN. 3. Short term culture of the LDN produced massive thread-like structures stained with SYTOX green. Immunostaining with specific mAbs revealed that histone and myeloperoxidase (MPO) were colocalized on the fibrous structure, indicating NETs 3. DLD-1, selectively attached to the NETs, which was totally abrogated by the pretreatment with 100u/ml DNAse. Conclusion(s): During abdominal surgery, immunosuppressive LDN are markedly increased in circulating blood. The LDN extensively produces NETs which support the metastasis formation by trapping the circulating tumor cells in target organ. Functional blockade of the LDN might effectively reduce the recurrence rate after curative surgery.

Kumar, A. and M. Bharkatiya (2019). "Simultaneous estimation of drugs present in microbeads for colon-targeted drug delivery system." Asian Journal of Pharmaceutical and Clinical Research **12**(11): 122-125.

Objectives: The present study was aimed to develop Eudragit S100 coated colon-targeted sustained-release formulations of alginate-pectin and alginate-hydroxypropyl methylcellulose microbeads containing norfloxacin (NF) and tinidazole (TZ) for the treatment of amebiasis which was simultaneous estimated. Method(s): Taguchi L9 orthogonal array design has been used to optimize the composition and operating conditions for the preparation of formulations. Nine batches (P1-H5) were prepared by taking three independent variables (X<inf>1</inf> - drug:polymer ratio, X<inf>2</inf> - concentration of sodium alginate, and X<inf>3</inf> - curing time) at three levels (1, 2, and 3). Response variables studied for batches (P1-H5) were mean particle size (micro m) (Y<inf>1</inf>), drug entrapment efficiency (% w/w) (Y<inf>2</inf>), and drug loading (% w/w) (Y<inf>3</inf>). NF and TZ were simultaneous estimated by ultraviolet spectrophotometric method. Drug-polymer compatibility study was carried out by differential scanning calorimetry and Fourier-transform infrared spectroscopy and indicates no physicochemical interaction. Result(s): Microbeads were analyzed for morphological characteristics, mean particle size, drug entrapment efficiency, drug loading, and in vitro drug release. The average size of optimized alginate-pectin microbeads was found to be 881+/-0.05 micro m with an entrapment efficiency of 78.50+/-0.28% (NF) and 86.50+/-0.32% (TZ) which was simultaneous estimated. Conclusion(s): The studies concluded that formulated enteric-coated alginate-pectin microbeads after enteric coating can be used effectively for the delivery of NF and TZ to colon. Copyright © 2019 The Authors. Published by Innovare Academic Sciences Pvt Ltd.

Kumar, A. and R. K. Dutta (2015). "CdS quantum dots immobilized on calcium alginate microbeads for rapid and selective detection of Hg super(2+) ions." RSC advances **5**(93): 76275-76284.

Mercury is extremely toxic to the environment and is detrimental to human health. We describe here the development of an analytical method comprising mercaptoacetic acid capped CdS quantum dots (QDs) immobilized on calcium alginate microbeads (referred here as CA[at]CdS) for rapid, selective and quantitative detection of Hg super(2+) ions based on a fluorescence quenching phenomenon. The feasibility of detecting Hg super(2+) ions in this method is extended to real time analysis by spiking 0.5 mg L super(-1) and 1.0 mg L super(-1) Hg super(2+) ions in batches of municipal tap water. The mechanism of fluorescence quenching has been explained on the basis of adsorption of Hg super(2+) (adsorption capacity was determined to be 88.33 mu g g super(-1)). The selectivity of Hg super(2+) ions is attributable to its soft acid-soft

base interaction between Hg super(2+) and the sulphydryl group of the mercaptoacetic acid capped CdS QDs. The fluorescence quenching phenomenon satisfied the Stern-Volmer equation and was linearly correlated with Hg super(2+) ions concentrations in the range of 0.015 and 2.0 mg L super(-1). The limit of detection of Hg super(2+) ion was determined to be 0.008 mg L super(-1) at an optimized condition, i.e., pH 6 and contact time 30 min; and the detection was not affected by other experimentally relevant cations like Na super(+), Mg super(2+), K super(+), Ca super(2+), Mn super(2+), Fe super(2+), Cu super(2+), Pb super(2+), Cr super(3+), Zn super(2+), As super(3+), Cd super(2+); and anions like Cl super(-), CO sub(3) super(2-), HCO sub(3) super(-), HPO sub(4) super(-), SeO sub(4) super(-), SO sub(4) super(2-). The major advantage of this nano-fluoroprobe is that it can detect as well as remove Hg super(2+) ions from an aqueous medium. The fluoroprobe can be recovered and re-used for subsequent cycles of detection and removal of Hg super(2+) ions.

Kumar, A., et al. (2017). "Immune mediators as biomarker candidates in familial amyotrophic lateral sclerosis." Neurology. Conference: 69th American Academy of Neurology Annual Meeting, AAN **88**(16 Supplement 1).

Objective: To identify immune mediators as pathogenic disease biomarkers in cerebrospinal fluid (CSF) and serum in familial amyotrophic lateral sclerosis (FALS) patients. Background(s): ALS produces severe disability and high rates of mortality, with 80% of the patients dying within 5 years of onset. FALS cases, caused by C9ORF72 hexanucleotide repeat expansion appear to be more aggressive than sporadic cases. Nonetheless, the pathophysiology of these cases has not been fully elucidated and requires the exploration for distinctive biomarkers. Design/Methods: CSF and serum were obtained from the Natural History and Biomarkers of C9ORF72 ALS and FTD study at NIH and the Johns Hopkins Neuroimmunology Biorepository. Immune meditors which included chemokines and cytokines were quantified using multiplexed microbead array assays (Luminex, EMD Millipore Corp., MA) in cases of FALS and frontotemporal dementia (n=15), sporadic ALS (n=9) and neurological disease controls (n=14). Non-parametric statistics was used to analyze the 3 groups. Result(s): IL-1 pro-inflammatory pathway appeared to be significantly increased in the CSF of familial ALS cases vs. neurological disease controls. In serum, significant increase were identified among the same groups for interferon a2, platelet derived growth factor AA (PDGF-AA) and soluble CD40 ligand. Differences were also observed between familial and sporadic ALS cases in serum concentrations of Flt3 ligand (Flt3-L), granulocyte-macrophage colonystimulating factor (GM-CSF) and CXCL5 (RANTES). Conclusion(s): Cases of FALS appear to have a pro-inflammatory immune mediators profile in the CSF and serum. Selective increases of IL-1 pro-inflammatory pathway were observed in cases of FALS compared to neurological disease controls. Increases in levels of Flt3-L, GM-CSF were seen in FALS cases compared with sporadic ALS. Despite no correspondence between the immune profile of CSF and serum, evidence of increase of immune mediators was observed in cases of FALS in both serum and CSF, a finding that support the presence of possible immune disturbances in cases of FALS.

Kumar, A. and B. Starly (2016). Modeling human mesenchymal stem cell expansion in vertical wheel bioreactors using lactate production rate in regenerative medicine biomanufacturing. ASME 2016 11th International Manufacturing Science and Engineering Conference, MSEC 2016.

Stem cells are critical components of regenerative medicine therapy. However, the therapy will require millions to billions of therapeutic stem cells. To address the need, we have recently cultured stem cells in 3D microgels and used them as a vehicle for cell expansion within a low shear stress rotating wheel type bioreactor within a 500ml volumetric setting. This study specifically highlights the cell encapsulation in microbead process, harvesting and operation of microbeads within a dynamic bioreactor environment. We have specifically encapsulated stem cells (human adipose derived) into microbeads prepared from alginate hydrogels via an electrostatic jetting process. This study highlights the effect of fabrication process parameters on end-point biological quality measures such as stem cell count and viability. We were able to maintain a >80% viability during the 21 day static culture period. We have also measured the concentration of metabolites produced during the expansion, specifically lactate production measured during specific time points within culture inside the rotating wheel bioreactor Future work will need to address predicting yields in higher volume settings, efficiency of harvest and a more detailed description of the hydrodynamics affecting stem cell growth. Copyright © 2016 by ASME.

Kumar, C., et al. (2004). "Synthesis and characterization of S-Au interaction in gold nanoparticle bound polymeric beads." Journal of Nanoparticle Research **6**(4): 369-376.

A detailed X-ray Absorption Spectroscopic examination of S-Au interaction in gold nanoparticle bound to Polystyrene-Divinyl Benzene (PS-DVB) micro beads was carried out. Gold nanoparticles were bound to the surface of the commercially available PS-DVB beads using a simple one step procedure. Influence of polystyrene backbone on the electronic structure of the gold nanoparticles was observed through X-ray Absorption Near Edge Structure (XANES) spectra of Au at L III edge. An additional structure in the white line of the S K-edge XANES spectrum confirmed the presence of S-Au bonding. Transmission Electron Microscopy (TEM) studies coupled with Selected Area Electron Diffraction Pattern and X-ray Diffraction studies revealed the morphology of the Au nanoparticles bound to the micro beads.[PUBLICATION ABSTRACT]

Kumar, G. S., et al. (2016). "Thermostable alpha-amylase immobilization: Enhanced stability and performance for starch biocatalysis." Biotechnology & Applied Biochemistry **63**(1): 57-66.

The uses of thermostable starch hydrolytic biocatalysts are steadily increasing for the industrial application because of their obvious need for biocatalytic performance at elevated temperatures. The starch liquefaction and saccharification can be carried out simultaneously by the use of thermostable starch hydrolytic biocatalysts, thus minimizing the unit operations, time, and efforts. The cost factor hampers the industrialization of expensive soluble (free) enzymes for biocatalytic applications and the immobilization of enzymes offers promising alternative to the hurdle. The present investigation was aimed for immobilization of thermostable alpha-amylase using calcium alginate, and statistical optimization studies were carried out for enhanced biocatalytic performance. Initially, one-parameter at a time optimization studies were carried out for identification of significant factors influencing the immobilization. Furthermore, a statistical approach, response surface methodology, was applied for immobilization of alpha-amylase. The immobilized alpha-amylase in alginate microbeads showed enhanced stability to temperature and reusable property for up to seven cycles (with the retention of 50% initial activity). Finally, the kinetic behavior of free and immobilized enzyme showed the Km value of 1.2% and 2.6% (w/v) and Vmax of 1,020 and 1,030 U, respectively. Fifty percent reduction in affinity of the immobilized enzyme toward substrate was compensated by its longer stability.

Kumar, J., et al. (2013). "ECONOMICAL SYNTHESIS OF MAGNETIC MICROBEADS FOR BIOREMEDIATION APPLICATIONS." OnLine Journal of Biological Sciences **13**(1): 35.

There are very few reports of utilizing the iron based wastes materials for applications like the removal of heavy metals like arsenic, lead and also, for the adsorption of the hazardous dyes. In the current study, the focus has been to utilize the metal tailings of irregular morphology to

obtain the spherical magnetic beads. The precursor substances were studied for their morphology transformation under different reaction conditions viz., atmospheric conditions, under pressure and on an aluminium hot plate along with the fatty acid mixtures. The particles were characterized for their morphology through the SEM analysis. The results of post functionalization reveals the particles do not undergo size reduction under atmospheric pressure but significant change in morphology was observed. On the contrary, under pressure at 25 psi (using single stage air cooled reciprocating compressor), it was observed to have not only changed the morphology but also the size reduction of about 30% for a slight increase of pressure above atmospheric pressure.

Kumar, K., et al. (2013). "Hmg-coa reductase inhibitors do not attenuate the inflammatory response associated with glutaraldehyde-fixed bioprosthetic heart valve conduits." Canadian Journal of Cardiology **1)**: S261.

BACKGROUND: Bioprosthetic valve failure due to calcification continues to remain the major determinant in utilizing this valve type for young adults. Evidence suggests that there is an immunological response of the recipient to xenograft bioprosthetic heart valves leading to inflammation and eventual premature calcification. Information on the impact of statins and their anti-inflammatory properties on bioprosthetic valve failure remains limited and difficult to study in the clinical setting. We sought to examine the efficacy of statin therapy in a rodent model of bioprosthetic valve implantation. METHOD(S): To mimic the human scenario, fresh or 48-hour glutaraldehyde-fixed aortic valve root conduits fromLewis rats or Hartley guinea pigs were microsurgically implanted intravascularly into the infra-renal aorta of Lewis rats.Animals were assigned to 1 of 4 groups (n = 10 / group). The syngeneic control group consisted of a fresh rat valve conduit implanted into a rat (Group 1). The xenogeneic control group consisted of glutaraldehydefixed guinea pig valve conduit implanted into a rat (Group 2), thusmimicking the clinical scenario. Groups 3 and 4 consisted of xenogeneic groups treated with either daily steroids (methylprednisolone [0.5mg/kg]) or rosuvastatin (20mg/kg). At the study end-point (28-days post implantation), valve conduits were excised for histological and immunological analyses. RESULT(S): Electron microscopy confirmed that following fixation, our rodent model prosthesis conduit undergoes similar changes that occur with bioprosthetic valves for humans. Steroid treatment attenuated the inflammatory response seen within the xenogeneic glutaraldehyde-fixed valve conduits. This finding was confirmed by H&E analysis (median inflammatory score 0 versus ++ as reviewed by two blinded pathologists), immunohistochemistry (median CD68 infiltration 32% versus 42%, Figure 1), and micro-bead cytokine analyses (IL-1 alpha, IL-beta, TNF-alpha, IFN). Treatment with rosuvastatin did not decrease this inflammatory response and was consistent among all tests performed. CONCLUSION(S): In vivo rodent models represent a new field of valve prosthesis study. Data from our in vivo rodent model of bioprosthetic valve implantation confirms that prosthesis failure is associated with a localized inflammatory response. Treatment with daily rosuvastatin was unable to attenuate this response. This data is in keeping with emerging clinical studies that have also failed to show benefit with statin therapy for valvular heart disease. Utilizing this rodent model, further analyses can be performed to identify possible therapeutic interventions for bioprosthetic calcification. (Figer Presented) .

Kumar, P. S. and G. Sankaranarayanan (2016). "Investigation on environmental factors of waste plastics into oil and its emulsion to control the emission in DI diesel engine." Ecotoxicology & Environmental Safety **134**: 440-444.

Rapid depletion of conventional fossil fuel resources, their rising prices and environmental issues are the major concern of alternative fuels. On the other hand waste plastics cause a very serious environmental dispute because of their disposal problems. Waste plastics are one of the promising factors for fuel production because of their high heat of combustion and their increasing availability in local communities. In this study, waste plastic oil (WPO) is tested in DI diesel engine to evaluate its performance and emission characteristics. Results showed that oxides of nitrogen (NO x) emission get increased with WPO when compared to diesel oil. Further, the three phase (O/W/O) plastic oil emulsion is prepared with an aid of ultrasonicater according to the %v (10, 20 & 30). Results expose that brake thermal efficiency (BTE) is found to be increased. NO x and smoke emissions were reduced up to 247 ppm and 41% respectively, when compared to diesel at full load condition with use of 30% emulsified WPO. [ABSTRACT FROM AUTHOR]

Kumar, S., et al. (2015). "Investigation of the tracers for plastic-enriched waste burning aerosols." Atmospheric Environment **108**: 49-58.

To better identify the tracers for open-waste burning (OWB) aerosols, we have conducted aerosol sampling at 2 landfill sites, i.e., Okhla and Bhalswa in New Delhi. The metals such as, As, Cd, Sb and Sn, which have been observed almost negligible in remote aerosols, are found abundantly in these OWB aerosol samples (n=26), i.e., 60+/-65, 41+/-53, 537+/-847 and 1325+/-1218ngm⁻³, respectively. Samples (n=20) collected at urban locations in New Delhi, i.e., at Employees' State Insurance (ESI) hospital and National Physical Laboratory (NPL) also show high abundances of these metals in the particles. Filter samples are also analyzed for water-soluble dicarboxylic acids (C<inf>2</inf>-C<inf>12</inf>) and related compounds (oxocarboxylic acids and alpha-dicarbonyls). Terephthalic acid (tPh) was found to account for more than 77% of total diacids determined in OWB aerosols. However, such a high abundance of tPh is not observed in aerosols collected at urban sites. Instead, phthalic acid (Ph) was found as the third/fourth most abundant diacid (~3%) following C<inf>2</inf> (>70%) and C<inf>4</inf> (>12%) in these waste burning influenced urban aerosols. A possible secondary formation pathway of Ph by photo-degradation of phthalate ester (di-2-ethylhexyl phthalate) in plastic-waste burning aerosol is suggested. Ionic composition of OWB aerosols showed that Cl⁻ is the most abundant ion (40+/-8% of total ions determined). The correlation studies of the potential metals with the organic tracers of garbage burning, i.e., phthalic, isophthalic and terephthalic acids show that especially Sn can be used as marker for tracing the plastic-enriched waste burning aerosols. Copyright © 2015.

Kumar, V. E., et al. (2018). "Occurrence of microplastics in fishes from two landing sites in Tuticorin, South east coast of India." Marine Pollution Bulletin **135**: 889-894.

Microplastics pollution of the marine environment has been reported worldwide. Here, we investigate the occurrence of microplastics in two species of fishes namely Rastrilleger kanagurta and Epinephalus merra bought from Thirespuram and Punnakayal fish landing sites at Tuticorin. Out of the total 40 fish, 12 fish showed the presence of microplastic particulates in the intestine. The particulates included microfibers (80%) in red, black and translucent colors and irregularly shaped microplastic fragments (20%). The microplastics were identified as

Polyethylene and Polypropylene by Fourier Transform Infrared Radiation analysis. Though microplastics were detected in the gut of the species, the risk of transfer due to consumption can be safely ruled out as the fish are degutted prior to consumption here. Presence of microplastics in the Tuticorin coast is a matter of concern due to its proximity to the Gulf of Mannar, a sensitive coral reef patch already threatened by marine pollution.

Kumari, B. and C. D. Naidu (2018). "Influence of plastic waste strips on engineering behaviour of soils." International Journal for Research in Applied Science and Engineering Technology **6**(3): 1685-1698.

Rapid improvements in the engineering world have influence a lifestyle of human beings in utmost extends but day to day activities of mankind are augmenting risk in the environment in the same proportion. Plastic wastes have become one of the major problems for the world. The harmful gas which is being produced by this agent leads to tremendous health related problems. So, effective engineering implementation of this has become one of the challenging jobs for engineers. Engineer are seeking for astute implementation of these wastes in ample amount and implementing these wastes in Soil stabilization helps to reduce the risk of natural destruction which is caused due to rainfall or other aspect and also it aid in reducing the waste in an ample amount. Plastic is considered as one of the major pollutant of environment as it would not decay or can't be destroyed so implementing this for some good purpose helps to reduce its effect also. This implies that stabilization using waste plastic strips is an economic method where use of waste materials as plastic and other cheaply available material of plastic can be used which is found accessibly. This paper reflects that plastic wastes can be used in stabilization of soil which is concluded from various tests conducted on fiber reinforced soil with varying fiber content and different aspect ratio and profound analysis of their results depicts that it can be used in the fields. Therefore, it is of utmost importance considering the design and construction methodology to maintain and improve the performance of such pavements. In this paper, different means of plastic waste as shopping bags and other plastic material which is locally available are used so as a reinforcement to perform the CBR studies while mixing with soil for improving engineering performance of sub grade soil. In this the Plastic strips which are collected for stabilization of soil were mixed randomly with the soil. With this a series of California Bearing Ratio (CBR) tests were carried out randomly reinforced soil in which the percentage of plastic strips with varying percentage of plastic strips with different lengths and proportions were carried on. And the results and conclusion were summed up which shows that use of plastic in soil in an appropriate amount really aids in improving the strength of soil and also helps in modification of soil properties which might be in term of strength of sub grade soil The amount of wastes has increased year by year and the disposal becomes a serious problem. Particularly, recycling ratio of the plastic wastes in life and industry is low and many of them have been reclaimed for the reason of unsuitable ones for incineration. It is necessary to utilize the wastes effectively with technical development in each field. This study presents a simple way of recycling plastic waste in the field of civil engineering as reinforcing material. Reinforced soil construction is an efficient and reliable technique for improving the strength and stability of soils. The technique is used in a variety of applications, ranging from retaining structures and embankments to subgrade stabilization beneath footings and pavements. This paper describes an experimental study on mixing plastic waste pieces with two types of soil (clayey soil and sandy soil) at different mixing ratios (0,2,4,6,8)% by weight respectively. For the two types of soils, the shear strength parameters (cohesion value and angle of internal friction) of reinforced and unreinforced samples were investigated by the direct shear test. In addition, a series of compaction tests were performed on clayey soil mixed with different percentages of waste pieces. It was found that, there is significant improvement in the strength of soils due to increase in internal friction. The percentage of increase in the angle of internal friction for sandy soil is slightly more than that in clayey soil, but there is no significant increase in cohesion for the two types of soils. Also, it was concluded that the plastic pieces decreases the maximum dr

Kumari, R., et al. (2014). "Calorific Value Measurements and Optimization of Waste Cooking Oil Bio-Diesel, Crude Plastic Oil and Their Blends for the Synthesis of Low Cost High Energy Fuels." National Journal on Chembiosis **5**(1).

Plastic is an artificial polymer which is having a wide application in manufacturing industries and consumer products as it is light weight, economical, strong, convenient and durable. Plastic is a non-biodegradable material because of which it is very harmful to the environment. Plastics have use in various spheres of economy - infrastructure, construction, agriculture, consumer goods, telecommunications, packaging, etc. Because of growing plastic industries the amount of plastic waste has also increased which is a major problem in front of environmental researchers. Currently worldwide accepted technology used for plastic disposal is incineration which releases extremely toxic compounds leading to environmental issues if not handled carefully. Hence an alternate solution to the exponentially growing plastic waste is being analyzed across the globe. Plastic waste can well be handled with pyrolysis, a thermochemical decomposition method. Pyrolysis, a Plastic to Fuel (PTF) technology, is done at a temperature of 420-440?C. Oil derived from PTF technology has a complex chemical composition but can be used as a fuel conveniently because of its higher energy density. The bio-diesel obtained from the waste cooking oil is blended in different proportions with crude plastic oil obtained from the pyrolysis process of the plastic waste using ultrasonic vibrator. The calorific values of diesel, Crude plastic oil, Standard bio-diesel and bio-diesel obtained from waste cooking oil are 45,457kJ/kg, 25,353 - 43,496 kJ/kg, 39,011kJ/kg and 37,120.16kJ/kg respectively. Bio-diesel from waste cooking oil synthesized by conventional route blended with crude plastic oil obtained after pyrolysis in different proportion was analyzed for its calorific value and was tested with constant speed 4- stroke diesel engine to study the fuel blend performance.

Kumi-Larbi, A. J., et al. (2018). "Recycling waste plastics in developing countries: Use of low-density polyethylene water sachets to form plastic bonded sand blocks." Waste Management **80**: 112-118.

In many developing countries low-density polyethylene (LDPE) sheets, bags and water sachets are a major waste problem because local collection and recycling systems do not exist. As a result, LDPE has no value and is dumped causing aesthetic, environmental and public health issues. A relatively simple technology has been developed in the Cameroon that produces LDPE-bonded sand blocks and pavers. The application of this technology is an example of a community-driven waste management initiative that has potential to impact on the global plastics waste crisis because it can transform waste LDPE and other readily available types of plastics into a valuable local resource. In this research, waste LDPE water sachets have been melted and mixed with sand to form LDPE-bonded sand blocks. The effect of sand particle size and sand to plastic ratio on density, the compressive strength and water adsorption are reported. Optimum samples have been further characterised for flexural strength and thermal conductivity. LDPE-bonded sand is a strong, tough material with compressive strengths up to ~27MPa when produced under optimum processing conditions. The density and compressive strength increase as the particle size of the sand decreases. The potential for using this simple technology and the materials it produces to transform LDPE plastic waste management in developing countries is discussed.

Kuny, T. and H. Leuenberger (2003). "Compression behaviour of the enzyme beta-galactosidase and its mixture with microcrystalline cellulose." International Journal of Pharmaceutics **260**(1): 137-147.

The behaviour of beta-galactosidase powder under compaction was investigated to get more information on powder properties and to further characterise tablet excipients. The enzyme beta-galactosidase, the model excipient microcrystalline cellulose and several mixtures of these two substances were compressed at different compaction forces. The relative density of the obtained tablets was calculated and the Heckel equation as well as the modified Heckel equation was used to characterise the bulk powders and their mixtures. Microcrystalline cellulose is known as a model substance for plastic powders, the used beta-galactosidase was found to be a brittle substance. In further experiments, the activity loss of the compacted enzyme powder was investigated and used to characterise the behaviour of the binary mixtures in various ratios. Data interpretation with percolation theory led to a critical beta-galactosidase concentration of 20%. Between 100 and 20%, the enzyme builds a lattice and dominates the binary system. For beta-galactosidase amounts below 20% in mixtures with plastic excipients, the activity loss increases strongly because of higher shearing forces during compaction due to the system dominance of the plastic particles.

Kuo, C. T. and C. H. Liu (2008). "A novel microfluidic driver via AC electrokinetics." Lab on a Chip **8**(5): 725-733.

A novel ac electrokinetic microfluidic driver based on alternating current electro-osmosis flow induced by asymmetrically capacitance/chemistry-modulated microelectrode arrays has been successfully developed and demonstrated. Asymmetric capacitance modulation (ACM) is made of comb electrode arrays and parts of individual electrode surfaces are modulated/deposited with a SiO(2) dielectric layer. This proposed design can be utilized to shift the optimal operation frequency of maximum velocity to a higher frequency to minimize electrolytic bubble generation and enhance micropumping performance. The pumping velocity, described in this paper, is measured via the tracing of microbeads and is a function of applied potential, signal frequency, buffer concentration, and dielectric layer thickness. A maximum pumping velocity up to 290 microm s(-1) in 5 mM buffer solution with the applied potential of 10 Vpp is observed in our prototype device, and the estimated maximum flow rate is up to 26.1 microl h(-1). This is the first successful demonstration regarding bubble-free ac electrokinetic micropumping via such asymmetrically capacitance-modulated electrode arrays.

Küpper, F. C. and N. A. Kamenos (2018). "The future of marine biodiversity and marine ecosystem functioning in UK coastal and territorial waters (including UK Overseas Territories) – with an emphasis on marine macrophyte communities." Botanica Marina **61**(6): 521-535.

Marine biodiversity and ecosystem functioning – including seaweed communities – in the territorial waters of the UK and its Overseas Territories are facing unprecedented pressures. Key stressors are changes in ecosystem functioning due to biodiversity loss caused by ocean warming (species replacement and migration, e.g. affecting kelp forests), sea level rise (e.g. loss of habitats including salt marshes), plastic pollution (e.g. entanglement and ingestion), alien species with increasing numbers of alien seaweeds (e.g. outcompeting native species and parasite transmission), overexploitation (e.g. loss of energy supply further up the food web), habitat destruction (e.g. loss of nursery areas for commercially important species) and ocean acidification (e.g. skeletal weakening of ecosystem engineers including coralline algal beds). These stressors are currently affecting biodiversity, and their impact can be projected for the future. All stressors may act alone or in synergy. Marine biodiversity provides crucial goods and services. Climate change and biodiversity loss pose new challenges for legislation. In particular, there are implications of climate change for the designation and management of Marine

Protected Areas and natural carbon storage by marine systems to help control the global climate system. The UK currently has legal obligations to protect biodiversity under international and European law.

Kuppers, B., et al. (2019). "Influence of surface roughness and surface moisture of plastics on sensor-based sorting in the near infrared range." Waste Management & Research **37**(8): 843-850.

In the project 'NEW-MINE' the use of sensor-based sorting machinery in the field of 'landfill mining' is investigated. Defilements pose a particular challenge in the treatment and sorting of plastics contained in landfills. For this reason, the effects of various pollutants caused by the interactions in the landfill body or the mechanical treatment steps in landfill mining are examined. In the following elaboration, the focus is on the influences of surface moisture and surface roughness of plastics on sensor-based sorting by means of near-infrared technology. Near-infrared radiation (NIR) in a wavelength range of 990 nm to 1500 nm has been used for the detection and classification of plastic particles. The experiments demonstrate that increased surface roughness reduces signal noise and thereby improves the classification of both spectrally similar and transparent plastics, but reduces the yield of low-softening plastics because their sliding speed on a sensor-based chute sorter varies as a result of the heating of the chute. Surface moisture causes the absorption of radiation from 1115 nm (high density polyethylene [HDPE], linear low density polyethylene [LLDPE], polyethylen terephthalate [PET] and polyvinylchloride [PVC]) or from 1230 nm (low density polyethylene [LDPE], polypropylene [PP] and thermoplastic polyurethane [TPU]) up to at least 1680 nm, which causes amplification or attenuation of various extremes in the derivative. However, the influence of surface moisture on the yield of plastics is usually very low and depends on the spectral differences between the different plastics.

Kuramitz, H., et al. (2006). "Application of an automated fluidic system using electrochemical bead-based immunoassay to detect the bacteriophage MS2 and ovalbumin." Analytica Chimica Acta **561**(1-2): 69-77.

A fully-automated fluidic system for a bead-based immunoassay with electrochemical detection was developed. Assays for the bacteriophage MS2 and ovalbumin (OVA) were demonstrated using this system. Streptavidin-coated paramagnetic microbeads were used as a mobile solid phase. The immunoassay sandwich was made by attaching a biotinylated antibody to the streptavidin-coated beads, capturing antigen, and then exposing the antigen to an antibody conjugated with beta-galactosidase. beta-Galactosidase converts p-aminophenyl galactopyranoside (PAPG) to p-aminophenol (PAP), which is electrochemically oxidized to p-quinone imine (PQI). The behavior of paramagnetic microbeads in the fluidic system was investigated using beads with immobilized beta-galactosidase at different concentrations of beads and flow rates for each procedure in the assay. Furthermore, the fully-automated MS2 and OVA assays were demonstrated using the fluidic system. The limits of detection for MS2 and OVA were 990 (1.6 x 10¹¹ particles mL⁻¹) and 470 ng mL⁻¹, respectively. © 2006 Elsevier B.V. All rights reserved.

Kurbonov, U., et al. (2013). "Intracoronary infusion of autologous CD133+ cells in myocardial infarction and tracing by Tc99m MIBI scintigraphy of the heart areas involved in cell homing." Stem Cells International.

CD133 mesenchymal cells were enriched using magnetic microbead anti-CD133 antibody from bone marrow mononuclear cells (BMMNCs). Flow cytometry and immunocytochemistry analysis using specific antibodies revealed that these cells were essentially 89 ± 4% CD133+ and 8 ± 5%

CD34 +. CD133+/CD34+ BMMNCs secrete important bioactive proteins such as cardiotrophin-1, angiogenic and neurogenic factors, morphogenetic proteins, and proinflammatory and remodeling factors in vitro. Single intracoronary infusions of autologous CD133+/CD34+ BMMNCs are effective and reduce infarct size in patients as analyzed by Tc99m MIBI myocardial scintigraphy. The majority of patients were treated via left coronary artery. Nine months after cell therapy, 5 out of 8 patients showed a net positive response to therapy in different regions of the heart. Uptake of Tc99 isotope and revitalization of the heart area in inferoseptal region are more pronounced (P = 0.016) as compared to apex and anterosptal regions after intracoronary injection of the stem cells. The cells chosen here have the properties essential for their potential use in cell therapy and their homing can be followed without major difficulty by the scintigraphy. The cell therapy proposed here is safe and should be practiced, as we found, in conjunction with scintigraphic observation of areas of heart which respond optimally to the infusion of autologous CD133+/CD34+ BMMNCs. © 2013 Ubaidullo Kurbonov et al.

Kurien, B. T., et al. (2013). "Prolidase deficiency breaks tolerance to lupus-associated antigens." International Journal of Rheumatic Diseases **16**(6): 674-680.

AIM: Prolidase deficiency is a rare autosomal recessive disease in which one of the last steps of collagen metabolism, cleavage of proline-containing dipeptides, is impaired. Only about 93 patients have been reported with about 10% also having systemic lupus erythematosus (SLE).

METHODS: We studied a large extended Amish pedigree with four prolidase deficiency patients and three heterozygous individuals for lupus-associated autoimmunity. Eight unaffected Amish children served as normal controls. Prolidase genetics and enzyme activity were confirmed. Antinuclear antibodies (ANA) were determined using indirect immunofluorescence and antibodies against extractable nuclear antigens were determined by various methods, including double immunodiffusion, immunoprecipitation and multiplex bead assay. Serum C1q levels were determined by enzyme-linked immunosorbent assay.

RESULTS: Two of the four homozygous prolidase deficiency subjects had a positive ANA. One had anti-double-stranded DNA, while another had precipitating anti-Ro. By the simultaneous microbead assay, three of the four had anti-Sm and anti-chromatin. One of the three heterozygous subjects had a positive ANA and immunoprecipitation of a 75 000 molecular weight protein. The unaffected controls had normal prolidase activity and were negative for autoantibodies.

CONCLUSIONS: Prolidase deficiency may be associated with the loss of immune tolerance to lupus-associated autoantigens even without clinical SLE.

Kurihara, K., et al. (2019). "Significance of IL-17A-producing CD8⁺CD103⁺ skin resident memory T cells in psoriasis lesion and their possible relationship to clinical course." Journal of Dermatological Science **95**(1): 21-27.

BACKGROUND: A number of studies have shown the relationship between the pathogenesis of psoriasis and skin resident memory T (T_{RM}) cells.

OBJECTIVE: To investigate the cytokine profile of T_{RM} cells from skin lesions of psoriasis and the relationship of skin T_{RM} cells to the future clinical course of psoriasis.

METHODS: We used stocked samples of T cells that were ex vivo expanded from skin biopsies of 10 patients with psoriasis vulgaris. A half of 4-mm punch biopsy specimens was subjected to expansion of skin-infiltrating T cells using IL-2 and anti-CD3/CD28 antibody-coated microbeads. More than 10⁶ T cells per specimen were stocked at -80degreeC. Defrosted cells were subjected to flow cytometric analysis. Another half of skin biopsies were subjected to immmunofluorescence staining for CD103 and other markers.

RESULTS: The biopsied skin revealed CD8⁺CD103⁺ T_{RM} cells were present in the epidermis of psoriasis and associated with acanthosis. Sorted CD103⁺ T cells were mostly CD8⁺ memory T cells expressing CD69 with a skin-homing potential. A part of CD8⁺CD103⁺ T cells produced interferon-gamma, IL-17A or IL-22. Notably, CD8⁺CD103⁺ T_{RM} cells more frequently produced IL-17A than did CD8⁺CD103⁻ T cells. We retrospectively divided the 10 cases into the non-advanced therapy group, and the advanced therapy group in which systemic biologics or others were initiated within one year. The frequency of CD8⁺CD103⁺IL-17A⁺ T_{RM} cells tended to be higher in the advanced therapy group.
CONCLUSION: These results suggest that IL-17A-producing CD8⁺CD103⁺ T_{RM} cells are associated with a progressive clinical course of psoriasis.

Kuriyama, N., et al. (2009). "Predictive markers of blood cytokine and chemokine in recurrent brain infarction." Journal of Interferon & Cytokine Research **29**(11): 729-734.

The mechanism of the inflammatory response in the vascular wall in atherothrombosis and during the progression of atherosclerosis has attracted attention. We focused on the potential usefulness of inflammatory markers in chronic recurrent brain infarction, and analyzed the role of inflammatory markers in atherosclerosis of the intracranial artery. The subjects were 2 groups of patients treated between 2004 and 2006: a group of outpatients with recurrent infarction (group RI), who developed atherothrombotic brain infarction twice; another group of outpatients with brain infarction without recurrence (group BI), who developed brain infarction once and remained free of recurrence for >1 year; and a group of control subjects with normal brain magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) (group C). Plasma samples were collected from each group of patients for the simultaneous measurement of 17 kinds of candidate inflammatory markers, using a fluorescent microbead array system, and the results were compared with head MRA findings. The levels of high-sensitivity C-reactive protein (hsCRP) and monocyte chemoattractant protein-1 (MCP-1) were significantly higher in group RI patients than in groups C and BI. Subjects with a hsCRP level > or =0.3 and a MCP-1 level > or =200 in the serum have, respectively, a 1.92 and 2.98 relative risk to have a potential recurrent infarction. Regarding the relation of inflammatory marker levels with MRA findings, group RI showed significantly higher levels of hsCRP at M1 lesions and MCP-1 at A1 and M1 lesions than group BI (P < 0.05). In conclusion, the MCP-1 level as well as hsCRP in the blood can be a potential predictive marker of recurrent thrombotic brain infarction, and may reflect inflammation that promotes intracranial large-artery atherosclerosis.

Kurowska-Stolarska, M., et al. (2009). "MiR-155 and MiR-34a regulate TNF-alpha production by human monocytes." Arthritis and Rheumatism **10)**: 1242.

Purpose: Dysregulated pro-inflammatory activation of synovial monocyte and macrophage is of fundamental importance in pathogenesis of rheumatoid arthritis (RA). Recently microRNA (miRNA) have been identified as critical post-transcriptional regulators of many components of immune responses. The aim of our study was to investigate the role of candidate miRNAs, miR-155 and mir-34a in the activation of RA synovial fluid (SF) and blood monocyte/macrophages. Method(s): CD14+ cells from SF or peripheral blood (PB) of RA patients (n=7) and CD14+ cells from PB of healthy controls (n=6) were isolated using CD14 MACS MicroBeads. PB CD14+ cells were stimulated with LPS (100 ng/ml), Pam3CSK4 (300 ng/ml), PolyI:C (50 mug/ml), CPG (3 mug/ml), control CPG (3 mug/ml) or protease activated receptor-2

(PAR2) agonist (SLIGKV-NH2; 50muM) for 24h. PB CD14+ cells were transfected with miR-155, miR-34a or scramble mimics (all 3.5 mg/3x106 cells) by electroporation (Amaxa). Expression of AXL (receptor tyrosine kinase) and TNF production were tested 36 h later. Total RNA was isolated by miRNeasy kit. TaqMan miRNA and mRNA assays were used for semiquantitative determination of the expression of miR-155, miR-34a and AXL, respectively. The expression of U6B small nuclear RNA and beta-actin were used as endogenous controls. To identify the cellular targets of candidate miRs, multiple target prediction programs and mRNA transcriptomic signatures of SF CD14+ cells were employed. Result(s): Synovial fluid CD14+ cells expressed higher levels of miR-155 (64 fold, p<0.05) and miR-34a (4.5 fold, p<0.05) than PB matched CD14+ cells. Expression of miR-155 was up-regulated by TLR2, TLR3, TLR4 and TLR9 ligands (p<0.05) but not by PAR2 agonist in PB CD14+ cells. In contrast, miR-34a expression was either not affected (Pam3CSK4, SLIGKV-NH2) or down-regulated (LPS, PolyI:C, CPG; p<0.05) under the same conditions. Overexpression of miR-155 and miR-34a mimics in PB monocytes induced TNF production (10170 +/- 385 pg/ml) and (991 +/- 33), respectively. Using computational target ranking system combined with mRNA transcriptomic data we identified a negative regulator of TLR/IL-1R signalling, AXL, to be targeted by miR-34a. Overexpression of miR-34a and miR-155 mimics decreased the expression of AXL in PB monocytes by (48 +/- 3%) and (38 +/- 16%), respectively. Conclusion(s): These data suggest that overexpression of miR-155 and miR-34a in CD14+ cells can result in downregulation of AXL expression which in turn can lead to the overproduction of TNF. We provide a novel mechanism for deregulated TNF production in RA synovial macrophages amenable to therapeutic intervention in due course.

Kurowska-Stolarska, M. S., et al. (2010). "The role of miR-155 in the activation of RA and PsA synovial fluid monocytes." Arthritis and Rheumatism **10)**: 1422.

Purpose: MicroRNA (miR) network has emerged recently as an important post transcriptional regulator of immune response. Each individual miRNA species is capable of targeting a large number of distinct mRNA transcripts often belonging to one pathway. In our previous study we identified miR-155 to be strongly up-regulated in RA and PsA synovial fluid (SF) CD14+ cells compared to matched peripheral blood (PB) CD14+ cells suggesting that this miR may be involved in regulation of inflammatory pathways in arthritic joints. The aim of our study was to investigate the impact of miR 155 on the cytokine production and transcriptomic signature of RA and PsA SF monocyte and macrophage. Method(s): CD14+ cells from SF or PB of RA patients (n=14), PsA patients (n=13) and CD14+ cells from PB of healthy controls (n=6) were purified using CD14 MACS MicroBeads. PB CD14+ cells were transfected with miR-155 or scramble mimics (20 nM). Total RNA was isolated by miRNeasy kit. TaqMan miRNA and mRNA assays were used for semi-quantitative determination of the expression of miR-155 and its targets. The expressions of U6B small nuclear RNA or beta-actin were used as endogenous controls. Target prediction program and mRNA transcriptomic signature of RA and PsA SF CD14+ cells were employed to identify the cellular targets of miR-155 in SF CD14+ cells. Result(s): Overexpression of miR-155 in PB CD14+ monocytes and PB CD14+ derived macrophages triggered TNF production suggesting that miR-155 may indeed be involved in post-transcriptional control of inflammatory pathways in SF monocyte. A computational target ranking system (TargetScan human 5.1, aggregate Pct above 4.0) predicted 127 mRNA targets for miR-155. To identify mRNAs that are specifically targeted in SF monocytes we cross-referenced TargetScan predictions with a list of 2312 mRNAs that were differentially expressed in SF CD14+ cells compared to PB CD14+ cells of RA (n=8) and PsA (n=7) patients (GeneChip Affymetrix U133 plus 2). This approach produced a list of 26 miR-155 targets that were relevant to SF CD14+ activation. Among them, 24 genes were up-regulated and 2 genes were down-regulated in SF

CD14+ cells compared to PB CD14+ cells. Since miRs exert their function by mRNA degradation, we focused on genes that were down-regulated in SF CD14+ cells, namely SHIP1 (Src homology-2 domain-containing inositol 5-phosphatase 1) and ZNF652 (zinc finger DNA-binding protein). Expression of SHIP1 was down-regulated by 9 and 3.9 fold in SF CD14+ cells from RA (n=8) and PsA (n=7) patients, respectively. ZNF652 was decreased by 4.43 and 2.97 fold in SF CD14+ cells from RA and PsA patients, respectively. The decrease of SHIP1 and ZNF652 expression in SF monocyte was confirmed by QPCR on additional patient samples. Experimental validation revealed that the expression of SHIP1 and ZNF652 was inhibited in PB CD14+ cells transfected with miR-155 mimic compared to control mimic transfected cells (48 +/- 10% and 43+/- 7%, respectively). Conclusion(s): This study identified functional miRNA-mRNA networks that may be responsible for pro-inflammatory activation of synovial fluid monocyte and macrophage in RA and PsA patients.

Kurtela, A. and N. Antolović (2019). "The problem of plastic waste and microplastics in the seas and oceans: Impact on marine organisms." Ribarstvo, Croatian Journal of Fisheries **77**(1): 51-56.

A global problem of today is the large amount of waste in the seas and oceans, primarily plastic waste. It is estimated that every year 1.25 to 2.41 million tons of plastic material is being carried by rivers into the seas and oceans. Waste is a major problem for marine organisms, causing entanglement, choking, strangulation, malnutrition and death. In 1972 the problems caused by microplastics, particles smaller than 5 mm, were first observed. Such particles bind pathogenic microorganisms on to their surface. Increasing quantities of microplastics have been found in the stomachs of fish, and also in shellfish that feed by filtering sea water. Ingested by marine organisms, such plastics may eventually pass through the food web and can end up ingested by humans. In addition, plastic releases chemical compounds whose effect on marine organisms and humans has still not been studied. Many international and state organizations offer solutions through recycling plastic waste, as well as reducing the production of plastic materials and informing the public about the problem. © The Author(s) 2019.

Kushima, S., et al. (2019). "Targeting nicotinamide adenine dinucleotide (NAD) glycohydrase activity of CD38 exerts anti-myeloma effect accompanying intracellular NAD elevation." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Introduction. The development of novel agents has improved the outcomes of multiple myeloma (MM) patients. Especially, daratumumab, an anti-CD38 monoclonal antibody which exerts therapeutic effect against MM cells through direct cell damage, antibody dependent cellular cytotoxicity (ADCC) and complement-dependent cytotoxicity (CDC), has shown its high efficacy in clinical practice. CD38 is a transmembrane glycoprotein highly expressed in plasma cells. CD38 is also a major nicotinamide adenine dinucleotide (NAD) glycohydrase in mammalian tissues, which regulate cellular levels of NAD. However, the role of CD38 as a NAD glycohydrase (NADase) in survival of MM cells is not well understood. In the present study, we conducted CD38 enzyme activity inhibition on MM cells using a small molecule compound 78c, a specific inhibitor for NADase enzymatic activity of CD38, in order to study the role of CD38 NADase activity in MM cell survival and to examine whether CD38 enzyme inhibition could be a new therapeutic strategy of MM. Materials and methods. MM cell lines (NCI-H929, KMS-12BM, KMS-12PE, U266) were treated with CD38 NADase inhibitor, 78c, in vitro. Viability of MM cell lines and patient-derived MM cells were analyzed by flow cytometry after 7AAD staining. MM cell lines possessing CD38 positive and negative fraction were sorted according to the CD38 expression using CD38 Micro-Beads. CD38 low MM cell lines were treated with All-trans retinoic acid(ATRA)to increase surface CD38 expression. Intracellular NAD and NADH concentrations in

MM cells were analyzed using NAD / NADH assay kit. Detection of apoptosis in MM cell lines were examined by Annexin V and PI staining followed by flow cytometry analysis. Caspase inhibitor, Z-VAD-FMK, was used in combination with 78c to study the mechanism of 78c induced MM cell death. Results. 78c induced cell death in MM cell lines at low concentrations (IC<inf>50</inf> 10-20 muM). Addition of 78c to patient derived bone marrow cells showed cytotoxicity to MM cells, while toxicity to non-MM cells were limited. CD38 positive fraction of MM cell lines had better sensitivity to 78c compared to CD38 negative fraction. CD38 induction by ATRA in CD38 low MM cell lines showed increased sensitivity to 78c. These results proved that 78c efficacy correlates with surface CD38 expression. Comparison of intracellular NAD and NADH concentrations between CD38 positive and negative fractions of MM cell lines demonstrated a significant increase of NAD in the CD38 negative fraction compared to their positive counterparts, indicating that CD38 is indeed controlling the intracellular NAD concentration. Marked increase of NAD / NADH ratio was observed in 78c treated MM cell lines compared to control, proving that CD38 NADase inhibition affects intracellular NAD concentration in MM cells (Fig. 1). 78c treatment of MM cell lines significantly reduced the number of viable cells in the Annexin- / PI- region, however, addition of Z-VAD-FMK did not lead to recovery of viable cell numbers, indicating non-apototic cell death induction by CD38 NADase inhibition. Conclusions. CD38 is the major NADase in mammalian tissues, and involved in catabolism of NAD. CD38 NADase inhibitor, 78c, inhibited the growth of MM cells at low concentrations. 78c induced cell death was found to be highly specific to MM cells and its cytotoxic effect was associated with surface CD38 expression of MM cells. Increased amount of NAD in MM cells by 78c treatment suggests that NAD elevation is associated with MM cell death induced by CD38 NADase inhibition. Since, daratumumab has limited effect against CD38 NADase activity, modulation of intracellular NAD levels by CD38 NADase inhibition could provide a novel therapeutic strategy for MM (Fig. 2). (Figure Presented).

Kusmartsev, S., et al. (2014). "Human macrophages facilitate kidney stone clearances." Journal of Urology **1)**: e271.

INTRODUCTION AND OBJECTIVES: Kidney stones affect one of eleven Americans, costing 10 billion dollars yearly to treat. Renal macrophages play a critical role to maintain healthy, functional kidneys. In this report, we investigate macrophage phagocytic and inflammatory responses to natural stones as well as to inorganic crystals- calcium oxalate (CaOx) and calcium phosphate (CaP) crystals. METHOD(S): Human buffy coats were purchased from Life South Community Blood Center. The peripheral blood mononuclear cells were collected by histopaque-1077 and monocytes were purified using CD14 Miltenyi Biotec magnetic microbeads. Monocytes were differentiated into macrophages with macrophage colony-stimulating factor over a 7-day period. Macrophages were treated with crushed natural stones from human donors and synthetically produced CaOx and CaP crystals. Untreated macrophages were used as controls. Macrophage phagocytosis and morphological changes were observed in x200 and x400 field with a light microscope. Thirty-one Chemokine and thirty-six Cytokine protein levels in the cell supernatant were measured with R&D Proteome Profiler Human Array kits at 24 hours. RESULT(S): Within 24 hours, natural stones and both crystal types were surrounded by macrophages (A, B). Between 24 and 48 hours, small stones/crystals were visibly being phagocytized by the macrophages leading to their gradual destruction (C, arrows) while larger stones/crystals were more resistant to the macrophagemediated destruction. Macrophages that phagocytized stones/crystals displayed dark spots, indicative of mineral uptake (D). CCL2, CCL22, and MIP-1a/b were upregulated in macrophages exposed to all three stone types. Natural stone and CaOx crystals increased

C5/C5a, IL-1ra, and IL-8 within supernatant, but these signaling proteins were decreased in response to CaP crystals compared to controls. CONCLUSION(S): Human macrophages are capable of phagocytizing and eroding naturally-produced kidney stones. Composition of the stone appears to play a role in chemokine and cytokine production. The present study suggests that macrophages play an important role in clearing stones and initiating an immune response.(Figure Presented).

Kusunoki, T. and T. Kobayashi (2010). "Molecular imprinting micropolymerbeads having cooperative effect of both surfactant and inosine template." Journal of Applied Polymer Science **117**(1): 565-571.

Molecular imprinted polymer (MIP) microbeads were prepared by emulsion copolymerization of divinylbenzene (DVB) and methacrylic acid (MAA) in the presence of inosine (INO) template and laurylbenzenesulfonic acid (LBSA) as surfactant. The polymerization was carried out at 55 degree C under ultrasound exposure. The resulting copolymer microbeads, having 0.1-0.4 mu m diameter, were observed to have a binding behavior of INO and surfactant to the polymer which was strongly dependent of the bulk pH; for example, at pH 3, 6, and 10 values of binding for INO to the imprinted copolymer were 3.7 mu mol/g, 2.1 mu mol/g, and 0 mu mol/g, respectively. It was found that LBSA surfactant bound to the MIP microbeads similarly depending on pHs. At pH 3, 6, and 10, the LBSA values of binding were 23 mu mol/g, 1.3 mu mol/g, and 4.8 mu mol/g. It was also noted that the surfactant binding was enhanced in the presence of the INO template. This demonstrated that a cooperative binding with the surfactant was cooperatively occurred in the presence of INO. [copy 2010 Wiley Periodicals, Inc. J Appl Polym Sci, 2010

Kvaratskhelia, E., et al. (2017). "Alteration in the Cytokine Secretion Pattern in T Cells of Patients with Cystic Fibrosis Caused by DNA Methyltransferase Inhibitor 5-Azacitidine." Georgian Medical News(272): 153-157.

Cystic fibrosis (CF) is the autosomal-recessive disorder caused by mutation in the cystic fibrosis transmembrane conductance regulator gene (CFTR). The Airway inflammation plays a central role in the progression of CF disease. Cystic fibrosis characterized by the overproduction of the pro-inflammatory cytokines and reduced expression of anti-inflammatory cytokines. Although the mechanisms of abnormal cytokine expression is still poorly understood, altered epigenetic regulations in T cells might contribute. In the present study we examined the expression of IFN-gamma and IL-10 by CF T cells prior to and following 5-azaC treatment. In addition we investigated DNMTs levels in nuclear extracts of CD4+ T cells derived from CF and non-CF individuals. Seven CF patients (age: 5-12 years) were included in the study and compared to six age-matched healthy subjects (age: 6- 13 years). CD4+ T cells were isolated from PBMC using CD4 MicroBead kit (Miltenyi Biotec GmbH) and were cultured in RPMI 1640 medium at 37degreeC with 5% CO2, in presence or absence of 5-azacytidine. Concentrations of IL-10 and gamma-INF in CD4+ T Cells were measured by ELISA (eBoiscience, san Diego, CA, USA). In our study we showed that 5 Azacytidine alters nuclear levels of DNMT 3a as well as modulates cytokine levels in CD4+ T cells derived from CF patients. After 5-azaC treatment secretion of IFN-gamma was significantly decreased in CF T cells, while amount of IL-10 was elevated by ~2.5 times compared to untreated controls (P<0.05). In summary, data presented in this report demonstrates that epigenetic mechanisms such as DNA methylation may be considered as a one of the potential therapeutic target in a treatment of Cystic Fibrosis.

Kwak, N. S., et al. (2012). "The synthesis of poly(vinylphosphonic acid-co-methacrylic acid) microbeads by suspension polymerization and the characterization of their indium adsorption properties." Journal of Hazardous Materials **203-204**: 213-220.

Poly(vinylphosphonic acid-co-methacrylic acid) microbeads were synthesized by suspension polymerization, and their indium adsorption properties were investigated. The obtained microbeads were characterized by Fourier transform infrared (FT-IR) spectroscopy and scanning electron microscopy (SEM). The microbeads were wrinkled spheres, irrespective of the components, and their sizes ranged from 100 to 200 mum. The microbeads were thermally stable up to 260degreeC. As the vinylphosphonic acid (VPA) content was increased, the synthetic yields and ion-exchange capacities decreased and the water uptakes increased. The optimum synthetic yield, ion-exchange capacity and water uptake were obtained at a 0.5 mol ratio of VPA. In addition, the maximum adsorption predicted by the Langmuir adsorption isotherm model was greatest at a 0.5 mol ratio of VPA.

Kwan, C. S., et al. (2014). "Historical occurrences of polybrominated diphenyl ethers and polychlorinated biphenyls in Manila Bay, Philippines, and in the upper Gulf of Thailand." Science of the Total Environment **470-471**: 427-437.

Historical trends of the accumulation of polybrominated diphenyl ethers (PBDEs) and polychlorinated biphenyls (PCBs) in a typical tropical Asian environment were investigated using radio-dated sediment cores from Manila Bay, the Philippines and from the upper Gulf of Thailand. Vertical profiles indicated earlier usage of PCBs than of PBDEs which coincided with their industrial production. The increasing concentrations of total PBDEs and PCBs toward the surface suggested an increased consumption of PBDEs; and possible leakage of PCBs from old machineries into the aquatic environment in recent years. Current input of PCBs to the catchment of Manila Bay was supported by the analyses of air samples and plastic resin pellets. The vertical profiles of total PBDEs in the cores (i.e., rapidly increasing concentrations corresponding to the mid-1980s until mid-1990s, followed by a decrease until the early 2000s, and increasing again toward the surface) likely corresponded to the rapid economic growth in Asia in the 1990s, the Asian financial crisis in 1997, and the economic recovery since early 2000s. BDE-209 was predominant especially on the surface layers. BDEs 47 and 99 generally decreased toward the surface, reflecting the phase-out of the technical penta-PBDE products and the regulation by the Stockholm Convention in recent years. Increasing ratios of BDE-202/209, 206/209, 207/209 and decreasing % of BDE-209 down the core layers may provide evidence for the anaerobic debromination of BDE-209 in the sediment cores. Inventories in ng/cm(2) of total PCBs were higher than total PBDEs (92 vs. 34 and 47 vs. 11 in the Philippines; 47 vs. 33 in Thailand). However, the doubling times indicated faster accumulation of total PBDEs (6-7 years) and BDE-209 (6-7.5 years) than of PCBs (8-11 years). Furthermore, the temporal increase in BDE-209 was comparable to or faster than those reported in other water bodies around the world.

Kwon, B., et al. (2017). "Monitoring of styrene oligomers as indicators of polystyrene plastic pollution in the North-West Pacific Ocean." Chemosphere **180**: 500-505.

Styrene oligomers (SOs) as global contaminants are an environmental concern. However, little is known on the distribution of SOs in the ocean. Here, we show the distribution of anthropogenic SOs generated from discarded polystyrene (PS) plastic monitored from the coastal ocean surface waters (horizontal distribution) and deep seawaters (vertical distribution) in the North-West Pacific Ocean. SOs concentrations in surface seawater and deep seawater ranged from 0.17 to 4.26 micro g L⁻¹ (total mean: 1.48+or-1.23 micro g L⁻¹) and from 0.31 to 4.31 micro g L⁻¹ (total mean: 1.32+or-0.87 micro g L⁻¹), respectively. Since there is no significant difference in the mean concentrations, SOs seems to be spread across marine environment selected in this study. Nevertheless, regional SOs appears

to persist to varying degrees with their broad horizontal and vertical distribution in the ocean. Each horizontal and vertical distribution of SOs differs by approximately 1.95-2.57 times, probably depending on the events of weather and global ocean circulation. These results provide the distribution pattern of SOs for assessing environmental pollution arising from PS plastic.

Kwon, B. and K. Moon (2019). "Physicochemical properties of styrene oligomers in the environment." Science of the Total Environment **683**: 216-220.

Currently, styrene oligomers (SOs) are persistent contaminants that are present in the environment globally. SOs are artificial substances originating from styrene-based polymer materials, mainly including PS plastic, resin, and rubber. However, the behavior of SOs in the environment is not well-understood yet due to the scarcity of experimental data. The objective of this study was to use in-silico tool to estimate key physicochemical properties of these SOs. The US EPA EPI suite program was used to predict SOs' physicochemical properties including solubility, vapor pressure, LogKow, Henry's constant, LogKoc, and fugacity-based multimedia mass balance. Although styrene monomer (SM) and SOs have structural similarity, the physicochemical properties of SOs are significantly different from those of SM, a precursor of SOs. In particular, it is estimated that as much as the heavy molecular weight, most SOs persist for comparable periods of time in a sandy environment. Although there is uncertainty, this preliminary in-silico study provides a sufficient reason to assure an experimental study to better determine properties of SOs.

Kwon, B. G., et al. (2018). "Qualitative assessment to determine internal and external factors influencing the origin of styrene oligomers pollution by polystyrene plastic in coastal marine environments." Environmental Pollution **234**: 167-173.

The objective of this study is to investigate the qualitative contribution of internal and external factors of the area contaminated by polystyrene (PS) in coastal marine environments. This study is based on the extensive results of monitoring the styrene oligomers (SOs) present in sand and seawater samples along various coastlines of the Pacific Ocean. Here, anthropogenic SOs is derived from PS during manufacture and use, and can provide clues about the origin of SOs by PS pollution. The monitoring results showed that, if the concentration of SOs in water is higher than those concentrations in beach sand, this area could be affected by PS plastic caused by an external factor. On the other hand, if the concentration of SOs is higher in the beach sand, the region can be mainly influenced by PS plastic derived from its own area. Unlike the case of an external factor, in this case (internal influence), it is possible to take policy measures of the area itself for the PS plastic problem. Thus, this study is motivated by the need of policy measures to establish a specific alternative to the problems of PS plastic pollution in ocean environments.

Kwon, B. G., et al. (2015). "Global styrene oligomers monitoring as new chemical contamination from polystyrene plastic marine pollution." Journal of Hazardous Materials **300**: 359-367.

Polystyrene (PS) plastic marine pollution is an environmental concern. However, a reliable and objective assessment of the scope of this problem, which can lead to persistent organic contaminants, has yet to be performed. Here, we show that anthropogenic styrene oligomers (SOs), a possible indicator of PS pollution in the ocean, are found globally at concentrations that are higher than those expected based on the stability of PS. SOs appear to persist to varying degrees in the seawater and sand samples collected from beaches around the world. The most persistent forms are styrene monomer, styrene dimer, and styrene trimer. Sand samples from beaches, which are commonly recreation sites, are particularly polluted with these high SOs concentrations. This finding is of interest from both scientific and public perspectives because SOs may pose potential long-term risks to the environment in combination with other endocrine disrupting chemicals. From SOs monitoring results, this study proposes a flow diagram for SOs leaching from PS cycle. Using this flow diagram, we conclude that SOs are global contaminants in sandy beaches around the world due to their broad spatial distribution.

Kwon, H., et al. (2017). "DNA as an environmental sensor: detection and identification of pesticide contaminants in water with fluorescent nucleobases." Organic & Biomolecular Chemistry **15**(8): 1801-1809.

Environmental contaminants pose a substantial health risk in many areas of the world. One of these risks is contamination of water with toxic organic species, such as herbicides and insecticides. Here we describe the discovery and properties of a set of fluorescent chemosensors that respond to micromolar concentrations of a broad range of common organic pesticides. The chemosensors are short DNA-like oligomers with fluorophores replacing DNA bases that are assembled via a DNA synthesizer. We screened a library of 1296 tetrameric compounds on polystyrene microbeads, and identified a set of chemosensor sequences that respond strongly to a set of structurally varied pesticide analytes. We show that ten chemosensors on beads can be used to detect and identify 14 different common pesticides at 100 muM, using the pattern of fluorescence intensity and wavelength changes. Limits of detection for two analytes were as low as 2 muM. The chemosensors are shown to function successfully in a practical setting, correctly identifying unknown pesticide contaminants in water from Felt Lake, California. The results establish a simple, low cost strategy for sensing environmental spills of toxic organics.

Kwon, H., et al. (2015). "Pattern-based detection of anion pollutants in water with DNA polyfluorophores." Chemical Science **6**(4): 2575-2583.

Many existing irrigation, industrial and chemical storage sites are currently introducing hazardous anions into groundwater, making the monitoring of such sites a high priority. Detecting and quantifying anions in water samples typically requires complex instrumentation, adding cost and delaying analysis. Here we address these challenges by development of an optical molecular method to detect and discriminate a broad range of anionic contaminants with DNA-based fluorescent sensors. A library of 1296 tetrameric-length oligodeoxyfluorosides (ODFs) composed of metal ligand and fluorescence modulating monomers was constructed with a DNA synthesizer on PEG-polystyrene microbeads. These oligomers on beads were incubated with Y super(III) or Zn super(II) ions to provide affinity and responsiveness to anions. Seventeen anions were screened with the library under an epifluorescence microscope, ultimately yielding eight chemosensors that could discriminate 250 mu M solutions of all 17 anions in buffered water using their patterns of response. This sensor set was able to identify two unknown anion samples from ten closely-responding anions and could also function quantitatively, determining unknown concentrations of anions such as cyanide (as low as 1 mM) and selenate (as low as 50 mu M). Further studies with calibration curves established detection limits of selected anions including thiocyanate (detection limit similar to 300 mu M) and arsenate (similar to 800 mu M). The results demonstrate DNA-like fluorescent chemosensors as versatile tools for optically analyzing environmentally hazardous anions in aqueous environments.

Kwon, J.-H., et al. (2017). "Microplastics as a vector of hydrophobic contaminants: Importance of hydrophobic additives." Integrated Environmental Assessment & Management **13**(3): 494-499.

ABSTRACT Despite a recent boom in research on the environmental fate, distribution, and

harmful effects of chemical substances associated with marine plastic debris, no consensus has been reached on whether chemicals originating from microplastics cause serious environmental harm. For the risk assessment of chemical contaminants associated with microplastics, it would be useful to group organic chemicals into 2 categories: additives and nonadditives. Whereas plastic particles are not likely to be diffuse sources of chemicals that are not intentionally added to plastic products, continuous leaching of additives would result in higher concentrations, at least at a local scale. Unlike plasticizers and flame retardants, which have been relatively well investigated, antioxidants and photostabilizers have been rarely studied, even though many of them are highly hydrophobic and are not readily biodegradable. More research on the fate and effects of chemicals via microplastics should focus on those additives. Integr Environ Assess Manag 2017;13:494-499. © 2017 SETAC [ABSTRACT FROM AUTHOR]

Kyrikou, I. and D. Briassoulis (2007). "Biodegradation of Agricultural Plastic Films: A Critical Review." Journal of Polymers & the Environment **15**(2): 125-150.

The growing use of plastics in agriculture has enabled farmers to increase their crop production. One major drawback of most polymers used in agriculture is the problem with their disposal, following their useful life-time. Non-degradable polymers, being resistive to degradation (depending on the polymer, additives, conditions etc) tend to accumulate as plastic waste, creating a serious problem of plastic waste management. In cases such plastic waste ends-up in landfills or it is buried in soil, questions are raised about their possible effects on the environment, whether they biodegrade at all, and if they do, what is the rate of (bio?)degradation and what effect the products of (bio?)degradation have on the environment, including the effects of the additives used. Possible degradation of agricultural plastic waste should not result in contamination of the soil and pollution of the environment (including aesthetic pollution or problems with the agricultural products safety). Ideally, a degradable polymer should be fully biodegradable leaving no harmful substances in the environment. Most experts and acceptable standards define a fully biodegradable polymer as a polymer that is completely converted by microorganisms to carbon dioxide, water, mineral and biomass, with no negative environmental impact or ecotoxicity. However, part of the ongoing debate concerns the question of what is an acceptable period of time for the biodegradation to occur and how this is measured. Many polymers that are claimed to be ‘biodegradable’ are in fact ‘bioerodable’, ‘hydrobiodegradable’, ‘photodegradable’, controlled degradable or just partially biodegradable. This review paper attempts to delineate the definition of degradability of polymers used in agriculture. Emphasis is placed on the controversial issues regarding biodegradability of some of these polymers. [ABSTRACT FROM AUTHOR]

Kyun-Woo, L., et al. (2013). "Size-Dependent Effects of Micro Polystyrene Particles in the Marine Copepod Tigriopus japonicus." Environmental Science & Technology **47**(19): 11278-11283.

We investigated the effects of three sizes of polystyrene (PS) microbeads (0.05, 0.5, and 6-µm diameter) on the survival, development, and fecundity of the copepod Tigriopus japonicus using acute and chronic toxicity tests. T. japonicus ingested and egested all three sizes of PS beads used and exhibited no selective feeding when phytoplankton were added. The copepods (nauplius and adult females) survived all sizes of PS beads and the various concentrations tested in the acute toxicity test for 96 h. In the two-generation chronic toxicity test, 0.05-µm PS beads at a concentration greater than 12.5 µg/mL caused the mortality of nauplii and copepodites in the F0 generation and even triggered mortality at a concentration of 1.25 µg/mL in the next generation. In the 0.5-µm PS bead treatment, despite there being no significant effect on the F0 generation, the highest concentration (25 µg/mL) induced a significant decrease in survival compared with the control population in the F1 generation. The 6-µm PS beads did not affect the survival of T. japonicus over two generations. The 0.5- and 6-µm PS beads caused a significant decrease in fecundity at all concentrations. These results suggest that microplastics such as micro- or nanosized PS beads may have negative impacts on marine copepods. [ABSTRACT FROM AUTHOR]

La Monica, G., et al. (2014). "TCR stimulation up-regulates the expression of klotho mRNA in T cells." Transplantation **1)**: 316.

Background:There has been an increasing awareness of the role of Fibroblast growth factor 23(FGF23) in mineral metabolism and in chronic kidney disease(CKD). FGF23 mediates its functions through FGF receptors and the co-receptor Klotho. Klotho is known to participate in aging-related phenomena, but data on possible participation of Klotho in the immune cell functions are fragmentary. To investigate the role of FGF23 signaling in human lymphocytes, we analyzed FGF23 receptor and Klotho expression following T and B cell stimulation. Method(s):PBMC were isolated from healthy volunteers and CD4+CD25- T cells and CD19+ B cells were selected using magnetic microbeads. CD4+CD25- T cells were cultured with alphaCD3/CD28 microbeads while CD19+B cells were cultured with anti-IgM, anti-CD40, IL-21 (BCR/CD40-stimulation) for 24, 48 and 72h. A variety of parameters of T and B cells activity including proliferation and activation, were monitored by flow cytometry. RNA expression of Klotho, FGF23 and FGF23R1 were analyzed by RT-PCR. Result(s):At mRNA level, FGF23 was not expressed in resting T or B cells, FGF23R1 was expressed in both. Klotho was up-regulated in T cells only, even as early as 24h after TCR activation and the level of expression increased over time up to 72h, but it was completely absent in B cells subsets. The expression of Klotho closely correlated with the proliferation of T cells and activation markers CD25, CD69, CD44 on stimulated T cells. Adding recombinant FGF23 at different doses (0.01, 0.1, 1, 10, 100 and 1000ng/ml) in the T and B cell cultures, showed that the proliferation of T cells at 24, 48, 72h decreased at high doses of FGF23 (10 to 1000ng/ml) with no evidence of increased T cell death. Conclusion(s):These data indicate that Klotho is up-regulated in T cells upon stimulation but it is completely absent in B cells. FGF23 at high doses decreased T cell proliferation, suggesting a potential inhibitory role for Klotho in human T cells. (Figure Presented).

La Seta Catamancio, S., et al. (2015). "Automated manufacturing process for the production of genetically modified lymphocytes using the CliniMACS Prodigyc platform." Human Gene Therapy **26 (10)**: A36.

MM-TK is a medicinal product constituted of T lymphocytes engineered ex vivo with the retroviral vector (RVV) SFCMM-3 Mut2 #48 to express a mutated form of the Herpes Simplex Virus Thymidine kinase (HSV-TK Mut2) and a truncated form of the human Low affinity Nerve Growth Factor Receptor (DLNGFR) genes. It was developed as adjunctive therapy in leukaemia patients undergoing stem cell transplantation, to promote immune reconstitution and to control viral infections and disease relapses. In order to optimize the cellular manufacturing process, MolMed have strengthened an alliance with Miltenyi Biotec for tailoring of CliniMACS Prodigy platform. A closed and automated process was developed with a specific software designed to manufacture a robust, safe and consistent product. The manufacturing process consists in PBMC stimulation, RVV transduction in RetroNectin-coated bags and immunoselection of transduced cells by CD271-LS Microbeads reagent. Selected cells are then further expanded before final formulation in freezing medium. Four development full-scale runs demonstrated that cell processing can be performed in the closed-automated-system. Good results were achieved for all inprocess parameters evaluated (cell recovery and viability, total process yield), for quality attributes (product and process related impurities), and potency (DLNGFR expression, ganciclovir sensitivity, Vector Copy Number; immunophenotype for identity, activation and sub-populations markers) of the final product. A formal process GMP validation is ongoing. These results will support discussion with Regulatory Authorities for the introduction of this new process in the late phase of the ongoing clinical study and for the market.

La Seta Catamancio, S., et al. (2015). "Automated manufacturing process for the production of genetically modified lymphocytes." Molecular Therapy **1)**: S183-S184.

The MM-TK is a medicinal product constituted of T lymphocytes ex vivo genetically modified with the gamma retroviral vector SFCMM-3 Mut2 #48 to express a mutated form of the Herpes Simplex Virus Thymidine kinase (HSV-TK Mut2) and a truncated form of the human Low affinity Nerve Growth Factor Receptor (DELTALNGFR) genes. It has development as adjunctive therapy in leukaemia patients or undergone bone marrow transplantation. The current manufacturing process is performed following semi-automated procedure using instrument and tubing set not marketing compliant. In order to optimize this and to standardize cellular therapeutic production for clinical trial and for the market, MolMed have strengthened an alliance with Miltenyi Biotec for tailoring of CliniMACS Prodigy platform for MM-TK DS manufacturing. A closed and automated cell process was developed using the new device with a specific software designed in order to manufacture a robust, safe and consistent product. The manufacturing process essentially consists in the stimulation of a large number of PBMCs (about 3x109 cells) isolated from an haploidentical donor, with anti-CD3 monoclonal antibody and IL-2, transduction of the stimulated cells with the SFCMM-3 Mut2 #48 retroviral vector in RetroNectin coated bags and immunoselection of positively transduced cells using the CD271-LS Microbeads reagent (Miltenyi Biotec). Selected TK cells are then further expanded for 7 days before final formulation in freezing medium. The whole manufacturing process lasts 13 days. The following steps have been automated: cell concentration and cell washing at different manipulation steps and immunomagnetic selection of the transduced cells. Four development full-scale runs demonstrate that automated cell processing for the genetic manipulation of T lymphocytes can be performed in the closed- and automated-system designed by MolMed, reaching good results for all in-process parameters evaluated: cell recovery of 80-90%; cell viability more than 80% at each step; total process yield of 72%. The DS/DP product has been evaluated for the quality attributes as product and process related impurities (CD14% + CD16% + CD19% and residual retronectin, residual anti-CD3, residual CD271 microbeads) and potency of the product (DELTALNGFR expression; sensitivity to Ganciclovir; Vector Copy Number; immunophenotype as CD3%, CD4%, CD8%, CD45%, CD25, CD69, , HLA-DR, CD95; CD45RA and CD62L). The results will support the discussion with Regulatory Autorities and permit the introduction of the new optimized closed manufacturing process in the late phase of the clinical trial and for the market.

Laban, S., et al. (2018). "Cancer-specific antibodies to self-antigens and HPV-16 E6 in recurrent and non-recurrent head and neck squamous cell carcinoma patients." Oncology Research and Treatment **41 (Supplement 1)**: 96.

Purpose: We have previously shown that the expression of cancer-testis antigens is associated with shorter survival in head and neck squamous cell carcinoma (HNSCC) patients. Here we present serologic immune- monitoring data for cancer-specific antibodies in patients with or without recurrence during follow-up. Method(s): Serum or plasma samples from the biobank of the Head & Neck Cancer Center Ulm (117 patients) were analyzed to determine the sero-prevalence of antigen reactivity in non-recurrent (NR) patients (pt) and in recurrent disease (RD). Samples were analyzed by multiplex serology for antibodies to 20 tumor-specific self-antigens, 9 oncogenes, to HPV-16 E6 and to polyomavirus BKV and JCV VP1 capsid protein as positive control antigens. Median fluorescence intensity (MFI) of microbead- bound human immunoglobulins was determined using a Luminex platform. Result(s): Antibody reactivity to >=1 antigen was detected in 70/95 NR pt and in 21/22 RD pt. Sero-positivity against MAGE-A3, -A4, NY-ESO-1, SpanXa1, cmyc and HPV16 E6 was found in >=10% of NR pt. In RD pt, antibodies against MAGE-A1, -A3, -A4, Recoverin, N-Rhodopsin, SpanXa1, cmyc, Histone H2B and p53 were found in >=10% of pt. In most patients with recurrence-free follow-up, antibody reactivities stayed stable or decreased over time. In contrast, in many recurrent patients, increased reactivity was found at the time of recurrence. Conclusion(s): Overall sero-positivity to self-antigens and HPV-16 E6, as well as patterns of antigen sero-positivity differed between NR and RD pt. Multiplex serology may be useful for individual risk assessment and the monitoring for disease recurrence during follow-up. Data analysis and the analysis of a validation cohort is ongoing.

Lacerda, A., et al. (2019). "Plastics in sea surface waters around the Antarctic Peninsula." Scientific Reports **9**(1): 3977.

Although marine plastic pollution has been the focus of several studies, there are still many gaps in our understanding of the concentrations, characteristics and impacts of plastics in the oceans. This study aimed to quantify and characterize plastic debris in oceanic surface waters of the Antarctic Peninsula. Sampling was done through surface trawls, and mean debris concentration was estimated at 1,794 items.km⁻² with an average weight of 27.8 g.km⁻². No statistical difference was found between the amount of mesoplastics (46%) and microplastics (54%). We found hard and flexible fragments, spheres and lines, in nine colors, composed mostly of polyurethane, polyamide, and polyethylene. An oceanographic dispersal model showed that, for at least seven years, sampled plastics likely did not originate from latitudes lower than 58degreeS. Analysis of epiplastic community diversity revealed bacteria, microalgae, and invertebrate groups adhered to debris. Paint fragments were present at all sampling stations and were approximately 30 times more abundant than plastics. Although paint particles were not included in plastic concentration estimates, we highlight that they could

have similar impacts as marine plastics. We call for urgent action to avoid and mitigate plastic and paint fragment inputs to the Southern Ocean.

Lachenmeier, D. W., et al. (2015). "Microplastic identification in German beer - an artefact of laboratory contamination?" Deutsche Lebensmittel Rundschau **111**(10): 437-440.

Recent studies have detected microplastic fibres and particles in some food groups including honey and beer. The aim of this work was to replicate a method for microplastic analysis in beer. Several methodological pitfalls were detected in the literature method, including the staining agent rose bengal used in microscopic analysis, which false-negatively excludes some synthetic agents including the beer filtration aid polyvinylpolypyrrolidone (PVPP). False positive results may occur for non-plastic compounds such as starch or kieselgur. Other pitfalls in the analysis include the considerable background contamination, which did not allow differentiation between beer samples from blank samples in our laboratory. Specialized cleanrooms are required, but even then contamination may occur, because cleanroom classifications focus on small particles and may exclude the relevant sizes of microplastic particles. We judge the previous nonvalidated literature methods that reported positive findings in foods as unsuitable for the purpose of microplastic identification and believe that the results were artefacts due to contamination. Especially because beer production includes a microfiltration step to remove yeast cells, microplastic contamination due to raw materials is highly unlikely. So far, a validated methodology for microplastic detection in foods or beverages is unavailable.

Ladewig, S. M., et al. (2015). "Natural Fibers: A Missing Link to Chemical Pollution Dispersion in Aquatic Environments." Environmental Science & Technology **49**(21): 12609-12610.

Lagarda-Leyva, E. A., et al. (2019). "Managing plastic waste from agriculture through reverse logistics and dynamic modeling." Clean Technologies & Environmental Policy **21**(7): 1415-1432.

Agrofood companies in the region of southern Sonora, Mexico, including those in Valle del Yaqui, employ agrochemical products (insecticides, herbicides, fertilizers, adhesives, fungicides) in the production of foods and face the problem of plastic waste management, specifically from the empty containers and packages from the different products used. This paper proposes a reverse logistics model in the tomato supply chain to economically and environmentally assess the collection process and final disposal of the empty agrochemical packages using dynamic hypotheses and scenario assessment. The challenge in the proposal was to create a dynamic model to observe the current behavior with special attention to environmental pollution and its effects on the health of the communities with the greatest exposure. The results show that this proposal is viable following these stages: (1) analysis of the product supply chain; (2) characterization of the production process; (3) preparation of the causal diagram and dynamic hypotheses; (4) construction of the Forrester diagram and equations; (5) simulation and sensitivity analysis; and (6) design of the user interface. The application of the proposed model supports decision making in the organization regarding the use of containers of discarded agrochemicals, with the aim of reducing their environmental impact. [ABSTRACT FROM AUTHOR]

Lagarde, F., et al. (2016). "Microplastic interactions with freshwater microalgae: Hetero-aggregation and changes in plastic density appear strongly dependent on polymer type." Environmental Pollution **215**: 331-339.

In this study, the interactions between microplastics, chosen among the most widely used in industry such as polypropylene (PP) and high-density polyethylene (HDPE), and a model freshwater microalgae, Chlamydomas reinhardtii , were investigated. It was shown that the presence of high concentrations of microplastics with size >400 µm did not directly impact the growth of microalgae in the first days of contact and that the expression of three genes involved in the stress response was not modified after 78 days. In parallel, a similar colonization was observed for the two polymers. However, after 20 days of contact, in the case of PP only, hetero-aggregates constituted of microalgae, microplastics and exopolysaccharides were formed. An estimation of the hetero-aggregates composition was approximately 50% of PP fragments and 50% of microalgae, which led to a final density close to 1.2. Such hetero-aggregates appear as an important pathway for the vertical transport of PP microplastics from the water surface to sediment. Moreover, after more than 70 days of contact with microplastics, the microalgae genes involved in the sugar biosynthesis pathways were strongly over-expressed compared to control conditions. The levels of over-expression were higher in the case of HDPE than in PP condition. This work presents the first evidence that depending on their chemical nature, microplastics will follow different fates in the environment. [ABSTRACT FROM AUTHOR]

Laglbauer, B. J. L., et al. (2014). "Macrodebris and microplastics from beaches in Slovenia." Marine Pollution Bulletin **89**(1/2): 356-366.

The amount of marine debris in the environment is increasing worldwide, which results in an array of negative effects to biota. This study provides the first account of macrodebris on the beach and microplastics in the sediment (shoreline and infralittoral) in relation to tourism activities in Slovenia. The study assessed the quality and quantity of macrodebris and the quality, size and quantity of microplastics at six beaches, contrasting those under the influences of tourism and those that were not. Beach cleanliness was estimated using the Clean Coast Index. Tourism did not seem to have an effect on macrodebris or microplastic quantity at beaches. Over 64% of macrodebris was plastic, and microplastics were ubiquitous, which calls for classification of plastics as hazardous materials. Standard measures for marine debris assessment are needed, especially in the form of an all-encompassing debris index. Recommendations for future assessments are provided for the Adriatic region.

Lahens, L., et al. (2018). "Macroplastic and microplastic contamination assessment of a tropical river (Saigon River, Vietnam) transversed by a developing megacity." Environmental Pollution **236**: 661-671.

Both macroplastic and microplastic contamination levels were assessed for the first time in a tropical river estuary system, i.e. the Saigon River, that traverses a developing South East Asian megacity, i.e. Ho Chi Minh City, Vietnam. The analysis of floating debris collected daily on the Nhieu Loc - Thi Nghe canal by the municipal waste management service shows that the plastic

mass percentage represents 11-43%, and the land-based plastic debris entering the river was estimated from 0.96 to 19.91g inhabitant⁻¹ d⁻¹, namely 350 to 7270g inhabitant⁻¹ yr⁻¹. Microplastics were assessed in the Saigon River and in four urban canals by sampling bulk water for anthropogenic fiber analysis and 300mum mesh size plankton net exposition for fragment analysis. Fibers and fragments are highly concentrated in this system, respectively 172,000 to 519,000 items m⁻³ and 10 to 223 items m⁻³. They were found in various colors and shapes with smallest size and surface classes being predominant. The macroplastics and fragments were mainly made of polyethylene and polypropylene while the anthropogenic fibers were mainly made of polyester. The relation between macroplastic and microplastic concentrations, waste management, population density and water treatment are further discussed.

Lahive, E., et al. (2019). "Microplastic particles reduce reproduction in the terrestrial worm Enchytraeus crypticus in a soil exposure." Environmental Pollution **255**(Part 2).

Terrestrial environments are subject to extensive pollution by plastics and, based on the slow degradation of plastics, are likely to act as long term sinks for microplastic debris. Currently the hazards of microplastics in soil and the potential impacts on soil organisms is poorly understood. Particularly the role of particle characteristics, such a size or polymer type, in dose-response relationships for microplastics is not known. The aim of this study was to assess the ingestion and toxicity of nylon (polyamide) particles, in three different size ranges, to Enchytraeus crypticus in a soil exposure. Effects were also compared with those of polyvinyl chloride (PVC) particles, in a single size range. Nylon particle ingestion was confirmed using fluorescence microscopy, with greatest ingestion for particles in the smallest size range (13-18 micro m). To investigate how particle size affected survival and reproduction, E. crypticus were exposed to nylon particles in two well-defined size ranges (13-18 and 90-150 micro m) and concentrations of 20, 50, 90 and 120 g/kg (2-12% w/w). An intermediate nylon size range (63-90 micro m) and a larger sized PVC particle (106-150 micro m), both at 90 g/kg, were also tested. Survival was not affected by either of the polymer types or sizes. Reproduction was significantly reduced, in a dose-dependent manner, by the nylon particles at high exposure concentrations (>90 g/kg). Smaller size ranges (13-18 micro m) had a greater effect compared to larger size ranges (>63 micro m), with a calculated EC₅₀ for the 13-18 micro m size range of 108+or-8.5 g/kg. This greater hazard could be qualitatively linked with the ingestion of a greater number of smaller particles. This study highlights the potential for toxic effects of plastics in small size ranges to soil organisms at high exposure concentrations, providing understanding of the hazards microplastics may pose in the terrestrial environment.

Lai, Y. H., et al. (2019). "Nutritional optimization of Arthrospira platensis for starch and Total carbohydrates production." Biotechnology Progress **35**(3): e2798.

Present study aims to optimize the production of starch and total carbohydrates from Arthrospira platensis. Growing concerns toward unprecedented environmental issues associated with plastic pollution has created a tremendous impetus to develop new biomaterials for the production of bioplastic. Starch-based biopolymers from algae serve as sustainable feedstock for thermoplastic starch production due to their abundant availability and low cost. A. platensis was cultivated in Zarrouk's medium at 32 +/- 1degreeC and exposed to red light with a photoperiod of 12:12 hr light/dark. Growth kinetics studies showed that the maximum specific growth rate (mu_{max}) obtained was 0.059 day⁻¹ with the doubling time (t_d) of 11.748 days. Subsequently, Zarrouk's medium with different concentrations of sulfur, phosphorus and nitrogen was prepared to establish the nutrient-limiting conditions to

enhance the accumulation of starch and total carbohydrates. In this study, the highest starch accumulated was 6.406 +/- 0.622 mg L⁻¹ under optimized phosphorus limitation (0.025 g L⁻¹) conditions. Nitrogen limitation (0.250 g L⁻¹) results demonstrated significant influenced (p < 0.05) on total carbohydrates (67.573 +/- 2.893 mg L⁻¹) accumulation in A. platensis. The starch accumulation in A. platensis was significantly affected (p < 0.05) by phosphorus limitation (0.0025 g L⁻¹). Subsequently, the optimized phosphorus concentration was coupled with mixotrophic cultivation to further enhance the starch accumulation. The results obtained indicated that, the starch (11.426 +/- 0.314 mg L⁻¹) and carbohydrates (43.053 +/- 2.986 mg L⁻¹) concentration obtained was significantly high (p < 0.05) under mixotrophic cultivation. Therefore, it shown that nutrient limitation and mixotrophic cultivation are viable strategies to enhance the accumulation of starch and total carbohydrates in A. platensis.

Laina, E. (2018). "Expert Group Identifies Barriers and Response Options on Marine Litter and Microplastics." Environmental Policy & Law **48**(3/4): 168-171.

The article offers information on the first meeting of the Ad Hoc Open-ended Expert Group on Marine Litter and Microplastics held from May 29–31, 2018 in Nairobi, Kenya, under the United Nations Environment Programme (UNEP). Topics discussed include environmental, social and economic costs of marine litter and microplastics; plastic-to-energy strategies, uncoordinated clean-up efforts and consequences of unplanned transitions to green development; and need to address consumer use of plastics.

Laitala, K., et al. (2018). "Does Use Matter? Comparison of Environmental Impacts of Clothing Based on Fiber Type." Sustainability **10**(7): 2524.

Several tools have been developed to compare the environmental impact of textiles. The most widely used are Higg Materials Sustainability Index (MSI) and MADE-BY Fiber Benchmark. They use data from production to evaluate the environmental impacts of textiles differentiated by fiber type. The use phase is excluded from both tools. This article discusses whether there is evidence that the use of textiles differs systematically between different fiber types and examines the consequences of comparing the environmental impacts of clothing based on differences in production of fibers alone without including differences in their use. The empirical material in this paper is based on analysis of rating tools and a literature review on clothing use. It shows that fiber content contributes to the way consumers take care of and use their clothing. When use is omitted, major environmental problems associated with this stage, such as spread of microplastics, are also excluded. This one-sided focus on material production impacts also excludes the importance of product lifespans, quality, and functionality. The consequence is that short-lived disposable products are equated with durable products. Comparing dissimilar garments will not help consumers to make choices that will reduce the environmental burden of clothing. We need an informed discussion on how to use all materials in the most environmentally sustainable way possible.

Lakew, M., et al. (1997). "Combined immunomagnetic cell sorting and ELISPOT assay for the phenotypic characterization of specific antibody-forming cells." Journal of Immunological Methods **203**(2): 193-198.

A combination of immunomagnetic cell sorting and ELISPOT (enzyme-linked immunospot) techniques were evaluated to permit enrichment and characterization of antibody-secreting cells (ASC). Cell suspensions containing putative ASC were first incubated with magnetic microbeads coated with antibodies specific for a given cell surface marker. After separation of bead-cell clusters and free cells, the resulting cell populations were examined for the presence of ASC by an ELISPOT assay. As a model system, the expression of selected cell differentiation markers by human circulating ASC was evaluated after parenteral tetanus vaccination and during the course of a Leishmania infection. Prior treatment of blood MNC with beads coated with antibodies to CD38, HLA-DR or CD19 permitted the isolation of virtually all blood ASC. Further, prior immunomagnetic removal of T (CD2⁺) cells from blood MNC, followed by isolation of CD38⁺ cells facilitated the detection of Leishmania major-specific ASC in all 6 patients examined, whereas parasite-specific ASC among unfractionated blood mononuclear cells could only be detected in 3 of these 6 patients. This simple and rapid approach provides accurate estimates of the frequency of ASC within a given B cell population or subpopulation, and can efficiently enrich functional ASC from complex cell suspensions. It should be particularly useful in situations where ASC are present at low frequencies.

Lalegul, O., et al. (2012). "Encapsulation of human adipose mesenchymal stem cells in fibrin microbeads from platelet rich plasma and their in vitro evaluation." Journal of Tissue Engineering and Regenerative Medicine **1)**: 160.

Platelet-rich plasma (PRP) is identified as autologous blood with a concentration of platelets in high levels. Platelets contain a variety of growth factors and cytokines that are principal in soft tissue healing and bone mineralization. In this study, fibrin microbeads were developed using a novel technique for encapsulating mammalian cells (patent application TR-PT 2012/01068). PRP was obtained from anticoagulated human whole blood samples. Human adipose derived mesenchymal stem cells (hAdMSCs) were isolated from lipoaspirates collected under ethical approval; then cultured and characterized by FACS. Encapsulation protocol was optimised. hAdMSCs-containing PRP-alginate solution was prepared and fibrin microbeads were dropwise formed in CaCl2 solution. Later, alginate was extracted by the calcium chelator sodium citrate. hAdMSC-encapsulated fibrin microbeads were cultured at 5% CO2-95% air and 37 degreeC. Microbeads obtained from PRP and platelet poor plasma were used as controls. SEM analyses were performed to characterize fibrin microbeads. In vitro release of TGF-b1 from fibrin microbeads was examined in cell culture medium by using ELISA kit. Viability of encapsulated hAdMSCs was evaluated by MTT assay. In vitro differentiation properties of encapsulated hAd-MSCs were investigated histologically. In vitro experiments demonstrated that encapsulated hAdMSCs retained viability, proliferated for >6 weeks and retained tri-lineage differentiation property inside fibrin microbeads.

Lalitha, K. (2015). "Work place evaluation of safe biomedical waste management practices in designated microscopy centres(DMC) and tuberculosis unit(TU) under revised national tuberculosis control programme." Indian Journal of Public Health Research and Development **6**(1): 99-102.

Safe biomedical waste management (BMWM) at RNTCP centres is critical for worker and patient safety. Though there are guidelines, wide gap between precept and practice of BMWM exists. Hence this cross sectional study was undertaken in randomly selected 8 DMCs/ TUs of two districts of Bihar state in 2007 to evaluate the infrastructure, resource availability and to identify the constraints and difficulties in effective implementation of guidelines for safe BMWM practices at DMC/TUs.16 Lab technicians and 60 patients on DOTS were interviewed. Main observations were that sharp-pits available in 50%DMCs/TUs; sputum sample not disposed as per guidelines in 50%DMCs/TUs and in 6 DMCs, foot-operated bins and running water supply not available. Plastic waste incinerated at 3 DMC/TUs. All lab-technicians trained in last 6 months but hand washing practices glaringly lacking. Only 25% patients were aware of safe disposal of sputum. Need for emphasis on worker safety among lab technicians and Proper

Patient counseling regarding safe sputum disposal. Copyright © 2015, Indian Journal of Public Health Research and Development. All rights reserved.

Lam, C. S., et al. (2018). "A Comprehensive Analysis of Plastics and Microplastic Legislation Worldwide." Water, Air, and Soil Pollution **229 (11) (no pagination)**(345).

Aquatic or land-based plastic pollution has raised serious concerns for ecosystems, and especially human and animal health worldwide. A variety of legislative instruments were developed to control, reduce, and manage the usage of plastics in day-to-day life to minimize the adverse outcomes brought by sending these plastic to landfill. Existing legislation heavily embraces levies, bans, and voluntary efforts through "reduce and reuse campaigns." Thus, the present review highlights the pros and cons of the existing legislation and its implementation. It also assesses the need for the improvement of plastic legislation to better consider environmental and human health impacts. The paper proposes new efficient management strategies to aid in the development of plastic legislation which prevents increase of plastic pollution worldwide, the potential challenges that would arise from its implementation, and the mechanisms for overcoming these challenges. The paper proposes a conventional management strategy based on the current plastic management and legislation. It aims to improve the feasibility and effectiveness of the implementation of future plastic policies. Copyright © 2018, Springer Nature Switzerland AG.

Lam, L. T. and L. Roberts-Rapp (2014). "Multiplex analysis of anti-apoptotic BCL2 family and caspase 3 activation by microbead arrays." Assay & Drug Development Technologies **12**(3): 190-196.

We have developed a multiplex assay to measure the expression of anti-apoptotic proteins and caspase 3 activation using the Luminex platform. In this report, we show three applications for this assay. First, we used this assay to identify biomarkers for BCL2 inhibitors to obtain a quantitative measure of expression of anti-apoptotic proteins (BCL2, BCLxL, and MCL1) in a panel of cell lines and correlated their response to BCL2/BCLxL inhibitor, ABT-263 (navitoclax). Second, we used this assay to monitor the change of MCL1 protein expression and induction of active caspase 3 after treatment with cyclin-dependent kinase inhibitor flavopiridol. Finally, we used this assay to screen for small molecules that decrease MCL1 protein and identified new combinations with ABT-263. This method provides a quick and convenient way to measure basal expression of the anti-apoptotic proteins and monitor expression change upon drug treatment. It is also applicable for high-throughput screening for compounds that decrease the expression of these anti-apoptotic proteins.

Lam, S. S., et al. (2019). "Microwave vacuum pyrolysis of waste plastic and used cooking oil for simultaneous waste reduction and sustainable energy conversion: Recovery of cleaner liquid fuel and techno-economic analysis." Renewable & Sustainable Energy Reviews **115**: N.PAG-N.PAG.

Microwave vacuum pyrolysis was examined and compared to conventional pyrolysis for its technical and economic feasibility in co-processing of waste plastic and used cooking oil simultaneously to generate fuel product. The pyrolysis demonstrated beneficial process features with respect to high heating rate (29 °C/min) to provide fast heating, high process temperature for extensive cracking (581 °C), short process time (20 min), and low electrical energy consumption (0.38 kWh). The combined use of microwave vacuum pyrolysis and activated carbon reaction bed produced up to 84 wt% yield of liquid oil, containing light hydrocarbons and higher heating value (49 MJ/kg) than diesel and gasoline, hence showing great promise for application as fuel. The use of activated carbon reaction bed showed beneficial effect in creating a reduction environment that prevented the oxidation or formation of oxygenated by-products.

A positive synergistic effect between waste plastic and used cooking oil was also observed. The liquid oil obtained from this pyrolysis approach presented a low oxygen and nitrogen content, and free of sulphur, showing 'cleaner' properties with respect to reduced char residues, sludge formation, corrosiveness, degradation of oil quality, and emission of undesired SOx and NOx during its utilization in combustion process. The techno-economic analysis indicated that this pyrolysis approach showed low production cost (USD 0.25/L compared to USD 0.523/L of diesel price in Malaysia). Our results demonstrate that microwave vacuum pyrolysis is potentially economically feasible and show promise as a sustainable approach for energy conversion in providing improved process features and production of cleaner liquid fuel. Image 1 • Microwave vacuum pyrolysis treats waste plastic and used cooking oil simultaneouly. • It combines microwave heating, activated carbon reaction bed and vacuum condition. • It shows high heating rate, temperature, low process time and electric consumption. • 84 wt% yield of liquid oil with diesel-range hydrocarbons and high energy content. • Cleaner liquid composition (sulphur free, low oxygen and nitrogen) is observed. [ABSTRACT FROM AUTHOR]

Lamb, C. L., et al. (2019). "Enrichment of Antigen-Specific Class-Switched B Cells from Individuals Naturally Immunized by Infection with Group A Streptococcus." Msphere **4**(6): 06.

The low frequency of circulating antigen-specific memory B cells is a considerable obstacle in the discovery and development of human monoclonal antibodies for therapeutic application. Here, we evaluate two solid-phase isolation methods to enrich the number of antigen-specific B cells from individuals naturally immunized against streptolysin O (SLO), a key virulence factor and known immunogen of group A streptococcus (GAS). Class-switched B cells obtained from individuals with a history of GAS infection were separated from peripheral blood mononuclear cells (PBMCs) by immunomagnetic methods. SLO-specific B cells were further enriched directly by binding to SLO monomers and captured by streptavidin-coated magnetic microbeads or indirectly by binding a fluorescently labeled SLO-streptavidin tetramer and captured by anti-fluorophore immunomagnetic microbeads. SLO-bound B cells were quantitated by flow cytometry and/or expanded in batch culture to determine IgG specificity. From individuals who have suffered a GAS infection >=2 years prior, only the direct method enriched SLO-specific B cells, as determined by flow cytometry. Likewise, in batch culture, B cells isolated by the direct method resulted in an average of 375-fold enrichment in anti-SLO IgG, while no enrichment was observed for B cells isolated by the indirect method. The direct method established here provides a simple approach to increase low-frequency antigen-specific B cell populations supporting many downstream applications, such as immortalization of B cells, cloning of immunoglobulin genes, or purification of antibodies from supernatant for future study. Overall, this process is efficient, is inexpensive, and can be applied to many naturally immunogenic antigens. IMPORTANCE Bacteria called group A streptococci can cause a variety of skin and soft tissue infections ranging from mild pharyngitis ("strep throat") to deadly necrotizing fasciitis (sometimes called "flesh-eating" disease). In each case, the development of disease and the degree of tissue damage are mediated by toxins released from the bacteria during infection. Consequently, novel therapies aimed at clearing bacterial toxins are greatly needed. One promising new treatment is the utilization of monoclonal antibodies delivered as an

immunotherapeutic for toxin neutralization. However, current methods of antibody development are laborious and costly. Here, we report a method to enrich and increase the detection of highly desirable antigen-specific memory B cells from individuals previously exposed to GAS using a cost-effective and less-time-intensive strategy. We envision that this method will be incorporated into many applications supporting the development of immunotherapeutics.

Lamb, J. B., et al. (2018). "Plastic waste associated with disease on coral reefs." Science **359**(6374): 460-462.

Plastic waste can promote microbial colonization by pathogens implicated in outbreaks of disease in the ocean. We assessed the influence of plastic waste on disease risk in 124,000 reef-building corals from 159 reefs in the Asia-Pacific region. The likelihood of disease increases from 4% to 89% when corals are in contact with plastic. Structurally complex corals are eight times more likely to be affected by plastic, suggesting that microhabitats for reef-associated organisms and valuable fisheries will be disproportionately affected. Plastic levels on coral reefs correspond to estimates of terrestrial mismanaged plastic waste entering the ocean. We estimate that 11.1 billion plastic items are entangled on coral reefs across the Asia-Pacific and project this number to increase 40% by 2025. Plastic waste management is critical for reducing diseases that threaten ecosystem health and human livelihoods.

Lambert, S., et al. (2014). "Occurrence, degradation, and effect of polymer-based materials in the environment." Reviews of Environmental Contamination & Toxicology **227**: 1-53.

There is now a plethora of polymer-based materials (PBMs) on the market, because of the increasing demand for cheaper consumable goods, and light-weight industrial materials. Each PBM constitutes a mixture of their representative polymer/sand their various chemical additives. The major polymer types are polyethylene, polypropylene,and polyvinyl chloride, with natural rubber and biodegradable polymers becoming increasingly more important. The most important additives are those that are biologically active, because to be effective such chemicals often have properties that make them resistant to photo-degradation and biodegradation. During their lifecycle,PBMs can be released into the environment form a variety of sources. The principal introduction routes being general littering, dumping of unwanted waste materials,migration from landfills and emission during refuse collection. Once in the environment,PBMs are primarily broken down by photo-degradation processes, but due to the complex chemical makeup of PBMs, receiving environments are potentially exposed to a mixture of macro-, meso-, and micro-size polymer fragments, leached additives, and subsequent degradation products. In environments where sunlight is absent (i.e., soils and the deep sea) degradation for most PBMs is minimal .The majority of literature to date that has addressed the environmental contamination or disposition of PBMs has focused on the marine environment. This is because the oceans are identified as the major sink for macro PBMs, where they are known to present a hazard to wildlife via entanglement and ingestion. The published literature has established the occurrence of microplastics in marine environment and beach sediments, but is inadequate as regards contamination of soils and freshwater sediments. The uptake of microplastics for a limited range of aquatic organisms has also been established, but there is a lack of information regarding soil organisms, and the long-term effects of microplastic uptake are also less well understood.There is currently a need to establish appropriate degradation test strategies consistent with realistic environmental conditions, because the complexity of environmental systems is lost when only one process (e.g., hydrolysis) is assessed in isolation. Enhanced methodologies are also needed to evaluate the impact of PBMs to soil and freshwater

environments.

Lambert, S. and M. Wagner (2016). "Characterisation of nanoplastics during the degradation of polystyrene." Chemosphere **145**: 265-268.

The release of plastics into the environment has been identified as an important issue for some time. Recent publications have suggested that the degradation of plastic materials will result in the release of nano-sized plastic particles to the environment. Nanoparticle tracking analysis was applied to characterise the formation of nanoplastics during the degradation of a polystyrene (PS) disposable coffee cup lid. The results clearly show an increase in the formation of nanoplastics over time. After 56 days' exposure the concentration of nanoplastics in the PS sample was 1.26 x 10(8) particles/ml (average particles size 224 nm) compared to 0.41 x 10(8) particles/ml in the control.

Lambert, S. and M. Wagner (2016). "Formation of microscopic particles during the degradation of different polymers." Chemosphere **161**: 510-517.

This study investigated the formation and size distribution of microscopic plastic particles during the degradation of different plastic materials. Particle number concentrations in the size range 30 nm–60 µm were measured by nanoparticle tracking analysis (NTA) and Coulter Counter techniques. Each of the plastics used exhibited a measureable increase in the release of particles into the surrounding solution, with polystyrene (PS) and polylactic acid (PLA) generating the highest particle concentrations. After 112 d, particle concentrations ranged from 2147 particles ml −1 in the control (C) to 92,465 particles ml −1 for PS in the 2–60 µm size class; 1.2 × 10 5 particles ml −1 (C) to 11.6 × 10 6 for PLA in the 0.6–18 µm size class; and 0.2 × 10 8 particles ml −1 (C) to 6.4 × 10 8 particles ml −1 for PS in the 30–2000 nm size class (84 d). A classification of samples based on principal component analysis showed a separation between the different plastic types, with PLA clustering individually in each of the three size classes. In addition, particle size distribution models were used to examine more closely the size distribution data generated by NTA. Overall, the results indicate that at the beginning of plastic weathering processes chain scission at the polymer surface causes many very small particles to be released into the surrounding solution and those concentrations may vary between plastic types. [ABSTRACT FROM AUTHOR]

Lambert, W. S., et al. (2017). "Oral Delivery of a Synthetic Sterol Reduces Axonopathy and Inflammation in a Rodent Model of Glaucoma." Frontiers in Neuroscience **11**: 45.

Glaucoma is a group of optic neuropathies associated with aging and sensitivity to intraocular pressure (IOP). The disease is the leading cause of irreversible blindness worldwide. Early progression in glaucoma involves dysfunction of retinal ganglion cell (RGC) axons, which comprise the optic nerve. Deficits in anterograde transport along RGC axons to central visual structures precede outright degeneration, and preventing these deficits is efficacious at abating subsequent progression. HE3286 is a synthetic sterol derivative that has shown therapeutic promise in models of inflammatory disease and neurodegenerative disease. We examined the efficacy of HE3286 oral delivery in preventing loss of anterograde transport in an inducible

model of glaucoma (microbead occlusion). Adult rats received HE3286 (20 or 100 mg/kg) or vehicle daily via oral gavage for 4 weeks. Microbead occlusion elevated IOP ~30% in all treatment groups, and elevation was not affected by HE3286 treatment. In the vehicle group, elevated IOP reduced anterograde axonal transport to the superior colliculus, the most distal site in the optic projection, by 43% (p = 0.003); HE3286 (100 mg/kg) prevented this reduction (p = 0.025). HE3286 increased brain-derived neurotrophic factor (BDNF) in the optic nerve head and retina, while decreasing inflammatory and pathogenic proteins associated with elevated IOP compared to vehicle treatment. Treatment with HE3286 also increased nuclear localization of the transcription factor NFkappaB in collicular and retinal neurons, but decreased NFkappaB in glial nuclei in the optic nerve head. Thus, HE3286 may have a neuroprotective influence in glaucoma, as well as other chronic neurodegenerations.

Lambert, W. S., et al. (2019). "Towards A Microbead Occlusion Model of Glaucoma for a Non-Human Primate." Scientific Reports **9**(1): 11572.

Glaucoma is a group of optic neuropathies associated with aging and sensitivity to intraocular pressure (IOP). The disease causes vision loss through the degeneration of retinal ganglion cell neurons and their axons in the optic nerve. Using an inducible model of glaucoma, we elevated IOP in the squirrel monkey (Saimiri boliviensis) using intracameral injection of 35 mum polystyrene microbeads and measured common pathogenic outcomes in the optic projection. A 42% elevation in IOP over 28 weeks reduced anterograde transport of fluorescently-labeled cholera toxin beta from retina to the lateral geniculate nucleus (60% decrease), and to the superior colliculus (49% decrease). Pressure also reduced survival of ganglion cellaxons in the optic nerve by 22%. The same elevation caused upregulation of proteins associated with glaucomatous neurodegeneration in the retina and optic nerve, including complement 1q, interleukin 6, and brain-derived neurotrophic factor. That axon degeneration in the nerve lagged deficits in anterograde transport is consistent with progression in rodent models, while the observed protein changes also occur in tissue from human glaucoma patients. Thus, microbead occlusion in a non-human primate with a visual system similar to our own represents an attractive model to investigate neurodegenerative mechanisms and therapeutic interventions for glaucoma.

Lambert, W. S., et al. (2015). "Nanosponge-Mediated Drug Delivery Lowers Intraocular Pressure." Translational Vision Science & Technology **4**(1): 1.

PURPOSE: We examined the efficacy of an extended-release drug delivery system, nanosponge (NS) encapsulated compounds, administered intravitreally to lower intraocular pressure (IOP) in mice.

METHODS: Bilateral ocular hypertension was induced in mice by injecting microbeads into the anterior chamber. Hypertensive mice received NS loaded with ocular hypotensive drugs via intravitreal injection and IOP was monitored. Retinal deposition and retinal ganglion cell (RGC) uptake of Neuro-DiO were examined following intravitreal injection of Neuro-DiO-NS using confocal microscopy.

RESULTS: Brimonidine-loaded NS lowered IOP 12% to 30% for up to 6 days (P < 0.02), whereas travoprost-NS lowered IOP 19% to 29% for up to 4 days (P < 0.02) compared to saline injection. Three bimatoprost NS were tested: a 400-nm NS and two 700-nm NS with amorphous (A-NS) or amorphous/crystalline (AC-NS) crosslinkers. A single injection of 400 nm NS lowered IOP 24% to 33% for up to 17 days compared to saline, while A-NS and AC-NS lowered IOP 22% to 32% and 18% to 26%, respectively, for up to 32 days (P < 0.046). Over time retinal deposition of Neuro-DiO increased from 19% to 71%; Neuro-DiO released from NS was internalized by RGCs.

CONCLUSIONS: A single injection of NS can effectively deliver ocular hypotensive drugs in a linear and continuous manner for up to 32 days. Also, NS may be effective at targeting RGCs, the neurons that degenerate in glaucoma.

TRANSLATIONAL RELEVANCE: Patient compliance is a major issue in glaucoma. The use of NS to deliver a controlled, sustained release of therapeutics could drastically reduce the number of patients that progress to vision loss in this disease.

Lambertini, E., et al. (2012). "Role of slug transcription factor and different cell culture conditions on osteogenic potential of human mesenchymal stem cells." Osteoporosis International **2)**: S413.

Objective(s): In order to develop alternative strategies to induce efficient osteogenic differentiation of human mesenchymal stem cells (hMSCs) for their clinical use in bone tissue repair we aimed to identify i. new transcription factors with crucial role in determining MSC fate, and ii. new static or dynamic 3D culture systems for affecting MSC behaviour. Material(s) and Method(s): We used hMSCs from periodontal ligament (PDL) and umbilical cord Wharton's jelly (WJ) after standard immunophenotyping. We assessed cell viabilty with propidium iodide and Calcein-AM, morphological changes by different microscopic techniques (optical microscopy, SEM, TEM), gene expression by qRT-PCR, immunocytochemistry, and Western blot. Slug gene knockdown was obtained by transfection with siRNA sequence targeting Slug gene transcript. 3D dynamic culture experiments were performed in RCCS bioreactor (Synthecon) with High Aspect Ratio Vessel (HARV) using the cells incapsulated in Ba-alginate microbeads. ALP activity measuring and Alizarin Red S staining were used to monitor osteogenic differentiation after culturing the cells in osteogenic medium. Result(s): We demonstrated that Slug transcription factor expression is essential for osteogenesis. Slug knockdown negatively affects deposition of mineralized matrix, but seems to reprogram the hMSC towards chondrocyte differentiation, by modulating the expression of specific differentiation markers (Runx2, Sox5, Sox6, Sox9, Stat1, Col1 and >Col2) and miRNA-221. Comparing 2D vs 3D culture >conditions we demonstrated that hMSCs osteogenic potential, cell adhesion and interaction, osteoblastic markers expression and deposition of mineralized matrix were improved when alginate-entrapped hMSCs were cultured in the bioreactor. In addition, when Polymeric Micelles (self-assembling colloidal systems) were chosen to deliver in culture medium osteogenic inducers (instead of traditional solubilization with DMSO which is known to be cytotoxic), an increase of osteogenic potential was observed. Conclusion(s): The goal of using new modality for in vitro hMSCs culture and discovering new regulatory signaling pathways for a possible cell phenotype manipulation is to bridge the gap between traditional 2D cell culture and the in vivo setting, with an approach that places cultured hMSCs in an environment that more closely represents the complex 3D structure of native tissue. Therefore, our data add new informations to develop innovative therapeutic strategies for metabolic bone disease and bone regenerative medicine.

Lamblin, A., et al. (2001). "Blood mediated reaction following intraportal islet allograft in pigs. [French]." Annales de Chirurgie **126**(8): 743-750.

Study aim: Intraportal islet allograft appears to be one of the promising treatments for type I diabetes. However, many limiting factors persist. An activation of the coagulation cascade upon contact with islets, has been reported recently in vitro and could play a crucial role in a non specific inflammatory reaction and favour the specific immune reaction. The aim of this experimental study was to confirm in vivo this activation of the coagulation cascade. Material(s) and Method(s): An allogenic islets preparation or a material control (inert microbeads) was injected intraportally, in Large White pigs (n=26), associated with or without an anticoagulant

treatment (heparin). Systemic markers of haemostasis were measured in pigs for 72 hours following injection of the studied material. Result(s): The thrombin-antithrombin complex increased and platelet count decreased in groups receiving preparation of islets, both indicators of an activation of the coagulation cascade. This activation was proportional to the injected volume and was partially attenuated by heparin. No activation was observed in pigs receiving the material control. Conclusion(s): The activation of the coagulation cascade and the non specific inflammatory reaction could be one of the obstacles to the success of the islet allografts. The use of anticoagulant and anti-inflammatory molecules could potentially allow an improvement of the present results of islet allograft. © 2001 Editions scientifiques et medicales Elsevier SAS.

Lambrechts, D., et al. (2013). "Fluorescent oxygen sensitive microbead incorporation for measuring oxygen tension in cell aggregates." Biomaterials **34**(4): 922-929.

Molecular oxygen is a main regulator of various cell functions. Imaging methods designed as screening tools for fast, in situ, 3D and non-interfering measurement of oxygen tension in the cellular microenvironment would serve great purpose in identifying and monitoring this vital and pivotal signalling molecule. We describe the use of dual luminophore oxygen sensitive microbeads to measure absolute oxygen concentrations in cellular aggregates. Stable microbead integration, a prerequisite for their practical application, was ensured by a site-specific delivery method that is based on the interactions between streptavidin and biotin. The spatial stability introduced by this method allowed for long term measurements of oxygen tension without interfering with the cell aggregation process. By making multiple calibration experiments we further demonstrated the potential of these sensors to measure local oxygen tension in optically dense cellular environments.

Lammel, D. R., et al. (2019). "Testing Contrast Agents to Improve Micro Computerized Tomography (µCT) for Spatial Location of Organic Matter and Biological Material in Soil." Frontiers in Environmental Science.

Soil carbon is essential for soil and ecosystem functioning. Its turnover and storage in soil are multifaceted processes that involve microbial activity in complex physical matrices. Biological litter, which include plants, animals and microorganisms, is decomposed in soil stimulating soil biota (archaea, bacteria, fungi, protists and animals) activity and yielding soil organic matter (SOM). Such decomposition processes are influenced by local physico-chemical characteristics including the spatial distribution of aggregates and pores. More refined analytical tools are needed to better understand these processes, especially considering the spatial 3D structure of soil matrices. Using synchrotron radiation (X-ray) micro computerized tomography (SR-µCT), we tested different contrast agents (staining methods) based on silver (Ag), eosin (Br based) and liquid and gaseous iodine (I) in order to spatially image biological material and SOM in soil samples. We also performed K-edge SR-µCT for the Ag and I2 treatments and conventional µCT for additional soil samples applying the I2 treatment. Our results indicated that I2 was the most efficient contrast method for SR-µCT imaging of soil samples. I2 qualitatively improved the images, but mainly, by using the K-edge SR-µCT, this method provided a powerful tool to determine the spatial location of SOM. We acknowledge that the use of SR-µCT is an expensive technique to study soil samples, which comes with bottlenecks in terms of access to facilities and measurement time. Nevertheless, we show that the I2 treatment improved soil images also using standard µCT. In conventional µCT the I2 treatment improved the visualization of biological material and consequently improved the qualitative analysis of fine plants roots and micro-fauna (Collembola). This improvement may have a positive implication in soil biology, by improving a non-destructive method to detect fungi (SR-μCT), soil fauna (conventional μCT) and roots in undisturbed soil samples. An unexpected finding was that the I2 treatment also stained the plastic sample containers (nylon and polyimide), indicating the potential for the I2 staining procedure to be applied for the detection of plastic pollution in soil samples.

Lan, M. l. (2008). "Biomaterials for trellising and mulching in tomato cultivation: efficacy and time saving." PHM Revue Horticole **506**: 14-19.

An on-going trial begun in 2007 at the South Brittany Horticultural Experiment Station on the testing of biodegradable materials (biomaterials) in tomato production is described. Tomato plants of cv. Brazil were planted in April in soil with plastic film mulching in a cold tunnel, with harvesting from June to November. The efficacy of 17 micro m biodegradable Bi-OPL film for mulching, and 2 mm Plantobio string made from paper and Plantobio 20 mm clips for plant training was compared to that of their plastic homologues. The advantages of the biodegradable products included reducing work load at the end of the cropping season, requiring 4 times less work time than traditional plastic products, and there were none of the problems associated with the disposal of plastic waste. Despite the higher prices of the biodegradable products, an economic balance analysis involving costs of supplies and labour showed that plastic and biodegradable products were equally favourable.

Lan, W. J., et al. (2010). "Duplexed on-microbead binding assay for competitive inhibitor of epidermal growth factor receptor by quantitative flow cytometry." Basic & Clinical Pharmacology & Toxicology **107**(1): 560-564.

Upon binding agonist, the epidermal growth factor receptor (EGFR) is dimerized and auto-phosphorylated to activate downstream pathway that induces diverse physiology and pathology processes. Conventional methods for evaluation of EGFR inhibitors are limited. This study describes a duplexed on-microbead binding assay allowing competitive EGFR inhibitors to be quantificationally evaluated in vitro. Polystyrene microbeads barcoded by fluoresceine isothiocyanate fluorescence as high brightness and low brightness microspheres were coated with receptor tyrosine kinase (RTK) ligand-epidermal growth factor (EGF)/stem cell factor (SCF) and ATP/GTP, respectively. High and low brightness microbeads were mixed and incubated with EGFR and its competitive inhibitor in binding assay buffer. Phycoerythrin (PE) fluorescence-labelled antibody was employed to report the level of EGFR binding to EGF/SCF and ATP/GTP. Values were numbered via PE molecules assessed by quantitative flow cytometry.

Lanctôt, C. M., et al. (2018). "Application of nuclear techniques to environmental plastics research." Journal of Environmental Radioactivity **192**: 368-375.

Plastic pollution is ubiquitous in aquatic environments and its potential impacts to wildlife and humans present a growing global concern. Despite recent efforts in understanding environmental impacts associated with plastic pollution, considerable uncertainties still exist regarding the true risks of nano- and micro-sized plastics (<5 mm). The challenges faced in this field largely relate to the methodological and analytical limitations associated with studying plastic debris at low (environmentally relevant) concentrations. The present paper highlights how radiotracing techniques that are commonly applied to trace the fate and behaviour of chemicals and particles in various systems, can contribute towards addressing several important and outstanding questions in environmental plastic pollution research. Specifically, we discuss the use of radiolabeled microplastics and/or chemicals for 1) determining sorption/desorption kinetics of a range of contaminants to different types of plastics under varying conditions, 2) understanding the influence of microplastics on contaminant and nutrient bioaccumulation in

aquatic organisms, and 3) assessing biokinetics, biodistribution, trophic transfer and potential biological impacts of microplastic at realistic concentrations. Radiotracer techniques are uniquely suited for this research because of their sensitivity, accuracy and capacity to measure relevant parameters over time. Obtaining precise and timely information on the fate of plastic particles and co-contaminants in wildlife has widespread applications towards effective monitoring programmes and environmental management strategies.

Lang, P., et al. (2004). "Transplantation of a combination of CD133+ and CD34+ selected progenitor cells from alternative donors." British Journal of Haematology **124**(1): 72-79.

Positive selected haematopoietic stem cells are increasingly used for allogeneic transplantation with the CD34 antigen employed in most separation techniques. However, the recently described pentaspan molecule CD133 appears to be a marker of more primitive haematopoietic progenitors. Here we report our experience with a new CD133-based selection method in 10 paediatric patients with matched unrelated (n = 2) or mismatched-related donors (n = 8). These patients received a combination of stem cells (median = 29.3 x 10(6)/kg), selected with either anti-CD34 or anti-CD133 coated microbeads. The proportion of CD133+ selected cells was gradually increased from patient to patient from 10% to 100%. Comparison of CD133+ and CD34+ separation procedures revealed similar purity and recovery of target populations but a lower depletion of T cells by CD133+ selection (3.7 log vs. 4.1 log, P < 0.001). Both separation procedures produced >90% CD34+/CD133+ double positive target cells. Engraftment occurred in all patients (sustained primary, n = 8; after reconditioning, n = 2). No primary acute graft versus host disease (GvHD) >/= grade II or chronic GvHD was observed. The patients showed a rapid platelet recovery (median time to independence from substitution = 13.5 d), whereas T cell regeneration was variable. Five patients are alive with a median follow-up of 10 months. Our data demonstrates the feasibility of CD133+ selection for transplantation from alternative donors and encourages further trials with total CD133+ separated grafts.

Lang, P., et al. (2016). "Final results of a multicenter phase I/II study using CD3/ CD19 depleted stem cells for haploidentical transplantation in children." Bone Marrow Transplantation **1)**: S463-S464.

Introduction: A total of 163 pediatric patients with ALL, AML/ MDS, CML/JMML (n = 67) relapsed/refractory solid tumors (neuroblastoma, soft tissue sarcomas, n = 68) and nonmalignant diseases (immune deficiencies, hemoglobinopathies) (n = 28) received T and B cell depleted peripheral stem cells from full haplotype mismatched family donors within this phase I/II trial. 34/163 patients received a 2nd or 3rd HSCT. Material (or patients) and methods: AntiCD3/antiCD19 coated magnetic microbeads and the CliniMACSs device were used for graft manipulation. A short course single agent prophylaxis with MMF was given. Patients received either myeloablative TBI or Busulfan based conditioning regimens (n = 26) or a toxicity reduced regimen (Melphalan (140 mg/m²) fludarabine (160 mg/m²) thiotepa (10 mg/kg), n = 131) and serotherapy with ATG-F or OKT3. Result(s): A median number of 15.2x10E6/kg CD34+ progenitors, 77x10E6/kg NK cells and 48x10E3/kg residual T cells were infused. Primary engraftment occurred in 90.8% of patients. In a multivariate analysis, the influence of diagnosis, conditioning regimen, number of infused progenitors/T cells/NK cells and type of serotherapy was investigated. Only diagnosis remained significant. Median time to reach >500 neutrophiles/mul was 10 days. GvHD grade 0-1 occurred in 78%. 16% and 6% had GvHD grade II and III-IV, respectively. Chronic limited and extensive GvHD was observed in 13% and 12%. In an univariate analysis, only use of ATG-F significantly reduced the incidence of aGvHD, whereas the above factors did not. Transplant related mortality was low with 8% at one year. Regeneration of NK cells was very fast (mean number CD56 +/mul at day +90/180: 234/233), whereas T cells recovered slower (mean number CD3+/mul at day +90/180:205/426). Event free survival at 3 years was 41% for patients with acute leukemias CR 1-3 (1st HSCT) and 14% for patients with active disease. Patients with nonmalignant diseases had a favorable EFS at 3 years of 60% whereas patients with solid tumors did worse (25%). Conclusion(s): Transplantation of CD3/CD19 depleted haploidentical stem cells resulted in a robust myeloic engraftment and in a fast recovery of donor NK cells. The method helped to prevent GvHD very effectively and to reduce TRM, despite intensive pretreatment of the patients. Patients with acute leukemias in any CR had a favorable EFS whereas potential anti tumor effects were not sufficient in patients with active disease. Since only short course MMF was used, the method offers a basis for further post-transplant immune therapies.

Lang, P., et al. (2016). "Transplantation of haploidentical CD3/CD19 depleted stem cells in children: Final results of a multicenter phase I/II study." <u>Biology of Blood and Marrow Transplantation</u> **1)**: S62.

A total of 163 pediatric patients with ALL, AML/MDS, CML/JMML (n=67) relapsed/refractory solid tumors (neuroblastoma, soft tissue sarcomas, n=68) and nonmalignant diseases (immune deficiencies, hemoglobinopathies) (n=28) received T and B cell depleted peripheral stem cells from full haplotype mismatched family donors. Thirty-four patients received a 2nd or 3rd HSCT. AntiCD3/antiCD19 coated magnetic microbeads and the CliniMACS device were used for graft manipulation. A short course single agent prophylaxis with MMF was given. Patients received either myeloablative TBI or Busulfan based conditioning regimens (n=26) or a toxicity reduced regimen (Melphalan (140 mg/m²) fludar-abine (160 mg/m²) thiotepa (10mg/kg), n=131) and serotherapy with ATG-F or OKT3. A median number of 15.2x 10E6/kg CD34+ progenitors, 77x 10E6/kg NK cells and 48x 10E3/kg residual T cells were infused. Primary engraft-ment occurred in 90.8% of patients. In a multivariate analysis, the influence of diagnosis, conditioning regimen, number of infused progenitors/T cells/NK cells and type of serotherapy was investigated. Only diagnosis remained significant. Median time to reach >=500 neutrophiles/mul was 10 days. GvHD grade 0-1 occurred in 78%. 16% and 6% had GvHD grade II and III-IV, respectively. Chronic limited and extensive GvHD was observed in 13% and 12%. In an univariate analysis, only use of ATG-F significantly reduced the incidence of aGvHD, whereas the above factors did not. Transplant related mortality was low with 8% at one year. Regeneration of NK cells was very fast (mean number CD56+/mul at day +90/180: 234/233), whereas Tcells recovered slower (mean number CD3+/mul at day +90/180: 205/426). Event free survival (EFS) at 3 years was 41% for patients with acute leukemias CR 1-3 (1stHSCT) and 14% for patients with active disease. Patients with nonmalignant diseases had a favorable EFS at 3 years of 60% whereas patients with solid tumors did worse (25%). Conclusion(s): Transplantation of CD3/CD19 depleted hap-loidentical stem cells resulted in a robust myeloid engraftment and in a fast recovery of donor NK cells. The method helped to prevent GvHD very effectively and to reduce TRM, despite intensive pretreatment of the patients. Patients with acute leukemias in any CR had a favorable EFS whereas potential anti-tumor effects were not sufficient in patients with active disease. Since only short course MMF was used, the method offers a basis for further post-transplant immune therapies.

Lang, P., et al. (2014). "Effects of a new dosing scheme of ATG-F of donor NK cells and immune recovery in haploidentical T and B cell depleted stem cell transplantation." <u>Bone Marrow Transplantation</u> **1)**: S214-S215.

Introduction: T and B cell depletion of haploidentical peripheral stem cells with CD3/CD19 coated magnetic microbeads effectively prevents from GvHD and allows to coinfuse large numbers of donor NK cells and other accessory cells Additional in vivo depletion of the graft with serotherapy is not mandatory. Thus, a dosing scheme of ATG is needed, which provides a rejection prophylaxis by depleting lymphocyte subsets of the patients but which does not harm the stem cell graft. We present data with reduced ATG doses given at the beginning of the conditioning regimen in order not to impair cotransfused NK cells and immune recovery. Materials (or patients) and Methods: A total of 33 pediatric patients received 3x10 mg/kg ATG-F (Fresenius) starting at day -12, followed by fludarabine (160 mg/m², d -8 to -5), thiotepa (10 mg/m² d -4) and melphalan (140 mg/m² d -3 to -2). Most patients received MMF untill day 30-60. ATG serum levels were measured in 19 patients by flow cytometry (amount of ATG binding to the Jurkat cell line, defined as T cell specific rabbit IgG). Apoptosis/ necrosis of donor NK cells was assessed with Annexin V/PI staining and flow cytometry. Result(s): Median time to ANC>500 and to independence from platelet transfusion was 9.5 and 13.5 days. Graft rejection occurred in 7/33 patients (21%). All rejectors could be rescued with reconditioning and 2nd stem cell donation or with infusion of autologous back ups. Acute GvHD grade I and II-IV was observed in 12/26 (46%) and 2/26 (8%) patients without rejection, respectively. Limited (extensive) chronic GvHD occurred in 5/24 (1/24) evaluable patients. Median peak levels of 22.1 mug/ml specific rabbit IgG were reached between day -8 and -6 and dropped to 2.9 mug/ml at day 0. In vitro incubation of NK cells from healthy donors with a comparable dosage of ATG-F (1 mug/ml) resulted in 26 % apoptosis and 0.2 % necrosis (70% vital cells) after 24 hours. Moreover, NK cells were incubated with patient's serum, taken after ATG treatment and adjusted to a concentration of 1 or 2 mug/ml. Cell death occurred in 20% of NK cells each. Functional activity was measured against K562 targets. Specific lysis of decreased from 83% to 71% (corresponding to a loss of 15% activity) after incubation with 2mug/ml and to 11% (87% loss of activity) with 1000mug/ml. Immune recovery was monitored and compared with a historical group receiving OKT3 and the same chemotherapy (n=34). Recovery of CD56+ NK cells was fast with a mean number of 414 vs. 232 cells/mul (ATG group vs. OKT3 group, P<0.01) at day +14, 252 vs. 342 cells/mul at day +30 (P=0.1) and 189 vs. 217 cells/mul at day +90 (P=0.3). CD3+ T cells reached 36 vs. 12/mul at day +30 and 189 vs. 225/mul at day +90 (no significant differences for all data pairs). Discussion(s): Conclusion(s): ATG-F was started at an early time point, resulting in low serum levels of specific ATG at day 0 and in a fast NK cell recovery. In vitro results suggested, that the majority of NK cells will not be damaged herewith. Immune recovery of T and NK cells was comparable to that of a historical control group who received OKT3. However. The rejection rate was higher than expected and an increase of the ATG dose has to be considered. This approach will be also of interest for other transplantation strategies in which various components of the grafts and additionally given T cells have to be preserved.

Lang, P., et al. (2013). "Transplantation of TcRalphabeta/CD19 depleted stem cells from haploidentical donors in children: Current results." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Graphic T-cell depletion of the graft is an effective method to prevent or completely avoid Graft-versus-Host Disease (GvHD) in haploidentical stem cell transplantation. In order to increase the T-cell depletion efficacy while maintaining the anti-tumor and anti-infectious properties of the graft, we have investigated a new T-cell depletion method which removes alphabeta+ T-lymphocytes via a biotinylated anti-TcRalphabeta antibody followed by an anti-biotin antibody conjugated to magnetic microbeads while retaining gammadelta+ T-lymphocytes, Natural killer (NK) cells and other cells in the graft. In addition, CD19+ B-lymphocytes were concomitantly depleted for the prevention of posttransplant EBV-associated lymphoproliferative disease. The CliniMACS system was used for manipulation of peripheral stem cell grafts from full haplotype mismatched family donors in 35 patients. Results The overall depletion of alphabeta+ T-cells was highly effective with 4.6 log (range 3.8-5.0). Patients received a median number of only 14 x 103/kg residual alphabeta+ T-cells. Recovery of CD34+ stem cells was 72%, and the median number of infused CD34+ stem cells was 12 x 106/kg (range 5-38 x 106/kg). Additionally, the patients received 2 types of potential antileukemic effector cells: 107 x 106/kg (range 35 -192 x 106/kg) CD56+ NK-cells and 11 x 106/kg (range 5-30 x 106/kg) gammadelta+ T-lymphocytes. Diagnoses were ALL (n=20), AML/MDS/JMML (n=9), nonmalignant diseases (n=4), solid tumors (n=2); disease status: CR2-CR6 (n=17), active disease (n=18). 23 patients received a second or third SCT (65%). A toxicity reduced conditioning regimen (fludarabin 40mg/m² or clofarabin 50mg/m² (day -8 to d -5), thiotepa 10mg/kg (d -4), melphalan 70mg/m² (d -3 and d -2) was used. The anti CD3 specific OKT3 antibody was used as rejection prophylaxis from day -8 to day -1 without affecting cotransfused effector cells because of its short half-life period in the first 7 patients. However, due to its restricted availability, the substance was substituted since 2011 by a reduced ATG-F dose (15mg/kg) given at start of the conditioning regimen in order not to impair NK and gammadelta+ T-cells of the grafts (1 mg/kg d -12, 4 mg/kg d -11, 5 mg/kg d -10 and -9; n=28 patients). Short course MMF (until day +30) was given in 25 patients. Graft rejection occurred in 14% of the patients. However, after reconditioning and second stem cell donation, final engraftment was achieved in all patients. The median time to reach neutrophil and platelet recovery in patients with primary engraftment was 10 and 11 days respectively. All patients showed a rapid immune reconstitution with 250 (OKT3 conditioning) and 273 (ATG conditioning) CD3+ T-cells/mul, 30 (OKT3) and 47 (ATG) CD3+4+/mul and 300 (OKT3) and 382 (ATG) CD56+ NK-cells/mul at day +30 posttransplant. gammadelta+ T-cells started to expand faster than alphabeta+ T-cells in the early post-transplant period (156 vs. 82 cells/mul at day +30) whereas at day +90, alphabeta+ T-cells were predominant (170 vs. 134 cells/mul). Acute GvHD grade 0-I occurred in 25 patients (71%); 6 patients had GvHD II (17%), 3 patients had GvHD III (9%) and one patients experienced GvHD grade IV (3%). 3 patients experienced chronic GvHD (8%). Incidence of acute GvHD was not influenced by the number of residual T cells or by the type of serotherapy. 1 year EFS for patients with acute leukemias was 66% (any CR) and 14% (active disease).TRM at 1 year was 20%. Conclusions These data indicate that transplantation of TcR alphabeta+/CD19 depleted cells from a haploidentical donor results in sustained engraftment, remarkably fast immune reconstitution and low incidence of both acute and chronic GvHD. OKT3 could be substituted by ATG without negative effects. The anti-leukemic efficacy of this approach in comparison to other methods of T-cell depletion needs to be evaluated with a longer patient follow-up.

Lang, P., et al. (2014). "Current results with transplantation of tcrab/CD19 depleted stem cells from haploidentical donors in children." Bone Marrow Transplantation **1)**: S377.

Introduction: T-cell depletion is an effective method to prevent Graft-versus-Host Disease (GvHD) in haploidentical stem cell transplantation. Materials (or patients) and Methods: In order to increase T-cell depletion efficacy while maintaining anti-tumor and anti-infectious activity of the graft, we have evaluated a new method which removes alphabeta+ T-cells via a biotinylated anti-TcRalphabeta antibody followed by an anti-biotin antibody conjugated to magnetic microbeads while retaining gammadelta+ T-cells, Natural killer (NK) cells and others. CD19+ B-cells were concomitantly depleted to prevent EBV-LPD. The CliniMACS system was used for manipulation of PBSCs from full haplotype mismatched family donors. Result(s): The overall depletion of alphabeta+ T-cells was highly effective with 4.6 log. Patients received a median number of only 14 x 10³/ kg residual alphabeta+ T-cells. Recovery of CD34+ stem cells was 72%, and the median number of infused CD34+ stem cells was 12x106/kg. Additionally, the patients received potential antileukemic effector cells: 107x106/kg CD56+ NK cells and 11x106/kg gammadelta+ T-cells. Diagnoses: ALL (n=20), AML/MDS/JMML (n=9), nonmalignant diseases (n=4), solid tumors (n=2); disease status: CR2-CR6 (n=17), active disease (n=11, 45%). 23 patients received a 2nd/3rd SCT (65%). The conditioning regimen comprised fludarabin 40mg/m² or clofarabin 50mg/m² (day -8 to d -5), thiotepa 10mg/kg (d -4), melphalan 70mg/m² (d -3 and d -2). OKT3 was used as rejection prophylaxis from day -8 to day -1 in the first 7 patients and was substituted since 2011 by a reduced ATG-F dose (15mg/kg) given at start of the regimen in order not to impair NK and gammadelta+ T-cells of the grafts (1 mg/kg d -12, 4 mg/kg d -11, 5 mg/kg d -10 and -9; n=28 patients). Short course MMF (until day +30) was given in 25 patients. Graft rejection occurred in 14% of the patients. However, after reconditioning and second stem cell donation, final engraftment was achieved in all patients. Median time to reach neutrophil and platelet recovery in patients with primary engraftment was 10 and 11 days respectively. All patients showed a rapid immune reconstitution with 250 (OKT3 conditioning) and 273 (ATG conditioning) CD3+ T-cells/mul 30 (OKT3) and 47 (ATG) CD3+4+/mul and 300 (OKT3) and 382 (ATG) CD56+ NK-cells/mul at day +30 posttransplant. gammadelta+ T-cells started to expand faster than alphabeta+ T-cells in the early post-transplant period (156 vs 82 cells/mul at day +30) whereas at day +90, alphabeta+ T-cells were predominant (170 vs 134 cells/mul). Acute GvHD grade 0-I occurred in 25 patients (71%); 6 patients had GvHD II (17%), 3 patients had GvHD III (9%) and one patients experienced GvHD grade IV (3%). 3 patients experienced chronic GvHD (8%). Incidence of acute GvHD was not influenced by the number of residual T cells or by type of serotherapy. 2 year EFS was: 80% (nonmalignant diseases); 37% and 9% (acute leukemias, any CR and active disease). Patients with any CR and 1st SCT showed better results than patients with subsequent SCT (100% vs 30%). Discussion(s): These data indicate that transplantation of TcR alphabeta+/ CD19 depleted cells from a haploidentical donor results in fast immune reconstitution and low incidence of both acute and chronic GvHD. OKT3 could be substituted by ATG without negative effects. The anti-leukemic efficacy of this approach in comparison to other methods of T-cell depletion needs to be evaluated with a longer patient follow-up.

Lang, P., et al. (2015). "Improved immune recovery after transplantation of TCRalphabeta/CD19-depleted allografts from haploidentical donors in pediatric patients." Bone Marrow Transplantation **50 Suppl 2**: S6-10.

Immune recovery was retrospectively analyzed in a cohort of 41 patients with acute leukemia, myelodysplastic syndrome and nonmalignant diseases, who received alphabeta T- and B-cell-depleted allografts from haploidentical family donors. Conditioning regimens consisted of fludarabine or clofarabine, thiotepa, melphalan and serotherapy with OKT3 or ATG-Fresenius. Graft manipulation was carried out with anti-TCRalphabeta and anti-CD19 Abs and immunomagnetic microbeads. The gammadelta T cells and natural killer cells remained in the grafts. Primary engraftment occurred in 88%, acute GvHD (aGvHD) grades II and III-IV occurred in 10% and 15%, respectively. Immune recovery data were available in 26 patients and comparable after OKT3 (n=7) or ATG-F (n=19). Median time to reach >100 CD3+ cells/muL, >200 CD19+ cells/muL and >200 CD56+ cells/muL for the whole group was 13, 127 and 12.5 days, respectively. Compared with a historical control group of patients with CD34+ selected grafts, significantly higher cell numbers were found for CD3+ at days +30 and +90 (267 vs 27 and 397 vs 163 cells/muL), for CD3+4+ at day +30 (58 vs 11 cells/muL) and for CD56+ at day +14 (622 vs 27 cells/muL). The clinical impact of this accelerated immune recovery will be evaluated in an ongoing prospective multicenter trial.

Lang, P., et al. (2014). "Improved immune recovery after transplantation of TCRalphabeta/CD19 depleted allografts from haploidentical donors in pediatric patients." Blood. Conference: 56th Annual Meeting of the American Society of Hematology, ASH **124**(21).

Transplantation of haploidentical stem cells has become an accepted option for pediatric patients and adults with high risk malignancies who lack a matched related or unrelated donor. In recent years, the majority of pediatric transplant centers chose the CD34 positive selection of peripheral stem cells, which allowed minimizing GvHD by effective reduction of T cells in the graft. However, infectious complications caused by delayed immune recovery were a major reason for transplant related mortality (TRM). In order to improve the immune recovery, we have established a new T-cell depletion method which removes alphabeta+ T-lymphocytes via a biotinylated anti-TcRalphabeta antibody followed by an anti-biotin antibody conjugated to magnetic microbeads while retaining gammadelta+ T-lymphocytes, natural killer (NK) cells and other cells in the graft. In addition, CD19+ B-lymphocytes were concomitantly depleted for the prevention of post-transplant EBV-associated lymphoproliferative disease. Immune recovery was retrospectively analyzed in a cohort of 41 patients with acute leukemia, MDS and non-malignant diseases, who received alphabeta T and B cell depleted allografts from haploidentical family donors. Conditioning regimens consisted of fludarabine or clofarabine, thiotepa, melphalan and serotherapy with OKT3 or ATG-Fresenius. Graft manipulation was carried out with anti TCRalphabeta and anti CD19 antibodies and immunomagnetic microbeads. gammadelta T cells and NK cells remained in the grafts. Primary engraftment occurred in 88%, acute graft versus host disease (aGvHD) grade II and III-IV occurred in 10% and 15%. Immune recovery data were available in 26 patients and comparable after OKT3 (n=7) or ATG-F (n=19). Median time to reach > 100 CD3+/mul, > 200 CD19+ cells/mul and > 200 CD56+ cells/mul for the whole group was 13, 127 and 12.5 days. Compared to a historical control group of patients with CD34 positive selected grafts, significantly higher cell numbers were found for CD3+ at days +30 and +90 (267 vs. 27 and 397 vs. 163 cells/mul), for CD3+4+ at day +30 (58 vs. 11 cells/mul) and for CD56+ at day +14 (622 vs. 27 cells/mul). The clinical impact of this accelerated immune recovery will be evaluated in an ongoing prospective multi-center trial.

Lang, P., et al. (2012). "A new dosing scheme of ATG-f prevents rejection and maintains immune recovery in haploidentical t and b cell depleted stem cell transplantation." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

T and B cell depletion of haploidentical peripheral stem cells with CD3/CD19 coated magnetic microbeads prevents GvHD and allows to coinfuse large numbers of donor NK cells and other accessory cells. The anti CD3 specific OKT3 antibody was routinely used as rejection prophylaxis without affecting CD3 negative cells. However, due to its restricted availability, the substance had to be substituted by polyclonal ATG preparations with a longer half life period and comprising a broader variety of antigen, with the CD56 antigen in particular. We present data with reduced ATG doses given at the beginning of the conditioning regimen in order not to impair cotransfused NK cells and immune recovery. A total of 27 pediatric patients (ALL/AML n=9, relapsed solid tumors n=13, nonmalignant diseases n=5) received either 3x5 mg/kg (n=7) or 3x10 mg/kg (n=20) ATG-F (Fresenius) starting at day -12, followed by fludarabine (160 mg/m², d -8 to -5) thiotepa (10 mg/m² d -4) and melphalan (140 mg/m² d -3 to -2). A median number of 14.4x106 CD34/kg and 62x106 NK cells/kg with 37x103 T cells/kg were infused. Median time to ANC>500 was 9 days in both groups. Graft rejection occurred in 3/7 patients with 15 mg ATG (42%) and in 2/20 patients with 30 mg ATG (10%). After reconditioning with a TLI based regimen, final engraftment was achieved in all patients. Acute GvHD grade II-IV was observed in 1/4 (15 mg) and 1/18 (6%, 30 mg) patients without rejection. Extensive chronic GvHD occurred in 1/4 (15 mg group) and 1/18 (30 mg group) patients. Immune recovery was monitored in the 30 mg group and compared with a historical group receiving OKT3 and the same chemotherapy (n=34). Recovery of CD56+ NK cells was fast with a mean number of 473 vs. 230 cells/mul at day +14, 299 vs. 281 cells/mul at day +30 and 245 vs. 236 cells/mul at day +90. CD3+ T cells reached 12 vs. 16/mul at day +30 and 138 vs. 217/mul at day +90 (30 mg group vs. OKT3 group; no significant differences for all data pairs). ATG serum levels were measured in 9 patients by flow cytometry (amount of ATG binding to the Jurkat cell line, defined as T cell specific rabbit IgG). Median peak levels of 10.5 mug/ml (15 mg group) and 15.0 mug/ml (30 mg group) specific rabbit IgG were reached between day -8 and -6 and dropped to 1.2 and 2.6 mug/ml at day 0. In vitro incubation of NK cells from healthy donors with a comparable dosage of ATG-F (1 or 10 mug/ml) resulted in 26 (41)% apoptosis and 0.2 (0.2)% necrosis (70 (52)% vital cells) after 24 hours. Conclusion(s): Our aim was to substitute OKT3 by ATG in patients who receive CD3/19 depleted haploidentical peripheral stem cells without hampering donor NK cells infused on day 0 and subsequent immune recovery. Administration of 15 or 30 mg/kg ATG-F was started at an early time point (day -12) of the regimen. Both doses resulted in low serum levels of specific ATG at day 0 and in a fast NK cell recovery. In vitro results suggested, that the majority of NK cells will not be damaged herewith. However, 15 mg/kg seemed to be not effective in preventing graft rejection and use of 30 mg/kg ATG-F has to be recommended. Immune recovery of T and NK cells was comparable to that of a historical control group who received OKT3. This approach will be also of interest for other transplantation strategies in which various components of the grafts and additionally given Tregs or specific T cells have to be preserved.

Lang, P., et al. (2004). "Long-term outcome after haploidentical stem cell transplantation in children." Blood Cells Molecules & Diseases **33**(3): 281-287.

We present an update of our results with transplantation of highly purified stem cells from one to three loci mismatched parental donors. Sixty-three pediatric patients with acute lymphoblastic leukemias (n = 32), acute myeloid, chronic myeloid and myelomonocytic leukemias (n = 13), myelodysplastic syndromes (n = 4), lymphomas (n = 4), and various nonmalignant diseases (n = 10) underwent transplantation. Mobilized peripheral-blood stem cells were selected with either anti-CD34- or anti-CD133-coated microbeads. Patients received a median of 19.5 x 10(6) purified cells and <25,000 CD3+ T lymphocytes per kilogram, with no regular posttransplant pharmacological immunosuppression. Engraftment occurred in 98% of patients (primary sustained engraftment, 83%; engraftment after reconditioning/stem cell boosts, 15%). Moreover, all survivors but one had a stable three-lineage engraftment with a median follow up of 4.1 years (range 0.6-8 years). Primary acute graft-versus-host disease (GvHD) grade II was seen in only 7% of patients. No severe primary acute GvHD grades III-IV occurred. Thirteen percent of the patients developed transient chronic GvHD. Probability of disease-free survival (DFS) at 3 years was 60% for patients with nonmalignant diseases and 48% for patients with acute lymphatic leukemia (ALL)/non-Hodgkin lymphoma (NHL) in complete remission (CR)1-3. None of the ALL/NHL patients with active disease survived. Children with acute and chronic myeloid leukemias had a poorer outcome (3-year DFS = 18%), whereas two of four patients with myelodysplastic syndrome (MDS) are alive. Relapse probability of the whole group was not significantly increased when compared to a historical control group. The incidence of lethal viral infections was 18% between 1995 and 2002 and has since been reduced to 8% by the introduction of new therapeutic strategies. In summary, the use of stem cells from haploidentical parental donors should be strongly considered in all children who need transplantation but lack an identical donor.

Lang, P., et al. (2010). "Long-term survival and relapse rate after transplantation of highly T and B cell-depleted stem cells from alternative donors in paediatric patients with acute lymphatic leukaemia." Bone Marrow Transplantation **2)**: S72.

We present long term results in 68 children with ALL who received highly T and B cell depleted stem cells from matched unrelated (n = 17) or full haplotype mismatched related donors (n = 51) at our institution. Our aim was to minimize GvHD and to avoid EBV LPD in both matched and mismatched transplantations. Remission status was: CR1, n = 18; CR2, n = 23; >=CR3, n = 12; non remission or second transplant, n = 15. Graft manipulation was carried out with microbeads and the CliniMACS^{TM} device (indirect depletion of T and B cells with CD34 + positive selection (n = 50); or direct depletion with anti-CD3/anti-CD19 coated microbeads (n = 18)). T and B cell counts were reduced for 4-5 log with median numbers of residual T cells of 15 000/kg bw (CD34 + selection) and 49 000/kg bw (CD3/19 depletion). No pharmacological immune suppression was given after positive selection, whereas patients with CD3/19 depletion received MMF. The conditioning regimens were either TBI or Bu based (n = 50) or a toxicity reduced protocol (Flud, TT, Mel) was used (n = 18). Rejection prophylaxis was carried out with ATG or OKT3. Primary engraftment occurred in 85%. After reconditioning, final engraftment was achieved in 98%. GvHD grade 0-1 occurred in 86%. 12% had grade II, 4% had grade III. Chronic GvHD occurred in 4 patients. No GvHD related mortality was observed. Median follow up was 5.9 years. EFS at 1 year was 56% (CR1), 51% (CR2) and 50% (>=CR3); EFS at 5 years was 49% (CR1), 46% (CR2) and 27% (>=CR3). Median survival of patients with active disease was 0.2 years. Relapse rates at 1 year were 0.32 (CR1), 0.47 (CR2) and 0.46 (>=CR3); relapse rates at 5 years were 0.32 (CR1), 0.47 (CR2) and 0.64 (>=CR3). TRM at 1 year was 14%, causes of death remained viral and fungal infections, no EBV LPD occurred. Conclusion(s): positive selection of progenitor cells or depletion of T and B cells can minimize acute and chronic GVHD in both matched unrelated and mismatched related transplantations and may prevent GvHD related mortality. Lethal infections occurred in 14% of the patients probably due to the delayed recovery of T cells. Despite profound depletion of donor T cells, relapse rates were acceptable and remained on a stable level after the first year in patients with complete remission. Thus, absence of GvHD may not necessarily be associated with high relapse rates in childhood ALL. Apart from T cells, other effector cells like NK cells are likely to exert GvL effects and may contribute to the favorable EFS of our patients.

Lang, P., et al. (2011). "Role of IL15 stimulation of CD3/19 depleted transplants from haplo-identical donors in paediatric malignancies." Bone Marrow Transplantation **1)**: S136.

T and B cell depleted haploidentical grafts and a melphalan based intensity reduced regimen result in low toxicity and stable survival in patients with leukemias in CR. However, patients with active disease or second transplantation show unacceptable relapse rates. In an ongoing study, 36 pediatric patients with acute leukemias and advanced MDS received melphalan, fludarabine or clofarabine, thiotepa and OKT3. T and B cells were depleted by antiCD3/antiCD19 coated magnetic microbeads, whereas NK cells remained into the grafts. Remission status was: CR1-3=18, NR=18, 18/36 already had received previous allogeneic transplantations. Relapse rates at 2 years were 20% (CR patients) and 73% (active disease or 2nd trp). Thus, we investigated options to reduce the risk of relapse by increasing antileukemic activity of donor NK cells in the grafts. Over night incubation with Interleukin 15 increased NK activity most effectively (specific lysis at E:T=20:1 against K562: 28% prior to and 71% after stimulation, n=10). After additional IL2 stimulation a 22 fold increase in thymidine uptake indicated proliferation of

NK cells (n=5). No T cell proliferation was detectable. Based on these results, we started a pilot study with ex vivo IL15 stimulated grafts in 4 patients at very high risk (ALL, 2nd or 3rd relapse, active disease or CR (n=2); AML 1st relapse, active disease (n=2)). All patients received a backbone of unstimulated cells at day 0 to ensure engraftment. Additionally, parts of the grafts were incubated over night and infused at day +1 (medians: CD56=9.4x10⁶/kg (range 3.7-24.4); CD34=1.5x10⁶/kg; CD14=34x10⁶/kg, CD3=0.01x10⁶/kg). No side effects occurred. All patients engrafted within 12 days. 3 patients had acute GvDH grade 0-I, 1 patient had GvHD grade III. Recovery of NK cells was remarkably fast (526 CD56+/mul at day +14 versus 256 CD56+/mul in patients without IL15 stimulation). After additional administration of IL2 in vivo high NK activity (specific lysis>90% against K 562, E:T=20:1) was detectable in peripheral blood. Two patients are disease free (day +244 and 764), 2 patients died from relapse (day 56 and 64). Conclusion(s): ex vivo stimulation with IL15 strongly increases cytotoxic activity of NK cells in T and B cell depleted grafts and can counterbalance G-CSF mediated inhibitory effects. Those grafts were infused without any side effects and resulted in a fast recovery of functional donor NK cells. Further studies have to evaluate this approach.

Lang, P., et al. (2010). "Use of IL15 stimulated, CD3/19 depleted transplants from haploidentical donors in pediatric malignancies." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

T and B cell depleted haploidentical grafts and a melphalan based intensity reduced regimen result in low toxicity and stable event free survival in patients with leukemias in CR1-3. However, patients with active disease or with second or subsequent transplantation show unacceptable relapse rates. In an ongoing study, 36 pediatric patients with acute leukemias and advanced MDS (median age: 11 years) received melphalan (2x70mg/m²), fludarabine (4x40mg/m²) or clofarabine (4x50mg/m²), thiotepa (10mg/kg) and OKT3 (0.1mg/kg). T and B cells were depleted by antiCD3/antiCD19 coated magnetic microbeads, whereas NK cells remained into the grafts (median number= 120x106/kg). Remission status was: CR1-3=18, NR=18, 18/36 already received previous allogeneic transplantations. Relapse rates at 2 years were 20% (CR patients) and 73% (active disease patients or 2nd trp). Thus, we investigated options to reduce the risk of relapse by increasing antileukemic activity of donor NK cells in the grafts in vitro. Over night incubation with Interleukin 15 increased NK activity most effectively (specific lysis at E:T=20:1 against K562: 28% prior to and 71% after stimulation, n=10). After additional IL2 stimulation a 22 fold increase in thymidine uptake indicated proliferation of NK cells (n=5). Due to the profound depletion, no T cell proliferation was detectable. Based on these results, we started a pilot study with ex vivo IL15 stimulated grafts in 4 patients at very high risk (ALL, 3rd relapse, active disease (n=1); ALL 2nd relapse, remission (n=1); AML 1st relapse, active disease (n=2)). All patients received a backbone of unstimulated cells at day 0 to ensure engraftment. Additionally, parts of the grafts were incubated over night, washed four times and afterwards infused at day +1 (median numbers: CD56+CD3- =9.4x106/kg (range 3.7-24.4); CD34=1.5x106/kg; CD14=34x106/kg, CD3=0.01x106/kg). No acute side effects occurred. All patients engrafted within 12 days. 3 patients had acute GvDH grade 0-I, 1 patient had GvHD grade III. Recovery of NK cells was remarkably fast (526 CD56+/mul at day 14 posttransplant versus 256 CD56+/mul in patients without IL15 stimulation (means)). After additional administration of IL2 in vivo (1x106 Units/m²/day s.c.) high NK activity (specific lysis>90% against K 562, E:T=20:1) was detectable in peripheral blood. Two patients are disease free (day 154 and 674 posttransplant), 2 patients died from relapse (day 56 and 64). Conclusion(s): ex vivo stimulation with IL15 strongly increases cytotoxic activity of NK cells in T and B cell depleted grafts from haploidentical donors and can counterbalance G-CSF mediated inhibitory effects. Those grafts were infused without any acute side effects and resulted in a fast recovery of functional donor NK cells. Potential interactions with stem cells and stem cell derived NK reconstitution have to be investigated. Further studies have to evaluate if this approach might contribute to reduce relapse rates in high risk patients.

Lang, P., et al. (2011). "NK cell activity influences long term outcome of pediatric leucemias after T cell depleted stem cell transplantation." Blood. Conference: 53rd Annual Meeting of the American Society of Hematology, ASH **118**(21).

T cell depletion with magnetic microbeads can effectively reduce GvHD rates after stem cell transplantation from both mismatched related donors as well as from matched or partially matched unrelated donors. However, T cell recovery is markedly delayed after this procedure and T cell mediated antileukemic effects may be reduced. Thus, we focused on the rapidly regenerating donor derived NK cell system and addressed the question, whether its functional activity would influence the probability of relapse in a long term analysis. Temporal development of NK cell activity was monitored in 47 pediatric patients with leukemias (ALL, AML, CML, JMML) and myelodysplastic syndromes after transplantation of T cell depleted stem cells from matched unrelated (n=18) and mismatched related (haploidentical, n=29) donors with a median follow up of 7.4 years (2.1-12). 38 patients had CR1-3, 9 patients had active disease at time of transplantation. EFS and relapse rate at 5 years for the entire group were 36% and 40%, respectively (EFS and relapse rate for ALL patients in CR1-3: 50% and 36%; EFS and relapse rate for AML/MDS patients: 22% and 30%). CD34+ selection with magnetic microbeads resulted in 8x10³/kg residual T cells. No posttransplant immune suppression was given. 89% of the patients had no GvHD, 9% had GvHD grade I and only 2 patients had GvHD grade II or III. NK cells recovered rapidly after transplantation (300 CD56+/muL at day 30, median), whereas T cell recovery was delayed (median: 12 CD3+/muL at day 90). NK activity was measured as specific lysis of K562 targets several times after transplantation (mean: 3 assays per patient). Four temporal patterns of lytic activity could be differentiated: consistently low, consistently high, decreasing and increasing activity. Patients with consistently high or increasing activity had significantly lower relapse probability than patients with consistently low or decreasing levels (0.18 vs 0.73 at 5 years, p<0.05). The subgroup of patients with ALL showed similar results (0.75 vs 0.14 at 5 years, p<0.05). Speed of T cell recovery had no influence. These data suggest that both achieving and maintaining a high level of NK activity may contribute to prevent relapse. Thus, this model comprises direct functional data in the form of NK cell activation levels which are likely to be influenced by the presence of different cytokines in each patient. Our observations may have some clinical implications: immunomagnetic depletion of T cells prevents GvHD and can be performed in pediatric leukemias in remission without excessive increase in relapse rates. High levels of NK activity seem to be of importance. Since NK activity could be markedly increased by in vitro stimulation with Interleukin 2 (IL-2), in vivo administration should be considered.

Lang, P., et al. (2011). "First clinical results with alpha-beta+ T-cell depleted haplo-identical stem cells in children." Bone Marrow Transplantation **1)**: S135-S136.

We have investigated the depletion of alpha-beta+ T-lymphocytes via a biotinylated anti-alpha-beta antibody followed by an anti-biotin antibody conjugated to magnetic microbeads in order to increase anti-tumor effects of haploidentical stem cell grafts. 5 pediatric patients with advanced and refractory leukemias (ALL, active disease n=3, graft failure n=1;

AML, active dis, n=1) received a haploidentical transplantation with such alpha-beta+ T cell depleted grafts using the CliniMACSmu system. Depletion of alpha-beta+ T-cells was 4.5 log (range 3.8 - 5.0). The recovery of CD34+ stem cells, CD56+ NK cells and gamma-delta+ T-cells was 72%, 76% and 80%, respectively. The median number of infused CD34+ stem cells, CD56+ NK cells and gamma-delta+ T-lymphocytes was 11.9 x10⁶/kg (range 7.5 -30 x 10⁶/kg), 107 x 10⁶/kg (range 35 -186 x10⁶/kg) and 11.9 x10⁶/kg (range 7.5 - 30.2 x 10⁶/kg), respectively. The conditioning regimen comprised melphalan, thiotepa, fludarabin and OKT-3 from day -7 to day -1 in 4 patients and treosulphan, thiotepa, fludarabin and OKT-3 in 1 patient. No further posttransplant prophylaxis for GvHD was given. All patients showed a rapid engraftment with a median of 9 days to reach an ANC > 500 and 12 days (range 6 -21) to reach >20000 platelets. All patients had a complete donor engraftment and showed a rapid immune reconstitution with circulating donor-derived gamma- delta T-cells first observed at day +3 followed by circulating donor-derived alpha-beta+ T-cells first observed at around day +20. Median time to reach 100 CD3/mul was only 30 days. Despite the high number of infused gamma-delta+ T-lymphocytes, only 1 patient experienced a grade 3 GvHD of the skin. 2 patients relapsed after transplantation, 3 patients are in remission for 0.46 (ALL, active dis.), 0.42 (AML, active dis.) and 0.26 (ALL, second trp) years up to now. In conclusion, the first preliminary experience of haploidentical transplantation with - T-cell depleted grafts showed a rapid and sustained engraftment, a rapid immune reconstitution and a low incidence of GvHD. A clinical trial in children and adults is underway to corroborate these promising preliminary findings.

Lang, P., et al. (2014). "Transplantation of CD3/CD19 depleted allografts from haploidentical family donors in paediatric leukaemia." British Journal of Haematology **165**(5): 688-698.

Transplantation of T- and B-cell depleted allografts from haploidentical family donors was evaluated within a prospective phase II trial in children with acute lymphoblastic leukaemia, acute myeloid leukaemia and advanced myelodysplastic syndrome (n = 46). 20 patients had active disease; 19 patients received a second or third stem cell transplantation (SCT). Toxicity-reduced conditioning regimens consisted of fludarabine or clofarabine (in active disease only), thiotepa, melphalan and serotherapy. Graft manipulation was carried out with immunomagnetic microbeads. Primary engraftment occurred in 88%, with a median time to reach >1.0 x 109/l leucocytes, >20 x 109/l platelets and >0.1 x 109/l T-cells of 10, 11 and 50 days, respectively. After retransplantation, engraftment occurred in 100%. Acute graft-versus-host disease (GvHD) grade II and III-IV occurred in 20% and 7%, chronic GvHD occurred in 21%. Both conditioning regimens had comparable toxicity. Transplant-related mortality (TRM) was 8% at one year and 20% at 5 years. Event-free survival at 3 years was: 25% (whole group), 46% (first, second or third complete remission [CR], first SCT) vs. 8% (active disease, first SCT) and 20% (second or third SCT, any disease status). This approach allows first or subsequent haploidentical SCTs to be performed with low TRM. Patients in CR may benefit from SCT, whereas the results in patients with active disease were poor.

Lang, P., et al. (2011). "Transplantation of haploidentical CD3/CD19 depleted stem cells in pediatric patients: Current results of the Tubingen trial and additional immunotherapeutic approaches." European Surgery - Acta Chirurgica Austriaca **242)**: 20-21.

Background. We investigated the safety and efficacy of T and B cell depleted peripheral stem cells from full haplotype mismatched parental donors in pediatric patients. Methods. Use of the Clinimacs system and CD3/CD19 coated magnetic microbeads resulted in a 4 log depletion of T cells and allowed to cotransfuse high numbers of donor NK cells (median:

107+/-10⁶/kg). TBI or busulfan based myeloablative regimens or a melphalan based intensity reduced regimen were used. All patients underwent intensive pretreatment according to current study protocols; 41/106 already received previous allogeneic transplantations. The diagnoses were: acute leukemias and MDS (n=60), solid tumors (n=32) and nonmalignant diseases (n=14). Results. Primary engraftment occurred in 89% of patients. After TLI based reconditioning and second haploidentical stem cell donation, final engraftment was achieved in 100%. Median time to reach >500 neutrophiles/mul and independence from platelet substitution was 10 (8-15) and 9 (5-59) days respectively. 35% of patients had no GvHD, 36% had grade I, 23% had grade II and 4% had grade III. Chronic limited and extensive GvHD was observed in 8 and 11%. Transplant related mortality was 0% at day 100 and 8% at one year. Event free survival at 3 years was 66% for patients with leukemias in any CR and 80% for patients with nonmalignant diseases. Over all survival at 2 years was 20% for patients with solid tumors. Relapse or progression were themajor causes of death. Thus, pilot studies with IL-15 stimulated grafts and posttransplant donor-NK cell infusions were initiated and are currently ongoing. Conclusions. Transplantation of CD3/CD19 depleted haploidentical stem cells resulted in a fast recovery of neutrophiles and platelets. Engraftment rates similar to that of patients with myeloablative standard conditioning and positive selected stem cells could be achieved, possibly due to a graft facilitating effect of cotransfused NK cells. The regimen helped to minimize TRM, despite intensive pretreatment (including previous transplantation). However, relapse remains a major problem and further immunotherapeutic elements have to be evaluated.

Lang, P., et al. (2010). "Haploidentical stem cell transplantation with reduced-intensity conditioning in refractory diseases: Current results." Bone Marrow Transplantation **2)**: S295.

Transplantation of haploidentical, positive selected stem cells in combination with TBI or Bu based conditioning regimens can result in significant toxicity. New graft manipulation methods and a melphalan based intensity reduced regimen may help to reduce these complications. We present our results with a direct depletion procedure for T and B cells using antiCD3/ antiCD19 coated magnetic microbeads. Melphalan (2 x 70 mg/ m²), fludarabine (4 x 40 mg/m²) or clofarabine (4 x 50 mg/m²), thiotepa (10 mg/kg) and OKT3 (0.1 mg/kg) was used as preparative regimen. 36 pediatric patients (median age: 11 years) were included. All patients underwent intensive pretreatment according to current study protocols; 18/36 already received previous allogeneic transplantations. The diagnoses were: ALL (n = 19), AML (n = 14), advanced MDS (n = 3); remission status was: CR1 = 2, CR2 = 7, CR3 = 9, NR = 18. All donors were full haplotype mismatched parents. Primary engraftment occurred in 89% of patients. After TLI based reconditioning and second haploidentical stem cell donation, final engraftment was achieved in 100%. Median time to reach > 500 neutrophiles/mul and independence from platelet substitution was 10 (8-15) and 9 (5-59) days respectively. GvHD grade 0 occurred in 36%. 54% and 8% had GvHD grade I-II and III, respectively. Chronic limited and extensive GvHD was observed in 8 and 11%. Transplant related mortality was 0% at day 100 and 8% at one year. Event free survival at 2 years was 66% for patients with any CR (1st SCT) (n = 8) and 10% for patients with active disease (1st SCT) (n = 12). 1 year EFS in patients after 2nd SCT was 30% (n = 18). Causes of death were myocardiopathy (n = 2), infection (n = 1), GvHD (n = 1) and relapse (n = 22). Relapse rates at 2 years were 20% (CR patients) and 73% (active disease patients or 2nd trp). Conclusion(s): Transplantation of CD3/CD19 depleted haploidentical stem cells with a reduced intensity regimen resulted in a fast recovery of neutrophiles and platelets. Engraftment rates similar to that of patients with myeloablative standard conditioning and positive selected stem cells could be achieved, possibly due to a graft facilitating effect of cotransfused NK cells. The regimen helped to minimize TRM, despite intensive pretreatment, and is suited for 2nd or 3rd transplantation. Patients in any CR had a favorable outcome, whereas patients with active disease showed high relapse rates. Especially in these patients, further therapeutic elements have to be evaluated.

Lang, P. J., et al. (2010). "Long term survival and relapse rate after transplantation of highly T and B cell depleted stem cells from alternative donors in pediatric patients with acute lymphatic leukemia." Biology of Blood and Marrow Transplantation **16 (2 SUPPL 2)**: S301-S302.

We present long term results in 68 children with ALL who received highly T and B cell depleted stem cells from matched unrelated (n = 17) or full haplotype mismatched related donors (n = 51) at our institution. Our aim was to minimize GvHD and to avoid EBV LPD in both matched and mismatched transplantations. Remission status was: CR1, n = 18; CR2, n = 23; >=CR3, n = 12; non remission or second transplant, n = 15. Graft manipulation was carried out with microbeads and the CliniMACSTM device (indirect depletion of T and B cells with CD34+ positive selection (n 5 50); or direct depletion with anti-CD3/anti-CD19 coated microbeads (n = 18)). Tand B cell counts were reduced for4-5 log with mediannumbers of residual T cells of 15 000/kg bw (CD34+ selection) and 49 000/kg bw (CD3/19 depletion). No pharmacological immune suppression was given after positive selection, whereas patients with CD3/19 depletion received MMF. The conditioning regimens were either TBI or Bu based (n 5 50) or a toxicity reduced protocol (Flud, TT, Mel) was used (n 5 18). Rejection prophylaxis was carried out with ATG or OKT3. Primary engraftment occurred in 85%. After reconditioning, final engraftment was achieved in 98%. GvHD grade 0-1 occurred in 86%. 12% had grade II, 4% had grade III. Chronic GvHD occurred in 4 patients. No GvHD related mortality was observed. Median follow up was 5.9 years. EFS at 1 year was 56%(CR1), 51%(CR2) and 50%(>=CR3); EFS at 5 years was 49%(CR1), 46%(CR2) and 27%(>=CR3). Median survival of patients with active disease was 0.2 years. Relapse rates at 1 year were 0.32(CR1), 0.47(CR2) and 0.46(>=CR3); relapse rates at 5 years were 0.32(CR1), 0.47(CR2) and 0.64(>=CR3). TRM at 1 year was 14%, causes of death remained viral and fungal infections, no EBV LPD occurred. Conclusion(s): positive selection of progenitor cells or depletion of T and B cells can minimize acute and chronic GVHD in both matched unrelated and mismatched related transplantations and may prevent GvHD related mortality. Lethal infections occurred in 14% of the patients probablydue to the delayed recovery of Tcells. Despite profound depletion of donor T cells, relapse rates were acceptable and remained on a stable level after the first year in patients with complete remission. Thus, absence of GvHD may not necessarily be associated with high relapse rates in childhood ALL. Apart from T cells, other effector cells like NK cells are likelyto exert GvL effects and may contribute to the favorable EFS of our patients.

Lang, P. J., et al. (2017). "Effects of various ATG doses on rejection rate and immune recovery in haploidentical T and B cell depleted stem cell transplantation." Blood. Conference: 59th Annual Meeting of the American Society of Hematology, ASH **130**(Supplement 1).

T and B cell depletion of haploidentical stem cells with CD3/CD19 coated magnetic microbeads prevents from GvHD and allows to coinfuse donor NK cells and other accessory cells. Additional in vivo depletion of the graft by serotherapy is not necessary. Thus, a dosing scheme of ATG is needed, which provides a rejection prophylaxis by depleting lymphocyte subsets of the patients but which does not harm the graft, in particular cotransfused NK cells. We retrospectively analyzed the impact of various Grafalon (anti-human T-lymphocyte immunoglobulin = ATLG; formerly ATG-Fresenius) doses given at day -12 on engraftment rate and on posttransplant immune recovery. A total of 50 pediatric patients received either 3x5 (n=7), 3x10 (n=34) or

3x20mg/kg (n=9) ATLG starting at day -12 to day -9, followed by fludarabine (160 mg/m², d -8 to -5), thiotepa (10 mg/m²d -4) and melphalan (140 mg/m²d -3 to -2). Diagnoses were: ALL/AML n=10, relapsed solid tumors n=33, nonmalignant diseases n=7. Most patients received MMF until day 30-60. ATLG serum levels were measured in 24 patients by flow cytometry (T cell specific rabbit IgG). Apoptosis/necrosis of donor NK cells was assessed with Annexin V/PI staining. A median number of 16x10 CD34/kg and 65x10 NK cells/kg with 29x10 T cells/kg were infused. Median time to ANC>500/mul was 9.5 days. Graft rejection occurred in 3/7 patients with 15mg (42%), in 7/34 patients with 30mg (20%) and in 1/9 patients with 60mg ATLG (11%). All rejectors could be rescued by reconditioning and 2 stem cell donation or by infusion of autologous back ups. Acute GvHD grade 0-I occurred in 47 patients (94%), GvHD grade II and III-IV was observed in 1 and 2 patients (2%, 4%), respectively. Chronic GvHD occurred in 9 patients (18%). TRM at 1 year was 10% for the entire group. Immune recovery of CD3+ T cells was influenced by the various amounts of ATLG given in the 3 subgroups (15 vs 30 vs 60mg/kg) with a median number of 98 vs 10 vs 2 cells/mul at day +30, 95 vs 100 vs 2 cells/mul at day +90 and 75 vs 218 vs 239 cells/mul at day +180 (figure 1a). Recovery of CD56+ NK cells was fast and reliable and reached peaks of 459 vs 342 vs 155 cells/mul at day +30. Later on NK cells dropped to normal levels of 152 vs 167 vs 104 cells/mul at day +90 and 118 vs 172 vs 99 cells /mul at day +180. ATLG serum levels reached mean peak values of 9.6 mug/ml +/-4.7 vs 22.1+/-13.8 mug/ml vs 53.7 +/-13.9 mug/ml at day -8 and dropped to 1.4 +/-1mug/ml vs and 3.0 +/-1.98 mug/ml and 11.5 +/-5.8 mug/ml at day 0 (15 vs 30 vs 60mg/kg, figure 1b). In vitro incubation of isolated NK cells from healthy donors with comparable ATLG doses (1 or 10 mug/ml) resulted in 26 (41)% apoptosis and 0.2 (0.2)% necrosis after 24 hours. Thus, vitality of 73 (59)% of NK cells were preserved. Conclusion(s): Our aim was to reduce the rejection rate and to improve immune recovery in patients receiving CD3/19 depleted haploidentical peripheral stem cells, in particular without hampering donor NK cells in the grafts. Administration of 15, 30 or 60 mg/kg ATLG was started at an early time point (day -12) of the regimen. Higher ATLG doses correlated with higher serum levels. Peak levels at day -8 provided a rejection prophylaxis. At day 0, various lower levels were achieved and minimized further in vivo depletion. Increased ATLG doses were associated with a lower rejection rate. On the other hand, recovery of T cells was slower after 60mg/kg ATLG in the early posttransplant phase with lower CD3 counts at day 30 and 90. Since all rejectors were successfully regrafted, it may be reasonable to balance between rejection risk and impaired immune recovery and to use an average dose (30mg). Further studies should investigate if serotherapy might be given even earlier than in this analysis.

Lanouar, S., et al. (2018). "Effect of cross-linking on the physicochemical and in vitro properties of pullulan/dextran microbeads." Journal of Materials Science: Materials in Medicine **29 (6) (no pagination)**(77).

Hydrogels are very promising for tissue engineering as they provide scaffolds and a suitable microenvironment to control cell behavior and tissue regeneration. We used a patented method to obtain beads of pullulan/dextran cross-linked with sodium trimetaphosphate (STMP), that were already described for in vivo bone repair. The aim of this study was to provide a comparative analysis of microbeads made of polysaccharides prepared using three different STMP feeding ratio of 1.5, 2.25 or 3 % w/w. The morphology, swelling and biodegradability of these structures were assessed. Mesenchymal stem cells were also seeded to evaluate the cell organization onto the beads. We found that the amount of phosphorus resulting from the cross-linking was proportional to the introduced STMP concentration. An increase of cross-linking decreased the in vitro enzymatic degradability, and also decreased the swelling in

PBS or water. The microstructures observed by SEM and confocal microscopy indicated that homogeneous spherical microbeads were obtained, except for the lower cross-linking ratio where the shapes were altered. Beads hydrated in PBS exhibited a mean diameter ranging from 400 to 550 micro m with the decrease of STMP ratio. Cells adhered to the surface of microbeads even in the absence of protein coating. Cell viability studies revealed an increase in cell numbers over two weeks for the highest cross-linked beads, whereas the two lowest STMP concentrations induced a decrease of cell viability. Overall, this study demonstrated that pullulan/dextran hydrogels can be designed as microbeads with adjustable physicochemical and biological properties to fulfill requirements for tissue engineering approaches. Copyright © 2018, Springer Science+Business Media, LLC, part of Springer Nature.

Lares, M., et al. (2019). "Intercomparison study on commonly used methods to determine microplastics in wastewater and sludge samples." Environmental Science & Pollution Research **26**(12): 12109-12122.

The harmonized procedures in terms of the sampling, sample treatment and identification of microplastics in different environmental samples are missing, which poses challenges to researchers to compare the results or to adopt 'the most effective' monitoring approach. Furthermore, in the related literature, the used procedures are rarely tested with spiked microplastics to predetermine their recovery rates. Without this knowledge, results should only be discussed as rough estimations of the real environmental concentrations of microplastics. In this study, six different methods previously used in microplastic studies of different media were tested with municipal wastewater and digested sludge samples, spiked with seven different types of plastic particles and fibres. Recovery rates, time consumption, advantages and disadvantages were assessed and most suitable treatment procedures (i.e. high recovery rates in short amount of time) were chosen for both wastewater and sludge. Suitability of staining with Rose Bengal was examined together with most efficient methods, but it did not improve the recovery of microplastics. In addition, the possible impacts of the treatments for identification with micro-Raman and FTIR microscope were assessed. Filtration with size fractioning was found to be the best method for both wastewater and sludge samples, with recovery rates of spiked microplastics around 91.4% and 92.9%, respectively.

Larin, K. V., et al. (2012). Optical sensing of macromolecules and microparticles distribution in tissues. 11th IEEE SENSORS 2012 Conference, October 28, 2012 - October 31, 2012, Taipei, Taiwan, Institute of Electrical and Electronics Engineers Inc.

This paper describe a highly systematic set of experiments demonstrating capability of Optical Coherence Tomography (OCT) technique for depth-resolved, real-time and truly noninvasive analysis of complex diffusion processes of macromolecules in epithelial and vascular tissues as well to image and detect magnetic microparticles (stationary and moving) under the skin with single-particle sensitivity. For example, we demonstrate that the permeation of VLDL, LDL, HDL, and glucose in normal and diseased human carotid endarterectomy tissues could be quantified that supported previous suggestions of an enhanced transport mechanism specific to LDL. Additionally, we investigated sensitivity of OCT to assess magnetic microbead (d=2.8 um) count under the skin, which could the basis for development of continuous glucose sensing platform. 2012 IEEE.

Lasee, S., et al. (2017). "Microplastics in a freshwater environment receiving treated wastewater effluent." Integrated Environmental Assessment & Management **13**(3): 528-532.

Small plastic fragments (microplastics or solid particles <5 mm in size or "microbeads" used in personal care products and cosmetics) may ultimately find their way into aquatic environments.

We studied the presence of microplastics (particle sizes 53-105 mum and 106-179 mum) spatially and temporally in 3 connected urban lakes being fed by treated wastewater effluent in Lubbock, Texas. These lakes also serve as drainage during storm events. Water samples from drainage playa wetlands within the city were also collected. Our interest was in determining the presence or absence of microplastics in a freshwater environment as well as the source apportionment between personal care products (via wastewater) and discarded plastics (via runoff).

Lauper, M., et al. (2013). "Rumination of different-sized particles in muskoxen (Ovibos moschatus) and moose (Alces alces) on grass and browse diets, and implications for rumination in different ruminant feeding types." Mammalian Biology **78**(2): 142-152.

The obligatory, periodic regurgitation of forestomach material and its subsequent re-mastication is the hallmark of the most diverse extant large herbivore group, the ruminants. Although the process of rumination is well understood in domestic species, differences between free-ranging wild ruminant species, for example of different body size or different feeding type, remain speculative to date. Here we investigate the proportion of plastic particles of varying size (1, 10 and 20 mm) and density (1.03, 1.20 and 1.44 mg/ml) that are recovered intact or ruminated-upon after insertion into the reticulorumen (RR) of domestic cattle (Bos primigenius f. taurus) on grass silage, and of muskoxen (Ovibos moschatus; n=4) and moose (Alces alces; n=2) both fed browse and grass diets. In the three species, the proportion of particles leaving the RR intact depended on particle size, with density showing no effect in this study. The major proportion of 1 mm particles was excreted intact, whereas intact 10-20 mm particles were only excreted sporadically, and not in all animals. Intact particles were mostly found in the initial samples after marker application, and mean retention times of intact particles were always shorter than those of ruminated particles. There were no differences between moose and muskoxen, but diet had a significant effect, with a higher proportion of 1 mm particles ruminated upon on the grass diet in both species, indicating a higher 'filter-bed effect' with entrapment of small particles in a fibre mat in the RR on a grass diet. Given that less particles were ruminated on the grass diet, one could either assume that free-ranging browsers ruminate less than grazers on similar food intakes (or that they have higher food intakes at similar levels of rumination). The existing data on time-budgets of free-ranging ruminants, however, does not suffice to test these hypotheses. The fact that indication of a 'filter-bed effect' was also detectable in moose raises the question whether adaptations described in 'cattle-type' ruminants really serve to re-inforce the processes of RR contents stratification and the 'filter-bed', or whether they are not rather directed at other aims, such as maximizing microbial yield from the RR.

Laurent, V. M., et al. (2002). "Assessment of mechanical properties of adherent living cells by bead micromanipulation: comparison of magnetic twisting cytometry vs optical tweezers." Journal of Biomechanical Engineering **124**(4): 408-421.

We compare the measurements of viscoelastic properties of adherent alveolar epithelial cells by two micromanipulation techniques: (i) magnetic twisting cytometry and (ii) optical tweezers, using microbeads of same size and similarly attached to F-actin. The values of equivalent Young modulus E, derived from linear viscoelasticity theory, become consistent when the degree of bead immersion in the cell is taken into account. E-values are smaller in (i) than in (ii): approximately 34-58 Pa vs approximately 29-258 Pa, probably because higher stress in (i) reinforces nonlinearity and cellular plasticity. Otherwise, similar relaxation time constants, around 2 s, suggest similar dissipative mechanisms.

Lavelli, V. and P. S. C. Sri Harsha (2019). "Microencapsulation of grape skin phenolics for pH controlled release of antiglycation agents." Food Research International **119**: 822-828.

Grape skin (GS) phenolics can prevent structural damage of proteins due to reducing sugars or dicarbonyl compounds, which is the leading cause of hyperglycaemia damage and is involved in inflammatory diseases. In this study, alginate hydrogel was used to encapsulate GS phenolics as a pH dependent releasing system. Microbeads were obtained by a vibrating nozzle method using calcium chloride as hardening agent. Encapsulation efficiency for total phenolics was 68%. At pH 1.4, the alginate microbeads remained intact and only 13% of total phenolic compounds of the microbeads was released. The percent release depended on the compound: procyanidin B1 release was 74%, catechin and epicatechin release was ~ 50%, while anthocyanin and flavonol release was less than 11%. At pH 7.4, the microbeads were dissolved and formed a viscous solution that showed ability to protect bovine serum albumin from glycation induced by both fructose and methylglyoxal. The antiglycation activity was 246 mmol catechin equivalents (CE)/kg of dry microbeads in the fructose model system and 78 mmol CE/kg of dry microbeads in the methylglyoxal model system. These values corresponded to 68% and 62% of the expected activity, probably due to interaction between phenolics and the alginate carrier. Despite the recovery of antiglycation activity was incomplete, results of this study confirmed the efficiency of alginate to act as a pH controlled released system for GS phenolics. This functionalized polymer could be applied in the prevention of advanced-glycation-endproducts related diseases.

Lavers, J. L. and A. L. Bond (2016). "Ingested plastic as a route for trace metals in Laysan Albatross (Phoebastria immutabilis) and Bonin Petrel (Pterodroma hypoleuca) from Midway Atoll." Marine Pollution Bulletin **110**(1): 493-500.

Seabirds are declining faster than any other group of birds, with plastic ingestion and associated contaminants linked to negative impacts on marine wildlife, including >170 seabird species. To provide quantitative data on the effects of plastic pollution, we sampled feathers and stomach contents from Laysan Albatross (Phoebastria immutabilis) and Bonin Petrel (Pterodroma hypoleuca) on Midway Atoll, North Pacific Ocean, and assessed our ability to detect change over time by synthesizing previous studies. Between 25 and 100% of fledglings exceed international targets for plastic ingestion by seabirds. High levels of ingested plastic were correlated with increased concentrations of chlorine, iron, lead, manganese, and rubidium in feathers. The frequency of plastic ingestion by Laysan Albatross and concentration of some elements in both species is increasing, suggesting deterioration in the health of the marine environment. Variability in the frequency of plastic ingestion by Laysan Albatross may limit their utility as an indicator species.

Lavers, J. L., et al. (2014). "Plastic ingestion by Flesh-footed Shearwaters (Puffinus carneipes): implications for fledgling body condition and the accumulation of plastic-derived chemicals." Environmental Pollution **187**: 124-129.

To provide much needed quantitative data on the lethal and sublethal effects of plastic pollution on marine wildlife, we sampled breast feathers and stomach contents from Flesh-footed Shearwater (Puffinus carneipes) fledglings in eastern Australia. Birds with high levels of ingested plastic exhibited reduced body condition and increased contaminant load ($p<0.05$). More than 60% of fledglings exceed international targets for plastic ingestion by seabirds, with 16% of fledglings failing these targets after a single feeding (range: 0.13-3.21 g of plastic/feeding). As top predators, seabirds are considered sentinels of the marine environment. The amount of plastic ingested and corresponding damage to Flesh-footed Shearwater fledglings is the highest reported for any marine vertebrate, suggesting the condition of the Australian marine environment is poor. These findings help explain the ongoing decline of this species and are worrying in light of increasing levels of plastic pollution in our oceans.

Lavers, J. L., et al. (2019). "Clinical Pathology of Plastic Ingestion in Marine Birds and Relationships with Blood Chemistry." Environmental Science & Technology **53**(15): 9224.

Pollution of the environment with plastic debris is a significant and rapidly expanding threat to biodiversity due to its abundance, durability, and persistence. Current knowledge of the negative effects of debris on wildlife is largely based on consequences that are readily observed, such as entanglement or starvation. Many interactions with debris, however, result in less visible and poorly documented sublethal effects, and as a consequence, the true impact of plastic is underestimated. We investigated the sublethal effects of ingested plastic in Flesh-footed Shearwaters (Ardenna carneipes) using blood chemistry parameters as a measure of bird health. The presence of plastic had a significant negative effect on bird morphometrics and blood calcium levels and a positive relationship with the concentration of uric acid, cholesterol, and amylase. That we found blood chemistry parameters being related to plastic pollution is one of the few examples to date of the sublethal effects of marine debris and highlights that superficially healthy individuals may still experience the negative consequences of ingesting plastic debris. Moving beyond crude measures, such as reduced body mass, to physiological parameters will provide much needed insight into the nuanced and less visible effects of plastic.

Law, K. L., et al. (2014). "Distribution of surface plastic debris in the eastern Pacific Ocean from an 11-year data set." Environmental Science & Technology **48**(9): 4732-4738.

We present an extensive survey of floating plastic debris in the eastern North and South Pacific Oceans from more than 2500 plankton net tows conducted between 2001 and 2012. From these data we defined an accumulation zone (25 to 41 degreeN, 130 to 180 degreeW) in the North Pacific subtropical gyre that closely corresponds to centers of accumulation resulting from the convergence of ocean surface currents predicted by several oceanographic numerical models. Maximum plastic concentrations from individual surface net tows exceeded 10(6) pieces km(-2), with concentrations decreasing with increasing distance from the predicted center of accumulation. Outside the North Pacific subtropical gyre the median plastic concentration was 0 pieces km(-2). We were unable to detect a robust temporal trend in the data set, perhaps because of confounded spatial and temporal variability. Large spatiotemporal variability in plastic concentration causes order of magnitude differences in summary statistics calculated over short time periods or in limited geographic areas. Utilizing all available plankton net data collected in the eastern Pacific Ocean (17.4 degreeS to 61.0 degreeN; 85.0 to 180.0 degreeW) since 1999, we estimated a minimum of 21,290 t of floating microplastic.

Lawren, B. (1990). "Plastic Rapt." National Wildlife **28**(6): 10.

The most effective way to address the plastic waste problem in the US is to make less of it. Known as source reduction, this approach focuses on banning frivolous uses of plastic whenever possible. Grass roots consumer involvement in this problem is forcing plastic manufacturers to search out new solutions, such as biodegradable and photodegradable plastics. The pros and cons of the degradable plastics debate are presented and assessed. The most environmentally benign solution is recycling so that eventually very little new plastic would have to be produced. Recycling will involve the concerted efforts of industry, science, and the consuming public.

Lawton, G. (2019). "Plastic measures." New Scientist **244**(3259): 38-38.

Microplastics now contaminate the food we eat and the air we breathe. The race is on to see if our health is at risk, reports Graham Lawton

Lazarevic, D., et al. (2010). "Plastic waste management in the context of a European recycling society: Comparing results and uncertainties in a life cycle perspective." Resources, Conservation and Recycling **55**(2): 246-259.

A number of life cycle assessment (LCA) studies have been undertaken within the last 15 years comparing end-of-life treatment options for post-consumer plastic waste, including techniques such as: mechanical recycling, feedstock recycling, incineration with energy recovery and landfilling. These have attempted to support decisions in the formulation of waste management strategies and policies. In light of the introduction of life cycle thinking into European waste policies, specifically in relation to the waste hierarchy, a literature review of publically available LCA studies evaluating alternative end-of-life treatment options for plastic waste has been conducted. This has been done in order to: establish if a consensus exists as to the environmentally preferable treatment option for plastic waste; identify the methodological considerations and assumptions that have led to these conclusions; and determine the legitimacy of applying the waste hierarchy to the plastic waste stream. The majority of the LCA studies concluded that, when single polymer plastic waste fractions with little organic contamination are recycled and replace virgin plastic at a ratio of close to 1:1, recycling is generally the environmentally preferred treatment option when compared to municipal solid waste incineration. It has been found that assumptions relating to the virgin material substitution ratio and level of organic contamination can have a significant influence upon the results of these studies. Although a limited number of studies addressed feedstock recycling, feedstock recycling and the use of plastic waste as a solid recovered fuel in cement kilns were preferred to municipal solid waste incineration. Landfilling of plastic waste compared to municipal solid waste incineration proved to be the least preferred option for all impact categories except for global warming potential. Due to the uncertainty surrounding some assumptions in the studies, it cannot be said with confidence that the waste hierarchy should be applied to plastic waste management as a general rule. © 2010 Elsevier B.V. All rights reserved.

Le, D. Q., et al. (2016). "Temporal and spatial changes in persistent organic pollutants in Vietnamese coastal waters detected from plastic resin pellets." Marine Pollution Bulletin **109**(1): 320-324.

Plastic resin pellets collected at Minh Chau island and Ba Lat estuary between 2007 and 2014 in Vietnam were analyzed for dichloro-diphenyl-trichloroethanes (DDTs), polychlorinated biphenyls (PCBs) and hexachlorocyclohexanes (HCHs). The study was carried out as part of the International Pellet Watch program for monitoring the global distribution of persistent organic pollutants (POPs). Higher levels of DDTs compared to PCBs indicated agricultural inputs rather than industrial discharges in the region. Most POP concentrations on both beaches decreased over the period, with the exception of HCH isomers. Though the concentration of DDTs showed a drastic decline on both beaches between 2007/2008 and 2014, DDTs accounted for 60-80% of total DDTs, suggesting that there is still a fresh input of these chemicals in the region. This study strongly recommends further investigations to track temporal and spatial patterns of POP levels in the marine environment using plastic resin pellets.

Le Guen, C., et al. (2020). "Microplastic study reveals the presence of natural and synthetic fibres in the diet of King Penguins (Aptenodytes patagonicus) foraging from South Georgia." Environment International **134**: 105303.

Marine ecosystems are experiencing substantial disturbances due to climate change and overfishing, and plastic pollution is an additional growing threat. Microfibres are among the most pervasive pollutants in the marine environment, including in the Southern Ocean. However, evidence for microfibre contamination in the diet of top predators in the Southern Ocean is rare. King Penguins (Aptenodytes patagonicus) feed on mesopelagic fish, which undergo diel vertical migrations towards the surface at night. Microfibres are concentrated in surface waters and sediments but can also be concentrated in fish, therefore acting as contamination vectors for diving predators feeding at depth. In this study, we investigate microfibre contamination of King Penguin faecal samples collected in February and March 2017 at South Georgia across three groups: incubating, chick-rearing and non-breeding birds. After a KOH digestion to dissolve the organic matter and a density separation step using a NaCl solution, the samples were filtered to collect microfibres. A total of 77% of the penguin faecal samples (36 of 47) contained microfibres. Fibres were measured and characterized using Fourier-Transform Infrared spectroscopy to determine their polymeric identity. Most fibres (88%) were made of natural cellulosic materials (e.g. cotton, linen), with only 12% synthetic (e.g. polyester, nylon) or semi-synthetic (e.g. rayon). An average of 21.9+/-5.8 microfibres g⁻¹ of faeces (lab dried mass) was found, with concentrations more than twice as high in incubating penguins than in penguins rearing chicks. Incubating birds forage further north at the Antarctic Polar Front and travel longer distances from South Georgia than chick-rearing birds. This suggests that long-distance travelling penguins are probably more exposed to the risk of ingesting microfibres when feeding north of the Antarctic Polar Front, which might act as a semi-permeable barrier for microfibres. Microfibres could therefore provide a signature for foraging location in King Penguins.

Le Guernic, A., et al. (2019). "Comparison of viability and phagocytic responses of hemocytes withdrawn from the bivalves Mytilus edulis and Dreissena polymorpha, and exposed to human parasitic protozoa." International Journal for Parasitology **16**: 16.

Bivalve molluscs are now considered indicator species of aquatic contamination by human parasitic protozoa. Nonetheless, the possible effects of these protozoa on the immune system of their paratenic hosts are poorly documented. The aim of this study was to evaluate the effects of two protozoa on hemocyte viability and phagocytosis from two mussels, the zebra mussel (freshwater habitat) and the blue mussel (seawater habitat). For these purposes, viability and phagocytic markers have been analysed on hemocytes from mussels without biological stress (control hemocytes), and on hemocytes exposed to a biological stress (Toxoplasma gondii and Cryptosporidium parvum oocysts). We report, for the first known time, the interactions between protozoa and hemocytes of mussels from different aquatic environments. Zebra mussel hemocytes showed a decrease in phagocytosis of fluorescent microbeads after exposure to both protozoa, while blue mussel hemocytes reacted only to T. gondii oocysts. These decreases in the ingestion of microbeads can be caused by competition between beads and oocysts and can be influenced by the size of the oocysts. New characterisations of their immune capacities, including aggregation, remain to be developed to understand the specificities of both mussels.

Le Hingrat, Q., et al. (2018). "Efficiency of HIV-2 cultures from clinical isolates is enhanced after purification by anti-CD44 microbeads." Journal of Virological Methods **257**: 12-15.

In-depth study of HIV often requires large stock of patients-derived viruses obtained through viral cultures. HIV cultures are currently limited by low recovery rates, especially when viral load is below 100,000 copies per mL. This is problematic for HIV-2 as most patients have

spontaneously low to undetectable viremia. New approaches have been developed to enhance viral recovery rates but they are complex or costly to implement. We tested the impact of muMACS^{TM} VitalVirus Isolation Kit (Miltenyi), a HIV virions capture method using paramagnetic microbeads directed against CD44, a human glycoprotein present in HIV envelope. This method separates viruses from interfering proteins in 45 min, using a reduced sample volume (200 muL versus 1000 muL for classic culture assays). The impact of this purification method on virus recovery rate was assessed with 23 HIV-1 and 29 HIV-2 plasma samples with a wide range of viral loads, in comparison to a classic culture assay used routinely in our laboratory. For both HIV-1 and HIV-2, the culture identification delay was decreased using viral purification (<=7days in most cases). The recovery rate of cultures was improved for HIV-2 isolates (17/29 versus 8/29; p = 0.03) but not for HIV-1 (7/23 versus 5/23; p = 0.74). Notably, HIV-2 isolates with viral loads over 10,000 copies per mL were frequently recovered in culture (68% versus 32% without purification; p = 0.03). This marked improvement on HIV-2, but not on HIV-1, cultures is puzzling. CD44-microbeads may enable a close and prolonged contact between cells and viruses, and may thus overcome HIV-2 difficulties to infect target cells. Copyright © 2018 Elsevier B.V.

Le Ly Thuy, T., et al. (2012). "Isolation and detection of Campylobacter jejuni from chicken fecal samples by immunomagnetic separation-PCR." Food Control **24**(1/2): 23-28.

Campylobacter jejuni (C. jejuni) is one of the leading causes of bacterial food-borne disease worldwide. The presence of Campylobacter in chicken feces poses a high risk for contamination of chicken meat and for Campylobacter infections in human. Detection of this bacterium in chicken fecal specimens before slaughter is therefore vital to prevent disease transmission. By combining two techniques - immunomagnetic separation (IMS) and polymerase chain reaction (PCR), this study developed a reliable and specific method for rapid detection of C. jejuni in chicken fecal samples. The specificity of the assay was assured by two selection steps: (1) DynabeadsReg.M-270 Amine microbeads (2.8 micro m in diameter) coated with C. jejuni monoclonal antibodies were used as the primary selection to isolate bacteria from fecal samples. (2) A PCR assay amplifying the Hippuricase gene was performed as the specific selection to accurately confirm the presence of C. jejuni. Without pre-enrichment, this method was able to detect approximately 10 CFU of C. jejuni in 1 micro l of spiked feces within 3 h.

Le, S., et al. (2017). "Fabrication of paper devices via laser-heating-wax-printing for high-tech enzyme-linked immunosorbent assays with low-tech pen-type pH meter readout." Analyst **142**(3): 511-516.

In this work, a new method named laser-heating-wax-printing (LHWP) is described to fabricate paper devices for developing sensitive, affordable, user-friendly paper-based enzyme-linked immunosorbent assays (P-ELISAs) that initially use common pen-type pH meters for portable, quantitative readout. The LHWP enables a rapid patterning of wax in paper via one step of heating the wax layer coated on the paper surface using a mini-type CO₂ laser machine. Wax-patterned paper microzones created in this way are utilized to conduct the pen-type pH meter-based P-ELISAs with enzyme-loaded SiO₂ microbeads for highly efficient signal amplification of each antibody-antigen binding event. The results show that this new P-ELISA system is quantitatively sensitive to the concentrations of a model protein analyte in buffer samples ranging from 12.5 to 200 pg mL⁻¹, with a limit of detection of ca. 7.5 pg mL⁻¹ (3sigma). Moreover, the satisfactory recovery results of assaying several human serum samples validate its feasibility for practical applications.

Leads, R. R., et al. (2019). "The Effect of Microplastic Ingestion on Survival of the Grass Shrimp Palaemonetes pugio (Holthuis, 1949) Challenged with Vibrio campbellii." Environmental Toxicology & Chemistry **38**(10): 2233-2242.

Recent research indicates that microplastic (<5 mm) ingestion may impact the immune function of marine and aquatic organisms at the tissue and cellular levels; however, their susceptibility to disease following exposure has not been directly investigated. The objective of the present study was to directly evaluate the impact of microplastic ingestion on the susceptibility of the grass shrimp Palaemonetes pugio to bacterial infection with Vibrio campbellii. Grass shrimp were exposed to one of several particle treatments (natural sediment, polyethylene spheres, polypropylene fragments, tire fragments, and polyester fibers) or particle-free water for 96 h at a nominal concentration of 50 000 particles/L prior to a bacterial challenge with V. campbellii. No significant mortality was observed among any of the particle types during the 96-h particle exposure. The survival of grass shrimp following V. campbellii challenge did not vary significantly among shrimp exposed to particle-free water, sediment, polyethylene spheres, polypropylene fragments, tire fragments, and polyester fibers. Grass shrimp cleared the majority of ingested particles and all the ventilated particles within 48 h. The present study shows that microplastic ingestion did not alter the susceptibility of grass shrimp to bacterial infection, and also provides depuration rates for a variety of microplastic shapes and polymer types that were previously lacking. This information increases our understanding of the size- and shape-dependent effects of microplastic ingestion. Environ Toxicol Chem 2019;38:2233-2242. © 2019 SETAC.

Leads, R. R. and J. E. Weinstein (2019). "Occurrence of tire wear particles and other microplastics within the tributaries of the Charleston Harbor Estuary, South Carolina, USA." Marine Pollution Bulletin **145**: 569-582.

Microplastics (<5 mm) are ubiquitous in the marine environment, occurring in both sediments and surface waters worldwide. However, few studies have documented the presence of microplastics and tire wear particles in coastal rivers. A survey of microplastics and low-density tire wear particles (>=63 mum) in the sediment and surface water of the three major tributaries within the Charleston Harbor estuary was conducted. Intertidal sediment, subtidal sediment, and sea surface microlayer concentrations ranged from 0 to 652 microplastics/m², 3-4,375 microplastics/kg wet weight, and 3-36 microplastics/L, respectively. Blue fibers and tire wear particles were the two most abundant microplastic types observed, constituting 26.2% and 17.1%, respectively, of total microplastics. Tire wear particles were primarily identified by morphology, and ATR-FTIR analysis was conducted for a small subset (n = 5) of larger particles (>=500 mum). The present study provides the first microplastic field assessment of low-density tire wear particles in estuarine tributaries. Copyright © 2019 Elsevier Ltd

Leary, T. F., et al. (2015). "Mass transfer in the biomolecular binding of a target against probe molecules on the surface of microbeads sequestered in wells in a microfluidic cell." Lab on a Chip **15**(2): 459-477.

Diagnostic tools which screen the binding interactions of a protein target against a display of biomolecular probes to identify molecules which bind the target are central to cell proteomic studies, and to diagnostic assays. Here, we study a microfluidic design for screening interactions in which the probe molecules are hosted on microbeads sequestered in wells arranged at the bottom of a microfluidic flow channel. Assays are undertaken by streaming an analyte solution with a fluorescently labelled target through the cell, and identifying the fluorescing beads. Numerical simulations are first constructed for the analyte flow over the microbeads in the well array, and the increase in the target concentration on the microbead surface. The binding profile is expressed as a function of the ratio of the convective to the diffusive transport rates

(Peclet number or Pe), and the ratio of the kinetic to the diffusive rates (Damkohler number, Da). For any Pe, as Da becomes small enough, the transport is determined by the intrinsic kinetic binding rate. As Pe increases, a thin concentration boundary layer develops over the top surface of the microbead because of the convective flow, and target binds more rapidly. However, the relatively stagnant layers of liquid in the well provide a diffusion barrier which slows the target transport, and for any Da and Pe the transport is slower than equivalent patches of probes arranged on the channel wall. Experiments are also undertaken at high Pe, using the binding of fluorescently labelled NeutrAvidin as a target to probes of its binding partner, biotin, on the microbead surface. The binding profile is compared to the simulations to measure the kinetic rate constant, and this comparison shows that the transport in the cell is not kinetically limited because of the diffusion barriers created by the stagnant liquid layer in the well. Simulations and experiments on microbeads which are only partially recessed in the well demonstrate an increase in the mass transfer rate as more of the microbead surface intersects the flow and the diffusion limitation due to the stagnant layer of liquid surrounding the bottom part of the microbead is minimized.

Leautaud, V., et al. (2014). Evaluation of a qualitative human immunodeficiency virus-1 diagnostic assay based on nucleic acid sequence based amplification and lateral flow readout. 2014 IEEE Healthcare Innovation Conference, HIC 2014.

In this study, a qualitative human immunodeficiency virus-1 (HIV-1) diagnostic assay was developed and evaluated as part of an effort to create a point-of-care diagnostic test for pediatric HIV-1. The assay is based on extraction of viral ribonucleic acid (RNA) with magnetic microbeads, isothermal amplification using nucleic acid sequence based amplification (NASBA), and detection of amplified RNA on lateral flow strips. Using mock samples consisting of plasma spiked with in vitro transcribed RNA or HIV-1C particles, more than 80% of samples with a concentration of 1,000 copies/mL or higher tested positive with the assay. Using clinical samples from pediatric patients at the Queen Elizabeth Central Hospital in Blantyre, Malawi, more than 80% of samples with a concentration of 10,000 copies/mL or higher tested positive. These results indicate that this assay is capable of detecting HIV-1 at concentrations found in pediatric samples and shows promise for use in low resource settings but requires further improvements to increase the specificity and sensitivity at low viral loads. © 2014 IEEE.

Lebreton, L., et al. (2019). "A global mass budget for positively buoyant macroplastic debris in the ocean." Scientific Reports **9**(1): 12922.

Predicted global figures for plastic debris accumulation in the ocean surface layer range on the order of hundreds of thousands of metric tons, representing only a few percent of estimated annual emissions into the marine environment. The current accepted explanation for this difference is that positively buoyant macroplastic objects do not persist on the ocean surface. Subject to degradation into microplastics, the major part of the mass is predicted to have settled below the surface. However, we argue that such a simple emission-degradation model cannot explain the occurrence of decades-old objects collected by oceanic expeditions. We show that debris circulation dynamics in coastal environments may be a better explanation for this difference. The results presented here suggest that there is a significant time interval, on the order of several years to decades, between terrestrial emissions and representative accumulation in offshore waters. Importantly, our results also indicate that the current generation of secondary microplastics in the global ocean is mostly a result of the degradation of objects produced in the 1990s and earlier. Finally, we propose a series of future emission scenarios until 2050, discussing the necessity to rapidly reduce emissions and actively remove waste accumulated in the environment to mitigate further microplastic contamination in the global ocean.

Lebreton, L., et al. (2018). "Evidence that the Great Pacific Garbage Patch is rapidly accumulating plastic." Scientific Reports **8**(1): 4666.

Ocean plastic can persist in sea surface waters, eventually accumulating in remote areas of the world's oceans. Here we characterise and quantify a major ocean plastic accumulation zone formed in subtropical waters between California and Hawaii: The Great Pacific Garbage Patch (GPGP). Our model, calibrated with data from multi-vessel and aircraft surveys, predicted at least 79 (45-129) thousand tonnes of ocean plastic are floating inside an area of 1.6 million km²; a figure four to sixteen times higher than previously reported. We explain this difference through the use of more robust methods to quantify larger debris. Over three-quarters of the GPGP mass was carried by debris larger than 5 cm and at least 46% was comprised of fishing nets. Microplastics accounted for 8% of the total mass but 94% of the estimated 1.8 (1.1-3.6) trillion pieces floating in the area. Plastic collected during our study has specific characteristics such as small surface-to-volume ratio, indicating that only certain types of debris have the capacity to persist and accumulate at the surface of the GPGP. Finally, our results suggest that ocean plastic pollution within the GPGP is increasing exponentially and at a faster rate than in surrounding waters.

Lebreton, L. C. M. and J. C. Borrero (2013). "Modeling the transport and accumulation floating debris generated by the 11 March 2011 Tohoku tsunami." Marine Pollution Bulletin **66**(1-2): 53-58.

A global ocean circulation model is coupled to a particle-tracking model to simulate the transport of floating debris washed into the North Pacific Ocean by the Tohoku tsunami. A release scenario for the tsunami debris is based on coastal population and measured tsunami runup. Archived 2011/2012 hindcast current data is used to model the transport of debris since the tsunami, while data from 2008 to 2012 is used to investigate the distribution of debris on timescales up to 4. years. The vast amount of debris pushed into ocean likely represents thousands of years worth of 'normal' litter flux from Japan's urbanized coastline. This is important since a significant fraction of the debris will be comprised of plastics, some of which will degrade into tiny particles and be consumed by marine organisms, thereby allowing adsorbed organic pollutants to enter our food supply in quantities much higher than present. © 2012 Elsevier Ltd.

Lebreton, L. C. M., et al. "Numerical modelling of floating debris in the world's oceans." Marine Pollution Bulletin.

A global ocean circulation model is coupled to a Lagrangian particle tracking model to simulate 30 years of input, transport and accumulation of floating debris in the world ocean. Using both terrestrial and maritime inputs, the modelling results clearly show the formation of five accumulation zones in the subtropical latitudes of the major ocean basins. The relative size and concentration of each clearly illustrate the dominance of the accumulation zones in the northern hemisphere, while smaller seas surrounded by densely populated areas are also shown to have a high concentration of floating debris. We also determine the relative contribution of different source regions to the total amount of material in a particular accumulation zone. This study provides a framework for describing the transport, distribution and accumulation of floating marine debris and can be continuously updated and adapted to assess scenarios reflecting changes in the production and disposal of plastic worldwide. © 2012.

Lebreton, L. C. M., et al. (2017). "River plastic emissions to the world's oceans." Nature communications **8**: 15611.

Plastics in the marine environment have become a major concern because of their persistence at sea, and adverse consequences to marine life and potentially human health. Implementing mitigation strategies requires an understanding and quantification of marine plastic sources, taking spatial and temporal variability into account. Here we present a global model of plastic inputs from rivers into oceans based on waste management, population density and hydrological information. Our model is calibrated against measurements available in the literature. We estimate that between 1.15 and 2.41 million tonnes of plastic waste currently enters the ocean every year from rivers, with over 74% of emissions occurring between May and October. The top 20 polluting rivers, mostly located in Asia, account for 67% of the global total. The findings of this study provide baseline data for ocean plastic mass balance exercises, and assist in prioritizing future plastic debris monitoring and mitigation strategies.

Lechner, A. and D. Ramler (2015). "The discharge of certain amounts of industrial microplastic from a production plant into the River Danube is permitted by the Austrian legislation." Environmental Pollution **200**: 159-160.

Numerous studies have quantified the amount of plastic litter in aquatic ecosystems and tried to assess its impacts and threats. This reflects a rising awareness of plastic as an environmental problem. As a next logical step, identifying and regulating the sources must be in the focus of scientific efforts. We report on a spillage of industrial microplastic (IMP) from a production plant situated at an Austrian Danube tributary. This is the first identified point source of IMP litter in freshwater systems. However, due to generous thresholds established by the Austrian government substantial amounts of IMP are legally introduced into running waters. Copyright © 2015 Elsevier Ltd All rights reserved.

Leddy, H. A., et al. (2014). "Follistatin in chondrocytes: the link between TRPV4 channelopathies and skeletal malformations." FASEB Journal **28**(6): 2525-2537.

Point mutations in the calcium-permeable TRPV4 ion channel have been identified as the cause of autosomal-dominant human motor neuropathies, arthropathies, and skeletal malformations of varying severity. The objective of this study was to determine the mechanism by which TRPV4 channelopathy mutations cause skeletal dysplasia. The human TRPV4(V620I) channelopathy mutation was transfected into primary porcine chondrocytes and caused significant (2.6-fold) up-regulation of follistatin (FST) expression levels. Pore altering mutations that prevent calcium influx through the channel prevented significant FST up-regulation (1.1-fold). We generated a mouse model of the TRPV4(V620I) mutation, and found significant skeletal deformities (e.g., shortening of tibiae and digits, similar to the human disease brachyolmia) and increases in Fst/TRPV4 mRNA levels (2.8-fold). FST was significantly up-regulated in primary chondrocytes transfected with 3 different dysplasia-causing TRPV4 mutations (2- to 2.3-fold), but was not affected by an arthropathy mutation (1.1-fold). Furthermore, FST-loaded microbeads decreased bone ossification in developing chick femora (6%) and tibiae (11%). FST gene and protein levels were also increased 4-fold in human chondrocytes from an individual natively expressing the TRPV4(T89I) mutation. Taken together, these data strongly support that up-regulation of FST in chondrocytes by skeletal dysplasia-inducing TRPV4 mutations contributes to disease pathogenesis.

Lee, B. S., et al. (2009). Microbead-based suspension immuoassay in a lab-on-a-disc. 13th International Conference on Miniaturized Systems for Chemistry and Life Sciences, MicroTAS 2009, November 1, 2009

- November 5, 2009, Jeju, Korea, Republic of, Chemical and Biological Microsystems Society.

A portable, disc-based, and fully automated enzyme-linked immuno-sorbent assay (ELISA) system is developed to test infectious diseases from whole blood. The innovative laser irradiated ferrowax microvalves and centrifugal microfluidics were utilized for the full integration of the microbead-based suspension ELISA assays on a disc starting from whole blood. The concentrations of the antigen and the antibody of Hepatitis B virus (HBV), HBsAg and Anti-HBs respectively, were measured using the lab-on-a-disc (LOD). All the necessary reagents are preloaded on the disc and the total process of the plasma separation, incubation with target specific antigen or antibody coated microbeads, multiple steps of washing, enzyme reaction with substrates, and the absorbance detection could be finished within 30 minutes. Compared to the conventional ELISA, the operation time was dramatically reduced from over 2 hours to less than 30 minutes while the limit of detection was kept similar; e.g. the limit of detection of Anti-HBs tests were 8.6 mIU mL-1 and 10 mIU mL-1 for the disc-based and the conventional ELISA respectively. 2009 CBMS.

Lee, B. S., et al. (2009). "A fully automated immunoassay from whole blood on a disc." Lab on a Chip **9**(11): 1548-1555.

A portable, disc-based, and fully automated enzyme-linked immuno-sorbent assay (ELISA) system is developed to test infectious diseases from whole blood. The innovative laser irradiated ferrowax microvalves and centrifugal microfluidics were utilized for the full integration of microbead-based suspension ELISA assays on a disc starting from whole blood. The concentrations of the antigen and the antibody of Hepatitis B virus (HBV), HBsAg and Anti-HBs respectively, were measured using the lab-on-a-disc (LOD). All the necessary reagents are preloaded on the disc and the total process of the plasma separation, incubation with target specific antigen or antibody coated microbeads, multiple steps of washing, enzyme reaction with substrates, and the absorbance detection could be finished within 30 minutes. Compared to the conventional ELISA, the operation time was dramatically reduced from over 2 hours to less than 30 minutes while the limit of detection was kept similar; e.g. the limit of detection of Anti-HBs tests were 8.6 mIU mL(-1) and 10 mIU mL(-1) for the disc-based and the conventional ELISA respectively.

Lee, C. A., et al. (2018). "Cryopreserved neonatal hepatocytes may be a source for transplantation: Evaluation of functionality toward clinical use." Liver Transplantation **24**(3): 394-406.

Neonatal livers are a potential source of good-quality hepatocytes for clinical transplantation. We compared viability and function of neonatal hepatocytes (NHs) and adult hepatocytes (AHs) and report their clinical use both intraportally and in alginate microbeads. Following isolation from donor livers, hepatocyte function was assessed using albumin, alpha-1-antitrypsin, and factor VII. Metabolic function was investigated by measuring resorufin conjugation, ammonia metabolism, uridine diphosphate glucuronosyltransferase enzyme activity, and cytochrome P450 (CYP) function following induction. Activation of the instant blood-mediated inflammatory reaction by NHs and AHs was investigated using an in vitro blood perfusion model, and tissue factor expression was analyzed using real-time polymerase chain reaction (RT-PCR). Clinical hepatocyte transplantation (HT) was undertaken using standard protocols. Hepatocytes were isolated from 14 neonatal livers, with an average viability of 89.4% +/- 1.8% (mean +/- standard error of the mean) and average yield of 9.3 x 10⁶ +/- 2.0 x 10⁶ cells/g. Hepatocytes were isolated from 14 adult livers with an average viability of 78.6% +/- 2.4% and yield 2.2 x 10⁶ +/- 0.5 x 10⁵ cells/g. NHs had significantly higher viability after cryopreservation than AHs, with better attachment efficiency and less plasma

membrane leakage. There were no differences in albumin, alpha-1-antitrypsin, and factor VII synthesis between NHs and AHs (P > 0.05). Neonatal cells had inducible phase 1 enzymes as assessed by CYP function and functional phase 2 enzymes, in which activity was comparable to AHs. In an in vitro blood perfusion model, AHs elicited increased thrombus formation with a greater consumption of platelets and white cells compared with NHs (28.3 x 10⁹ versus 118.7 x 10⁹ and 3.3 x 10⁹ versus 6.6 x 10⁹ ; P < 0.01). Intraportal transplantation and intraperitoneal transplantation of alginate encapsulated hepatocytes was safe, and preliminary data suggest the cells may activate the immune response to a lesser degree than adult cells. In conclusion, we have shown NHs have excellent cell viability, function, and drug metabolism making them a suitable alternative source for clinical HT. Liver Transplantation 24 394-406 2018 AASLD.

Lee, C. S., et al. (2013). "Tailoring adipose stem cell trophic factor production with differentiation medium components to regenerate chondral defects." Tissue engineering. Part A. **19**(11-12): 1451-1464.

Recent endeavors to use stem cells as trophic factor production sources have the potential to translate into viable therapies for damaged or diseased musculoskeletal tissues. Adipose stem cells (ASCs) can be differentiated into chondrocytes using the chondrogenic medium (CM), but it is unknown if this approach can optimize ASC growth factor secretion for cartilage regeneration by increasing the chondrogenic factor production, while decreasing angiogenic and hypertrophic factor production. The objective of this study was to determine the effects the CM and its components have on growth factor production from ASCs to promote cartilage regeneration. ASCs isolated from male Sprague-Dawley rats and cultured in monolayer or alginate microbeads were treated with either the growth medium (GM) or the CM for 5 days. In subsequent studies, ASC monolayers were treated with either the GM supplemented with different combinations of 50 mug/mL ascorbic acid-2-phosphate (AA2P), 100 nM dexamethasone (Dex), 10 ng/mL transforming growth factor (TGF)-beta1, and 100 ng/mL bone morphogenetic protein (BMP)-6 or with the CM excluding different combinations of AA2P, Dex, TGF-beta1, and BMP-6. mRNA levels and growth factor production were quantified at 8 and 24 h after the last media change, respectively. The CM increased chondrogenic factor secretion (TGF-beta2, TGF-beta3, and insulin-like growth factor [IGF]-I) and decreased angiogenic factor production (the vascular endothelial growth factor [VEGF]-A, the fibroblast growth factor [FGF]-2). Microencapsulation in the GM increased production of the chondrogenic (IGF-I, TGF-beta2) and angiogenic (VEGF-A) factors. AA2P increased secretion of chondrogenic factors (IGF-I, TGF-beta2), and decreased angiogenic factor (VEGF-A) secretion, in addition to decreasing mRNA levels for factors associated with chondrocyte hypertrophy (FGF-18). Dex increased mRNA levels for hypertrophic factors (BMP-2, FGF-18) and decreased angiogenic factor secretion (VEGF-A). TGF-beta1 increased angiogenic factor production (FGF-2, VEGF-A) and decreased chondrogenic factor mRNA levels (IGF-I, PTHrP). BMP-6 increased hypertrophic mRNA levels (FGF-18) and chondrogenic factor production (TGF-beta2). When ASC microbeads preconditioned with the CM were implanted in a focal cartilage defect and immobilized within an RGD-conjugated hydrogel, tissue infiltration from the edges of the defect and perichondrium was observed. These results show that differentiation media components have distinct effects on ASC's production of angiogenic, chondrogenic, and hypertrophic factors and that AA2P may be the most beneficial CM component for preconditioning ASCs to stimulate cartilage regeneration.

Lee, D. H. and J. S. Rhee (2018). "Microplastic dynamics in a marine mysid and potential effect on mysid growth." Toxicology and Environmental Health Sciences **10 (4)**: S43.

Mysids are relatively small-sized crustaceans that are commonly found in most aquatic environments, such as brackish, estuarine, coastal, and oceanic environments. Mysids are one of the most important food items for numerous aquariums, fisheries, and even for human. For more than 20 years, they have served as an ecotoxicology model taxonomic group because of its ease of culturing and handling in the laboratory, wide geographical distribution, short life-span, and physiological sensitivity to various environmental factors. In this study, juvenile and adult marine mysids (Neomysis awatschensis; Crustacea; Mysidae) were exposed to different sizes of microplastics, and the bioconcentration dynamics and responses of ecotoxicological and physiological responses were measured during the exposure and additional depuration periods. Microplastics bioconcentrated by age-and sizespecifically and the levels reduced gradually during the depuration phase. We measured morphological growth parameters and quantified the hormone ecdysterone (20-hydroxyecdysone: 20E), which controls molting in mysids. The lengths of the whole body, antennal scale, exopod, endopod, and telson were significantly smaller microplastics-exposed juvenile mysids than control group. Although no significant modulation in the levels of 20E was observed by initial microplatics exposure in juvenile, levels of 20E were significantly lower at constant exposures. After exposure to different sizes of microplastics, a series of parameters of antioxidant defenses system were significantly modulated during exposure and early depuration periods in juvenile mysids, while adult mysids showed no significant change. Our results suggest that microplastics could affect mysid growth and the significances are strongly associated with microplastics' sizes and exposure period in N. awathchesis.

Lee, H., et al. (2013). "Systemic immune modulation induced by alcoholic beverage intake in obese-diabetes (db/db) mice." Food and Chemical Toxicology **53**: 286-293.

Alcohol over-consumption is generally immunosuppressive. In this study, the effects of single or repetitive alcohol administration on the systemic immunity of db/db mice were observed to clarify the possible mechanisms for the increased susceptibility of obese individuals to alcohol-related immunological health problems. Alcohol (as a form of commercially available 20% distilled-alcoholic beverage) was orally administered one-time or seven times over 2 weeks to db/db mice and normal C57BL/6J mice. Immunologic alterations were analyzed by observation of body weight and animal activity, along with proportional changes of splenocytes for natural killer cells, macrophages, and T and B lymphocytes. Modulation of plasma cytokine level and immune-related genes were also ascertained by micro-bead assay and a microarray method, respectively. The immune micro-environment of db/db mice was an inflammatory state and adaptive cellular immunity was significantly suppressed. Low-dose alcohol administration reversed the immune response, decreasing inflammatory responses and the increment of adaptive immunity mainly related to CD4⁺ T cells, but not CD8⁺ T cells, to normal background levels. Systemic immune modulation due to alcohol administration in the obese-diabetic mouse model may be useful in the understanding of the induction mechanism, which will aid the development of therapeutics for related secondary diseases.

Lee, H. and Y. Kim (2018). "Treatment characteristics of microplastics at biological sewage treatment facilities in Korea." Marine Pollution Bulletin **137**: 1-8.

Microplastics that are contained in household dust, personal care products, and other factors, are discharged into sewage treatment facilities (STF). While these microplastics are treated at the STF with a high treatment efficiency through settling, precipitation, filtering, and other treatments, considering the large amount of effluent, large quantities of microplastics are still discharged into marine environments. In this study, biological STF using the anaerobic-anoxic-aerobic (A2O), sequence batch reactor (SBR), and the Media processes were

investigated to confirm the efficiency of these treatments and the associated amounts of microplastics released for each process. The three investigated processes were found to have treatment efficiencies of about 98% or more. However, due to the large amount of effluent, more than four billion pieces of microplastic were released each year in each facility. Thus, even though biological STF show high treatment efficiencies, substantially large amounts of microplastics are still released into the marine environment.

Lee, H., et al. (2019). "Microplastic contamination of table salts from Taiwan, including a global review." Scientific Reports **9**(1): 10145.

Plastic pollution is a rapidly worsening environmental problem, especially in oceanic habitats. Environmental pollution with microplastic particles is also causing food consumed by humans to be increasingly polluted, including table salts. Therefore, we present the first study which focuses only on table salt products purchased in Taiwan which we examined for the presence of microplastics. We used Fourier transform infrared spectroscopy to identify the polymer type of each particle. Within 4.4 kg of salt, we detected 43 microplastic particles which averages to 9.77 microplastic particles/kg. The identified polymer types were, in descending abundance, polypropylene, polyethylene, polystyrene, polyester, polyetherimide, polyethylene terephthalate, and polyoxymethylene. We combined our novel results with those of previous studies to provide the first global review of microplastic contamination of table salts. We found that 94% of salt products tested worldwide contained microplastics, with 3 out of 27 polymer types (polyethylene terephthalate, polypropylene, polyethylene) accounting for the majority of all particles. Averaging over seven separate studies, table salts contain a mean of 140.2 microplastic particles/kg. With a mean annual salt consumption of ~3.75 kg/year, humans therefore annually ingest several hundred microplastic particles from salt alone.

Lee, H., et al. (2019). "Estimating microplastic-bound intake of hydrophobic organic chemicals by fish using measured desorption rates to artificial gut fluid." Science of the Total Environment **651**(Part 1): 162-170.

One of the most important concerns about marine microplastics is their role in delivery of chemical contaminants to biota. The contribution of microplastic ingestion to the overall uptake of five hydrophobic organic chemicals (HOCs) [alpha -, beta -, and gamma -hexachlorocyclohexanes (HCHs), pentachlorobenzene (PeCB), and hexachlorobenzene (HeCB)] by fish is evaluated in this study. Partition coefficients of all five HOCs between surfactant micelles and simulated intestinal fluid (SIF), as well as between protein and SIF, were experimentally determined. Desorption of model HOCs from a polyethylene film into an artificial gut solution was measured to estimate the fraction of HOCs that can be absorbed from microplastics during their gut retention time. Monte-Carlo simulation (n=100,000) showed that the uptake via microplastic ingestion will be negligible for HCHs as compared to uptake via other exposure routes, water ventilation and food ingestion. On the other hand, microplastic ingestion might increase the total uptake rate of PeCB and HeCB due to their accelerated desorption from microplastics into the artificial gut solution under the model scenario, assuming an extremely high intake of microplastics. However, the steady-state bioaccumulation factor was predicted to decrease with increasing ingestion of microplastics, showing a dilution effect by microplastic ingestion. Results indicate that HOCs that are close to be at phase equilibrium between microplastics and environmental media are not likely to be further accumulated via ingestion of microplastics; this is true even for cases, where ingestion of microplastics contributes significantly to the total uptake of HOCs. Therefore, future studies need to focus on hydrophobic plastic additives that may exist in microplastics at a concentration higher than their equilibrium

concentration with water.

Lee, H., et al. (2014). "Sorption capacity of plastic debris for hydrophobic organic chemicals. (Special Section: The persistent and toxic substances in Korea.)." Science of the Total Environment **470**(471): 1545-1552.

The occurrence of microplastics (MPs) in the ocean is an emerging world-wide concern. Due to high sorption capacity of plastics for hydrophobic organic chemicals (HOCs), sorption may play an important role in the transport processes of HOCs. However, sorption capacity of various plastic materials is rarely documented except in the case of those used for environmental sampling purposes. In this study, we measured partition coefficients between MPs and seawater (K_{MPsw}) for 8 polycyclic aromatic hydrocarbons (PAHs), 4 hexachlorocyclohexanes (HCHs) and 2 chlorinated benzenes (CBs). Three surrogate polymers - polyethylene, polypropylene, and polystyrene - were used as model plastic debris because they are the major components of microplastic debris found. Due to the limited solubility of HOCs in seawater and their long equilibration time, a third-phase partitioning method was used for the determination of K_{MPsw}. First, partition coefficients between polydimethylsiloxane (PDMS) and seawater (K_{PDMSsw}) were measured. For the determination of K_{MPsw}, the distribution of HOCs between PDMS or plastics and solvent mixture (methanol:water=8:2 (v/v)) was determined after apparent equilibrium up to 12 weeks. Plastic debris was prepared in a laboratory by physical crushing; the median longest dimension was 320-440 micro m. Partition coefficients between polyethylene and seawater obtained using the third-phase equilibrium method agreed well with experimental partition coefficients between low-density polyethylene and water in the literature. The values of K_{MPsw} were generally in the order of polystyrene, polyethylene, and polypropylene for most of the chemicals tested. The ranges of log K_{MPsw} were 2.04-7.87, 2.18-7.00, and 2.63-7.52 for polyethylene, polypropylene, and polystyrene, respectively. The partition coefficients of plastic debris can be as high as other frequently used partition coefficients, such as 1-octanol-water partition coefficients (K_{ow}) and log K_{MPsw} showed good linear correlations with log K_{ow}. High sorption capacity of microplastics implies the importance of MP-associated transport of HOCs in the marine environment.

Lee, H. J., et al. (2008). "Rapid and separation-free sandwich immunosensing based on accumulation of microbeads by negative-dielectrophoresis." Biosensors and Bioelectronics **24**(4): 1000-1005.

We report here a rapid and separation-free immunoassay using a dielectrophoresis (DEP) device consisting of an interdigitated microarray (IDA) electrode and a polydimethylsiloxane (PDMS) substrate. On applying an AC voltage to the IDA in a negative-DEP (n-DEP) frequency region, goat anti-mouse immunoglobulin (anti-mouse IgG)-immobilized microbeads moved to the surface of the PDMS substrate placed above the IDA. The microbeads accumulated at designated areas of the PDMS surface that had been precoated with anti-mouse IgG. When the fluorescence microbeads bearing anti-mouse IgG were suspended in an analyte (mouse IgG) solution, the microbeads trapped the analyte to form immunocomplexes on microbeads. The microbeads reacted with mouse IgG accumulated and were captured at the designated areas of the PDMS surface via an antibody-antigen-antibody (sandwich) reaction. The captured microbeads were detected selectively by fluorescence measurements at the focused designated areas, regardless of the presence of uncaptured microbeads suspended in solution. Thus, the separation and washing-out steps usually required for conventional immunoassay are eliminated in the presented procedure. Since the formation of the sandwich structures was accelerated significantly by n-DEP, a period as short as 30 s was sufficient to detect the

immunoreaction at the surface. The fluorescence intensity of the captured microbeads at the designated areas increased with analyte concentration in the range 0.01-10 ng/mL. The present procedure therefore yields a rapid, sensitive, and separation-free immunoassay in a simple device. © 2008 Elsevier B.V. All rights reserved.

Lee, I. S., et al. (2006). "Ni/NiO core/shell nanoparticles for selective binding and magnetic separation of histidine-tagged proteins." Journal of the American Chemical Society **128**(33): 10658-10659.
Ni/NiO core/shell nanoparticles having high affinity with polyhistidine were synthesized by decomposition of a Ni surfactant complex followed by air oxidation. Ni/NiO nanoparticles showed selective and efficient binding to histidine-tagged proteins and easy separation by using a magnet. These provided a more convenient way to efficient purification of histidine-tagged proteins compared with the conventional Ni-NTA complex-bound resins and microbeads.

Lee, J., et al. (2010). "Diffractometric detection of proteins using microbead-based rolling circle amplification." Analytical Chemistry **82**(1): 197-202.
We present a robust, sensitive, fluorescent- or radiolabel-free self-assembled optical diffraction biosensor that utilizes rolling circle amplification (RCA) and magnetic microbeads as a signal enhancement method. An aptamer-based sandwich assay was performed on microcontact-printed streptavidin arranged in 15 microm wide alternating lines and could specifically capture and detect platelet-derived growth factor B-chain (PDGF-BB). An aptamer served as a template for the ligation of a padlock probe, and the circularized probe could in turn be used as a template for RCA. The concatameric RCA product hybridized to biotinylated oligonuclotides which then captured streptavidin-labeled magnetic beads. In consequence, the signal from the captured PDGF-BB was amplified via the concatameric RCA product, and the diffraction gratings on the printed areas produced varying intensities of diffraction modes. The detected diffraction intensity and the density of the microbeads on the surface varied as a function of PDGF-BB concentration. Our results demonstrate a robust biosensing platform that is easy to construct and use and devoid of fluorescence microscopy. The self-assembled bead patterns allow both a visual analysis of the molecular binding events under an ordinary bright-field microscope and serve as a diffraction grating biosensor.

Lee, J., et al. (2012). "Estrogen upregulates IL-21 production of CD4+ T lymphocytes in patients with systemic lupus erythematosus." International Journal of Rheumatic Diseases **1)**: 17.
Introduction: Systemic lupus erythematosus (SLE) is an autoimmune disease in which various organs and tissues are damaged through abnormal immune responses mediated by tissue-binding autoantibodies and immune complex deposition. As the majority of SLE patients are women of child-bearing age, estrogen has been suggested to play an important role in the pathogenesis of SLE. One of the proposed roles of estrogen is to induce B cell activation culminating in increased autoantibody production. IL-21, a common-c chain cytokine, has been shown to be crucial in differentiation of activated B cells into plasma cells. Based on these concepts, we hypothesized that estrogen contributes to pathogenesis of SLE via IL-21 dependent way and investigated the effect of estrogen on the production of IL-21 by T cells and subsequent B cell activation in SLE patients. Method(s): Peripheral blood mononuclear cells (PBMCs) were obtained from peripheral blood of 23 SLE patients and 16 healthy controls. CD4+ T cells, non CD4+ T cells, B cells were isolated using microbeads. Isolated cells were treated with 17-b estradiol at various concentrations for 48 hours (up to 72 hours in some experiments). The expression of IL-21 and its receptors was assessed by measuring protein and mRNA level using ELISA and RT-PCR, respectively. The level of immunoglobulin G secreted by activated B cells

were measured with specific ELISA. Result(s): The expression of IL-21 and its receptors in serum, PBMCs, and CD4+ T cells was higher in patients with SLE than healthy controls. Exposure of CD4+ T cells from SLE patients to 17-b estradiol leads to a dose-and time-dependent increase in IL-21 expression. The increase was abolished in the presence of MAP kinase (MEK, p38, JNK) inhibitors. B cells of healthy controls showed an increased antibody production when they were co-cultured with estrogen treated CD4+ T cells of patients with SLE. Treatment with anti-IL-21 antibody abrogated the increased antibody production of the co-culture systems, suggesting the increase was mediated by IL-21 dependent manner. Conclusion(s): This study revealed another role of estrogen in the pathogenesis of SLE. Estrogen upregulates IL-21 expression of CD4+ T cells via MAPK dependent pathways in SLE patients, which in turn in turn induces increased antibody production by B cells.

Lee, J., et al. (2014). "Estrogen upregulates interleukin-21 production of clusters of differentiation 4 positive T lymphocytes in patients with systemic lupus erythematosus." Annals of the Rheumatic Diseases. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **73**(SUPPL. 2).

Background Systemic lupus erythematosus (SLE) is an autoimmune disease in which various organs and tissues are damaged through abnormal immune responses mediated by tissue-binding autoantibodies and immune complex deposition. As the majority of SLE patients are women of child-bearing age, estrogen has been suggested to play an important role in the pathogenesis of SLE. One of the proposed roles of estrogen is to increase autoantibody production. IL-21, a common-gamma chain cytokine, has been shown to be crucial in the differentiation of activated B cells into plasma cells. Objectives Based on these concepts, we investigated the effect of estrogen on the production of IL-21 by T cells and subsequent B cell activation in SLE patients. Methods Peripheral blood mononuclear cells (PBMCs) were obtained from peripheral blood of 23 SLE patients and 16 healthy controls. CD4+ T cells, non CD4+ T cells and B cells were isolated using microbeads. Isolated cells were treated with 17-beta estradiol at various concentrations for 48hrs. The expression of IL-21 and its receptor was assessed by measuring the level of protein and mRNA using ELISA and RT-PCR, respectively. The level of immunoglobulin G was measured with specific ELISA. Results The expression of IL-21 and its receptor in serum, PBMCs, and CD4+ T cells were higher in the patients with SLE compared to healthy controls. Exposure of CD4+ T cells from SLE patients to 17-beta estradiol leads to a dose-and time-dependent increase in the IL-21 expression. The increase was abolished in the presence of MAP kinase (MEK, p38, JNK) inhibitors. B cells of healthy controls showed an increased antibody production when they were co-cultured with estrogen treated CD4+ T cells of patients with SLE. Treatment with anti-IL-21 antibody abrogated the increased antibody production of the co-culture systems, suggesting the increase was mediated by IL-21 dependent manner. Conclusions Estrogen upregulates IL-21 expression of CD4+ T cells via MAPK dependent pathways in SLE patients, which in turn induces increased antibody production by B cells.

Lee, J., et al. (2015). "Distribution and Size Relationships of Plastic Marine Debris on Beaches in South Korea." Archives of Environmental Contamination & Toxicology **69**(3): 288-298.

The characteristics of the distribution of plastic marine debris were determined on 12 beaches in South Korea in 2013 and 2014. The abundances of large micro- (1-5 mm), meso- (5-25 mm), and macroplastics (>25 mm) were 880.4, 37.7, and 1.0 particles/m(2), respectively. Styrofoam was the most abundant debris type for large microplastics and mesoplastics (99.1 and 90.9 %, respectively). Fiber (including fabric) was the most abundant of the macroplastics (54.7 %). There were no statistical differences in the mean numbers and weights of plastic debris among

three beach groups from west, south, and east coasts. No significant differences were detected between the abundances of beached plastics in high strandline and backshore for all three size groups. Spearman's rank correlation was used to determine the relationships between the three debris size classes. The abundance of large microplastics was strongly correlated with that of mesoplastics for most material types, which suggests that the contamination level of large microplastics can be estimated from that of mesoplastics. As surveying of smaller particles is more labor intensive, the surveying of mesoplastics with a 5-mm sieve is an efficient and useful way to determine "hot-spots" on beaches contaminated with large microplastics.

Lee, J., et al. (2013). "Mechanical, Thermal and Water Absorption Properties of Kenaf-Fiber-Based Polypropylene and Poly(Butylene Succinate) Composites." Journal of Polymers & the Environment **21**(1): 293-302.

The use of composites made from non-biodegradable conventional plastic materials (e.g., polypropylene, PP) is creating global environmental concern. Biodegradable plastics such as poly(butylene succinate) (PBS) are sought after to reduce plastic waste accumulation. Unfortunately, these types of plastics are very costly; therefore, natural lignocellulosic fibers are incorporated to reduce the cost. Kenaf fibers are also incorporated into PP and PBS for reinforcing purposes and they have low densities, high specific properties and renewable sourcing. However without good compatibilization, the interfacial adhesion between the matrix and the fibers is poor due to differences in polarity between the two materials. Maleic anhydride-grafted compatibilizers may be introduced into the system to improve the matrix-fiber interactions. The overall mechanical, thermal and water absorption properties of PP and PBS composites prepared with 30 vol.% short kenaf fibers (KFs) using a twin-screw extruder were being investigated in this study. The flexural properties for both types of composites were enhanced by the addition of compatibilizer, with improvements of 56 and 16 % in flexural strength for the PP/KF and PBS/KF composites, respectively. Good matrix-fiber adhesion was also observed by scanning electron microscopy. However, the thermal stability of the PBS/KF composites was lower than that of the PP/KF composites. This result was confirmed by both DSC and TGA thermal analysis tests. The water absorption at equilibrium of a PBS composite filled with KFs is inherently lower than of a PP/KF composite because the water molecules more readily penetrate the PP composites through existing voids between the fibers and the matrix. Based on this research, it can be concluded that PBS/KF composites are good candidates for replacing PP/KF composites in applications whereby biodegradability is essential and no extreme thermal and moisture exposures are required. [ABSTRACT FROM AUTHOR]

Lee, J., et al. (2014). "The influence of resource strategies on childhood phthalate exposure-The role of REACH in a zero waste society." Environment International **73**: 312-322.

The present study aims to investigate how resource strategies, which intend to reduce waste and increase recycling, influence on human exposure to hazardous chemicals from material recycling. In order to examine the flows of hazardous chemicals in recycled material, a mass flow analysis of plastics and paper at European level, including the flow of phthalates, i.e. di(2-ethylhexyl) phthalate (DEHP), di-n-butyl phthalate (DBP), and benzyl-butyl phthalate (BBP), has been performed. The result for the year 2012 shows that 26% of plastic wastes and 60% of paper consumed in Europe were recycled. This corresponds to the finding that approximately 4% of DEHP and BBP and 18% of DBP annual demands in Europe as raw material re-enter the product cycle with recycled plastics and paper. To examine the potential contribution of the phthalate exposure through recycled plastics and paper, a case study assessing the childhood exposures to phthalates from foods packed in recycled paper and plastics has been performed for 2-year-old children in Denmark. The result verifies that an increase in recycled paperboard and PET bottles in food packaging material causes a significant increase in childhood exposure to DBP corresponding to an additional exposure of 0.116-0.355. μg/kg. bw/day; up to 18% of the total DBP exposure in Danish 2-year-olds. While most of the DEHP exposure can be explained, more than 50% of DBP and 70% of BBP exposure sources still remain to be identified. Finally, a conceptual framework for a circular economy based on sustainable and clean resource flows is proposed in order to increase material recycling without increasing adverse health effects. •The regulation under REACH to control the quality of recycled materials is reviewed. © 2014 Elsevier Ltd.

Lee, J. H., et al. (2009). "Facile preparation of highly-scattering metal nanoparticle-coated polymer microbeads and their surface plasmon resonance." Journal of the American Chemical Society **131**(14): 5048-5049.

We report on the facile preparation of highly scattering metal-coated polystyrene (PS) latex beads by using solvent-controlled heterocoagulation. Starting with an aqueous dispersion of PS beads and poly(vinyl pyrrolidone)-capped metal nanoparticles (NPs), homogeneous and dense metal coatings were obtained by the controlled addition and removal of tetrahydrofuran (THF). Different sizes (30, 60, and 80 nm), chemistries (gold and silver), and shapes (sphere and cube) of NPs were successfully incorporated on commercially available PS beads. The resulting metal coated-PS microspheres exhibited highly enhanced scattering and tunable optical characteristics useful for biomedical imaging, sensors, and opto-electronic devices. The fabricated composite beads were stable, with no loss of metal coating, during long-term water storage. The morphology and coverage of the metal coating, and the bead's optical properties, were controllable over a wide range by the concentration of THF and metal NP, and NP size, shape, and chemistry.

Lee, K., et al. (2017). "Dual ionic cross-linked interpenetrating network of alginate-cellulose beads with enhanced mechanical properties for biocompatible encapsulation." Tissue Engineering - Part A **23 (Supplement 1)**: S135-S136.

Spherical hydrogels ('micro beads') made from alginate has been explored and used for biomedical application, delivery of biomolecule and cell transplantation, although restricted mechanical strength and short-term structural cohesion. In this study, controlling mechanical properties and maintaining the long-term structural integrity of spherical hydrogels could be achieved by creating interpenetrating networks (IPN) of alginate and aqueous-soluble cellulose with divalent and trivalent ions. By using various the aqueous-soluble cellulose, with varying concentration of cellulose or types of ions, the moduli of the resulting hydrogels could be controlled in a wide range with a simple yet highly efficient method of engineering alginate beads. We found that processing a dual sequential ionic crosslinking scheme to create IPN of alginate and cellulose with divalent and trivalent ions has synergistic effect to increase moduli and structural stability of hydrogels. Also the aqueous-soluble cellulose is found to undergo crosslinking reaction with trivalent ions more favorably than divalent ions. Especially, the aqueous-soluble anionic cellulose, containing either carboxylate or sulfonate, is easier to control

mechanical properties than other types of celluloses. As a result, the IPN alginate-cellulose beads demonstrate enhanced resistance to harsh chemical environment as compared to alginate beads and suitability for biomedical applications by encapsulating microbial species and therapeutic agents for controlled release.

Lee, K. H., et al. (2016). "Mixotrophic ability of the phototrophic dinoflagellates Alexandrium andersonii, A. affine, and A. fraterculus." Harmful Algae **59**: 67-81.

The dinoflagellate Alexandrium spp. have received much attention due to their harmful effects on diverse marine organisms, including commercially important species. For minimizing loss due to red tides or blooms of Alexandrium spp., it is very important to understand the eco-physiology of each Alexandrium species and to predict its population dynamics. Its trophic mode (i.e., exclusively autotrophic or mixotrophic) is one of the most critical parameters in establishing prediction models. However, among the 35 Alexandrium species so far described, only six Alexandrium species have been revealed to be mixotrophic. Thus, mixotrophic ability of the other Alexandrium species should be explored. In the present study, whether each of three Alexandrium species (A. andersonii, A. affine, and A. fraterculus) isolated from Korean waters has or lacks mixotrophic ability, was investigated. When diets of diverse algal prey, cyanobacteria, and bacteria sized micro-beads were provided, A. andersonii was able to feed on the prasinophyte Pyramimonas sp., the cryptophyte Teleaulax sp., and the dinoflagellate Heterocapsa rotundata, whereas neither A. affine nor A. fraterculus fed on any prey item. Moreover, mixotrophy elevated the growth rate of A. andersonii. The maximum mixotrophic growth rates of A. andersonii on Pyramimonas sp. under a 14:10h light/dark cycle of 20muEm⁻²s⁻¹ was 0.432d⁻¹, while the autotrophic growth rate was 0.243d⁻¹. With increasing mean prey concentration, the ingestion rate of A. andersonii increased rapidly at prey concentrations <650ngCml⁻¹ (ca. 16,240 cellsml⁻¹), but became saturated at the higher prey concentrations. The maximum ingestion rate by A. andersonii of Pyramimonas sp. was 1.03ngC predator⁻¹d⁻¹ (25.6 cells predator⁻¹d⁻¹). This evidence suggests that the mixotrophic ability of A. andersonii should be taken into consideration in predicting the outbreak, persistence, and decline of its harmful algal blooms.

Lee, N., et al. (2017). "Association of HLA Types with Non-Specific Binding of Negative Control Beads in Luminex Panel Reactive Antibody (PRA) Screening Assay." Clinical Laboratory **63**(1): 169-174.

BACKGROUND: Luminex panel reactive antibody (PRA) screening assays using microbeads are widely used for organ transplantation. Anti-HLA serum reactivity is calculated by correcting for non-specific binding to the negative control (NC) beads. High mean fluorescence intensity (MFI) value of NC beads are observed in some patients and can result in false negative results in the PRA screening assay. We analyzed the clinical characteristics and HLA types of those patients with high MFI values of NC beads.

METHODS: Sixty-six patients with high MFI values of NC beads (> 300) in the PRA LABScreen Mixed assay (One Lambda) tested were included as the high NC group. Age and gender matched controls with low MFI values of NC beads (< 100) (n = 132), tested with PRA, were selected as the low NC group and 207 healthy Koreans were used as normal controls. Association of clinical characteristics and HLA types with the high NC group were analyzed using Chi-square test or Fischer's exact test, as appropriate.

RESULTS: The proportion of patients with underlying liver disease was higher in the high NC group compared to the low NC group (18.1% vs. 1.5%, p < 0.001, OR = 14.2). The seropositivity of anti-nuclear antibody and rheumatoid factor, the frequency of use of intravenous immunoglobulin G, anti-thymocyte globulin, and rituximab showed no difference between two groups. The phenotype frequency (PF) of HLA-B46 was higher in the high NC group than in the low NC group (8.0% vs. 3.2%, p = 0.036, OR = 2.8). The PF of HLA-B7 was lower in the high NC group than in the healthy controls (0.0% vs. 6.5%, p = 0.008, OR = 0.1). The PF of HLA-DR1 was lower in the high NC group than in the low NC group (0.8% vs. 6.6%, p = 0.015, OR = 0.1) or healthy controls (0.8% vs. 7.4%, p = 0.003, Pc = 0.042, OR = 0.1).

CONCLUSIONS: Increased non-specific binding to NC beads was associated with underlying liver disease and HLAB46. HLA-B7 and HLA-DR1 were related to a lower chance of non-specific binding to NC beads. The mechanism of those associations, such as differences in non-specific antibody response according to HLA phenotype or underlying disease, needs to be elucidated in further studies.

Lee, R. J. and S. C. Mears (2012). "Reducing and Recycling in Joint Arthroplasty." Journal of Arthroplasty **27**(10): 1757-1760.

Reducing the need for costly contaminated waste processing after total hip arthroplasties (THAs) and total knee arthroplasties (TKAs) could decrease hospital overhead and the environmental impact. From March through April 2011, we prospectively identified 20 consecutive patients undergoing primary THA or TKA by 1 surgeon in 1 operating room at our institution. For each case, waste (excluding liquids) was collected and sorted as it was produced. The 10 THAs and 10 TKAs produced an average of 30.0 lb (range, 27.1-32.5) and 33.2 lb (range, 30.9-35.2) of waste per procedure, respectively, of which 6.8 lb (range, 6.0-7.8; 22.8%) and 7.3 lb (range, 5.4-8.7; 22.0%), respectively, were potentially recyclable paper or plastic. Waste management programs should focus on recycling clean operating room waste. © 2012 Elsevier Inc.

Lee, S., et al. (2019). "Aptamer Affinity-Bead Mediated Capture and Displacement of Gram-Negative Bacteria Using Acoustophoresis." Micromachines **10**(11): 11.

Here, we report a simple and effective method for capturing and displacement of gram-negative bacteria using aptamer-modified microbeads and acoustophoresis. As acoustophoresis allows for simultaneous washing and size-dependent separation in continuous flow mode, we efficiently obtained gram-negative bacteria that showed high affinity without any additional washing steps. The proposed device has a simple and efficient channel design, utilizing a long, square-shaped microchannel that shows excellent separation performance in terms of the purity, recovery, and concentration factor. Microbeads (10 micro m) coated with the GN6 aptamer can specifically bind gram-negative bacteria. After incubation of bacteria culture sample with aptamer affinity bead, gram-negative bacteria-bound microbeads, and other unbound/contaminants can be separated by size with high purity and recovery. The device demonstrated excellent separation performance, with high recovery (up to 98%), high purity (up to 99%), and a high-volume rate (500 micro L/min). The acoustophoretic separation performances were conducted using 5 Gram-negative bacteria and 5 Gram-positive bacteria. Thanks to GN6 aptamer's binding affinity, aptamer affinity bead also showed binding affinity to multiple strains of gram-negative bacteria, but not to gram-positive bacteria. GN6 coated bead can capture Gram-negative bacteria but not Gram-positive bacteria. This study may present a different perspective in the field of early diagnosis in bacterial infectious diseases. In addition to detecting living bacteria or bacteria-derived biomarkers, this protocol can be extended to monitoring the contamination of water resources and may aid quick responses to bioterrorism and pathogenic bacterial infections.

Lee, S. F., et al. (1996). "Separation of copper from plastic waste material by air classification and water flotation." Journal of Environmental Science and Health - Part A Environmental Science and Engineering and Toxic and Hazardous Substance Control **31**(5): 1197-1214.

The purpose of this research is to study air classification and water flotation as techniques to recover a large percentage of the copper currently being sent to landfills by metal recycling industries. These are appropriate techniques because they utilize internal plant streams which are the plant storm water and air from air conveyors used in material transport. The waste stream studied was a copper plastic waste stream that contains 3-13% copper with particle sizes between 0.5 and 5 mm. It is a crude chopped mixture that cannot be easily characterized. Air classification of the crude material could achieve an average of 60% copper recovery with 40% purity. Water flotation of the crude material could achieve an average of 60% copper recovery with 90% purity. A separation scheme is proposed that uses air classification columns that are followed by water flotation separators. The air classification operation removes the lighter fluff material. The water flotation operation purifies the recovered material. Based on the measurements made in this study, a minimum of 50% recovery of the input copper with a 90% purity can be obtained. For a 1000 tons/month feed of crude copper/plastic waste, this will result in approximately $2,000,000/year revenues (1994$) in copper and additional savings in landfill costs.

Lee, S. H., et al. (2014). "Generation of polyacrylamide microbeads by droplet based microfluidic platform and application." Toxicology and Environmental Health Sciences **6 (1 Supplement)**: S46.

Aptamers are single strand nucleic acids that binds specifically to their target molecules. Systematic Evolution of Ligands by Exponential Enrichment (SELEX) is a combinatorial chemistry technique in molecular biology for producing oligonucleotides of single strand nucleic acids. One of the most critical steps in the DNA SELEX is the conversion of double strand DNA (dsDNA) to ssDNA by asymmetric PCR or Biotin-sfreptavidin separations. We have studied that the generation of Copolymer Based Polyacrylamide microBeads (CBPmB) could be covalently cross-linked with acrydite modified oligomer by placing on droplet based microfluidic platform system. Acrydite oligomers are exposed on the surface of microbeads, they are used to amplification of ssDNA used aptamer-sensor and aptafilter, diagnostic tools, formatting some modified oligomer and DNA SELEX. Moreover, CBPmB formation was a simple method for uniformly shaped polyacrylamide gel microbeads that can be heatresistant during PCR amplification and circumvent the asymmetric PCR limitations mentioned above.

Lee, S. J., et al. (2014). "Aptamer/ISET-MS: a new affinity-based MALDI technique for improved detection of biomarkers." Analytical Chemistry **86**(15): 7627-7634.

With the rapid progress in the development of new clinical biomarkers there is an unmet need of fast and sensitive multiplex analysis methods for disease specific protein monitoring. Immunoaffinity extraction integrated with matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS) analysis offers a route to rapid and sensitive protein analysis and potentially multiplex biomarker analysis. In this study, the previously reported integrated selective enrichment target (ISET)-MALDI-MS analysis was implemented with ssDNA aptamer functionalized microbeads to address the specific capturing of thrombin in complex samples. The main objective for using an aptamer as the capturing ligand was to avoid the inherently high background components, which are produced during the digestion step following the target extraction when antibodies are used. By applying a thrombin specific aptamer linked to ISET-MALDI-MS detection, a proof of concept of antibody fragment background reduction in the ISET-MALDI-MS readout is presented. Detection sensitivity was significantly increased compared to the corresponding system based on antibody-specific binding as the aptamer ligand does not induce any interfering background residues from the antibodies. The limit of detection for thrombin was 10 fmol in buffer using the aptamer/ISET-MALDI-MS configuration as confirmed by MS/MS fragmentation. The aptamer/ISET-MALDI-MS platform also displayed a limit of detection of 10 fmol for thrombin in five different human serum samples (1/10 diluted), demonstrating the applicability of the aptamer/ISET-MALDI-MS analysis in clinical samples.

Lee, S. J., et al. (2015). "Pressure-Induced Alterations in PEDF and PEDF-R Expression: Implications for Neuroprotective Signaling in Glaucoma." Journal of Clinical & Experimental Ophthalmology **6**(5).

INTRODUCTION: Alterations in neuron-glia signaling are implicated in glaucoma, a neurodegenerative disease characterized by retinal ganglion cell (RGC) death. Pigment epithelium derived factor (PEDF) is a secreted protein with potential neuroprotective qualities in retinal disease, including chronic ocular hypertension. Here we sought to determine whether moderate, short-term elevations in IOP alter PEDF signaling and whether pressure-induced PEDF signaling directly impacts RGC apoptosis.

METHODS: In retina from naive mice and mice with unilateral, microbead-induced glaucoma, we examined expression and cell type-specific localization of PEDF and its receptor (PEDF-R), using quantitative PCR and immunohistochemistry. Using primary cultures of purified RGCs and Muller cells, we examined cell type-specific expression of PEDF in response to 48 hours of elevated hydrostatic pressure, using multiplex ELISA and immunocytochemistry. We also measured pressure-induced apoptosis of RGCs in the presence or absence of atglistatin, a potent and selective inhibitor of PEDF-R, and recombinant PEDF, using TUNEL assays.

RESULTS: PEDF and PEDF-R are constitutively expressed in naive retina, primarily in the ganglion cell and nerve fiber layers. Elevated IOP increases PEDF and PEDF-R expression, particularly associated with RGCs and Muller cells. Elevated pressure in vitro increased PEDF secretion by 6-fold in RGCs and trended towards an increase in expression by Muller cells, as compared to ambient pressure. This was accompanied by changes in the subcellular localization of PEDF-R in both cell types. Inhibition of PEDF signaling with atglistatin increased pressure-induced apoptosis in RGCs and treatment with recombinant PEDF inhibited pressure-induced apoptosis, both in a dose-dependent manner.

CONCLUSION: Our findings suggest that moderate, short-term elevations in IOP promote PEDF signaling via up-regulation of both PEDF and PEDF-R. Based on in vivo and in vitro studies, this PEDF signaling likely arises from both Muller cells and RGCs, and has the potential to directly inhibit RGC apoptosis.

Lee, S. J., et al. (2005). "Selective immobilization of fusion proteins on poly(hydroxyalkanoate) microbeads." Analytical Chemistry **77**(17): 5755-5759.

A novel fusion protein system employing the substrate-binding domain (SBD) of poly(hydroxyalkanoate) (PHA) depolymerase was developed for the specific immobilization of proteins on PHA microbeads, and was consequently used for immunoassays. The enhanced green fluorescent protein, red fluorescent protein, and severe acute respiratory syndrome coronavirus envelope protein were used as model proteins, and were selectively and functionally immobilized to the PHA microbeads by fusing them to the SBD. Using this PHA microbead system combined with SBD fusion technology, immunoassays could be successfully carried out.

Lee, S. K., et al. (2014). "High throughput synthesis of uniform biocompatible polymer beads with high quantum dot loading using microfluidic jet-mode breakup." Langmuir **30**(8): 2216-2222.

Uniform polymer microbeads with highly loaded quantum dots (QDs) are produced using high-throughput coherent jet breakup of a biocompatible poly(ethylene glycol) diacrylate (PEGDA) prepolymer resin, followed by in-line photopolymerization. A spiraling and gradually widening channel enables maximum absorption of radiated UV light for the in-line photopolymerization without coalescence and clogging issues. Although the dripping mode in general provides superior uniformity to the jet mode, our nozzle design with tapered geometry brings controlled jet breakup leading to 3% of uniform particle size distribution, comparable to dripping-mode performance. We achieve a maximum production rate of 2.32 kHz, 38 times faster than the dripping mode, at a same polymer flow rate. In addition, the jet-mode scheme provides better versatility with 3 times wider range of size control as well as the compatibility with viscous fluids that could cause pressure buildup in the microsystem. As a demonstration, a QD-doped prepolymer resin is introduced to create uniform biocompatible polymer beads with 10 wt % CdSe/ZnSe QD loading. In spite of this high loading, the resulting polymer beads exhibits narrow bandwidth of 28 nm to be used for the ultrasensitive bioimaging, optical coding, and sensing sufficiently with single bead.

Lee, S. Y., et al. (2013). "Development of microbiochip for detection of metalloproteinase 7 using fluorescence resonance energy transfer." Biochip Journal **7**(2): 164-172.

A protease is any enzyme that catalyzes the hydrolysis of proteins into smaller peptide fragments and amino acids, a process known as proteolysis. They are involved in a multitude of normal biological processes as well as in diseases, including cancer, stroke and infections. Here we present a microfluidicbased assay system to detect proteolytic activity using fluorescence resonance energy transfer (FRET) by quantum dot (QD)-peptide conjugates immobilized on microbeads. As an energy donor, QD was immobilized on the microbead surface by the avidin-biotin interaction. As an energy acceptor, the fluorophorelabeled peptide was then associated with QD, thus quenching the photoluminescence (PL) of the QD. The functionalized microbeads were introduced into the microbiochip and captured by a micropillar in the reaction chamber. In the presence of matrix metalloprotease-7 (MMP-7) as a model protease, the PL of QD quenched by fluorophore was recovered due to the proteolytic activity of MMP-7 in the fabricated microbiochip. Moreover, the FRET efficiency induced by MMP-7 was linearly dependent on the logarithmic concentration of MMP-7. This technology is not limited to sensing MMP-7, but could be used to monitor other protease activities (Schematic diagram). © 2013 The Korean BioChip Society and Springer-Verlag Berlin Heidelberg.

Lee, W. S., et al. (2019). "Bioaccumulation of polystyrene nanoplastics and their effect on the toxicity of Au ions in zebrafish embryos." Nanoscale **11**(7): 3173-3185.

As nano- and micro-sized plastics accumulate in the environment and the food chain of animals, including humans, it is imperative to assess the effects of nanoplastics in living organisms in a systematic manner, especially because of their ability to adsorb potential toxicants such as pollutants, heavy metals, and organic macromolecules that coexist in the environment. Using the zebrafish embryo as an animal model, we investigated the bioaccumulation and in vivo toxicity of polystyrene (PS) nanoplastics individually or in combination with the Au ion. We showed that smaller PS nanoplastics readily penetrated the chorion and developing embryos and accumulated throughout the whole body, mostly in lipid-rich regions such as in yolk lipids. We also showed that PS nanoplastics induced only marginal effects on the survival, hatching rate, developmental abnormalities, and cell death of zebrafish embryos but that these effects were synergistically exacerbated by the Au ion in a dose- and size-dependent manner. Such exacerbation of toxicity was well correlated with the production of reactive oxygen species and the pro-inflammatory responses synergized by the presence of PS, supporting the combined toxicity of PS and Au ions. The synergistic effect of PS on toxicity appeared to relate to mitochondrial damage as determined by ultrastructural analysis. Taken together, the effects of PS nanoplastics were marginal but could be a trigger for exacerbating the toxicity induced by other toxicants such as metal ions.

Lee, Y. H., et al. (2019). "Application of alginate microbeads as a carrier of bone morphogenetic protein-2 for bone regeneration." Journal of Biomedical Materials Research **107**(2): 286.

Bone morphogenetic protein-2 (BMP-2) is commonly used to enhance bone regeneration. The potential of BMP-2 for bone regeneration varies according to the concentration and release kinetics on the implanted site. Therefore, it is important to determine appropriate carriers of BMP-2. However, no optimal delivery vehicles have been identified. In the present study, we used alginate microbeads as a delivery vehicle for BMP-2. Alginate microbeads can be implanted onto the disease site through surgery or injection. The objective of this study was to evaluate that the osteoinductive properties of BMP-2 are effective in alginate microbeads as a carrier. In this study, the release kinetics of BMP-2 in alginate microbeads was evaluated using an enzyme-linked immunosorbent assay. BMP-2 released from alginate microbeads induced high alkaline phosphatase activity in canine adipose tissue-derived mesenchymal stem cells. Injection of alginate microbeads with BMP-2 into mouse subcutaneous tissue, as well as surgical implantation into the 5-mm circular calvarial defects in rats, was conducted and the results showed extensive new bone formation. In conclusion, alginate microbeads can be utilized as an effective BMP-2 delivery vehicle for use in orthopedic surgery and as an injectable vehicle for a minimally invasive therapy. © 2018 Wiley Periodicals, Inc. J Biomed Mater Res Part B: Appl Biomater, 107B: 286–294, 2019.

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Lee, Y. M., et al. (2009). "Cascade enzyme-linked immunosorbent assay (CELISA)." Biosensors & Bioelectronics **25**(2): 332-337.

Immunoassays are representative biochemical detection methods. Among them, sandwich-type immunoassays, typified by sandwich ELISA, have used in disease diagnosis or biochemical detection with high target selectivity. Horseradish peroxidase and alkaline phosphatase have been typically used for signal amplification in ELISA. Recently developed sandwich-type immunoassays such as biobarcode immunoassays, immuno-PCR, and immuno-RCA have improved sensitivity by changing mainly the signal amplification method. To develop a novel amplification method in ELISA, an enzyme-cascading system was incorporated into an ELISA, and the new assay is termed a cascading enzyme-linked immunosorbent assay (CELISA). This CELISA includes a trypsinogen-enterokinase combination as the cascading enzyme system, and was used to detect alpha-fetoprotein (AFP), which is a liver cancer marker, and prostate-specific antigen (PSA). Using a colorimetric reagent for signal generation, CELISA had 0.1-10pM limits-of-detection for AFP and PSA in whole human serum and assay buffers, depending on the platform, well plate, or microbead type used. This study represents the first example that incorporated an enzyme cascading step in an ELISA system, resulting in successful signal amplification with sensitive detection of pathogenic antigens in serum.

Lefebvre, C., et al. (2019). "Microplastics FTIR characterisation and distribution in the water column and digestive tracts of small pelagic fish in the Gulf of Lions." Marine Pollution Bulletin **142**: 510-519.

This study aims at quantifying and characterising microplastics (MP) distribution in the water column of the NW Mediterranean Sea as well as MP ingestion by the 2 main planktivorous fish of the area, sardine and anchovy. Debris of similar sizes were found in all water column samples and in all but 2 fish guts (out of 169). MP were found in 93% of water column samples with an average concentration of 0.23+or-0.20 MP.m⁻³, but in only 12% of sardines (0.20+or-0.69 MP.ind⁻¹) and 11% of anchovies (0.11+or-0.31 MP.ind⁻¹). Fibres were the only shape of MP encountered and polyethylene terephthalate was the main polymer identified in water columns (61%), sardines (71%) and anchovies (89%). This study confirms the ubiquity of MP in the Mediterranean Sea and imparts low occurrence in fish digestive tracts.

Lehmann, C., et al. (2012). "Magnetic colocalization of viral vectors and target cells improves transduction efficiency in human hematopoietic cells." Molecular Therapy **1)**: S223.

A major factor limiting viral transduction of target cells in cell culture is the diffusion of virus particles to the cell surface. Polycationic reagents, recombinant fibronectin, spinoculation or the use of polycationic magnetic particles and a magnetic field can be used to increase vector concentration at the cell surface. In a further refinement of this latter method, we have labeled the target cells with standard magnetic cell separation reagents (MACSMicroBeads) in addition to magnetic labeling of the viral vector particles before placing these on a magnetic cell separation column. Magnetic labeling of both virus particles and the target cells ensures an efficient colocalization within the high-gradient magnetic field of a MACS Separator leading to reduced viral reagent requirements and specific transduction of only the magnetically-labeled target cells (Blood: 117: e171-181). In this study, both polycationic magnetic particles and antibody-conjugated superparamagnetic nanoparticles (MicroBeads) were assessed for their ability to bind to viral vector particles and transduce human cell lines and primary hematopoietic cells. Polycationic magnetic particles complexed GFP-encoding adenoviral (AdV) and lentiviral (LV) vector particles effectively. After AdV transduction (pMOI, physical particles per cell=200-500) of human cells of low permissivity (K562, M-07e, HuT78), up to 15- fold more cells were transduced after magnetic colocalization with increases in target gene expression of over 40-fold. Similarly, CD34+ cells isolated from peripheral blood with CD34 MicroBeads could be transduced efficiently (pMOI=2000, 15% GFP+ cells (3 fold over control) and 8-fold higher

MFI). Transduction of human T cells and CD34+ cells with LV vectors was also supported using this protocol. Both numbers of transduced cells and the expression intensity of the transgene were increased (T cells, MOI=0.5, 30% GFP+; CD34+ cells, MOI=50, 75% GFP+). During LV budding from the cell membrane, host membrane proteins are also incorporated into the viral membrane. MicroBeads that bind these molecules can be used to isolate wildtype HIV from patient samples, but can also be used to magnetically label recombinant LV vectors (efficiency >90%) and direct them to a target cell. Using this approach, vector particles could be directed to target cells expressing the same surface molecule. An enhanced transduction was observed (3-fold) when both magnetically labeled vector and cells were combined in MACS columns as described above. (T cells, MOI=0.5, 30% GFP+; CD34+ cells, MOI=25, 69% GFP+). These novel transduction reagents and protocols enable a fast, flexible and reproducible transduction of target cells to be performed that is independent of vector titer. As current cell therapy and gene therapy approaches require many manual handling steps between collecting the patient or donor cell sample and returning the modified cell product to the patient, these protocols are currently being assessed for their suitability for incorporation into a functionally closed and fully automated cell processing device for the manufacture of gene therapeutic cellular products.

Lehner, R., et al. (2019). "Emergence of Nanoplastic in the Environment and Possible Impact on Human Health." Environmental Science & Technology **53**(4): 1748-1765.

On account of environmental concerns, the fate and adverse effects of plastics have attracted considerable interest in the past few years. Recent studies have indicated the potential for fragmentation of plastic materials into nanoparticles, i.e., "nanoplastics," and their possible accumulation in the environment. Nanoparticles can show markedly different chemical and physical properties than their bulk material form. Therefore possible risks and hazards to the environment need to be considered and addressed. However, the fate and effect of nanoplastics in the (aquatic) environment has so far been little explored. In this review, we aim to provide an overview of the literature on this emerging topic, with an emphasis on the reported impacts of nanoplastics on human health, including the challenges involved in detecting plastics in a biological environment. We first discuss the possible sources of nanoplastics and their fates and effects in the environment and then describe the possible entry routes of these particles into the human body, as well as their uptake mechanisms at the cellular level. Since the potential risks of environmental nanoplastics to humans have not yet been extensively studied, we focus on studies demonstrating cell responses induced by polystyrene nanoparticles. In particular, the influence of particle size and surface chemistry are discussed, in order to understand the possible risks of nanoplastics for humans and provide recommendations for future studies.

Lei, K., et al. (2017). "Microplastics releasing from personal care and cosmetic products in China." Marine Pollution Bulletin **123**(1-2): 122-126.

Microplastics (MPs) have become a major global issue; their release from various products affects the aquatic environment, especially marine ecosystems. As a primary source of MPs, personal care and cosmetics products (PCCPs) containing MPs contribute to this environmental risk. We visited several supermarket chains in Beijing, China to identify PCCPs containing MPs. Overall, 7.1% of facial cleansers contained MPs, with an average weight of 25.04+/-10.69mgMP/g and average size of 313+/-130mum; whereas, 2.2% of shower gel products contained an average weight of 17.80+/-7.50mgMPs/g with an average size of 422+/-185mum. The majority of MPs were made of polyethylene, based on Raman and Fourier transform-infrared spectra analyses, while only a few were made of walnut shells and carbon particles. Finally, estimated 39tons MPs were released into the environment based on PCCPs

use in China based on available data.

Lei, L., et al. (2018). "Polystyrene (nano)microplastics cause size-dependent neurotoxicity, oxidative damage and other adverse effects in Caenorhabditis elegans." Environmental Science: Nano **5**(8): 2009-2020.

(Nano)microplastics (N/MPs) are emerging contaminants of increasing concern. However, little is known about the potential toxicity difference between nanoplastics and microplastics on organisms. In this study, we investigated the effects of polystyrene N/MPs with diameter sizes of 100 and 500 nm at the nanoscale and 1.0, 2.0 and 5.0 micro m at the microscale on the survival, lifespan, motor behavior, movement-related neurons and oxidative stress in Caenorhabditis elegans. After 3 days of exposure to 1.0 mg L⁻¹ polystyrene particles of the five sizes, the 1.0 micro m group had the lowest survival rate, the largest decrease in body length and the shortest average lifespan in nematodes. We demonstrated that exposure to N/MPs accelerated the frequency of body bending and head thrashing, and increased crawling speed, which indicate that N/MPs can induce size-dependent excitatory toxicity on locomotor behavior. Of the five sizes of N/MPs, 1.0 micro m particles significantly downregulated the expression of unc-17 and unc-47, and resulted in obvious damage to cholinergic and GABAergic neurons. We also found that polystyrene N/MPs significantly elevated the expression of gst-4, which encodes glutathione S-transferase-4, a key enzyme in oxidative stress. Additionally, N/MPs-induced oxidative damage was effectively attenuated by natural antioxidants, curcumin and oligometric proanthocyanidins. Taken together, these findings suggest that (nano)microplastics can exert size-dependent toxicity and have extensive impacts on organisms.

Lei, L., et al. (2018). "Microplastic particles cause intestinal damage and other adverse effects in zebrafish Danio rerio and nematode Caenorhabditis elegans." Science of the Total Environment **619**(620): 1-8.

Microplastics have been frequently detected in aquatic environments, and there are increasing concerns about potential effects on biota. In this study, zebrafish Danio rerio and nematode Caenorhabditis elegans were used as model organisms for microplastic exposure in freshwater pelagic (i. e. water column) and benthic (i. e. sediment) environments. We investigated the toxic effects of five common types of microplastics: polyamides (PA), polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC) and polystyrene (PS) particles. Results showed no or low lethality in D. rerio after exposure for 10 d at 0.001-10.0 mg L⁻¹ microplastics. The PA, PE, PP and/or PVC microplastics with ~70 micro m size caused intestinal damage including cracking of villi and splitting of enterocytes. Exposure to 5.0 mg m⁻² microplastics for 2 d significantly inhibited survival rates, body length and reproduction of C. elegans. Moreover, exposure to microplastics reduced calcium levels but increased expression of the glutathione S-transferase 4 enzyme in the intestine, which indicates intestinal damage and oxidative stress are major effects of microplastic exposure. Among 0.1, 1.0 and 5.0 micro m sizes of fluorescently labeled PS, 1.0 micro m particles caused the highest lethality, the maximum accumulation, the lowest Ca²⁺ level in the intestine and the highest expression of glutathione S-transferase 4 in nematodes. Taken together, these findings suggest that intestinal damage is a key effect of microplastics; and that the toxicity of microplastics is closely dependent on their size, rather than their composition.

Leibacher, J., et al. (2017). "Human mesenchymal stromal cells undergo apoptosis and fragmentation after intravenous application in immune-competent mice." Cytotherapy **19**(1): 61-74.

BACKGROUND AIMS: The biodistribution of human MSCs after systemic delivery is incompletely understood. We investigated the changes in cell size and cell surface markers of human MSCs after intravenous (IV) injection in immune competent mice.

METHODS: Male human MSCs were labeled with fluorescent vital dye PKH67 and tracked after IV administration in C57/BL6 mice. MSCs were tracked in blood and different murine tissues by human SRY gene quantitative polymerase chain reaction (qPCR) analysis, flow cytometry and fluorescence microscopy. Calibrated microbeads were used to track the size of transplanted MSCs.

RESULTS: The majority of injected MSCs were detected by qPCR in the lungs 5 min after transplantation, whereas <0.1% were detected in other tissues over 24 h. Flow cytometric and fluorescence microscopic analysis indicated that MSCs continuously decreased in size after transplantation and underwent fragmentation. The majority of PKH⁺ MSCs and their fragments were found in lungs and liver. PKH⁺ MSCs rapidly became positive for annexin V, propidium iodide and calreticulin, indicating loss of cell integrity. In addition, PKH⁺ fragments co-stained with antibodies against C3b, F4/80 and/or GR-1 indicating opsonization. Preincubation of MSCs in hyperosmolaric hydroxyethyl starch (HyperHAES) decreased MSCs size before transplantation, delayed the loss of viability markers and increased the frequency of traceable MSCs up to 24 h after transplantation.

CONCLUSIONS: PKH67 labeled MSCs are fragmented after IV injection in mice, acquire apoptotic and phagocytic cell markers and accumulate in the lungs and liver.

Leifeld, F. (1996). "COTTON WASTE RECLAMATION." Recycling Textile & Plastic Waste: 107-119.

The article concentrates on the reclamation of cotton waste. It focuses on the recovery of cotton fibers that are used as wadding which is added to blends of raw materials to be spun in their pure state for special fabric qualities suitable cotton spinning. It is implied that efficient cleaning is related to the separated quantities of waste. It is stated that the quality of cleaning can only be judged by figures and is essential to maintain the quantity of separated wastes and their composition.

Leissner, S. and Y. Ryan-Fogarty (2019). "Challenges and opportunities for reduction of single use plastics in healthcare: A case study of single use infant formula bottles in two Irish maternity hospitals." Resources, Conservation & Recycling **151**: N.PAG-N.PAG.

• Quality assessment showed high material variability and problems in material labelling. • Quantity assessment explored recycling potentials and need for proper waste management. • Waste management practices can cause secondary environmental impacts. • Recycling potential may be greatest for smallest mass materials. • Mitigation calls for demand reduction, product adjustment and waste management. • Collaborative efforts are required to reduce quantity of single-use plastics. The issue of plastic pollution is now recognised as a catastrophic global crisis. Single-use plastics have attracted much attention in terms of elimination and mitigation measures. The concept of circular economy aims to attain a state where waste no longer exists. Pathways to eliminate or adapt stages of the life cycle, long before the end-of-life phase, are necessary to address single-use plastics. This paper examines single-use food packaging plastic waste in Irish maternity hospital settings through a case study of ready-to-use infant formula bottles. A quantitative and qualitative assessment of single-use plastics arising from infant feeding bottles is presented. Quantitative examination reveals a high variability in materials used for bottles, teats and associated packaging, thus creating difficulties in standardising labelling and identifying appropriate waste treatment options. Quantitative calculations reveal the extent of plastic waste generated by this single use product. Possible mitigation options include: demand reduction for single-use bottles in the first place, alternative solutions to

eliminate single-use bottles, opportunities for manufacturers to address product design, impetus for policy makers to act on coherent labelling systems for materials and improved overall waste management. Considering the level of confusion at hospital and household levels as to best practice in recycling, this research highlights the need for targeted collaborative research utilising sectoral best practice, waste hierarchy and circular economy principles. [ABSTRACT FROM AUTHOR]
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Leitner, G., et al. (2013). "Immunotherapy of mastitis." Veterinary Immunology and Immunopathology **153**(3/4): 209-216.
The aim of this study was to examine an alternative, immunologically based treatment for mastitis. A microbead carrying specific anti-mastitis bacteria antibodies and an enhancer of phagocytosis, termed Y-complex, was tested in two experiments. In experiment 1, 21 cows were challenged with Streptococcus dysgalactiae and treated with Y-complex, Cobactan LCReg. or saline. Y-complex cleared the bacteria by day 4 and by day 10 only one cow was positive and remained positive up to day 28. No bacteria were isolated from any of the seven cows treated with Cobactan LC after day 4; however, in two out of the seven cows, the bacteria were re-isolated on day 24. On day 28, cows treated with placebo had still not cleared the bacteria. Experiment 2 was a field study in which cows, naturally infected with Escherichia coli, S. dysgalactiae or coagulase-negative staphylococci (CNS), were treated with Y-complex (32 cows), sulfadiazine+trimethoprim or procaine penicillin+streptomycin (BA) (8 cows), or a non-steroidal anti-inflammatory drug (NSAID) (19 cows). Y-complex was as effective as antibiotics, and superior to NSAID, in eliminating bacteria. Milk quantity and quality following infection and treatment were similar for all treatments, but significantly less milk was discarded from cows treated with Y-complex as compared to antibiotics. Y-complex was proven to be safe and effective, and may serve as a new approach for the treatment of mastitis.

Leitner, W. W. and U. Krzych (1997). "Plasmodium falciparum malaria blood stage parasites preferentially inhibit macrophages with high phagocytic activity." Parasite Immunology **19**(3): 103-110.
Exposure to malaria blood stage antigens results in several defects of macrophages/monocytes one of which is an irreversible reduction of phagocytic activity. In the present study we analysed phagocytic activity of subpopulations of human monocyte-derived-macrophages (MDM) based on the capacity of individual cells to ingest FITC-labelled microbeads. The results demonstrate that malaria infection affected predominantly MDM subpopulations with high level of phagocytosis. This population decreased during parasitaemia, however, during recovery from the infection the highly phagocytic cells replaced the damaged cells. The exposure of MDM cultures to blood stage antigens showed that the highly active macrophages from persons with active malaria infection decreased further, while the population increased during recovery. Furthermore, we observed that while ingestion of a few parasitized RBC (3 schizonts) stimulated phagocytosis, larger amounts or longer exposure periods eventually paralysed the entire phagocytic system. Accordingly, by selectively blocking actively phagocytizing macrophages, the malaria parasite prevents both specific and non-specific immune responses, which are initiated by macrophages as phagocytes and professional antigen presenting cells.

Leitz, K. H., et al. (2011). "Ultrafast microsphere near-field nanostructuring." Proceedings of SPIE - The International Society for Optical Engineering **7925**.

Due to the steadily advancing miniaturization in all fields of technology nanostructuring becomes increasingly important. Whereas the classical lithographic nanostructuring suffers from both high costs and low flexibility, for many applications in biomedicine and technology laser based nanostructuring approaches, where near-field effects allow a sub-diffraction limited laser focusing, are on the rise. In combination with ultrashort pulsed laser sources, that allow the utilization of non-linear multi-photon absorption effects, a flexible, low-cost laser based nanostructuring with sub-wavelength resolution becomes possible. Among various near-field nanostructuring approaches the microsphere based techniques, which use small microbead particles of the size of the wavelength for a sub-diffraction limited focusing of pulsed laser radiation, are the most promising. Compared to the tip or aperture based techniques this approach is very robust and can be applied both for a large-scale production of periodic arrays of nanostructures and in combination with optical trapping also for a direct-write. Size and shape of the features produced by microsphere near-field nanostructuring strongly depend on the respective processing parameters. In this contribution a basic study of the influence of processing parameters on the microsphere near-field nanostructuring with nano-, pico- and femtosecond laser pulses will be presented. The experimental and numerical results with dielectric and metal nanoparticles on semiconductor and dielectric substrates show the influence of particle size and material, substrate material, pulse duration, laser fluence, number of contributing laser pulses and polarization on the structuring process.

Lembo, S., et al. (2012). "Visible blue light effects on denditric cells." Journal of Investigative Dermatology **2)**: S120.

Visible blue light has a wavelength spectrum from 400 nm to 475 nm with a peak at 420 nm. Theoretically, blue light could induce biological effects comparable to UVA radiation, since wavelengths of blue light are closely related to the UVA spectrum, hence effects on the skin have been reported. In the present study, the effects of blue light on dendritic cells (DCs) maturation and pro-inflammatory cytokines production are investigated. Monocyte derived dendritic cells were isolated from peripheral blood mononuclear cells, using anti-CD14 conjugate magnetic microbeads. To assess whether blue light was able to modify DCs differentiation and maturation process, CD 14+ cells were irradiated with 2.5; 5; 10 and 15 J/cmdegree of blue light. Thereafter immature DCs (iDCs) were generated through incubation with granulocytes monocytes-colony stimulating factor (GM-CSF) and interleukin (IL)-4. Finally mature DCs were obtained after incubation of iDCs with LPS and were identified through flow cytometry using anti CD83 and CD86 antibodies. The production of proinflammatory cytokines, such as IL-6 and TNF-alpha, was also assessed by intracitoplasmatic immunofluorescence in irradiated and unirradiated cells. The exposure to blue light did not alter the ability to terminal differentiate in mature DCs. Blue light treatment reduced, in a dose dependent manner, the production of IL-6 and TNF-alpha promoted by LPS in the mature DCs. This report indicates that blue light has anti-inflammatory effects on DCs, without altering their differentiation process.

Lemechko, P., et al. (2019). "Production of poly(3-hydroxybutyrate-co-3-hydroxyvalerate) using agro-industrial effluents with tunable proportion of 3-hydroxyvalerate monomer units." International Journal of Biological Macromolecules **128**: 429-434.

With increasing concerns about future oil depletion and plastic pollution, bioplastics saw an increasing interest from scientists and industrials. Among bioplastics, the polyhydroxyalkanoates

(PHA) are a promising family of polyester which are both biosourced and biodegradable. Biosynthesized by microorganisms, especially bacteria, control of their monomeric composition, and thus their thermal and mechanical properties, is still a challenge to really make tailor-made syntheses. Moreover, one way to decrease the high cost of production is to use waste as substrates for the microorganisms. In this study, a marine bacteria, Halomonas sp. SF2003 was grown on agro-industrial effluents as the sole carbon sources and was able to produce poly(3-hydroxybutyrate) (PHB) with a productivity of 1.3 g.L⁻¹ in 40 h of culture and a number-average molar weight of 342,000 g.mol⁻¹. With the addition of valeric acid in the substrates, poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBHV) with controlled proportion of hydroxyvalerate (HV) monomers were obtained. Their thermal and mechanical characteristics were investigated as a function of HV amount and showed a decrease of the glass transition and melting temperatures and in Young modulus with the HV content increase.

Lemoine, C. M. R., et al. (2018). "Transcriptional effects of polyethylene microplastics ingestion in developing zebrafish (Danio rerio)." Environmental Pollution **243**(Part A): 591-600.

Over the last few decades, plastic waste has become an increasing environmental concern as it accumulates in every environment on our planet. Though traditionally seen as a macroscopic problem (i.e., large plastic debris), plastic pollution is also evident at smaller scales. Indeed, the intentional industrial production of small plastic particles and the physical degradation of larger plastic debris have overtime resulted in an increased environmental prevalence of smaller plastic particles, including microplastics. While the effects of these small polymers on marine biota have been an important research focus, recent global surveys indicate that our freshwater lakes and rivers are also plagued by microplastics. However, despite these discoveries we currently have a limited understanding of the impact these particles may have on freshwater animals, particularly on vertebrate species. Thus, the aim of the present study was to assess the impact of high concentrations of microplastics (5 and 20 mg.L⁻¹) on the early life stages in zebrafish, a model freshwater vertebrate model. To do this, we exposed embryonic and larval zebrafish to fluorescently labelled polyethylene microspheres for up to 14 days and assessed their microplastic content, growth, hatching and oxygen consumption rates. We then explored the molecular underpinnings of the microplastic response by RNA sequencing. Over the course of the exposure, we observed a consistent accumulation of microplastics in the gastrointestinal tract of the fish in a concentration dependent manner, but could not detect any detrimental effects of these particles on larval development, growth or metabolism. However, whole animal transcriptomics revealed that microplastics induced a transient and extensive change in larval gene expression within 48 h exposure, which largely disappeared by 14 days. However, as these transcriptional changes occurred during a critical period of larval development, we suggest that an evaluation of the potential long-term impact of these particles is warranted.

Lenaker, P. L., et al. (2019). "Vertical Distribution of Microplastics in the Water Column and Surficial Sediment from the Milwaukee River Basin to Lake Michigan." Environmental Science & Technology **53**(21): 12227-12237.

Microplastic contamination was studied along a freshwater continuum from inland streams to the Milwaukee River estuary to Lake Michigan and vertically from the water surface, water subsurface, and sediment. Microplastics were detected in all 96 water samples and 9 sediment samples collected.

Lenormand, G., et al. (2007). "Out-of-equilibrium dynamics in the cytoskeleton of the living cell." Physical Review E. Statistical, Nonlinear, & Soft Matter Physics **76**(4 Pt 1): 041901.

We report here measurements of rheological properties of the human airway smooth muscle cell using forced nanoscale motions of Arg-Gly-Asp RGD-coated microbeads tightly bound to the cytoskeleton. With changes of forcing amplitude, the storage modulus showed small but systematic nonlinearities, especially after treatment with a contractile agonist. In a dose-dependent manner, a large oscillatory shear applied from a few seconds up to 400 s caused the cytoskeleton matrix to soften, a behavior comparable to physical rejuvenation observed in certain inert soft materials; the stiffness remained constant for as long as the large oscillatory shear was maintained, but suddenly fell with shear cessation. Stiffness then followed a slow scale-free recovery, a phenomenon comparable to physical aging. However, acetylated low-density lipoprotein acLDL-coated microbeads, which connect mainly to scavenger receptors, did not show similar out-of-equilibrium behaviors. Taken together, these data demonstrate in the cytoskeleton of the living cell behaviors with all the same signatures as that of soft inert condensed systems. This unexpected intersection of condensed matter physics and cytoskeletal biology suggests that trapping, intermittency, and approach to kinetic arrest represent central mesoscale features linking underlying molecular events to integrative cellular functions.

Lenz, R., et al. (2016). "Microplastic exposure studies should be environmentally realistic." Proceedings of the National Academy of Sciences of the United States of America **113**(29): E4121-4122.

Lenz, R., et al. (2015). "A critical assessment of visual identification of marine microplastic using Raman spectroscopy for analysis improvement." Marine Pollution Bulletin **100**(1): 82-91.

Identification and characterisation of microplastic (MP) is a necessary step to evaluate their concentrations, chemical composition and interactions with biota. MP >=10mum diameter filtered from below the sea surface in the European and subtropical North Atlantic were simultaneously identified by visual microscopy and Raman micro-spectroscopy. Visually identified particles below 100mum had a significantly lower percentage confirmed by Raman than larger ones indicating that visual identification alone is inappropriate for studies on small microplastics. Sixty-eight percent of visually counted MP (n=1279) were spectroscopically confirmed being plastic. The percentage varied with type, colour and size of the MP. Fibres had a higher success rate (75%) than particles (64%). We tested Raman micro-spectroscopy applicability for MP identification with respect to varying chemical composition (additives), degradation state and organic matter coating. Partially UV-degraded post-consumer plastics provided identifiable Raman spectra for polymers most common among marine MP, i.e. polyethylene and polypropylene.

Lenz, R. and M. Labrenz (2018). "Small microplastic sampling in water: development of an encapsulated filtration device." Water **10**(8).

A variety of microplastic sampling instrumentation is currently used for water pollution studies. Plankton net-based approaches have been the most adopted techniques for water column and surface sampling. When applied to microplastics (MP) in the lower micro m size range these methods, however, introduce non-negligible risks of sample contamination and loss due to instrument and procedure design. Based on the first principles of systems engineering design we have developed a mobile sampling platform for field application that fulfils the needs of producing usable MP samples with a lower size limit of 10 micro m using an encapsulated flow-through filtration concept. Here, we explain the requirements, development, and construction of the device for others to replicate and improve.

Lenzi, J., et al. (2016). "Plastic ingestion by a generalist seabird on the coast of Uruguay." Marine Pollution Bulletin **107**(1): 71-76.

We analyzed plastic ingestion by Kelp Gull (Larus dominicanus) from 806 pellets collected between 2011 and 2013. Employing a Raman spectroscopy, we characterized those polymers used to produce the plastics ingested. Debris was recorded in 143 pellets (%FO=17.7%, n=202, 92.58 g). Plastic was found in 119 pellets (%FO=83%) and non-plastic occurred in 56 pellets (%FO=39%). The most important debris category was plastic film with 55.3% (n=79). Plastic bags were observed in 19 pellets (%FO=2.4%, weight=25.02 g). Glass was the second most important component (%FO=18.9%) followed by plastic fragments (%FO=17.8%). Plastic debris represented the 65.3% of the debris fragments (n=132, weight=58.84 g), and was composed by polyethylene (52%), polypropylene (26%), polyamide (12%), polystyrene (6%), polyvinyl chloride (2%), and polyethylene terephthalate (2%). How plastics were obtained by gulls and the effects on individuals are discussed, as well as environmental considerations about plastic pollution on coastal environments.

Leo, C., et al. (2013). "Cell-cell contact is essential for IgE-regulating activity of human CD8-positive cytotoxic T lymphocytes in vitro." Experimental Dermatology **22 (3)**: e4-e5.

IgE-production in vitro in patients with extrinic atopic dermatitis (AD) / atopy syndrome is controlled in part by CD8pos T cells. Mechanisms remain unclear. Whereas in mice cell-cell contact is essential for this regulatory activity this was not investigated in humans, yet. Ficoll-isolated peripheral blood mononuclear cells (PBMC) of seven patients with exacerbated extrinsic atopic dermatitis/atopy syndrome were depleted of CD8pos lymphocytes using two purification cycles (MS-columns, anti-CD8 microbeads, Miltenyi Biotec, Bergisch Gladbach) according to the manufacturer's instruction. 5 9 105 cells/well were seeded in 24 well flat bottom plates (Corning, 6.5 mm transwell inserts, 0.4 m pore size, RPMI supplemented with fetal calf serum) and incubated for 10 days at 37degreeC. Conditions: (i) all PBMC, (ii) PBMC w/o CD8pos cells, (iii) PBMC CD8-depleted and subsequently reconstituted with CD8pos cells, (iv) CD8-depleted PBMC (lower transwell chamber) and CD8pos cells (upper chamber). Cell free supernatants were collected and stored at -80degreeC until determination of IgE levels using the ImmunoCap100 system (low rage level, Phadia, Freiburg). Under these experimental conditions, CD8-depletion resulted in elevated IgE-levels as compared to all PBMC in 50% of patients. CD8-reconstitution with cell-cell contact abandoned this elevation confirming earlier findings. In contrast, CD8-reconstitution in the transwell system, i.e. without cellcell contact, did not influence IgE-production significantly. Thus, the majority of IgE controlling mechanisms in vitro by CD8pos T cells seems to be dependent of T-B cell contact.

León, V. M., et al. (2018). "Potential transfer of organic pollutants from littoral plastics debris to the marine environment." Environmental Pollution **236**: 442-453.

Plastic polymers act as passive samplers in air system and concentrate hydrophobic organic contaminants by sorption or specific interactions, which can be transported to other systems such as the marine environment. In this study plastic debris was sampled in the surrounding area of a Mediterranean lagoon in order to determine the concentration of persistent and emerging organic contaminants. More specifically, desorption of 91 regulated and emerging organic contaminants (polycyclic aromatic hydrocarbons, polychlorinated biphenyls, organochlorinated pesticides, current-use pesticides, personal care products, other pesticides and plastic additives) was characterized for the first 24 h from different polymers to seawater and the remaining content of these contaminants was also extracted by ultrasonic extraction

with methanol. All samples were analyzed by Stir Bar Sorptive Extraction coupled to GC/MS. A significant fraction of sorbed contaminants in polymers was desorbed in the first 24 h, particularly for triazines and organophosphorus pesticides due to their lower hydrophobicity than other considered analytes. The remaining contaminants contained in plastics can be also transferred to seawater, sediments or biota. Considering 24 h desorbed fraction plus the remaining methanol extracted fraction, the highest transfer levels corresponded to personal care products, plastic additives, current-use pesticides and PAHs. This is the first study to show the relevance of the transport of organic contaminants on plastic debris from littoral areas to the marine environment. [ABSTRACT FROM AUTHOR]

Leonard, A., et al. (2017). "Bone marrow characterization in sickle cell disease: Inflammation and stress erythropoiesis lead to suboptimal cd34 recovery compared to normal volunteer bone marrow." Blood. Conference: 59th Annual Meeting of the American Society of Hematology, ASH **130**(Supplement 1).

Introduction Gene therapy for sickle cell disease (SCD) requires modification of a high number of long term engrafting hematopoietic stem cells (LT-HSCs) sufficient to sustain production of the gene of interest at levels capable of overcoming the pathogenic HbSS phenotype. Unlike beta-Thalassemia, the inflammatory bone marrow (BM) environment and stress erythropoiesis associated with SCD may have significant impacts on HSC quality and yield necessary for disease amelioration. Important work to optimize gene therapy through improvement in gene transfer efficiency, editing strategies, or transplant conditioning can only improve gene therapy in SCD if enough autologous HSCs are LT-HSCs, thus characterization of SCD BM and CD34+ HSCs is required. Collection type, storage, and delays in processing may further impact CD34+ recovery and should be investigated as a strategy to maximize LT-HSC recovery. Method(s): Twenty milliliters of BM from subjects with SCD (HbSS genotype) and normal volunteers was collected in different anticoagulants (Heparin, ACD-A) and processed immediately(day 0) or stored at 4C and processed the following day(day 1). After isolation via Ficoll density gradient centrifugation, the mononuclear (MN) layer was stained with antibodies against inflammatory markers (CD36, CD35, CD11b, CD62L, CD62P), non-MN cells (GPA, CD66b, CD41/61), or processed for CD34+ selection using a magnetic microbead CD34+ selection kit and stained for CD34, CD45, and GPA expression. Data were analyzed by conventional and imaging flow cytometry, the latter confirming post-CD34+ selection flow data and demonstrating antibody intensity as a characterization of HSC heterogeneity and progenitor lineage. Complete blood count and hemoglobin (HB) electrophoresis were obtained at the time of BM collection. Statistical analyses were performed using unpaired t-tests. Result(s): BM was collected from 18 subjects (16 with SCD; 11M; age 21-41 years). Median Hb (8.6 vs. 13.5 gm/dL, $p<0.01$) and white blood cell count (8.8 vs. 4.2 K/mcL, $p<0.05$) differed significantly between SCD and non-SCD subjects. Median percent sickle Hb in SCD subjects was 62%. Inflammatory markers and contamination with red cell and platelet markers in the post-Ficoll MN layer were higher in SCD vs. non-SCD BM regardless of anticoagulant (CD35 24% vs. 13%, $p<0.05$; CD36 22% vs. 11%, $p<0.05$; CD62P 16% vs. 3%, $p<0.05$; GPA 16% vs. 4%, $p<0.05$; CD41/61 19% vs. 3%, $p<0.05$), and trended higher on day 1 in SCD BM in both anticoagulants, significantly in Heparin (GPA 23% vs. 33% on day 1, $p<0.05$). Total CD45 expression was lower in SCD vs. non-SCD BM in both anticoagulants (p<0.05) and on day 0 (p<0.05) and 1 (p<0.01), with Amnis data confirming a higher CD34+CD45-population in SCD BM (4 +/- 2% vs. 0.5 +/- 0.3%, p<0.05). While there was no significant difference in total CD34+ cell count between SCD and non-SCD BM after selection post-Ficoll, there was a trend for lower CD34+ count in SCD in both anticoagulants (2.6x105 vs. 4.7x105, p=0.1). SCD CD34+ cells were characterized by higher GPA expression (28 +/- 5% vs. 13 +/- 3% in non-SCD BM, p<0.01) that worsened in Heparin on day 1 (22 +/- 6.3% vs. 35 +/- 12.4%, p<0.05). Image cytometry confirmed a majority of GPA expression in SCD BM is from single cell CD34+CD45+GPA+ and CD34+CD45-GPA+ HSCs in addition to red cell aggregates, with an increase in CD34+CD45-GPA+ HSCs on day 1 (10 +/- 5% vs. 0.6 +/- 0.2 % on day 0, p<0.05). Furthermore, the percentage of CD34hi HSCs was lower in SCD vs. non-SCD BM, with >50% SCD HSCs characterized as CD34dim (56% vs. 4% in non-SCD BM, p<0.001). Lastly, the purity of CD34+ selection worsened from day 0 to day 1 in SCD BM in heparin (94% vs. 68 +/- 8%, p<0.05) and ACD-A (88% vs. 68 +/- 0.7%, p<0.05). Conclusion(s): SCD BM is characterized by increased inflammation and cell contamination in the MN layer regardless of anticoagulant that worsens over time in Heparin more significantly than in ACD-A. Compared to non-SCD BM, CD34+ HSC yield post-Ficoll is lower in SCD subjects, and is characterized by a larger proportion of CD34+CD45+GPA+ and CD34+CD45-GPA+ HSCs that rise with delays in processing. This indication of early differentiation along the erythroid lineage, with more than 50% of HSCs losing CD34+ intensity suggesting they are not LT-HSCs, suggests suppression of inflammation and stress erythropoiesis, combined with early cell processing may be critical for maximal HSC recovery necessary for successful gene therapy in SCD.

Leonardo Pantoja, M., et al. (2018). "Characterisation of “flushable” and “non-flushable” commercial wet wipes using microRaman, FTIR spectroscopy and fluorescence microscopy: to flush or not to flush." Environmental science and pollution research international **25**(20): 20268-20279.

The introduction to the market of wet wipes, advertised and labelled as “flushable”, has been the subject of controversy due to their perceived potential to block sewer systems as observed with other non-woven cloths such as traditional non-flushable wipes. Non-woven cloths that enter wastewater systems can find their way into the aquatic environment via wastewater effluents and it has been suggested that the breakdown of these fabrics can release materials such as microplastics into the environment. Worldwide research has revealed the alarming number of aquatic organisms affected by the presence of plastic debris in the aquatic environment harbouring a potential risk to humans through the introduction of microplastics into the food chains. However, the actual material composition of flushable wipes, their fate and impacts in the aquatic environment have not yet been scientifically studied. This paper investigates the fibre composition of flushable and non-flushable wipes, specifically with regard to synthetic polymer material, using Fourier transform infrared (FTIR) and microRaman spectroscopy along with fluorescence microscopy. The study demonstrated the presence of polyester (polyethylene terephthalate, (PET)), high-density polyethylene (HDPE) and polyethylene/vinyl acetate (PEVA/EVA) in some flushable wipes and PET in all non-flushable. Other polymers such us polypropylene (PP), low-density polyethylene (LDPE), expanded polystyrene (EPS) and polyurethane (PU) were also identified as potential components in the flushable material. Hence, commercially available wet wipes labelled as flushable could also be considered as a possible source of microplastic fibres in the wastewater streams and, if not retained, in the environment.

Leon-Zayas, R., et al. (2019). "Draft genome sequences of five environmental bacterial isolates that degrade polyethylene terephthalate plastic." Microbiology Resource Announcements **8 (25) (no**

pagination)(e00237-19).

Here, we report the annotated draft genome sequences of three Pseudomonas spp. and two Bacillus spp. that, as consortia, degrade polyethylene terephthalate plastic. Improved microbial degradation of plastic waste could help reduce the billions of metric tons of these materials that currently exist in our environment. Copyright © 2019 Leon-Zayas et al.

Lesher-Perez, S. C., et al. (2017). "Dispersible oxygen microsensors map oxygen gradients in three-dimensional cell cultures." Biomaterials Science **5**(10): 2106-2113.

Phase fluorimetry, unlike the more commonly used intensity-based measurement, is not affected by differences in light paths from culture vessels or by optical attenuation through dense 3D cell cultures and hydrogels thereby minimizing dependence on signal intensity for accurate measurements. This work describes the use of phase fluorimetry on oxygen-sensor microbeads to perform oxygen measurements in different microtissue culture environments. In one example, cell spheroids were observed to deplete oxygen from the cell-culture medium filling the bottom of conventional microwells within minutes, whereas oxygen concentrations remained close to ambient levels for several days in hanging-drop cultures. By dispersing multiple oxygen microsensors in cell-laden hydrogels, we also mapped cell-generated oxygen gradients. The spatial oxygen mapping was sufficiently precise to enable the use of computational models of oxygen diffusion and uptake to give estimates of the cellular oxygen uptake rate and the half-saturation constant. The results show the importance of integrated design and analysis of 3D cell cultures from both biomaterial and oxygen supply aspects. While this paper specifically tests spheroids and cell-laden gel cultures, the described methods should be useful for measuring pericellular oxygen concentrations in a variety of biomaterials and culture formats. Copyright ©2017 The Royal Society of Chemistry.

Leskow, A., et al. (2019). "Can contamination of the environment by dioxins cause craniofacial defects?" Human & Experimental Toxicology **38**(9): 1014-1023.

Cleft lip and cleft palate also known as orofacial cleft is a congenital malformation involving the partial or total lack of anatomical continuity of craniofacial tissue. The most common environmental factors that may cause orofacial clefts include pharmaceuticals, alcohol, addictive drugs, and tobacco smoke. Living in the area of industrial factories, garbage, ironworks, crematoria, wastewater treatment plants, and plastic waste landfills also has a significant impact on the development of the craniofacial defects. Some of the main factors causing the formation of congenital craniofacial defects are dioxins, of which emission to the environment is an important environmental and health problem. Dioxins are a diverse group of organic chemical compounds, derivatives of oxanthrene and fumarates, which are organoleptically imperceptible. Acting mainly through induction of inflammation, they influence a number of metabolic processes, including the process of bone mineralization and embryonic development. In this work, we highlight the problem of orofacial cleft including the impact of dioxin on development of this defect and the recommended prevention.

Leslie, H. A., et al. (2017). "Microplastics en route: Field measurements in the Dutch river delta and Amsterdam canals, wastewater treatment plants, North Sea sediments and biota." Environment International **101**: 133-142.

Environmental contamination by plastic particles, also known as 'microplastics', brings synthetic materials that are non-degradable and biologically incompatible into contact with ecosystems. In this paper we present concentration data for this emerging contaminant in wastewater treatment plants (WWTPs) and freshwater and marine systems, reflecting the routes via which these particles can travel and the ecosystems they potentially impact along their path. Raw sewage influents, effluents and sewage sludge from seven municipal WWTPs in the Netherlands contained mean particle concentrations of 68-910L⁻¹, 51-81L⁻¹ and 510-760kg⁻¹ wet weight (ww), respectively (particle sizes between 10 and 5000mum). Even after treatment, wastewater constitutes a source of microplastic pollution of surface waters, and via biosolids applications in farming and forestry, plastic retained in sewage sludge can be transferred to terrestrial environments. The WWTPs investigated here had a mean microplastics retention efficiency of 72% (s.d. 61%) in the sewage sludge. In the receiving waters of treated and untreated wastewaters, we detected high microplastic levels in riverine suspended particulate matter (1400-4900kg⁻¹ dry weight (dw)) from the Rhine and Meuse rivers. Amsterdam canal water sampled at different urban locations contained microplastic concentrations (48-187L⁻¹), similar to those observed in wastewater that is emitted from sewage treatment facilities in the area. At least partial settling of the particles occurs in freshwater as well, as indicated by microplastics in urban canal sediments (<68 to 10,500particleskg⁻¹dw). Microplastics in suspension in the water column have the potential to be discharged into the sea with other riverine suspended particulates. We report microplastic concentrations from 100 up to 3600particleskg⁻¹ dry sediment collected at 15 locations along the Dutch North Sea coast. The high microplastic enrichment in marine sediments compared to most literature data for seawater at the surface supports the hypothesis of a seabed sink for these materials. Marine species are heavily exposed to plastic particles. Body residues between 10 and 100particlesg⁻¹dw were measured in benthic macroinvertebrate species inhabiting the Dutch North Sea coast: filter-feeding mussels and oysters (species for human consumption) as well as other consumers in the marine food chain.

Leslie, H. A., et al. (2016). "Propelling plastics into the circular economy - weeding out the toxics first." Environment International **94**: 230-234.

The Stockholm Convention bans toxic chemicals on its persistent organic pollutants (POPs) list in order to promote cleaner production and prevent POPs accumulation in the global environment. The original 'dirty dozen' set of POPs has been expanded to include some of the brominated diphenyl ether flame retardants (POP-BDEs). In addition to cleaner production, there is an urgent need for increased resource efficiency to address the finite amount of raw materials on Earth. Recycling plastic enhances resource efficiency and is part of the circular economy approach, but how clean are the materials we are recycling? With the help of a new screening method and detailed analyses, we set out to investigate where these largely obsolete BDEs were showing up in Dutch automotive and electronics waste streams, calculate mass flows and determine to what extent they are entering the new product chains. Our study revealed that banned BDEs and other toxic flame retardants are found at high concentrations in certain plastic materials destined for recycling markets. They were also found in a variety of new consumer products, including children's toys. A mass flow analysis showed that 22% of all the POP-BDE in waste electrical and electronic equipment (WEEE) is expected to end up in recycled plastics because these toxic, bioaccumulative and persistent substances are currently not effectively separated out of plastic waste streams. In the automotive sector, this is 14%, while an additional 19% is expected to end up in second-hand parts (reuse). These results raise the issue of delicate trade-offs between consumer safety/cleaner production and resource efficiency. As petroleum intensive materials, plastic products ought to be repaired, reused, remanufactured and recycled, making good use of the 'inner circles' of the circular economy. Keeping hazardous substances - whether they are well known POPs or emerging contaminants - out of products and plastic waste streams could make these cycles work better for businesses, people and nature.

Leslie, S. K., et al. (2016). "Development of a cell delivery system using alginate microbeads for tissue regeneration." Journal of materials chemistry. B, Materials for biology and medicine. **4**(20): 3515-3525.
Alginate microbeads incorporating adipose-derived stem cells (ASCs) have potential for delivering viable cells capable of facilitating tissue regeneration. These microbeads are formed in calcium crosslinking solutions containing organic osmolytes to ensure physiological osmolality, but the comparative effects of these osmolytes on the microencapsulated cells are not known. In addition, delivery parameters needed to use microencapsulated cells for tissue regeneration remain unknown. We investigated the following parameters: (1) osmolyte effects on microbead diameter, cell viability and growth factor production; (2) the effect of the number of cells per microbead and the number of microbeads per unit volume on cell viability, growth factor production, and microbead degradation; (3) the ability of both degradable and non-degradable alginate microbeads to localize cells at the delivery site in vivo; and (4) whether alginate microbeads containing alginate-lyase elicit an inflammatory response after repeated exposure. Smallest microbead diameters were achieved using glucose as the osmolyte but cell viability and growth factor production did not depend on osmolyte type. As cell number per microbead or microbead number per well increased, growth factor production per cell decreased although percent cell viability was unchanged. The rate of cell release varied with the number of beads per well and with the number of cells per microbead. At the highest microbead density and at the lowest density of cells per microbead, cell release was delayed. Therefore fewer microbeads may be sufficient for clinical applications. Both degradable (0.22 U g-1) and non-degradable (0 U g-1) alginate microbeads localized cells at the delivery site. Degradable alginate microbeads delivered subcutaneously elicited a mild chronic inflammatory response on second exposure, but how this might impact repeated use of the technology remains to be determined.

Lessa, M. A., et al. (2013). "Cutaneous microcirculation as a marker of endothelial dysfunction in patients undergoing on-pump coronary artery bypass graft." European Journal of Anaesthesiology **51)**: 71.
Background: Coronary artery bypass graf t (CABG) surgery with cardiopulmonary bypass (CPB) is associated with systemic inflammatory response and endothelial dysfunction. In the present study we used Laser Doppler perfusion monitoring associated with pharmacological and physiological stimulation to evaluate the subacute effects of the CPB in the skin microcirculation in patients undergoing CABG surgery. Material(s) and Method(s): Twenty-three patients were evaluated on the day of surgery and 7 days after the CABG surgery with CPB. Plasma nitrite/ nitrate (NOx) concentrations, cytokine detection by multiplex microbead Immunoassay and high-sensitivity C-reactive Protein (hs-CRP) were determined. The skin microcirculation was evaluated by microiontophoresis of acetykcoline (Ach) and sodium nitroprusside (SNP), post occlusive reactive hyperemia (POHR), and thermal hyperemia. Cytokines and inflammatory markers such as C-reactive protein (CPR), nitrite/nitrate and IL-6 were also analyzed. Results and Discussion: Seven days after the surgery patients presented high levels of IL-6 and CPR e low bioavailability of nitric oxide. CABG surgery with CPB induced a significant reduction in the skin microvascular flux after cumulative doses of Ach (endothelium-dependent) and after thermal hyperemia. There was a significant delay in time to maximum flux after POHR. CABG surgery with CPB did not induce any significant change in the microvascular flux after cumulative doses ot SNP (endothelium-independent). We observed a significant impairment of endothelial function and a well-preserved endothelium- independent vasodilatation in the skin

microcirculation in patients 7 days after the CABG surgery with CPB. Conclusion(s): Our results suggest that Laser Doppler perfusion monitoring in the skin microcirculation may be a useful tool for the assessment of the subacute CPB-induced endothelial dysfunction in patients.

Lestari, P. and Y. Trihadiningrum (2019). "The impact of improper solid waste management to plastic pollution in Indonesian coast and marine environment." Marine Pollution Bulletin **149**: 1.

Plastic pollution has become a major concern in Indonesian coast and marine environment today. It occurs because 14% of the solid waste (SW) components in this country is plastic, and the SW management (SWM) infrastructure and services are still limited. The objectives of this article are to discuss the improper SWM and its impact to plastic pollution in Indonesia. Ten plastic pollution studies concerning macroplastics (MaP) and microplastics (MP) were described. These studies covered 5 regions, namely Java, East Nusa Tenggara, East Kalimantan, South Sulawesi, North and Southwest Sumatera. The highest MP abundance of 37,440–38,790 particles/kg dry weight (DW) sediment was found in Jakarta Bay, followed by Wonorejo Coast in Surabaya City (414–590 MP particles/kg DW sediment). The MP has entered the food chain through bivalves and fish. Therefore, the plastic pollution which is related to population density, and inadequacy of SWM, needs urgent solution.

Le-Tien, C., et al. (2004). "Modified alginate matrices for the immobilization of bioactive agents." Biotechnology & Applied Biochemistry **39**(Pt 2): 189-198.

Bioactive agents (catalase - an enzyme, and nisin - a bacteriocin) were covalently immobilized on alginate activated with sodium periodate (oxidatively converting 2,3-dihydroxy groups into dialdehyde residues), followed or preceded by ionotropic gelation. For the same protein coupling yield, the retained enzyme activity of the immobilized enzyme (ImE) can be markedly increased by diminishing the bead diameter, a phenomenon that illustrates the role of substrate/product diffusion through the bead gel layer. When the amount of enzyme introduced for coupling was about 15 mg/100 mg of support and the bead diameter was about 100 microm, a high retained specific activity (95-98%) was obtained. Diffusion phenomena can be markedly decreased by enzyme immobilization on the surface of microbeads (obtained by gelation of activated alginate prior to immobilization). In this case, the retained activity was approx. 75% of that of the free enzyme. A slightly higher K (m) value of ImE suggested that the enzyme-substrate affinity was almost maintained. The profiles of ImE activities at various pH values, at various temperatures and when undergoing proteolysis showed a overall higher stability for the immbolized than that for the free enzyme. Nisin immobilized on the microbead surface, when submitted to proteolysis, conserved its bacteriocin activity, strongly inhibiting the growth of Lactobacillus sake when subjected to an agar spot test, whereas free nisin totally lost its activity.

Letzkus, M., et al. (2014). "Gene expression profiling of immunomagnetically separated cells directly from stabilized whole blood for multicenter clinical trials." Clinical and Translational Medicine **3**: 36.

BACKGROUND: Clinically useful biomarkers for patient stratification and monitoring of disease progression and drug response are in big demand in drug development and for addressing potential safety concerns. Many diseases influence the frequency and phenotype of cells found in the peripheral blood and the transcriptome of blood cells. Changes in cell type composition influence whole blood gene expression analysis results and thus the discovery of true transcript level changes remains a challenge. We propose a robust and reproducible procedure, which includes whole transcriptome gene expression profiling of major subsets of immune cell cells directly sorted from whole blood.

METHODS: Target cells were enriched using magnetic microbeads and an autoMACS Pro Separator (Miltenyi Biotec). Flow cytometric analysis for purity was performed before and after magnetic cell sorting. Total RNA was hybridized on HGU133 Plus 2.0 expression microarrays (Affymetrix, USA). CEL files signal intensity values were condensed using RMA and a custom CDF file (EntrezGene-based).

RESULTS: Positive selection by use of MACS Technology coupled to transcriptomics was assessed for eight different peripheral blood cell types, CD14+ monocytes, CD3+, CD4+, or CD8+ T cells, CD15+ granulocytes, CD19+ B cells, CD56+ NK cells, and CD45+ pan leukocytes. RNA quality from enriched cells was above a RIN of eight. GeneChip analysis confirmed cell type specific transcriptome profiles. Storing whole blood collected in an EDTA Vacutainer tube at 4degreeC followed by MACS does not activate sorted cells. Gene expression analysis supports cell enrichment measurements by MACS.

CONCLUSIONS: The proposed workflow generates reproducible cell-type specific transcriptome data which can be translated to clinical settings and used to identify clinically relevant gene expression biomarkers from whole blood samples. This procedure enables the integration of transcriptomics of relevant immune cell subsets sorted directly from whole blood in clinical trial protocols.

Leung, J. and K. Chan (2018). "Microplastics reduced posterior segment regeneration rate of the polychaete Perinereis aibuhitensis." Marine Pollution Bulletin **129**(2): 782-786.

Microplastics are found in abundance in and on coastal sediments, and yet, whether exposure to this emerging pollutant negatively impact whole organism function is unknown. Focusing on a commercially important polychaete, Perinereis aibuhitensis, we demonstrated that presence of microplastics increased mortality and reduced the rate of posterior segment regeneration. The impact of the micro-polystyrene beads was size-dependent with smaller beads (8-12 micro m in diameter) being more detrimental than those bigger in size (32-38 micro m). This observed difference suggests microplastic impact could be affected by physical properties, e.g., sinking speed, surface area available for sorption of chemicals and bacteria, and selective feeding behaviors of the target organism.

Leusden, P. v., et al. (2017). "Permeation of probe molecules into alginate microbeads: effect of salt and processing." Food Hydrocolloids **73**: 255-261.

The ability to exclude harmful factors from a hydrogel microbead is important for the degree of protection the beads offers to what is encapsulated within. The permeability of alginate microbeads, prepared by water-in-oil emulsification, was investigated by their ability to exclude FITC-labelled protein probes. The influence of alginate concentration, calcium concentration and method of addition, and salt content of the environment was investigated. The permeability was also compared to the permeability of beads made by the traditional method of dripping an alginate solution into a CaCl₂ solution. Beads produced with low amounts of CaCl₂ show a significant degree of swelling and are therefore very permeable (C/C₀ (BSA)=0.62, where C is the final concentration of BSA-FITC in the bead, and C₀ the concentration of BSA-FITC in the continuous phase). With additional calcium, either by adding more calcium crystals after the emulsification step or by washing with a CaCl₂ solution, beads swell less and are less permeable (C/C₀ (BSA)=0.13 and 0.12). Beads made by dripping are very permeable (C/C₀ (BSA) ~ 0.60). Because in this process the droplets of alginate are not constrained by a water-oil boundary, the beads can swell during gelation. The salt concentration in the continuous phase influences the strength of the electrostatic repulsion between the probes and the alginate

network and hence affects the permeation of the probes into the beads. In the absence of salt, even FITC (389Da) is mostly excluded from the interior of the beads (C/C₀ (FITC) ~ 0.09).

Leusden, P. v., et al. (2018). "Lipase diffusion in oil-filled, alginate micro- and macrobeads." Food Hydrocolloids **85**: 242-247.

Triglycerides, which are broken down in the lower part of the intestinal tract, give a stronger ileal brake feedback, resulting in a feeling of satiety and causing people to eat less. The digestion of triglycerides into fatty acids by lipase in the intestine can be delayed by encapsulating oil droplets. In this study the release of fatty acids and oil droplet breakdown in a simulated intestinal system was investigated, for oil droplets encapsulated in alginate micro- (10.7 micro m) and macrobeads (1.77 mm). It was found that fatty acid release rate was greatly decreased by encapsulating the oil droplets into an alginate matrix compared to loose droplets. Microscopic imaging of the breakdown of the oil droplets showed a sharp front moving from the bead interface to the centre of the bead, and the change in position of the front scaled linear with time. The motion of the front is well described by combining the mass balance for lipase with a Maxwell-Cattaneo type equation, for the mass flux vector. The front in microbeads seemed to move slightly slower (0.15 (+or-0.04) micro m per minute) than for the macrobeads (0.20 (+or-0.02) micro m per minute). The release of free fatty acids in microbeads was faster than in macrobeads, despite the slower front movement, because of the larger amount of surface area available.

Leveque, J. G. and R. C. Burns (2018). "Drinking water in West Virginia (USA): tap water or bottled water - what is the right choice for college students?" Journal of Water & Health **16**(5): 827-838.

West Virginia has had a history of water quality issues. In parallel, the world is facing a plastic pollution crisis. In order to better understand behavioral responses to perceived water quality, a survey was conducted at a major research university to ask participants about water quality perceptions and drinking water behaviors. A total of 4,188 students completed the survey during the Spring 2017 semester. Logistic regression analyses were used to predict behaviors.

Levett, P., et al. (2009). "Application of multiplex PCR and fluid microbead-based assay to investigation of institutional outbreaks of viral respiratory disease." International Journal of Antimicrobial Agents **2)**: S6.

Objective(s): The aim of this study was to investigate the use of molecular diagnostic assays for the detection of viral pathogens in institutional outbreaks. During the winter months from January to April 2008, specimens from 22 outbreaks of respiratory disease, investigated by public health departments in Saskatchewan, were tested at the Saskatchewan Disease Control Laboratory for viral pathogens. Method(s): 124 specimens were tested (mean 5.6 specimens per outbreak, range 2-12) using conventional virological methods (DFA and tissue culture) in addition to a multiplex PCR-fluid microbead-based assay (using the Abbott RVP kit on the Luminex 200) and real-time PCR assays. Result(s): Pathogens were detected by multiplex PCR-fluid microbeadbased assay in 79/124 specimens (63.7%). Of these, 60 specimens were positive for pathogens that were detectable by conventional virologic techniques. Viruses were detected in 22 specimens by DFA and in 18 by tissue culture. Multiple viruses were detected in 9 outbreaks. Real-time PCR assays were performed on all specimens from outbreaks in which pathogens were detected by multiplex PCRfluid microbead-based assay, with the exception of coronaviruses and rhinoviruses/enteroviruses, for which assays were not available. Realtime PCR assays were positive in 56/60 (93%) specimens. Conclusion(s): Using conventional

techniques (DFA and tissue culture), pathogens were detected from patients in 11 outbreaks. However, a commercial multiplex PCR-fluid microbead-based assay demonstrated pathogens in all 22 outbreaks, of which seven involved only coronaviruses and rhinoviruses/enteroviruses, which were not detectable by conventional methods and for which real-time PCR assays were not available. A combination of conventional methods (DFA) and the multiplex PCR-fluid microbead-based assay would give the most rapid and complete detection of viruses in the outbreaks studied.

Levin, A., et al. (2012). "Anti-TNF-induced regulatory macrophages mechanisms of immunosuppression." Journal of Crohn's and Colitis **1)**: S35.

Background: Anti TNF-a antibodies are effective at inducing and maintaining remission in Crohn's disease, although the exact mechanism by which they exert this function is not fully understood. We have previously shown that anti-TNF-a antibodies induce a distinct population of macrophages with immune-regulatory and wound healing properties. How these macrophages exert these functions has remained unclear. The aim of this study was to elucidate which pathways are involved in the wound healing and regulatory functions of anti-TNF induced regulatory macrophages. Method(s): PBMC were isolated from peripheral blood of healthy donors. Mixed lymphocyte reactions were established by coculturing PBMC of two individual donors in a 1:1 ratio. Cultures were treated with infliximab and macrophages were isolated using CD14-microbeads. Inflammatory M1 type macrophages were generated by culturing of monocytes in the presence of IFN-gamma. Gene expression was determined by microarray followed by pathway analysis. Result(s): As expected, infliximab-induced macrophages displayed upregulation of a number of genes associated with regulatory or wound healing macrophages including CD206 and CD163. Expression of known anti-inflammatory cytokines such as IL-10 and TGF-beta was not altered, indicating alterative mechanisms of immune-suppression. Interestingly, various lipid processing and signalling pathways were upregulated in infliximab induced regulatory macrophages, including cholesterol signalling through the lipid X and retinoic X receptors. Conclusion(s): Infliximab-induced macrophages express a number of genes associated with M2 macrophages, but do not show a clear upregulation of anti-inflammatory cytokines. Instead, various lipid signalling pathways are activated, suggesting a role for these pathways in the immunosuppression exerted by anti-TNF induced regulatory macrophages.

Levin, A., et al. (2013). "Vitamin D potentiates the immunosuppressive effect of anti-TNF induced regulatory macrophages." United European Gastroenterology Journal **1)**: A351.

INTRODUCTION: We have previously shown that anti-TNF-alpha antibodies induce a distinct population of macrophages with immune regulatory and wound healing properties. An environmental factor that has been shown to induce tolerogenicity in dendritic cells is Vitamin D. Interestingly, epidemiological studies have shown that Crohn's disease patients have a high prevalence of vitamin D deficiency. These results incited us to investigate the role of Vitamin D in anti-TNF induced macrophages. AIMS&METHODS: The aim of this study was to see if the Vitamin D receptor pathway is involved in the induction of anti-TNF induced macrophages and if Vitamin D can potentiate immunosuppressive effect of these macrophages. PBMC's were isolated from peripheral blood of healthy donors. Mixed lymphocyte reactions were established by co-culturing PBMC's of two healthy individual donors in a 1:1 ratio. Cultures were treated with anti-TNF to induce anti-TNF induced macrophages. Inflammatory M1 type macrophages were generated by culturing of monocytes in the presence of IFN-gamma. Gene expression of anti- TNF compared to M1 macrophages was determined by microarray followed by pathway analysis. To determine the effect of Vitamin D on the immunosuppressive effect of anti-TNF

induced regulatory macrophages, cell culture experiments were performed in the presence or absence of 1,25-dihydroxyvitamin D. Macrophages were isolated with CD14 microbeads and co-cultured with activated T-cells from a third donor. Proliferation was measured by ³H thymidine incorporation. RESULT(S): Anti-TNF induced macrophages displayed an increased expression of a number of components of the vitamin D receptor pathway, including the vitamin D receptor (VDR) and osteopontin (OPN). Addition of 1,25-dihydroxyvitamin D to the cultures did not result in enhanced numbers of regulatory macrophages. However, macrophages generated in the presence of 1,25-dihydroxyvitamin D did show an increased inhibition of T-cell proliferation, indicating increased immunosuppressive function. CONCLUSION(S): Anti-TNF induced macrophages show an increased activation of the vitamin D receptor pathway. Furthermore the immunosuppressive properties of wound healing macrophages induced by anti-TNF-alpha can be potentiated by 1,25-dihydroxyvitamin D.

Levina, V. V., et al. (2011). "Ovarian cancer stem cell cytokine microenvironment." Cancer Research. Conference: 102nd Annual Meeting of the American Association for Cancer Research, AACR **71**(8 SUPPL. 1).

Objectives: Epithelial ovarian cancer (EOC) is an extremely aggressive disease associated with a lack of early symptoms, rapid progression to peritoneal metastases, and poor prognosis for patients. Currently available treatments are not effective in preventing or slowing metastatic spread, and the therapeutic resistance of EOC remains a major unresolved clinical and scientific problem. Cancer stem cells (CSCs) represent the most aggressive part of the tumor. CSCs are drug resistant and are thought to be responsible for the failure of chemotherapy. Earlier, we demonstrated that chemotherapy can lead to selection of CSCs. We hypothesized that malignancy of CSCs was associated with an efficient cytokine network. Method(s): Ovarian CSCs and primary adherent epithelial cultures were established from ascites from ovarian cancer patient with stage III EOC. Ovarian CSCs were isolated using magnetic beads separation columns and human CD133 and CD44 Microbead kits from Miltenyl Biotec and were grown as tumor spheres. The High Content Screening (HCS) and High Content Analysis (HCA) platform from Thermo Scientific Cellomics was applied to study the CSC markers, embryonic markers, transcription factors, epithelial mesenchimal transition markers, cytokines, chemokines, growth and angiogenetic factor receptor expression and intracellular cytokine accumulation. Multiplex xMAP technology was used for the analysis of human cytokines and growth factors in cell culture medium. An in vivo SCID mouse model was used for the analysis of tumorigenity of bulk EOC cells and CSCs. Result(s): We established primary EOC cell lines and CSCs from ascites of 3 EOC patients. We confirmed that cells growing in tumor spheres demonstrate all the properties of CSCs: they express high levels of CSCs markers and low levels of differentiated markers, they have capacity to self-renew and differentiate, and they are highly tumorigenic in SCID mice. The EMT and CSC phenotypes were both exhibited in ovarian CSCs. We found that ovarian CSCs have a specific cytokine microenvironment involving the up-regulation of multiple cytokine-receptor axes. Conclusion(s): Our findings provide new knowledge regarding ovarian CSC biology. They elucidate the important role of the specific cytokine-receptor signaling axis for the self-renewal and proliferation of ovarian CSCs. We concluded that an optimal antitumor efficacy will be achieved by inhibiting both tumor cell populations: CSCs and bulk EOC cells. We suggest that combining two treatment modalities, e.g. RTK inhibitor that targets CSCs, and cisplatin that eradicates bulk tumor cells will represent a novel paradigm in EOC therapy.

Levine, B. L., et al. (2013). "Adoptive transfer of gene-modified T-cells engineered to express high-affinity TCR'S for cancer-testis antigens NY-ESO-1 or lage-1, in multiple myeloma (MM) patients post autologous hematopoietic stem cell transplant (ASCT)." Cytotherapy **1)**: S13.

Adoptive immunotherapy for cancer has been limited by poor antigen specificity, low target antigen expression, and self-tolerance.We hypothesized that genetic engineering of autologous T cells with affinity-enhanced tumor antigen-specific T cell receptors (TCRs) and ex vivo CD3/CD28 costimulation may overcome these limitations.We are conducting a clinical trial (NCT01352286) evaluating T cells engineered with an HLA-A0201 restricted, affinity-enhanced TCR that recognizes an epitope expressed by NY-ESO-1 and LAGE-1 tumor antigens (TCR-T). TCR-T are infused in the setting of profound lymphodepletion that accompanies high-dose chemotherapy followed by aSCT in patients with high risk or relapsed multiple myeloma (MM). TCR-T are manufactured from an apheresis product depleted of monocytes and CD25+ cells, gene-modified by lentivector, and expanded using microbead-based CD3/CD28 costimulation. 15 patients have been infused. 11 more are planned. An average of 8.5 x 10⁹ TCR-T, with transduction efficiency averaging 33%, was administered per patient. 15, 13, and 10 patients have reached the day 42, 100 and 180 MM assessment time points, respectively. At day 100, 10/13 (77%) patients have a best response of VGPR or better and 3/13 (23%) have partial responses. 5 patients have progressed after day 100 and 10 continue to respond to therapy. These results are especially encouraging since 4/15 patients had prior aSCT and 8/15 had high risk cytogenetics. TCR-T expanded through day 14, and persisted in all patients through day 180 and to levels up to 1% at 1yr in blood and marrow by flow cytometry. Patients with progressive disease showed low levels or loss of TCR-T, or loss of target tumor antigen at time of progression, suggesting specific activity of TCR-T. This is the first test of TCR-T in the MM setting, which indicates it is well tolerated and associated with encouraging response rates.

Levine, B. L., et al. (2013). "Safety and correlates of clinical response in an early phase clinical trial in multiple myeloma patients post auto-sct and adoptive immunotherapy with engineered t cells expressing an HLA-A2 restricted affinity-enhanced tcr for lage-1 and ny-ESO-1." Molecular Therapy **1)**: S114.

Immune-based therapy based on the adoptive transfer of engineered-T cells has shown recent and considerable promise against chemotherapy resistant tumors. Engineering of T cells to express tumor-antigen T cell receptors (TCRs) allows for the ability to target both surface and intracellular antigens. Rational affinity enhancement of TCRs allows for the ability to effectively overcome the limitations associated with central tolerance and generate potent T cells to target self-antigens expressed by tumors. We are conducting an early phase clinical trial (NCT01352286) to investigate the safety, feasibility and anti-tumor activity of T cells engineered to express an affinity-enhanced TCR which recognizes the NY-ESO-1/LAGE-1 peptide complex HLA-A*0201-SLLMWITQC. Under this protocol, patients with high risk or relapsed, NY-ESO-1 and/or LAGE-1 positive multiple myeloma (MM), are infused with autologous TCRengineered T cells, 2 days after autologous stem cell transplantation (aSCT). Engineered T cells are activated and expanded using anti- CD3/28 antibody conjugated microbeads, and gene modified to express affinity-enhanced TCR using lentivirus gene transfer. Disease response is evaluated in accordance with the IMWG criteria at 6 weeks, and 3 and 6 months post infusion. Patient blood and marrow is monitored for the persistence and phenotype of gene modified cells and marrow is monitored for expression of NY-ESO-1 and LAGE-1 antigen. 17 patients have been infused with an average of 2.7 x 109 gene modified cells (range 4.5 x 108 - 4.2 x 109). Infusions were well tolerated. At 3 months, 77% of patients experienced a very good partial response (VGPR) or better. In all patients, engineered T cells expanded robustly in vivo, and were detectable in peripheral blood and marrow at 180 days by both Q-PCR and flow-cytometry-based approaches in all but one case. In a subset of patients, robust and long-term persistence of engineered T

cells was observed in periphery and marrow, accompanied by ongoing strong clinical responses and absence of target antigen expression in marrow. Conversely, disease progression has been accompanied by loss of engineered T cells and re-expression of target antigen in marrow.

Levitan, I., et al. (2000). "A Chamber to Permit Invasive Manipulation of Adherent Cells in Laminar Flow with Minimal Disturbance of the Flow Field." Annals of Biomedical Engineering **28**(10): 1184-1193.

An obstacle to real-time in vitro measurements of endothelial cell responses to hemodynamic forces is the inaccessibility of the cells to instruments of measurement and manipulation. We have designed a parallel plate laminar flow chamber that permits access to adherent cells during exposure to flow. The "minimally invasive flow device" (MIF device) has longitudinal slits (1 mm wide) cut in the top plate of the chamber to allow insertion of a recording, measurement, or stimulating instrument (e.g., micropipette) into the flow field. Surface tension forces at the slit openings are sufficient to counteract the hydrostatic pressure generated in the chamber and thus prevent overflow. The invasive probe is brought near to the cell surface, makes direct contact with the cell membrane, or enters the cell. The slits provide access to a large number (and choice) of cells. The MIF device can maintain physiological levels of shear stress (<1-15 dyn/cm super(2)) without overflow in the absence and presence of fine instruments such as micropipettes used in electrophysiology, membrane aspiration, and microinjection. Microbead trajectory profiles demonstrated negligible deviations in laminar flow near the surface of target cells in the presence of microscale instruments. Patch-clamp electrophysiological recordings of flow-induced changes in membrane potential were demonstrated. The MIF device offers numerous possibilities to investigate real-time endothelial responses to well-defined flow conditions in vitro including electrophysiology, cell surface mechanical probing, local controlled chemical release, biosensing, microinjection, and amperometric techniques. [copy 2000 Biomedical Engineering Society. PAC00: 8780Fe, 8717Jj, 8719Uv, 8716Uv, 8719Nn

Lewis, R. (1999). "Vinyl chloride and polyvinyl chloride." Occupational Medicine **14**(4): 719-742.

Polyvinyl chloride (PVC) is an important plastic resin for construction, pipe and tubing, siding, and other uses. Exposures to vinyl chloride monomer during the early years of production resulted in an important sentinel health event: the recognition of an excess of a rare liver cancer, hepatic angiosarcoma, at facilities throughout the world. Several other syndromes, including acro-osteolysis, also have been associated with PVC, but less clearly with vinyl chloride. Extensive research ranging from large-scale epidemiologic studies to biomarker research into molecular mechanisms continues to provide valuable insight into the pathogenesis of occupational cancer. [References: 151]

Lewis, S. E., et al. (2019). "Upcycling aromatic polymers through C-H fluoroalkylation." Chemical Science **10**(25): 6270-6277.

The unique properties imparted by planar, rigid aromatic rings in synthetic polymers make these macromolecules useful in a range of applications, including disposable packaging, aerospace materials, flexible electronics, separation membranes, and engineering thermoplastics. The thermal and chemical stability of aromatic polymers, however, makes it difficult to alter their bulk and/or surface properties and results in challenges during recycling. In response, we report a platform approach for the C-H functionalization of aromatic polymers by taking advantage of their innate reactivity with electrophilic radical intermediates. The method uses mild reaction conditions to photocatalytically generate electrophilic fluoroalkyl radicals for the functionalization of an array of commercially relevant polyaromatic substrates, including post-industrial and post-consumer plastic waste, without altering their otherwise attractive thermomechanical properties. The density of fluorination, and thus the material properties, is tuned by either increasing the reagent concentration or incorporating longer perfluoroalkyl species. Additionally, the installation of versatile chemical functionality to aromatic polymers is demonstrated through the addition of a bromodifluoromethyl group, which acts as an initiator for atom transfer radical polymerization (ATRP) grafting of vinyl polymers. The method described herein imparts new and versatile chemical functionality to aromatic polymers, enabling an efficient approach to diversify the properties of these otherwise recalcitrant commodity plastics and demonstrating a viable pathway to upcycle post-consumer plastic waste.

Lewis, S. J. and K. W. Heaton (1997). "The intestinal effects of bran-like plastic particles: is the concept of 'roughage' valid after all?" European Journal of Gastroenterology & Hepatology **9**(6): 553-557.

OBJECTIVE: The mechanisms by which dietary fibre exerts is laxative action are not fully understood. Studies using sliced plastic tubing as a fibre substitute showed a decrease in both small and large bowel transit time. The significance of these studies is hard to interpret. We set out to compare the effects on intestinal function of wheat bran with plastic flakes similar in size and flaky shape to wheat bran (and devoid of plasticizers).

DESIGN AND METHODS: Volunteers consumed coarse wheat bran then, after a washout period, plastic flakes of the same size and shape as the bran. Before and after each intervention whole-gut transit time (WGTT), defecation frequency, stool form, stool water content, stool beta-glucuronidase activity and dietary intake were assessed.

RESULTS: Twenty-nine volunteers consumed a mean of 27.1 g of raw wheat bran and 24 g of plastic flakes a day. Baseline WGTT, interdefecatory intervals (IDI), stool form, weight, output, water content, and beta-glucuronidase were similar before both interventions. Both led to a decrease in mean faecal beta-glucuronidase activity, median WGTT (bran 25.8%, plastic 28.6%) and IDI (bran 23.3% plastic 25.0%). Both also increased stool form score (bran 28.6%, plastic 21.2%) and stool output (bran 67.1%, plastic 79.0%). Stool water content only rose with wheat bran (72%-75%, P = 0.014).

CONCLUSION: Overall, plastic 'pseudobran' was as effective at altering colonic function as wheat bran at a similar dosage but with fewer particles. The mechanism is not by increased faecal water. Reduction in enzyme activity with plastic flakes suggests that the plastic led to qualitative and, probably, beneficial changes in the bacterial flora or their metabolic processes. The concept of roughage deserves to be revived.

Lewis, S. J. and K. W. Heaton (1999). "Roughage revisited: the effect on intestinal function of inert plastic particles of different sizes and shape." Digestive Diseases & Sciences **44**(4): 744-748.

The mechanisms by which dietary fiber exerts its laxative action are not fully understood. Finely grinding wheat bran reduces its effect. Inert plastic particles are equipotent to bran if they consist of flakes or sliced tubing. It is not known whether altering the size or shape of inert particles alters their effect on intestinal function. In a randomized crossover study, 18 volunteers swallowed 24 g/day of plastic as branlike flakes or as small granules for 10-12 days with a two-week washout period between interventions. Whole-gut transit time (WGTT), orocecal transit time (OCTT), defecation frequency, stool form, stool water content, stool pH, and dietary intake were assessed. The plastic flakes caused a 24% (P < 0.001) reduction in WGTT and a 19% (P = 0.002) fall in OCTT.

Leyendeckers, H., et al. (2003). "Memory B cells specific for the NC16A domain of the 180 kDa bullous pemphigoid autoantigen can be detected in peripheral blood of bullous pemphigoid patients and induced in vitro to synthesize autoantibodies." Journal of Investigative Dermatology **120**(3): 372-378.

Bullous pemphigoid is a subepidermal blistering disease characterized by the synthesis of autoantibodies against the 180 kDa and the 230 kDa bullous pemphigoid antigens. Whether autoimmunity is also reflected by the presence of circulating autoantigen-specific memory B cells is still a matter of debate. We used a new assay combining two-step immunomagnetic enrichment with multiparameter flow cytometry to detect and characterize bullous pemphigoid 180 kDa-specific IgG+ B cells in blood of bullous pemphigoid patients. In a first magnetic separation, B cells were isolated from peripheral blood mononuclear cells using releasable microbeads conjugated to a CD19 antibody. From pre-enriched B cells, bullous pemphigoid 180 kDa-specific cells were then positively selected using microbeads directly conjugated with a recombinant N-terminal fragment of the bullous pemphigoid 180 kDa ectodomain, containing the noncollagenous 16A domain, which was recently shown to harbor major epitopes of autoantibodies in bullous pemphigoid sera. Noncollagenous 16A domain-specific IgG+ B cells were detectable in blood of most, if not all patients with serum autoantibodies against the noncollagenous 16A domain. The specificity of the cells was confirmed by in vitro differentiation into antibody-forming cells and analysis of the culture supernatant for the presence of noncollagenous 16A domain-specific IgG antibodies. All noncollagenous 16A domain-specific IgG+ B cells showed a clear memory immunophenotype. Noncollagenous 16A domain-specific IgG+ memory B cells may be crucial for continuous noncollagenous 16A domain-specific autoantibody production and/or play a part as antigen-presenting cells for priming and restimulation of bullous pemphigoid 180 kDa-specific T helper cells.

Lezehari, M., et al. (2012). "Fixed-bed column studies of pentachlorophenol removal by use of alginate-encapsulated pillared clay microbeads." Journal of Colloid and Interface Science **379**(1): 101-106.

Columns were packed with two alginate/pillared clays microbeads (aluminium-pillared clay and surfactant-modified aluminium-pillared clay). Pentachlorophenol sorption performance was assessed under variable operating conditions: different bed heights, influent pentachlorophenol concentrations and flow rates. These conditions greatly influenced the breakthrough time/volume, the saturation time/volume and the uptake capacity. Higher values of experimental uptake capacities were obtained for the encapsulated surfactant-modified aluminium-pillared clay compared with the encapsulated aluminium-pillared clay, and the values were compared with those obtained with other low-cost sorbents. The experimental breakthrough curves were modelled using Bed Depth Service Time (BDST), Wolborska and Thomas models. Linear relationship was obtained for the BDST model, indicating the suitability of this model; bed capacity increased sharply with the introduction of CTAB in the inorgano-pillared clay. Wolborska model was applied only to the initial part of the curves. Thomas model was no doubt the most suitable description of the adsorption mechanisms for the entire breakthrough curves. Experimental and Thomas model-predicted equilibrium uptake capacities were in accordance. © 2012 Elsevier Inc.

Li, A. Y., et al. (2019). "Insights into the feeding behaviors and biomechanics of Varroa destructor mites on honey bee pupae using electropenetrography and histology." Journal of Insect Physiology **119**: 103950.

Feeding behaviors and biomechanics of female Varroa destructor mites are revealed from AC-DC electropenetrography (EPG) recordings of mites feeding from Apis mellifera honey bee pupae and histology of mite internal ingestion apparatus. EPG signals characteristic of arthropod suction feeding (ingestion) were identified for mites that fed on pupae during overnight

recordings. Ingestion by these mites was confirmed afterwards by observing internally fluorescent microbeads previously injected into their hosts. Micrographs of internal ingestion apparatus illustrate the connection between a gnathosomal tube and a pharyngeal lumen, which is surrounded by alternating dilator and constrictor muscles. Inspection of EPG signals showed the muscularized mite pharyngeal pump operates at a mean repetition rate of 4.5cycles/s to ingest host fluids. Separate feeding events observed for mites numbered between 23 and 33 over approximately 16h of recording, with each event lasting ~10s. Feeding events were each separated by ~2min. Consecutive feeding events separated by either locomotion or prolonged periods of quiescence were grouped into feeding bouts, which ranged in number from one to six. Statistical analyses of EPG data revealed that feeding events were prolonged for mites having lower pharyngeal pump frequencies, and mites having prolonged feeding events went unfed for significantly more time between feeding events. These results suggest that mites may adjust behaviors to meet limitations of their feeding apparatus to acquire similar amounts of food. Data reported here help to provide a more robust view of Varroa mite feeding than those previously reported and are both reminiscent of, as well as distinct from, some other acarines and fluid-feeding insects.

Li, B., et al. (2019). "Polyethylene microplastics affect the distribution of gut microbiota and inflammation development in mice." Chemosphere **244**: 125492.

Environmental pollution caused by plastics has become a public health problem. However, the effect of microplastics on gut microbiota, inflammation development and their underlying mechanisms are not well characterized. In the present study, we assessed the effect of exposure to different amounts of polyethylene microplastics (6, 60, and 600 mug/day for 5 consecutive weeks) in a C57BL/6 mice model. Treatment with a high concentration of microplastics increased the numbers of gut microbial species, bacterial abundance, and flora diversity. Feeding groups showed a significant increase in Staphylococcus abundance alongside a significant decrease in Parabacteroides abundance, as compared to the blank (untreated) group. In addition, serum levels of interleukin-1alpha in all feeding groups were significantly greater than that in the blank group. Of note, treatment with microplastics decreased the percentage of Th17 and Treg cells among CD4⁺ cells, while no significant difference was observed between the blank and treatment groups with respect to the Th17/Treg cell ratio. The intestine (colon and duodenum) of mice fed high-concentration microplastics showed obvious inflammation and higher TLR4, AP-1, and IRF5 expression. Thus, polyethylene microplastics can induce intestinal dysbacteriosis and inflammation, which provides a theoretical basis for the prevention and treatment of microplastics-related diseases.

Li, B., et al. (2019). "The release and earthworm bioaccumulation of endogenous hexabromocyclododecanes (HBCDDs) from expanded polystyrene foam microparticles." Environmental Pollution **255**(Pt 1): 113163.

Hexabromocyclododecanes (HBCDDs) are common chemical additives in expanded polystyrene foam (EPS). To evaluate the bioaccumulation potential of endogenous HBCDDs in EPS microparticles by earthworms, two ecologically different species of earthworms (Eisenia fetida and Metaphire guillelmi) were exposed to soil added with EPS microparticles of different particle sizes (EPS₂₀₀₀, 830-2000mum and EPS₈₃₀, <830mum). To clarify the accumulation mechanisms, leaching experiments using EPS microparticles in different solutions were conducted. After exposure to EPS microparticles-amended soils (S-EPS) for 28d, the total concentrations of HBCDDs reached 307-371ngg⁻¹ dw in E. fetida and 90-133ngg⁻¹ dw in M. guillelmi, which were higher than those in earthworms

exposed to the soil that was artificially contaminated with a similar level of HBCDDs directly (ACS). The accumulation of HBCDDs in earthworms was significantly influenced by EPS microparticles' size and earthworms' species. The total concentrations of HBCDDs in earthworms' cast were significantly higher than the theoretical concentration of HBCDDs in S-EPS, which suggested that EPS microparticles can be ingested by earthworms. The release rate of HBCDDs from EPS₅₀₀₀ (2000-5000mum) into water-based solutions (<1%) after a 3.5-h incubation was far lower than that into earthworm digestive fluid (7%). These results illustrated that the ingestion of EPS microparticles and consequent solubilization of HBCDDs by digestive fluid play an important role in the accumulation of HBCDDs contained in EPS microparticles in earthworms. After a 28-d incubation with the soil solution, 4.9% of the HBCDDs was accumulatively leached from the EPS₅₀₀₀, which indicated that HBCDDs can be released from EPS microparticles to soil environment, and then accumulated by earthworms. Moreover, similar to those exposed to ACS, the diastereoisomer- and enantiomer-specific accumulation of HBCDDs in earthworms occurred when exposed to S-EPS. This study provides more evidence for the risk of microplastics to the soil ecosystem.

Li, C., et al. (2019). "Assessment of microplastics in freshwater systems: A review." Science of the Total Environment: 135578.

The reliance on plastic for a vast number of consumer products, many of them single-use, results in their continuous entry into aquatic environments. Plastic waste can fragment into smaller debris, some with a diameter < 5 mm (microplastics). Microplastics are of growing concern especially since 2014, however to date research on microplastic pollution has mainly focused on marine environments, partly because it has been mistakenly thought that sewage treatment plants could remove all plastic debris. To understand the impact of microplastic pollution in freshwater environments, an assessment of research on the sources, distribution and effects of microplastics, and trends in their analysis and policy has been carried out. Main sources of microplastic found in freshwater environments include synthetic textiles, personal care products, industrial raw materials and the improper disposal of plastic waste. Microplastic pollution is a global issue that presents with a broad range of concentration: for example, 3.5 x 10^³ microplastic units.L⁻¹ were reported in sediment of Lake Huron, in the US and as low as 1.2x10⁻⁴ units.L⁻¹ in countries with sparse population such as Mongolia. The main polymer constituents of microplastics found in freshwaters have been identified as polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyethylene terephthalate (PET), accounting for 70% of the total, each with a very similar frequency of occurrence. Despite microplastics being relatively inert, they are found to cause some effects in aquatic organisms. Future work should focus on monitoring microplastic pollution in regions from where there is currently scarce published data (e.g. South America, Africa and North Asia) and the study of their sources, stability, transport and effects to freshwater ecosystems. The establishment of standardized monitoring methods will allow for the comparison of data from different geographic areas. This information will inform measures to reduce the release and occurrence of microplastics in aquatic environments.

Li, C., et al. (2012). "Extraction of plasma from whole blood using a deposited microbead plug (DMBP) in a capillary-driven microfluidic device." Biomedical Microdevices **14**(3): 565-572.

We presented a depositedmicrobead plug (DMBP)- based microfluidic device capable of extracting plasma from whole blood by capillary forces. This device was fabricated by reversibly bonding a PDMS slab with a straight channel to a hydrophilic glass substrate. The DMBP was easily constructed at the inlet of the channel within 2 min by a method of natural deposition of microbeads without the need of weirs or photopolymerization. Capillary forces generated mainly on the hydrophilic glass substrate provided a driving force during the fabrication of the DMBP and plasma extraction, resulting in simplicity of operations. The DMBP only allows blood plasma to pass through but blocks blood cells, which was demonstrated experimentally using sheep blood. The DMBP enabled to remain in its initial configuration during plasma extraction. The high quality plasma was obtained without contamination of microbeads and blood cells. This easy-to-use, easy-to-integrate, disposable the DMBP-based microfluidic device has the potential to be integrated with on-chip bioanalytical units for the applications of point-of-care diagnostics ©Springer Science+Business Media, LLC 2012.

Li, C., et al. (2012). "A power-free deposited microbead plug-based microfluidic chip for whole-blood immunoassay." Microfluidics and Nanofluidics **12**(5): 829-834.

We present a deposited microbead plug (DMBP)-based microfluidic chip capable of performing plasma extraction and on-chip immunoassay. The DMBP used as a porous blood filter provides pure blood plasma without the contamination of blood cells or beads. Capillary- driven flow eliminates the requirement of external pumps. The human IgG and goat anti-human IgG sampleto- answer assay was performed in this chip within 600 s using only a 10 µl whole-blood sample. This easy-to-use, rapid, inexpensive, and disposable DMBP-based chip holds a great promise for point-of-care application. © Springer-Verlag 2011.

Li, C., et al. (2011). Simulation & prediction of pacific plastic pollution. Applied Mechanics and Materials. **50-51:** 890-895.

The Great Pacific Garbage Patch which characterized by exceptionally high concentrations of suspended plastic, chemical sludge, and other debris, has a variety of severe influence on the marine life and human beings. Therefore, cleaning up the patch immediately is a matter of great urgency. To solve the problem, three models which are based on different differential equations to predict the amount of waste plastic poured into the ocean are established. According to the basic model, in about next 20 years, the Pacific Ocean will be unable to hold more garbage. Based on the fact that salvaging the waste plastic in the ocean contributes to controlling marine pollution, in accordance with the better model, the Pacific Ocean still has the ability to accommodate garbage before 2060. By improving the better model, a series of results are obtained. Around 2060, the area of the Pacific Ocean Garbage Patch will reach relatively steady state; meanwhile, the annual emissions of the plastic will reach 32,397,273.47 tons. To keep a relatively stable state the area which should be cleaned up will reach about 3,601,672 square kilometers per year. To compare the effect of government increasing taxation and plastic salvaging, a conclusion is reached that the huge economic losses caused by taxes are far more than the amount of money spent in salvaging the plastic garbage. © (2011) Trans Tech Publications.

Li, F., et al. (2019). "Size effects of magnetic beads in circulating tumour cells magnetic capture based on streptavidin-biotin complexation." IET Nanobiotechnology IET **13**(1): 6-11.

Circulating tumour cells (CTCs) draw significant attention as a promising biomarker for cancer prognosis, status monitoring, and metastasis diagnosis. However, the concentration of CTCs in peripheral blood is usually extremely low, thereby requiring enrichment followed by isolation of CTCs prior to detection. An immunomagnetic separation is a promising tool for CTCs enrichment. In this study, a cost-effective magnetic separation method, based on streptavidin-biotin complexation, was developed and the effects of magnetic beads' size in CTCs capture were compared. Magnetic nanobeads which were 25 nm in diameter lead to highest capture efficiency (82.2%) compared with 150 nm magnetic beads and 1 micro m microbeads. Based on the streptavidin-biotin system, 25 nm magnetic nanobeads could capture model CTCs over 80% efficiency even at concentrations as low as ~25 cells/mL that may represent the actual level of CTCs in peripheral blood of cancer patients. Furthermore, the isolated cells remained robust and healthy showing insignificant changes in morphology and behaviour when cultured for 24 h immediately after capture and isolation. The magnetic nanobeads based on streptavidin-biotin complexation showed promise for the easy and efficient capture and isolation of healthy CTCs for further diagnosis and analysis.

Li, H., et al. (2011). "Hydrogel droplet microarrays with trapped antibody-functionalized beads for multiplexed protein analysis." Lab on a Chip **11**(3): 528-534.

Antibody microarrays are a powerful tool for rapid, multiplexed profiling of proteins. 3D microarray substrates have been developed to improve binding capacity, assay sensitivity, and mass transport, however, they often rely on photopolymers which are difficult to manufacture and have a small pore size that limits mass transport and demands long incubation time. Here, we present a novel 3D antibody microarray format based on the entrapment of antibody-coated microbeads within alginate droplets that were spotted onto a glass slide using an inkjet. Owing to the low concentration of alginate used, the gels were highly porous to proteins, and together with the 3D architecture helped enhance mass transport during the assays. The spotting parameters were optimized for the attachment of the alginate to the substrate. Beads with 0.2 micro m, 0.5 micro m and 1 micro m diameter were tested and 1 micro m beads were selected based on their superior retention within the hydrogel. The beads were found to be distributed within the entire volume of the gel droplet using confocal microscopy. The assay time and the concentration of beads in the gels were investigated for maximal binding signal using one-step immunoassays. As a proof of concept, six proteins including cytokines (TNFalpha, IL-8 and MIP/CCL4), breast cancer biomarkers (CEA and HER2) and one cancer-related protein (ENG) were profiled in multiplex using sandwich assays down to pg mL(-1) concentrations with 1 h incubation without agitation in both buffer solutions and 10% serum. These results illustrate the potential of beads-in-gel microarrays for highly sensitive and multiplexed protein analysis.

Li, H., et al. (2013). "Multiplex profiling of glycoproteins using novel bead-based lectin array." Glycoconjugate Journal **30 (4)**: 361.

Lectin array is becoming important in profiling targeted glycan/glycoprotein, but weak interaction between lectin and glycan causes low sensitivity of the approach. This study aims to develop a bead-based lectin array for improving the sensitivity of glycosylation profiling. Lectins are chemically coupled to fluorescent dye coated microbeads, and glycanlectin recognition is carried out three-dimensionally. The performance of this platform was evaluated, and the limit of detection of lectin Ricinus communis agglutinin 120 (RCA120) was 50 pg/mL (1 pM) of asialofetuin, providing the bead based lectin microarray with the highest sensitivity among the reported lectin microarrays. Furthermore, multiplexed assay was performed, which allowed the simultaneous detection of multiple carbohydrate epitopes in a single reaction vessel. The glycosylation patterns of hepatocellular carcinoma associated immunoglobulin G were analyzed, and increased (alpha-1, 6) core fucosylation and (alpha-2, 6) sialylation patterns were observed, which may provide significant clinical evidence for disease diagnosis.

Li, H. S., et al. (2005). "Characterization of endocytic vesicles using magnetic microbeads coated with signalling ligands." Traffic **6**(4): 324-334.

Iron microbeads coated with the protein ligands insulin and EGF (Fe-INS and Fe-EGF) were prepared. Examination of the traffic of these ligand-coated microbeads demonstrated their internalization via clathrin-coated vesicles. Using magnetic methods, we have purified vesicles derived from the endocytic pathway. Vesicles prepared by this method are essentially free of contamination with other endomembrane compartments. Examination of the vesicles derived from cells treated with Fe-INS beads demonstrated the presence of the components of the Ras/Erk cascade on their surface. We conclude that the coupling of the Erk-signalling cascade induced by insulin takes place on the surface of endocytic vesicles derived from the internalization of the insulin receptor.

Li, J., et al. (2018). "Microplastics in mussels sampled from coastal waters and supermarkets in the United Kingdom." Environmental Pollution **241**: 35-44.

Global contamination of the marine environment by plastic has led to the discovery of microplastics in a range of marine species, including those for human consumption. In this study, the presence of microplastics and other anthropogenic debris in seawater and mussels (Mytilus edulis) from coastal waters of the U.K., as well as supermarket sources, was investigated. These were detected in all samples from all sites with spatial differences observed. Seawater samples taken from 6 locations (in triplicates) displayed 3.5+/-2.0 debris items/L on average (range: 1.5-6.7 items/L). In wild mussels sampled from 8 locations around the U.K. coastal environment, the number of total debris items varied from 0.7 to 2.9 items/g of tissue and from 1.1 to 6.4 items/individual. For the supermarket bought mussels, the abundance of microplastics was significantly higher in pre-cooked mussels (1.4 items/g) compared with mussels supplied live (0.9 items/g). Micro-FT-IR spectroscopy was conducted on 136 randomly selected samples, with 94 items characterized. The spectra found that 50% of these debris items characterized were microplastic, with an additional 37% made up of rayon and cotton fibers. The microplastic levels detected in the supermarket bought mussels present a route for human exposure and suggests that their quantification be included as food safety management measures as well as for environmental monitoring health measures.

Li, J., et al. (2018). "Microplastics in freshwater systems: A review on occurrence, environmental effects, and methods for microplastics detection." Water Research **137**: 362-374.

The continuous increase in synthetic plastic production and poor management in plastic waste have led to a tremendous increase in the dumping into our aqueous environment. Consequently, microplastics commonly defined as sizes less than 5 mm are produced and stay in both seawater and freshwater environment. The presence of microplastics as a new type of emerging contaminant has become a great issue of concerns from public and government authorities. The sources of microplastics to freshwater systems are many with the largest portion from wastewater treatment plants. The abundance of microplastics varies with the location, from above 1 million pieces per cubic meter to less than 1 piece in 100 cubic meters. Microplastics can cause several harmful physical effects on humans and living organisms through such mechanisms as entanglement and ingestion. The microplastics can act as carriers of various toxins such as additives from industrial production processes and persistent contaminants by the sorption in waters. Those toxins may cause great health problems to humans. A few studies on the fishes demonstrated that the microplastics and the associated toxins are bio-accumulated and cause such problems as intestinal damage and change in metabolic profiles. In studies of microplastics, fresh water is first sampled by the nets with typical mesh size of 330 mum for collection of microplastics. After the volume reducing process, the samples will then go through the purification process including density separation by such inorganic salts as sodium chloride and digestion process by oxidizing agents or enzymes. The sequence of these two processes (namely purification and digestion) is dependent on the sample type. The purified samples can be studied by several analytical methods. The commonly used methods for the qualification studies are FTIR spectroscopy, Raman spectroscopy, pyrolysis-GC/MS, and liquid chromatography. A tagging method can be used in the quantification study. Our literature study finds that there is still no universal accepted quantification and qualification tools of microplastics in fresh waters. More work is anticipated so as to obtain accurate information on microplastics in freshwater, which can then be used for the better assessment of the environmental risk. Copyright © 2017 Elsevier Ltd

Li, J., et al. (2019). "Using mussel as a global bioindicator of coastal microplastic pollution." Environmental Pollution **244**: 522-533.

The ubiquity and high bioavailability of microplastics have an unknown risk on the marine environment. Biomonitoring should be used to investigate biotic impacts of microplastic exposure. While many studies have used mussels as indicators for marine microplastic pollution, a robust and clear justification for their selection as indicator species is still lacking. Here, we review published literature from field investigations and laboratory experiments on microplastics in mussels and critically discuss the suitability and challenges of mussels as bioindicator for microplastic pollution. Mussels are suitable bioindicator for microplastic pollution because of their wide distribution, vital ecological niches, susceptibility to microplastic uptake and close connection with marine predators and human health. Field investigations highlight a wide occurrence of microplastics in mussels from all over the world, yet their abundance varies enormously. Problematically, these studies are not comparable due to the lack of a standardized approach, as well as temporal and spatial variability. Interestingly, microplastic abundance in field-collected mussels is closely related to human activity, and there is evidence for a positive and quantitative correlation between microplastics in mussels and surrounding waters. Laboratory studies collectively demonstrate that mussels may be good model organisms in revealing microplastic uptake, accumulation and toxicity. Consequently, we propose the use of mussels as target species to monitor microplastics and call for a uniform, efficient and economical approach that is suitable for a future large-scale monitoring program.

Li, J., et al. (2016). "Microplastics in mussels along the coastal waters of China." Environmental Pollution **214**: 177-184.

Microplastic has been confirmed as an emerging pollutant in marine environments. One of the primary environmental risks of microplastics is their bioavailability for aquatic organisms. Bivalves are of particular interest because their extensive filter-feeding activity exposes them directly to microplastics present in the water column. In the present study, we investigated microplastic pollution in mussels (Mytilus edulis) from 22 sites along 12,400 mile coastlines of China in 2015. The number of total microplastics varied from 0.9 to 4.6 items/g and from 1.5 to 7.6 items/individual. M. edulis contained more microplastics (2.7 items/g) in wild groups than that (1.6 items/g) in farmed groups. The abundance of microplastics was 3.3 items/g in mussels from the areas with intensive human activities and significantly higher than that (1.6 items/g) with less human activities. The most common microplastics were fibers, followed by fragments. The proportion of microplastics less than 250 mum in size arranged from 17% to 79% of the total microplastics. Diatom was distinguished from microplastics in mussels for the first time using Scanning Electron Microscope. Our results suggested that the numbers of microplastic kept within a relatively narrow range in mussels and were closely related to the contamination of the environments. We proposed that mussels could be used as a potential bioindicator of microplastic pollution of the coastal environment.

Li, J., et al. (2019). "Focus topics on microplastics in soil: Analytical methods, occurrence, transport, and ecological risks." Environmental Pollution: 113570.

Microplastics with extremely high abundances are universally detected in marine and terrestrial systems. Microplastic pollution in the aquatic environment, especially in ocean, has become a hot topic and raised global attention. However, microplastics in soils has been largely overlooked. In this paper, the analytical methods, occurrence, transport, and potential ecological risks of microplastics in soil environments have been reviewed. Although several analytical methods have been established, a universal, efficient, faster, and low-cost analytical method is still not available. The absence of a suitable analytical method is one of the biggest obstacles to study microplastics in soils. Current data on abundance and distribution of microplastics in soils are still limited, and results obtained from different studies differ significantly. Once entering into surface soil, microplastics can migrate to deep soil through different processes, e.g. leaching, bioturbation, and farming activities. Presence of microplastics with high abundance in soils can alter fundamental properties of soils. But current conclusions on microplastics on soil organisms are still conflicting. Overall, research on microplastics pollution in soils is still in its infancy and there are gaps in the knowledge of microplastics pollution in soil environments. Many questions such as pollution level, ecological risks, transport behaviors and the control mechanisms are still unclear, which needs further systematical study.

Li, J., et al. (2015). "Tribo-charging properties of waste plastic granules in process of tribo-electrostatic separation." Waste Management **35**: 36-41.

Plastic products can be found everywhere in people's daily life. With the consistent growth of plastic consumption, more and more plastic waste is generated. Considering the stable chemical and physics characteristics of plastic, regular waste management methods are not suitable for recycling economic strategy of each government, which has become a serious environmental problem. Recycling plastic waste is considered to be the best way to treat it, because it cannot only deduce the waste but also save the energy to produce new virgin plastic. Tribo-electrostatic separation is strongly recommended for plastic separation as it can preserve the original properties of plastic and has little additional pollution. In this study, plastic granules are generated by crushing plastic waste in waste electric and electronic equipment. The tribo-charging properties of plastic waste were studied by vibrating tribo-charging and cyclone tribo-charging. The triboelectric series obtained by vibrating was: (-)-PE-PS-PC-PVC-ABS-PP-(+), while the triboelectric series obtained by cyclone was (-)-PE-PS-PC-PVC-ABS-PP-(+). Further, the cyclone charging was more effective and stable than vibrating charging. The impact factors experiments showed that small particle size was better changed than large ones and were more suitable recycled by tribo-electrostatic separation. High relative humidity was identified as impede charging effect. The results of this study will help defining the operating parameters of subsequent separator.

Li, J., et al. (2015). "Microplastics in commercial bivalves from China." Environmental Pollution **207**: 190-195.

We investigated microplastic pollution in 9 commercial bivalves from a fishery market in China. Multiple types of microplastics, including fibers, fragments and pellets, occurred in the tissue of all bivalves. The number of total microplastics varied from 2.1 to 10.5 items/g and from 4.3 to 57.2 items/individual for bivalves. Scapharca subcrenata contained on average 10.5 items/g and exhibited the highest levels of microplastics by weight. Fibers were the most common

microplastics and consisted of more than half of the total microplastics in each of the 8 species. In Alectryonella plicatula, pellets accounted for 60% of the total microplastics. The most common size class was less than 250 micro m and accounted for 33-84% of the total microplastics calculated by species. Our results suggest that microplastic pollution was widespread and exhibited a relatively high level in commercial bivalves from China. More intensive investigations on microplastics should be conducted in seafood.

Li, J., et al. (2018). "Characterization, source, and retention of microplastic in sandy beaches and mangrove wetlands of the Qinzhou Bay, China." Marine Pollution Bulletin **136**: 401.

Severe microplastic pollution from anthropogenic activities in coastal zones presents an imminent risk to marine ecosystems. In this study, abundant microplastics (15–12,852 items kg−1) with sizes ranging between 0.16 and 5.0 mm were extracted from 17 sediment samples collected in sandy beaches and mangrove wetlands of the Qinzhou Bay, Guangxi Province, Southwest China. Three types of microplastics (i.e. polystyrene, polypropylene, and polyethylene) were identified with Fourier transform infrared (FTIR) spectroscopy analysis. These detected microplastics were characterized by different colors (white, transparent, yellow, green, red, and blue) and shapes (fragment, fiber, and sphere). Microplastics were concentrated on supratidal beaches and wetlands outside of mangrove, and less abundant on intertidal beaches and inside of mangrove wetlands. Meanwhile, high microplastic concentrations were observed near mollusk farms. The spatial distribution and chemical speciation indicated that microplastics were derived from disintegration of large plastic debris (e.g., Styrofoam buoys used to support mollusk rafts) abandoned by aquaculture industry. Further, coastal vegetation (e.g. mangrove) could trap microplastic particles.

Li, J., et al. (2018). "Adsorption of antibiotics on microplastics." Environmental Pollution **237**: 460-467.

Microplastics and antibiotics are two classes of emerging contaminants with proposed negative impacts to aqueous ecosystems. Adsorption of antibiotics on microplastics may result in their long-range transport and may cause compound combination effects. In this study, we investigated the adsorption of 5 antibiotics [sulfadiazine (SDZ), amoxicillin (AMX), tetracycline (TC), ciprofloxacin (CIP), and trimethoprim (TMP)] on 5 types of microplastics [polyethylene (PE), polystyrene (PS), polypropylene (PP), polyamide (PA), and polyvinyl chloride (PVC)] in the freshwater and seawater systems. Scanning Electron Microscope (SEM) and X-ray diffractometer (XRD) analysis revealed that microplastics have different surface characterizes and various degrees of crystalline. Adsorption isotherms demonstrated that PA had the strongest adsorption capacity for antibiotics with distribution coefficient (K<inf>d</inf>) values ranged from 7.36 +/- 0.257 to 756 +/- 48.0 L kg⁻¹ in the freshwater system, which can be attributed to its porous structure and hydrogen bonding. Relatively low adsorption capacity was observed on other four microplastics. The adsorption amounts of 5 antibiotics on PS, PE, PP, and PVC decreased in the order of CIP > AMX > TMP > SDZ > TC with K<inf>f</inf> correlated positively with octanol-water partition coefficients (Log K<inf>ow</inf>). Comparing to freshwater system, adsorption capacity in seawater decreased significantly and no adsorption was observed for CIP and AMX. Our results indicated that commonly observed polyamide particles can serve as a carrier of antibiotics in the aquatic environment. Copyright © 2018 Elsevier Ltd

Li, J., et al. (2009). "Stimulation of specific cytokines in human conjunctival epithelial cells by defensins HNP1, HBD2, and HBD3." Investigative Ophthalmology & Visual Science **50**(2): 644-653.

PURPOSE: To investigate the effect of human defensins HNP1, HBD2, and HBD3 on human conjunctival epithelial cell cytokine secretion.

METHODS: HNP1, HBD2, and HBD3 were used to test cytotoxicity (1-50 microg/mL) and to stimulate (1-20 microg/mL) primary cultured and immortalized human conjunctival epithelial (IOBA-NHC) cells. Cytokine concentrations in the culture medium were measured by cytokine array and a multiplexed microbead analysis. Protein kinase activation was determined by Western blot analysis after defensin stimulation and with specific inhibitors.

RESULTS: HBD3, but not HNP1 or HBD2, killed more than 50% of IOBA-NHC cells at concentrations greater than 12.5 microg/mL. Only IL-6, IL-8, and RANTES were detected in the culture medium in the absence of defensins. All three cytokines increased in the presence of HNP1, HBD2, and HBD3 at concentrations of 5 to 20 microg/mL and between 2 and 8 hours and further accumulated at 24 hours Stimulation with HBD2 and HBD3 increased the secretion of IL-2 and MIP-1beta in IOBA-NHC cells but only of MIP-1beta in primary cultured cells. Activation of p42/44 mitogen-activated protein (MAP) kinase, Akt, and STAT3 was observed in primary and IOBA-NHC cells after defensin stimulation. Cytokine secretion was significantly decreased by the inhibition of p42/44 MAPK in IOBA-NHC cells.

CONCLUSIONS: HNP and HBD selectively increase the secretion of specific proinflammatory cytokines in conjunctival epithelial cells in a time- and concentration-dependent manner, suggesting a supporting role to the innate immune system of the ocular surface.

Li, K. C., et al. (2014). "Melting analysis on microbeads in rapid temperature-gradient inside microchannels for single nucleotide polymorphisms detection." Biomicrofluidics **8**(6): 064109.

A continuous-flow microchip with a temperature gradient in microchannels was utilized to demonstrate spatial melting analysis on microbeads for clinical Single Nucleotide Polymorphisms (SNPs) genotyping on animal genomic DNA. The chip had embedded heaters and thermometers, which created a rapid and yet stable temperature gradient between 60 degreeC and 85 degreeC in a short distance as the detection region. The microbeads, which served as mobile supports carrying the target DNA and fluorescent dye, were transported across the temperature gradient. As the surrounding temperature increased, the fluorescence signals of the microbeads decayed with this relationship being acquired as the melting curve. Fast DNA denaturation, as a result of the improved heat transfer and thermal stability due to scaling, was also confirmed. Further, each individual microbead could potentially bear different sequences and pass through the detection region, one by one, for a series of melting analysis, with multiplex, high-throughput capability being possible. A prototype was tested with target DNA samples in different genotypes (i.e., wild and mutant types) with a SNP location from Landrace sows. The melting temperatures were obtained and compared to the ones using a traditional tube-based approach. The results showed similar levels of SNP discrimination, validating our proposed technique for scanning homozygotes and heterozygotes to distinguish single base changes for disease research, drug development, medical diagnostics, agriculture, and animal production.

Li, L. (2009). Differentiation of embryonic stem cells into neural lineages in an alginate encapsulation microenvironment.

Cell replacement therapies, using renewable stem cell sources, hold tremendous potential to treat a wide range of degenerative diseases. Although many studies have established techniques to successfully differentiate stem cells into different mature cell lineages using growth factors or extracellular matrix protein supplementation in both two and three-dimensional configurations, their practicality is limited by lack of control, low yields of differentiated cells and oftentimes, heterogeneous cell population outcomes. In order to address these issues, we have previously established a murine embryonic stem cell alginate-poly-l-lysine microencapsulation

differentiation system. The three-dimensional alginate microenvironment maintains cell viability, is conducive to ES cell differentiation to hepatocyte lineage cells, and sustains differentiated cellular function. In addition, hepatocyte function was contingent upon aggregate formation within the alginate microbeads. The present studies were designed to determine the feasibility of adapting the alginate encapsulation technique to neuronal lineage differentiation. The results of our studies indicate that by incorporating the soluble inducer, retinoic acid into the permeable microcapsule system, cell aggregation was decreased and neuronal lineage differentiation enhanced. In conjunction with the mechanical and physical characterization of the alginate crosslinking network, we have determined that 2.2% alginate microencapsulation can be optimally adapted to both hepatocyte and neuronal differentiation from embryonic stem cells. However, differentiation could be directed away from the hepatocyte and towards the neural lineage by lowering initial seeding density and physical cell-cell aggregation blocking, even in the absence of RA. This study promises to offer insights into targeting cellular differentiation towards both endodermal and ectodermal cell lineages, and could potentially be generalizable and adaptable to the differentiation of other stem cell types given the correct inducible factors and material properties.

Li, L., et al. (2011). "Neural lineage differentiation of embryonic stem cells within alginate microbeads." Biomaterials **32**(20): 4489-4497.

Cell replacement therapies, using renewable stem cell sources, hold tremendous potential to treat a wide range of degenerative diseases. Although many studies have established techniques to successfully differentiate stem cells into different mature cell lineages using growth factors or extracellular matrix protein supplementation in both two and three-dimensional configurations, they are often limited by lack of control and low yields of differentiated cells. Previously, we developed a scalable murine embryonic stem cell differentiation environment which maintained cell viability and supported ES cell differentiation to hepatocyte lineage cells. Differentiated hepatocyte function was contingent upon aggregate formation within the alginate microbeads. The present studies were designed to determine the feasibility of adapting the alginate encapsulation technique to neural lineage differentiation. The results of our studies indicate that by incorporating the soluble inducer, retinoic acid (RA), into the permeable microcapsule system, cell aggregation was decreased and neural lineage differentiation enhanced. In addition, we demonstrated that even in the absence of RA, differentiation could be directed away from the hepatocyte and toward the neural lineage by physical cell-cell aggregation blocking. In conjunction with the mechanical and physical characterization of the alginate crosslinking network, we determined that 2.2% alginate microencapsulation can be optimally adapted to ES neural differentiation. This study offers insights into targeting cellular differentiation toward both endodermal and ectodermal cell lineages, and could potentially be adaptable to differentiation of other stem cell types given the correct inducible factors and material properties. © 2011 Elsevier Ltd.

Li, L., et al. (2020). "Effect of microplastic on anaerobic digestion of wasted activated sludge." Chemosphere **247**: 125874.

Over 90% of microplastics that enter wastewater treatment plants end in the wasted activated sludge. The effect of microplastic abundance on the activated sludge anaerobic digestion has been rarely reported. This study investigated the methane production performance during anaerobic digestion with different abundance of microplastic doses (0, 1,000, 3,000, 6,000, 10,000, 30,000, 60,000, 100,000 and 200,000 polyester particle/kg activated sludge). The methane production was reduced to 88.53 +/- 0.5%, 90.09 +/- 1.2%, 89.95 +/- 4.7%, 95.08 +/-

0.5%, 90.29 +/- 0.5%, 93.16 +/- 0.8%, 92.92 +/- 1.3%, and 92.72 +/- 0.6% as compared with control after digestion for 59 days. The methane production of all conditions was fitted with the logarithm model (R² > 0.95) and one-substrate model (R² > 0.99). The predicted and actual methane production values of digestion for 59 days had high correlation in all conditions with R² > 0.95. The analysis based on the biochemical methane potential test model indicated that the methane production potential (B₀) and hydrolysis coefficient (k) decreased at nearly all tested conditions. The reactor digestate with microplastics retained higher organic matter and nutrient concentration and had slightly lower dewaterability than the control. The inhibition of methane production potential could be attributed to the incomplete digestion with the existence of microplastics. The microbial community showed no significant difference with and without microplastics.

Li, L., et al. (2019). "Microplastics contamination in different trophic state lakes along the middle and lower reaches of Yangtze River Basin." Environmental Pollution **254**(Pt A): 112951.

Microplastics can enter freshwater lakes through many sources. They can act as carriers to adsorb bacteria, virus, or pollutants (e.g., heavy metal and toxic organic compounds) that threaten human health through food chain. Microplastics can exist in surface water and sediments in freshwater lakes after they enter the lakes through discharge points. Wastewater discharge is the main cause of lake eutrophication and is the main emission source of microplastics. The correlation between lake trophic state and microplastic abundance has been rarely reported. This study investigated the microplastic contamination in surface water and sediments of 18 lakes along the middle and lower reaches of the Yangtze River Basin in the period of August-September 2018. The correlation between lake trophic state and microplastic abundance in surface water and sediments was investigated and discussed. The microplastic abundance in surface water was approximately two orders of magnitude lower than that in sediments in all 18 lakes. Hong Lake had the highest microplastic abundance in surface water sample, and Nantaizi Lake had the highest microplastic abundance in sediment sample. The dominant microplastic shape was fiber of 93.81% in surface water sample and 94.77% in sediment sample. Blue-colored microplastics were dominant in nearly all lakes in surface water sample (around 40%-60%) and sediment sample (around 60%-80%), followed by purple- and green-colored ones. The microplastics size <1mm was dominant in surface water sample (around 40%-60%) and sediment sample (around 50%-80%). The dominant material was polypropylene in surface water sample (around 60%-80%) and sediment sample (around 40%-60%).

Li, L., et al. (2020). "Performance evaluation of MBR in treating microplastics polyvinylchloride contaminated polluted surface water." Marine Pollution Bulletin **150**: 110724.

The microplastics removal and its effects on membrane fouling in membrane bioreactor (MBR) for treating polluted surface water in drinking purpose was investigated in this study. Typical microplastics polyvinylchloride (PVC) with concentration 10 particles/L was added in the feed water. MBR was effective in treating organic matters and ammonia with removal rate over 80% and 95%, respectively. The removal performance was immediately inhibited with the microplastics PVC added into the MBR system, and recovered after operated for few days. The membrane fouling and cleaning results indicated that microplastics contamination could led to higher membrane fouling, and also the irreversible membrane fouling. The main contributor of rejection is the membrane module and the adsorption onto bio-carrier. The microbial community of the system before and after PVC addition did not show obvious difference. MBR has the potential to be used as effective technology in treating microplastics contaminated

polluted surface water.

Li, L., et al. (2008). "Enhancement of thermal stability of poly(divinylbenzene) microspheres." Materials Letters **62**(2): 179-182.

In order to enhance the thermal stability and prepare a new kind of carbon microbeads from poly(divinylbenzene) microspheres (PDM), air oxidation treatment was introduced to modify the pristine PDM. The results showed that the spherical shape of PDM was preserved via the air oxidation and further carbonization at 700 super(o)C. The changes of morphology, especially the surface functional groups and the thermal properties of PDM after air oxidation were investigated in detail by SEM, IR and TG/DSC measurements, respectively. The possible mechanism of oxidation treatment was elucidated.

Li, L., et al. (2019). "Effect evaluation of microplastics on activated sludge nitrification and denitrification." Science of the Total Environment **707**: 135953.

A large amount of microplastics have entered conventional wastewater treatment plants, and their effects on activated sludge nitrification and denitrification are rarely reported. This study investigated the effects of microplastics on activated sludge nitrification and denitrification using five typical microplastics, namely, polyvinyl chloride (PVC), polypropylene, polyethylene, polystyrene, and polyester (PES) with concentrations of 0, 1000, 5000, and 10,000 particles/L.

Li, L., et al. (2019). "The uptake of microfibers by freshwater Asian clams (Corbicula fluminea) varies based upon physicochemical properties." Chemosphere **221**: 107-114.

Microplastic is an umbrella term that covers particles with various physical and chemical properties. However, microplastics with a consistent shape, polymer type and size are generally used in exposure studies (e.g., spherical polyethylene or polystyrene beads 1-100 micro m in size). In the present study, we exposed freshwater Asian clams (Corbicula fluminea) to microfibers with different physicochemical properties at concentrations of 100 and 1000 fibers/L. The first experiment in this study exposed clams to microfibers made from six different polymers, demonstrating that Asian clams uptake more polyester (PET) (4.1 items/g) relevant to other polymers. The next experiment exposed clams to PET fibers of different size classes, demonstrating that uptake in the size range 100-250 micro m (1.7 items/g) was greater than other size classes. These results suggest that physicochemical properties such as polymer and size play important roles in the uptake of microfibers by organisms. Thus, we strongly suggest that the properties of microplastics used in future laboratory exposure experiments be considered, with the aim of being "environmentally relevant", i.e., similar to what is found in nature.

Li, L., et al. (2019). "Uptake and accumulation of microplastics in an edible plant." Kexue Tongbao/Chinese Science Bulletin **64**(9): 928-934.

Microplastic (MP, 100 nm-5 mm) may present an attributable risk to ecosystem and human health, and its pollution has become a global environmental concern. Despite a wealth of information on the accumulation of MPs in aquatic species, there is no information on the uptake and accumulation of MPs by higher plants. Terrestrial edible plants are directly exposed to MPs when agricultural soil was applied with organic manure, sewage sludge as fertilizer or plastic mulching. In this paper, the uptake of two sizes of polystyrene (PS) microbeads (0.2 and 1.0 µm) and then their distribution and migration in an edible plant lettuce were firstly investigated based on laboratory experiments. We used fluorescent markers to track PS microbeads in plant tissues and found fluorescence to be a sensitive and reliable detection method. Sections from untreated control lettuce showed no autofluorescence. When roots were treated with fluorescently labeled PS microbeads, the microbeads could be identified by its fluorescence. Our main study investigated the uptake of 0.2 μm beads, as few luminescence signals were observed in lettuce roots for 1.0 μm beads in our experiment. We observed that 0.2 μm fluorescent microbeads were extracellularly trapped in the root cap mucilage (which is a highly hydrated polysaccharide) and a "dark green tip" (which was typical of lettuce roots exposed to label PS beads) was usually visible to the naked eye. Confocal images revealed that the PS luminescence signals were mainly located in the vascular system and on the cell walls of the cortex tissue of the roots, indicated that the beads passed through the intercellular space via the apoplastic transport system. Once inside the central cylinder, the 0.2 μm PS beads were transferred from the roots to the stems and leaves via the vascular system following the transpiration stream. We also observed that the PS beads adhered to one another and self-assembled systematically into "grape-like" and "(chain) string-like" clusters in the intercellular space of the root and stem vascular tissue of lettuce plant. In contrast to the root and stem, PS beads were dispersed in the leaf tissue. Here, for the first time we provide evidence of the adherence, uptake, accumulation, and translocation of submicrometer MPs within an edible plant. Our findings highlight the previously underappreciated human exposure pathway to MPs through the consumption of contaminated crops and emphasize the need for new management strategies to control the release of MPs waste products into the terrestrial environment. Ultimately, the potential impacts of low range sized MPs on food safety of crop plants and human health need to be urgently considered. © 2019, Science Press. All right reserved.

Li, M., et al. (2010). "Blockage of TRAF6 by dominant negative peptides to inhibit multiple myeloma (MM) cell proliferation and osteoclast formation through NF-kappaB, JNK and Akt signal transduction pathways." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

Several members of the tumor necrosis factor receptor-associated factor (TRAF) family, including TRAF1, TRAF2, TRAF3, TRAF5, and TRAF6 have been implicated in regulating signal transduction from various TRAF family members. However, the unique biological function of TRAF6 is largely determined by its TRAF-C domain, which does not interact with peptide motifs that are recognized by TRAF1, -2, -3 or -5. We have reported inhibition of MM cell proliferation and increase of apoptosis through regulation of the NF-kappaB and JNK pathways through silencing TRAF6 C-domain mRNA and the dominant negative peptide expression vector (Chen H. et al, Oncogene, 2006; Li M. et al, Blood 2009). TRAF6 have been recently found as a ligase for Akt ubiquitination (Yang WL et al, Science, 2009). Akt signaling plays a central role in many biological functions, such as cell proliferation and apoptosis. In this study, we first investigated whether TRAF6 is over-expressed in MM tumor cells. Twelve MM fresh bone marrow (BM) aspirates derived from MM patients were assessed using Western blot analysis and immunohistochemical staining with anti-TRAF6 antibody. We found that TRAF6 protein was highly expressed in tumor cells from MM patients compared to normal human BM samples. Based on TRAF6, CD40, and RANKL sequences and crystal structures, we targeted the TRAF6 C-domain binding residues. We found that TRAF6 dominant negative binding peptide (TRAF6dn) significantly inhibited MM cell proliferation maximally at 72 hours using the MTS cell proliferation assay whereas effects on inducing MM cell apoptosis were most prominent at 48 hours as assessed with Annexin V staining with flow cytometric analysis. The decrease in cell proliferation and increase in cell apoptosis occurred in a concentration peptide-dependent fashion. Furthermore, phosphorylation of both AKT and NF-kappaB were also reduced using our

human TRAF6dn or decoy peptides. We also examined the effect of the TRAF6dn peptide on the JNK pathway since this signaling pathway is also associated with cell cycle effects in MM. We measured JUN kinase kinase (JNKK), which activates the MAP kinase homologues SAPK and JNK in response to IL-1 receptor stimulation. The results showed that the phosphorylation of JNKK is markedly reduced after treatment with the TRAF6dn peptide. Furthermore, we examined c-Jun, a component of the transcription factor complex AP-1, which binds and activates transcription at TRE/AP-1 elements. We evaluated the effect of TRAF6dn peptide on osteoclast formation using cells from human monocytes isolated by anti-CD14 micro-bead affinity column from MM patients' BM or peripheral blood mononuclear cells. The monocytes were cultured on slide-culture dishes (2 x 10⁵ cells/well).We found TRAF6dn markedly inhibited osteoclast cell formation from monocytes induced with RANKL and mCSF in a concentration-dependent fashion compared with a control group using tartrate resistant acid phosphatase staining. We further assessed whether TRAF6dn can reduce bone resorption using a dentin bone resorption assay. BM-derived monocytes were isolated as above and were cultured on dentin bone slides (4 x 10⁵ cells/slide). The cells treated with a TRAF6dn peptide or the control peptide, were incubated with 50ng/ml RANKL and 10ng/ml MCSF. All cells were cultured for 21 days. It was found that TRAF6dn significantly inhibited lacunar resorption in a concentration-dependent fashion. These studies suggest that TRAF6 is over-expressed in MM and our TRAF6dn peptide inhibits many signaling pathways critical to the growth of MM and formation of osteoclasts resulting in marked anti-MM effects and reduction in osteoclast formation resulting in marked inhibition of bone resorption. Thus, this novel approach may offer a new therapeutic approach to both treat multiple myeloma and reduce the clinical consequences resulting from enhanced bone loss that commonly occur in these patients.

Li, N., et al. (2010). "Expression level of toll-like receptors and the prognosis of chronic severe hepatitis B." Hepatology International **4 (1)**: 127.

Background: Toll-like receptors (TLRs) play key roles in innate immunity, and are expressed abundantly in dendritic cells. Although TLR has been involved in chronic hepatitis B virus (HBV) infection, its role in HBV-related chronic severe hepatitis (CSHB) is still largely unknown. This study aims to investigate the expression of TLR in monocyte derived dendritic cells (MoDC) from CSHB, to assess the contribution of TLRs in CSHB. Method(s): Peripheral blood was collected from 40 CSHB patients, 30 healthy subjects are as normal controls (NCs). Purified monocytes were isolated by combination of Histopaque-1.077 and CD14 Microbeads. MoDCs were induced with GM-CSF and IL-4 for 6 days from CD14⁺ monocytes. The expression of TLRs in MoDC were measured by Real-time PCR and FACS. Result(s): The expression of TLR1, -2, -7 were significantly higher in MoDC of CSHB than NCs, while decreased level of TLR3 in CSHB patients compared to NCs. We further found that TLR2 was significantly downregulated in CSHB patients with HBeAg⁺ compared to HBeAg⁻. TLR3 level was significantly decreased in nonsurvival patients with CSHB compared to survival, while TLR2 expression was dramatically increased in nonsurvival patients with CSHB. Further linear correlation analysis demonstrated significant correlations between TLR3 level and disease severity markers (total bilirubin, prothrombin activity, creatinine, the count of white blood cells, and maximum depth of ascites) for individual CSHB patients. Conclusion(s): TLR2 and TLR3 may be involved in the pathogenesis of CSHB, and TLR3 may influence on the prognosis of CSHB.

Li, N., et al. (2011). "Correlation of the expression of toll-like receptors in monocyte-derived dendritic cells with prognosis of chronic severe hepatitis B." Journal of Digestive Diseases **12**(2): 117-124.

OBJECTIVE: This study aims to measure the expression of toll-like receptors (TLR) in monocyte-derived dendritic cells (MoDC) from chronic severe hepatitis B (CSHB), to assess the contribution of TLRs in CSHB.

METHODS: Peripheral blood was collected from 40 CSHB patients, 30 chronic hepatitis B (CHB) patients, and 30 healthy individuals who served as healthy controls (HCs). Purified monocytes were isolated by a combination of Histopaque-1.077 and CD14 Microbeads. MoDCs were induced with granulocyte macrophage colony-stimulating factor and interleukin-4 for 6 days from CD14(+) monocytes. The expression of TLRs in MoDC was measured using real-time PCR and flow cytometry.

RESULTS: The expressions of TLR-1, -2, -7 were significantly higher in MoDC of CSHB than that of HCs, of which the level of TLR-3 was decreased. Particularly in CSHB patients, the TLR-3 expression was further decreased compared to CHB patients. In non-survival CSHB patients, TLR-3 level was significantly decreased, while TLR-2 expression was dramatically increased. Linear correlation analysis demonstrated significant correlations between TLR-3 level and disease severity markers (total bilirubin, prothrombin activity, creatinine, white blood cell count, and maximum volume of ascitic fluid) in individual CSHB patients.

CONCLUSIONS: TLR-2 and TLR-3 may be involved in the pathogenesis of CSHB, and TLR-3 may influence the prognosis of CSHB.

Li, P., et al. (2006). "Application of MTS in tumour cell proliferation prohibition studies in loading environment controlled by magnetic microbeads." Journal of Southwest Agricultural University **28**(4): 566-568.

Three methods of cell proliferating measurement were compared with samples of hepatocellular carcinoma (SMCC-7721). The method using trypan blue was not efficient for large samples and was more incidental in error calculation because of similar shapes of microbeads. As the colorimetric reagent of MTT [3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyl-tetrazolium bromide, SIGMA] was not water soluble, it was difficult to control the uniformity in isopropyl alcohol, which might get the result far from the veracity. Floating of microbeads by violent mixture in the solution also affected the veracity. In comparison, MTS [3-(4,5-dimethylthiazol-2-yl)-5(3-carboxymethoxyphenyl)-2-(4-sulopheny)-2H-tetraolium, innersalt] was not only more efficient in cell proliferation study in this loading environment by anti-jamming the effect of microbeads, it also had higher reliability, which showed no observable difference from the traditional method of trypan blue.

Li, P., et al. (2019). "CD4+CD25+ Regulatory T Cells Decreased CD8+IL-4+Cells in a Mouse Model of Allergic Asthma." Iranian Journal of Allergy Asthma & Immunology **18**(4): 369-378.

Interleukin (IL)-4-producing-CD8 (cytotoxic T cells, Tc) contribute to lung eosinophilia and airway hyper-responsiveness (AHR) to an antigen. CD4+CD25+ regulatory T cells (Tregs) attenuate airway inflammation and AHR. This study investigated whether Tregs decrease Tc2frequencies in ovalbumin (OVA)-induced asthma model of mice. Female C57BL/6 mice were sensitized with OVA intraperitoneally and challenged with OVA intranasally to induce allergic asthma model. Tregs were sorted by fluorescence activated cell sorting (FACS) and magnetic activated cell sorting (MACS) microbeads. OVA-sensitized mice were injected with Tregs or phosphate buffer saline (PBS) by tail vein ahead of the first challenge. Airway inflammation and airway hyper-responsiveness (AHR)were evaluated by histological analysis and invasive method, respectively. OVA-specific IgE and cytokine levels were detected by ELISA. Flow cytometry was used to detect the percentages of Tc1 and Tc2. Gata3 and T-bet mRNA was determined by quantitative PCR (qPCR). OVA-sensitized and challenged mice displayed typical asthma features, which included eosinophilic airway inflammation, higher levels of Th2 cytokines and AHR. Gata3 mRNA, Tc2 frequencies and OVA-specific IgE levels were significantly increased in OVA-sensitized and challenged mice. Compared to PBS treatment, Tregs decreased Tc2 frequencies, airway inflammation, Th2 cytokine levels and AHR in OVA-sensitized and challenged mice. IL-13 levels were negatively correlated with Tc1 frequencies and with IFNg levels in experimental mice. Our results demonstrated that Tregs could prevent airway inflammation and AHR by decreasing Tc2 frequencies and cytokine levels in OVA-induced asthma model of mice, supporting Tregmight be as a potent therapeutic target for alleviating airway inflammation and AHR.

Li, P., et al. (2017). "Encapsulation of Autoinducer Sensing Reporter Bacteria in Reinforced Alginate-Based Microbeads." Acs Applied Materials & Interfaces **9**(27): 22321-22331.

Quorum sensing, in which bacteria communities use signaling molecules for inter- and intracellular communication, has been intensively studied in recent decades. In order to fabricate highly sensitive easy-to-handle point of care biosensors that detect quorum sensing molecules, we have developed, as is reported here, reporter bacteria loaded alginate-methacrylate (alginate-MA) hydrogel beads. The alginate-MA beads, which were obtained by electrostatic extrusion, were reinforced by photo-cross-linking to increase stability and thereby to reduce bacteria leaching. In these beads the genetically engineered fluorescent reporter bacterium Escherichia coli pTetR-LasR-pLuxR-GFP (E. coli pLuxR-GFP) was encapsulated, which responds to the autoinducer N-(3-oxododecanoyl)homoserine lactone secreted by Pseudomonas aeruginosa. After encapsulation in alginate-MA hydrogel beads with diameters in the range of 100-300 mum that were produced by an electrostatic extrusion method and rapid photo-cross-linking, the E. coli pLuxR-GFP were found to possess a high degree of viability and sensing activity. The encapsulated bacteria could proliferate inside the hydrogel beads, when exposed to bacteria culture medium. In media containing the autoinducer N-(3-oxododecanoyl)homoserine lactone, the encapsulated reporter bacteria responded with a strong fluorescence signal due to an increased green fluorescent protein (GFP) expression. A prototype dipstick type sensor developed here underlines the potential of encapsulation of viable and functional reporter bacteria inside reinforced alginate-methacrylate hydrogel beads for whole cell sensors for bacteria detection.

Li, P., et al. (2020). "A preliminary study of the interactions between microplastics and citrate-coated silver nanoparticles in aquatic environments." Journal of Hazardous Materials **385**: 121601.

Microplastics and silver nanoparticles (AgNPs) are considered two emerging environmental contaminants that have adverse effects on aquatic environments. Knowledge on the interactions between AgNPs and microplastics may improve our understanding of these pollutants, posing to surrounding environments and public health. However, current knowledge regarding this issue is limited. Here, we investigate, for the first time, the interactions between AgNPs and the microplastics polyethylene (PE), polypropylene (PP), and polystyrene (PS) in aquatic environments.

Li, Q. and M. Prince (2015). "Evaluation of the immunogenicity of aldhhigh human head and neck squamous cell carcinoma cancer stem cells in vitro." Journal for ImmunoTherapy of Cancer. Conference: 30th Annual Scientific Meeting of the Society for Immunotherapy of Cancer, SITC **3**(SUPPL. 2).

Background: Using mouse models we reported that dendritic cells (DC) pulsed with cancer stem cells (CSC) enriched by virtue of their expression of the CSC marker aldehyde dehydrogenase (ALDH) significantly reduced development of pulmonary metastases and prolonged survival. In this recent study, we established the concept that the antigenicity/ immunogenicity of

ALDH^{high} human head and neck squamous cell carcinoma (HNSCC) cancer stem cells is distinct from that of ALDH^{low} non-CSCs. Method(s): Patients with HNSCC enrolled in the University of Michigan Special Project of Research Excellence (SPORE) were recruited to collect tumor and peripheral blood samples. T or B cells were purified from the PBMCs using anti-CD3-coupled or anti-CD19-coupled microbeads respectively with a MACS separator. Primary tumor samples were digested and collected. ALDEFLUOR+/ALDH^{high} or ALDEFLUOR-/ALDH^{low} cells were isolated from tumor cells. ALDH^{low} lysate-pulsed DCs (ALDH^{low} -DC) or ALDH^{high} lysate-pulsed DCs (ALDH^{high}-DC, e.g. CSC-DC) were used as vaccines. To detect T and B cells in PBMCs, PBMCs were stained with PerCP mouse anti-human CD3 and FITC mouse anti-human CD19. Before sensitization in vitro, T or B cells were activated respectively with immobilized anti-human CD3 and anti-human CD28 in complete medium (CM) containing hrIL-2 or lipopolysaccharide plus anti-human CD45. Statistical analyses were performed to compare various interactions of the DC vaccine-primed/sensitized T, B cells with autologous ALDH^{high} CSC vs. ALDH^{low} HNSCC target cells. Result(s): DCs generated from the PBMC and pulsed with the lysate of ALDH^{high} cells isolated from cultured HNSCC cells (CSC-DC) could sensitize autologous T, B lymphocytes in vitro, which was evident by cytokine production, CTL activity, and antibody secretion of these primed T, B cells in response to ALDH^{high} CSCs. In contrast, DCs pulsed with lysate of ALDH^{low} cells from the same HNSCC patient (ALDH^{low}-DC) resulted in limited sensitization/priming of autologous T, B lymphocytes to produce IFNgamma, lyse CSCs, and secrete IgM and IgG in response to ALDH^{high} CSCs. Conclusion(s): These results demonstrated significant differences in the antigenicity/immunogenicity between ALDH^{high} CSCs vs. ALDH^{low} cells isolated from the tumor specimen of patients with HNSCC, which indicates the existence of unique CSC antigens in the ALDH^{high} population. In addition, this study demonstrates that it is feasible to generate DCs from the PBMCs and isolate ALDH^{high} CSCs from tumor cells of the patients with HNSCC to prepare CSC-DC vaccines for clinical application.

Li, Q., et al. (2019). "Fusion of microplastics into the mussel byssus." Environmental Pollution **252**(Part A): 420-426.

Microplastics have been found to adhere to the surface of specific tissues or organs other than being ingested by the organisms. To further test the hypothesis that microplastics might get into specific body parts of organisms, mussel byssus was chosen as a target subject in the present study. In the field investigation, microplastics were found in mussel byssus, and the abundance of microplastics was 0.85-1.02 items/individual mussel and 3.69-9.16 items/g byssus, but the location of microplastics in byssus was not easily determined. Therefore, we simulated environmental conditions in the laboratory for mussels to form fresh byssus in the presence of microplastics. Three types of man-made microplastics (Polystyrene beads, Polyamide fragments, and Polyester fibers) were found in newly formed byssus of mussels after exposure to these test materials. We observed that microplastics not only adhered to the surface but also fused into the byssus of mussels. Since byssus is important for the well-being of mussels, the incorporation of microplastics into the byssus might impair the function of byssus. To the authors' best knowledge, this is the first study to show that microplastics can contact and fuse with the byssus of mussels during their formation, suggesting possible alternations for mussels to grip and interact with microplastics in the aquatic environments.

Li, Q., et al. (2019). "Separation and identification of microplastics from soil and sewage sludge."

Environmental Pollution **254**(Pt B): 113076.

Soil and sludge are important pools for microplastics (MPs), however standard separation methods for MPs from these pools are still missing. We tested the widely used methods for MPs extraction from water and sediment to six agriculture surface soils and three sewage sludges from municipal wastewater treatment plants and included an additional pre-digestion procedure with 30% H₂O₂ before floatation to remove soil or sludge organic matter (OM). Extraction efficiency of MPs were evaluated under different separation conditions, including floatation solution (NaCl, ZnCl₂, and NaI), filtration membrane, and oxidation solution.

Li, Q.-T., et al. (2010). "Human Health Risk Assessment on Contaminants in Recycled Plastic Bags Packaged Foods." Huanjing Kexue yu Jishu / Environmental Science & Technology **33**(11): 181-185.

Recycled plastic bags which are made from plastic waste contain many toxic and hazardous substances. However, because of its cheapness, the recycled plastic bags occupy large market share. Two kinds of simulated tests were designed, and amount of harmful substances moved from different colors of recycled plastic bags to food stimulants under certain conditions were designed. To make use of health risk assessment framework of EPA, health risks of human body was done for recycled plastic bags to package food. Based on assessment results, total carcinogenic risk and non-carcinogenic risk values of blue, yellow and white bags are less than 1, showing that the hazardous substances will not produce a significant hazard on human health. But the risk assessment of black and red plastic bags, risk values of Pb both exceed the critical value 1, showing that hazardous substances of black and red recycled plastic bags arouse a non-carcinogenic health risk to human body.

Li, R., et al. (2019). "Fluorometric lateral flow immunoassay for simultaneous determination of three mycotoxins (aflatoxin B₁, zearalenone and deoxynivalenol) using quantum dot microbeads." Mikrochimica Acta **186**(12): 748.

A fluorometric lateral flow immunoassay (LFA) is described for the simultaneous determination of the mycotoxins aflatoxin B₁ (AFB₁), zearalenone (ZEN) and deoxynivalenol (DON). The method is based on the use of CdSe/SiO₂ quantum dot microbeads (QBs) with a mean diameter of 106 nm. These have strong red luminescence (with excitation/emission peaks at 365/622 nm) which results in enhanced sensitivity. The QBs binding with monoclonal antibodies (mAbs) as the signal probes can react specifically with AFB₁, ZEN and DON, respectively. There is an inverse correlation between the fluorescence signal intensity of test line and the analyte content, which can realize the quantitative analysis of analytes within 15 min. The limits of detection in solution are 10, 80 and 500 pg mL⁻¹ for AFB₁, ZEN and DON, respectively. Besides, the average recoveries from spiked feed range from 85.5 to 119.0%, and the relative standard deviations are less than 16.4% for both intra- and inter-day assays. The method was used to analyze naturally contaminated feedstuff, and this resulted in a good agreement with data obtained by LC-MS/MS. Graphical abstractSchematic representation of a fluorometric method for the simultaneous determination of three mycotoxins. Quantum dot microbeads (QBs) binding with monoclonal antibodies (mAbs) are signal probes. There is an inverse correlation between the fluorescence intensity of test line and the analyte concentration.

Li, R., et al. (2020). "The distribution, characteristics and ecological risks of microplastics in the mangroves of Southern China." Science of the Total Environment **708**: 135025.

During the production, use and disposal of plastic products, microplastics (MPs) are dispersed into the surrounding environment and have inevitable impacts on mangrove ecosystems in estuaries and offshore areas. In the mangroves of Southern China, the systematic evaluation of the distribution, characteristics and ecological risks of MPs is lacking. In this study, surface sediments (0-5cm depth) were collected from six representative mangroves in China to explore MP contamination and its associated ecological risk. Based on the results, MP concentrations of MPs in mangrove sediments were as follows: FT (2249+/-747 items/kg), ZJ (736+/-269 items/kg), DF (649+/-443 items/kg), DZG (431+/-170 items/kg), YX (424+/-127 items/kg), and FCG (227+/-173 items/kg). The higher MP concentration in the Futian mangrove was mainly related to inputs from the Pearl River, the third largest river in China. The predominant shape, colour, and size of MPs were fibrous, white-transparent, and 500-5000mum, respectively. The main MP polymer types were polypropylene, polyethylene, and polystyrene. Degradation artefacts were present on surface of MPs as well as metallic and non-metallic elements. MPs concentration in mangrove sediments increased with increasing social-economic development of surrounding districts, which indicated the clear influence of anthropogenic activity on MP pollution in these mangroves. Furthermore, total organic carbon (TOC) and silt content were positively associated with MPs (P<0.01), indicating a facilitatory role in deposition of MPs in mangroves. Based on a comprehensive evaluation using the potential ecological risk factor (E_i), potential ecological risk (RI), polymer risk index (H) and pollution load index (PLI), MPs were found to present ecological risks in these mangroves, with the highest risk occurring in the Futian mangrove.

Li, S., et al. (2012). "Electrochemical performances of two kinds of electrolytes based on lithium bis(oxalate)borate and sulfolane for advanced lithium ion batteries." Journal of Power Sources **209**: 295-300.

Lithium bis(oxalato)borate (LiBOB) is a promising salt for lithium ion batteries. However, to achieve better electrochemical performance of LiBOB, the development of appropriate electrolytes is essential. In this work, the electrochemical behaviors of sulfolane (SL) with LiBOB were studied by employment of dimethyl sulfite (DMS) and diethyl sulfite (DES) as mixed solvents, respectively. Both of the LiBOB-based electrolytes show high oxidation potentials (>5.5 V), and good conductivities. When used in Li/MCMB (mesophase carbon microbeads) cells, these two kinds of novel electrolytes exhibit not only excellent film-forming characteristics, but also low impedances of the interface films. Besides, when used in LiFePO4/Li cells, compared to the cell with the electrolyte system of 1 M LiPF6-EC/DMC (1: 1, v/v), both of the LiBOB-based electrolytes exhibit several advantages, such as more stable cycle performance even at elevated temperature, and higher mean voltage.

Li, S., et al. (2018). "Aggregation kinetics of microplastics in aquatic environment: Complex roles of electrolytes, pH, and natural organic matter." Environmental Pollution **237**: 126-132.

Microplastics are an emerging contaminants of concern in aquatic environments. The aggregation behaviors of microplastics governing their fate and ecological risks in aquatic environments is in need of evaluation. In this study, the aggregation behavior of polystyrene microspheres (micro-PS) in aquatic environments was systematically investigated over a range of monovalent and divalent electrolytes with and without natural organic matter (i.e., Suwannee River humic acid (HA)), at pH 6.0, respectively. The zeta potentials and hydrodynamic diameters of micro-PS were measured and the subsequent aggregation kinetics and attachment efficiencies (alpha) were calculated. The aggregation kinetics of micro-PS exhibited reaction- and diffusion-limited regimes in the presence of monovalent or divalent electrolytes with distinct critical coagulation concentration (CCC) values, followed the

Derjaguin-Landau-Verwey-Overbeek (DLVO) theory. The CCC values of micro-PS were14.9, 13.7, 14.8, 2.95 and 3.20mM for NaCl, NaNO₃, KNO₃, CaCl₂ and BaCl₂, respectively. As expected, divalent electrolytes (i.e., CaCl₂ and BaCl₂) had stronger influence on the aggregation behaviors of micro-PS as compared to monovalent electrolytes (i.e., NaCl, NaNO₃ and KNO₃). HA enhanced micro-PS stability and shifted the CCC values to higher electrolyte concentrations for all types of electrolytes. The CCC values of micro-PS were lower than reported carbonaceous nanoparticles CCC values. The CCC[Ca²⁺]/CCC [Na⁺] ratios in the absence and presence of HA at pH 6.0 were proportional to Z^{-2.34} and Z^{-2.30}, respectively. These ratios were in accordance with the theoretical Schulze-Hardy rule, which considers that the CCC is proportional to z⁻⁶-z⁻². These results indicate that the stability of micro-PS in the natural aquatic environment and the possibility of significant aqueous transport of micro-PS.

Li, S., et al. (2014). "Studies on electrochemical performances of novel electrolytes for wide-temperature-range lithium-ion batteries." Acs Applied Materials & Interfaces **6**(7): 4920-4926.

Wide-temperature electrochemical behaviors of sulfolane (SL) with lithium difluoro(oxalato)borate (LiODFB) are studied using dimethyl sulfite (DMS) and diethyl sulfite (DES) as mixed solvents, respectively. In LiFePO4/Li cells, LiODFB-SL/DMS and LiODFB-SL/DES electrolytes always exert several advantages over a wide temperature range, such as stable cycling performance and good rate performance. Besides, in Li/mesophase carbon microbead cells, these novel electrolytes respectively exhibit excellent film-forming characteristics at both +60 and -20 degreeC, such as the formation of a stable and conductive SEI layer. It suggests that LiODFB-SL/DMS and LiODFB-SL/DES electrolytes are alterative candidate electrolytes for wide-temperature-range lithium-ion batteries.

Li, S. Y., et al. (2015). "Research on Environmental Impact Evaluation and Recycling Systematic Assessment of Plastic Waste in China." Applied Mechanics and Materials **768**(Selected Proceedings of the Ninth International Conference on Waste Management and Technology): 240-248.

With the increasing of plastic consumption, the recycling of plastic waste has become an important problem with huge environmental impact. In order to analyze the environmental impact of plastic waste recycling, this study presents a systematic evaluation framework for plastic waste's recycling process in China. Based on the framework, theoretical analysis and experimental research are made to evaluate the relationship of scale volume and environmental impact of plastic waste recycling. Cost and energy consumption of typical processing of plastic wastes have been calculated. And an optimization research is made to reduce the environmental impact, and increase recycling output efficiency for enterprise and local region.

Li, T., et al. (2018). "A review on phthalates removal using adsorption in aqueous environments." Journal of Agro Environment Science **37**(8): 1565-1573.

Phthalate esters (PAEs) are widely-used plasticizers added to plastic products, rubber materials, medical implements, and toys to improve plasticity. Over the last decades, the occurrence of PAEs in drinking water, surface water, and ground water is largely due to wastewater discharge, dry and wet deposition, and leachates from plastic waste. PAE-contaminated water has been linked to teratogenesis, mutagenicity and endocrine disruption in the reproduction system of fish and mammals, and has known carcinogenic effects. This work presents a review of current and future adsorptive materials used for phthalate removal from aquatic environments. Adsorbents include activated carbon and its derivatives, chitosan and modified chitosan, biochar, clay minerals, polymer resin, membrane, nanomaterials, molecular imprinted polymers (MIPs), as well as other emerging materials. Additionally, adsorbent efficiency, adsorption mechanisms, and costs have been summarized; generally, adsorption capacity increases with PAE hydrophobicity for most adsorbents. Langmuir and Freundlich's isotherm models are useful in describing adsorption data. Adsorption processes can be attributed to hydrophobic interaction, hydrogen bonding, electrostatic interaction, pi - pi stacking, and pore filling. Moreover, research advances suggest that modified chitosan, clay mineral and biochar of activated sludge and bacteria are promising adsorbents as they are low cost, environmentally friendly, and highly efficient.

Li, W., et al. (2019). "Colonization Characteristics of Bacterial Communities on Plastic Debris Influenced by Environmental Factors and Polymer Types in the Haihe Estuary of Bohai Bay, China." Environmental Science & Technology **53**(18): 10763-10773.

The colonization characteristics of bacterial communities on microplastics or plastic debris (PD) have generated great concern in recent years. However, the influence of environmental factors and polymer types on the formation of bacterial communities on PD in estuarine areas is less studied. To gain additional insights, five types of PD (polyvinyl chloride, polypropylene, polyethylene, polystyrene, and polyurethane) were exposed for three-time periods (two weeks, four weeks, and six weeks) in the Haihe Estuary. 16S rRNA gene sequencing was used to identify the bacterial communities on PD, in seawater, and in sediment samples. The results indicate that the average growth rate of a biofilm is affected by nutrients (total nitrogen and total phosphorus) and salinity. Furthermore, salinity is the primary factor affecting bacterial diversity of the colonies on PD. In addition, genera of bacteria show selectivity toward the PD polymer type and tend to colonize their preferred substrate. Compared with seawater and sediment, PD could be carriers for enrichment of Vibrio in the estuarine environment with salinity >=26 (+/-2), which might increase the ecological risk of PD in marine environments.

Li, W. C., et al. (2016). "Plastic waste in the marine environment: A review of sources, occurrence and effects." Science of the Total Environment **566-567**: 333-349.

This review article summarises the sources, occurrence, fate and effects of plastic waste in the marine environment. Due to its resistance to degradation, most plastic debris will persist in the environment for centuries and may be transported far from its source, including great distances out to sea. Land- and ocean-based sources are the major sources of plastic entering the environment, with domestic, industrial and fishing activities being the most important contributors. Ocean gyres are particular hotspots of plastic waste accumulation. Both macroplastics and microplastics pose a risk to organisms in the natural environment, for example, through ingestion or entanglement in the plastic. Many studies have investigated the potential uptake of hydrophobic contaminants, which can then bioaccumulate in the food chain, from plastic waste by organisms. To address the issue of plastic pollution in the marine environment, governments should first play an active role in addressing the issue of plastic waste by introducing legislation to control the sources of plastic debris and the use of plastic additives. In addition, plastics industries should take responsibility for the end-of-life of their products by introducing plastic recycling or upgrading programmes.

Li, W.-J., et al. (2019). "Effect of Preparation Solvent and Calcination Atmosphere on Ni@SiO2 Catalyst for Simultaneous Production of Hydrogen and Carbon Nanotubes from Simulated Plastic Waste Syngas." Energy Technology **7**(3): N.PAG-N.PAG.

SiO2 core supports are prepared via the Stöber method with various synthesizing solvents. Then,

a Ni shell is deposited on SiO2 by a deposition–precipitation method. The results illustrate that using isopropanol as the solvent governs the catalyst particle size with a superior dispersion and a high catalytic activity. Thus, the calcination atmosphere of the catalyst directly affects both the chemical state and the catalytic performance of the active sites. The Ni@SiO2-I-air (isopropanol) catalyst calcined by air with more Ni2+ facilitates the highest H2 production of 142.2 mmol g−1 h−1 but provides a carbon nanotube (CNT) yield of only 7.6%. Most importantly, the Ni@SiO2-I-H2 catalyst calcined by ambient H2 is prone to form Ni0 species, thus providing the best crystalline conversion and metal–support interaction, which benefits the production of CNTs to a maximum yield of 19.8% with a H2 production of 122.8 mmol g−1 h−1. Monodispersed Ni@SiO2 core-shell catalysts facilitate the catalytic conversion of simulated syngas from plastic waste to hydrogen and carbon nanotubes. [ABSTRACT FROM AUTHOR]

Li, X., et al. (2019). "Effects of chemical pretreatments on microplastic extraction in sewage sludge and their physicochemical characteristics." Water Research **171**: 115379.

Sewage sludge is a primary pathway for microplastics (MPs) entering into terrestrial ecosystems. However, a standardized method to analyze MP in sludge is lacking due to its high organic matter. This study investigated the extraction efficiency of six MPs in five solid matrices, i.e. sewage sludge, cattle manure, soil, sediment and silicon dioxide.

Li, X., et al. (2017). "Regulation of intraocular pressure by microRNA cluster miR-143/145." Scientific Reports **7**(1): 915.

Glaucoma is a major cause of irreversible blindness worldwide. Elevated intraocular pressure (IOP), which causes optic nerve damage and retinal ganglion cell death, is the primary risk factor for blindness in glaucoma patients. IOP is controlled by the balance between aqueous humor secretion from the ciliary body (CB) and its drainage through the trabecular meshwork (TM). How microRNAs (miRs) regulate IOP and glaucoma in vivo is largely unknown. Here we show that miR-143 and miR-145 expression is enriched in the smooth muscle and trabecular meshwork in the eye. Targeted deletion of miR-143/145 in mice results in significantly reduced IOP, consistent with an ~2-fold increase in outflow facilities. However, aqueous humor production in the same mice appears to be normal based on a microbeads-induced glaucoma model. Mechanistically, we found that miR-143/145 regulates actin dynamics and the contractility of TM cells, consistent with its regulation of actin-related protein complex (ARPC) subunit 2, 3, and 5, as well as myosin light chain kinase (MLCK) in these cells. Our data establish miR-143/145 as important regulators of IOP, which may have important therapeutic implications in glaucoma.

Li, Y., et al. (2014). "Asynchronous Magnetic Bead Rotation (AMBR) Microviscometer for Label-Free DNA Analysis." Biosensors **4**(1): 76-89.

We have developed a label-free viscosity-based DNA detection system, using paramagnetic beads as an asynchronous magnetic bead rotation (AMBR) microviscometer. We have demonstrated experimentally that the bead rotation period is linearly proportional to the viscosity of a DNA solution surrounding the paramagnetic bead, as expected theoretically.

Simple optical measurement of asynchronous microbead motion determines solution viscosity precisely in microscale volumes, thus allowing an estimate of DNA concentration or average fragment length. The response of the AMBR microviscometer yields reproducible measurement of DNA solutions, enzymatic digestion reactions, and PCR systems at template concentrations across a 5000-fold range. The results demonstrate the feasibility of viscosity-based DNA detection using AMBR in microscale aqueous volumes.

Li, Y., et al. (2011). "Chemiluminescence aptasensor for cocaine based on double-functionalized gold nanoprobes and functionalized magnetic microbeads." Analytical & Bioanalytical Chemistry **401**(1): 213-219.

A novel chemiluminescence (CL) aptasensor for highly sensitive detection of small-molecule targets using cocaine as a model analyte was developed in the present study. For the proposed aptasensor, the aptamers were immobilized on the surface of gold nanoparticles (AuNPs) functionalized magnetic microbeads (MB-AuNPs) and then hybridized with the signal DNA on the double-functional gold nanoprobes (DF-AuNPs) modified with horseradish peroxidase (HRP). When cocaine was introduced, a competition for the aptamer between cocaine and the signal DNA occurred and the gold nanoprobes were forced to dissociate from the MB-AuNPs surface based on the structure switching of the aptamer. The CL signals of Luminol-H(2)O(2)-HRP-PIP system were proportional to the concentration of cocaine. A linear range was obtained when the concentrations of cocaine were from 1 x 10(-9) to 1 x 10(-8) M with the detection limit of 0.48 nM (3sigma), much lower than those achieved by other methods. This new system can be easily extended to a variety of small-molecules, protein, and tumor cell analysis.

Li, Y., et al. (2019). "Effects of particle size and solution chemistry on Triclosan sorption on polystyrene microplastic." Chemosphere **231**: 308-314.

PS microplastic particle (<5mm) is an emerging contaminant of concern in aquatic and sediment systems with reported negative impacts on environmental and human health. TCS is a broad-spectrum antimicrobial which can affect ecosystems and result in long-term human health risks. The interaction between TCS and PS microplastic, partly determines the behavior and dispersion of TCS in the environment. In this study, the sorption kinetics and isotherms for TCS and PS microplastic were investigated. The influences of temperature, pH, ionic strength and coexisting heavy metals were assessed in batch experiments. The pseudo-second-order model (PSOM) was found to effectively describe the sorption kinetics of TCS on PS. TCS sorption on PS was found to be higher within the pH range of 3.0-6.0, while a decrease occurred at pH>6.0. This result indicates that TCS⁰ was the major species contributing to the sorption process through hydrophobic interaction. Temperature did not affect the sorption of TCS on polystyrene, with sorption K_d values of 0.15, 0.16, 0.18 and 0.17L/g at 288, 298, 308 and 318K, respectively. Furthermore, the sorption amount of TCS showed no obvious variation with NaCl concentrations varying between 0.001 and 0.1M. Finally, the coexistence of Cu(II)/Zn(II) had no significant influence on TCS sorption on PS, as Cu(II)/Zn(II) and TCS had different mechanisms of sorption on PS.

Li, Y., et al. (2019). "Ecological influences of the migration of micro resin particles from crushed waste printed circuit boards on the dumping soil." Journal of Hazardous Materials: 121020.

About 0.8 million tons of resin particles, which were generated from the recovery of waste printed circuit boards, were dumped on soil at Qingyuan city of China. Resin particles not only belong to micro plastic but also contain brominated flame retardants and heavy metals. There is little information about soil pollution caused by the dumped resin particles. This study found

resin particles would transfer from soil surface into soil at least 10 mm downward for six months. Average content of bromine in soil within 10 cm exceeded 2500 mg/kg. The highest content of Pb, Zn, and Cu was 3450, 1143 and 1450 mg/kg, which were approximately 6.9, 2.3 and 3.6 times as much as Grade III soil standard of China. Micro plastic, brominated flame retardants, and heavy metals made significant effects on soil bacterial community. Bacterial diversity was destroyed and the number of resistant bacteria increased obviously such as Acinetobacter, Pseudomonas and Paracoccus. This paper presented the ecological destroy of soil when the resin particles were deposited on soil surface. It also suggested the government to urgently manage the resin particles produced in the recovery of waste printed circuit boards.

Li, Y., et al. (2019). "Airborne fiber particles: Types, size and concentration observed in Beijing." Science of the Total Environment **705**: 135967.

Airborne fibers are of public concern because of their potential threat to the environment, however their physical and chemical properties are poorly understood. Fibers are defined as having an aspect ratio >3:1. Fiber particles were collected in the near surface air, surface deposited dust and building materials in Beijing. They were examined using analytical scanning electron microscopy. The particles were initially classified into two categories: organic and inorganic. Organic fibers comprised microplastic and natural organic fiber particles. Inorganic fibers were mainly man-made mineral fibers (MMMFs), asbestos (represented by chrysotile), calcium sulfate and metal fiber particles. Microplastic and MMMFs fibers were most abundant, accounting for 34.6% and 40.3% in total, respectively, followed by asbestos (7.8%), calcium sulfate (7.2%), metal fibers (5.6%) and natural organic fiber particles (4.5%). The number-concentration of these particles was about 16.7 x 10⁻³ fibers/ml at 1.5 m above the ground and about 14.1 x 10⁻³ fibers/ml at about 18 m, suggesting the particles were mainly derived from surface and were re-suspended. Approximately 80% of the airborne fiber were smaller than 20 mum in length, which is possibly the critical size for fiber particles to re-suspend into the air. Surface dust and construction sites were speculated to be the major contributors of the fiber particles.

Li, Y., et al. (2020). "Low level of polystyrene microplastics decreases early developmental toxicity of phenanthrene on marine medaka (Oryzias melastigma)." Journal of Hazardous Materials **385**: 121586.

Microplastics (MPs) have become global environmental concern. However, the effects of environmental concentrations of MPs, singly or in combination with organic pollutants, on the early development of marine fish remain unclear. In this study, fertilized eggs of marine medaka (Oryzias melastigma) were exposed to polystyrene MPs (0, 2, 20, 200mug/L) and/or phenanthrene (Phe, 50mug/L) for 28 days. The results revealed that MPs were accumulated on the chorion and ingested by larvae from 2 days post-hatching. High levels of MPs (20 and 200mug/L) decreased the hatchability, delayed the hatching time, and suppressed the growth, whereas Phe inhibited hatching and caused malformations in larvae. The presence of MPs at 20 and 200mug/L did not alter the toxicity of Phe. By contrast, combined exposure to 2mug/L MPs and Phe increased the hatchability by 25.8%, decreased malformation and mortality rates, and restored Phe-induced abnormal expressions of cardiac development-related genes. The reduced early developmental toxicity could be attributed to the decreased bioavailability and bioaccumulation of Phe by the low level of MPs. These findings contradicted the view that MPs would aggravate the toxicity of organic pollutants, and future studies are warranted to elucidate the ecological risks of marine MPs.

Li, Y., et al. (2019). "Interactions between nano/micro plastics and suspended sediment in water:

Implications on aggregation and settling." Water Research **161**: 486-495.

Interactions between nano/microplastics and suspended sediment (SS) in natural waters are important for the environmental fate of plastic particles. This study investigated the effect of heteroaggregation between nano/microplastics and SS on the settling of aggregates. In NaCl solutions (0.05-0.5M), large SS (100-500mum in diameter) significantly increased the settling ratio of polystyrene nanoplastics (PSNPs) with an average diameter of 100nm due to the formation of PSNPs-SS aggregates. The settling ratio of the heteroaggregates increased significantly when the NaCl concentration increased from 50 to 200mM. This was primarily because higher ionic strength reduced the electrostatic repulsion between large SS and PSNPs, and subsequently increased the heteroaggregation rate. No obvious differences in settling ratios were observed in 200 or 500mM NaCl solutions because the heteroaggregation entered the diffusion-controlled regime. However, in HA solutions (10-50mgL⁻¹), the surface adsorption of HA on PSNPs and large SS reduced the heteroaggregation of PSNPs-SS and thus led to the low co-settling ratio due to the steric hindrance according to the DLVO theory. In contrast, polyethylene microplastics (PEMPs) with diameters of 1.0-1.2mm were found to always float on water surface (up to 8 months), even after addition of 500mgL⁻¹ small SS (<10mum in diameter). Clearly, the heteroaggregation of PEMPs and small SS had minor effect on the settling of PEMPs due to the overwhelming boyanccy. These results provided new insight into the fate and distribution of nano/microplastics in aquatic environment, which affect the bioavailability of plastic particles in natural waters.

Li, Y.-X., et al. (2009). "Effects of glycerol and ethylene-acrylic acid on composition optimization of PVOH/starch-blended biodegradable resin using response surface methodology." Journal of Applied Polymer Science **114**(5): 2915-2921.

Response surface methodology was used to analyze the effect of glycerol (X1) and ethylene-acrylic acid (EAA) level (X2) on the objective (water solubility index (WSI), water absorption index (WAI), and tensile strength) attributes of a poly(vinyl alcohol) (PVOH)/starch-blended plastic resin. A rotable central composite design was used to develop models for the objective responses. The experiments were run with different barrel temperatures, such as zone 1: 100 degree C, zone 2: 100 degree C, zone 3: 105 degree C, and zone 4: 105 degree C, respectively, with a feed rate of 20 g/min and screw speed of 25 rpm. Responses were most affected by changes in glycerol level (X1) and to a lesser extent by EAA level (X2). Individual contour plots of the different responses were overlaid, and regions meeting the optimum WSI of 6.10%, WAI of 5.57 g gel/g dry wt, and tensile strength of 62.14 MPa were identified at the glycerol level of 72.41 mL and the EAA level of 36.03 g, respectively. [copy 2009 Wiley Periodicals, Inc. J Appl Polym Sci, 2009

Li, Z., et al. (2020). "Evaluating the effect of different modified microplastics on the availability of polycyclic aromatic hydrocarbons." Water Research **170**: 115290.

Microplastics (MPs) discharged into the natural environment undergo various wearthering pathways, such as mechanical abrasion and ultraviolet (UV) irradiation. However, little is known about the effects of such aged MPs on the bioavailability of hydrophobic organic compounds (HOCs) in aqueous environments. To simulate the natural oxidation and UV-ageing process of MPs, three kinds of modified polyethylene MPs were obtained by plastic etching processes common in industry and UV irradiation, namely, etched MPs (EMPs), UV-aged MPs (UV-MPs), and etched MPs followed by UV ageing (UV-EMPs). The modified MPs showed a higher content of surface oxygen-containing groups than the pristine MPs, and the specific surface area and pore volume increased significantly after etching and ultraviolet ageing, especially for the EMPs

(1.67m²g⁻¹ and 0.0049cm3 g⁻¹) and UV-EMPs (2.37m²g⁻¹ and 0.0089cm3 g⁻¹). The effect of modified MPs on the availability of 10 polycyclic aromatic hydrocarbons (PAHs, logK_{ow} 4.18-6.20) was evaluated by negligible-depletion solid-phase microextraction (nd-SPME). The free concentrations (C_{free}) of most PAHs (except for less hydrophobic PAHs, logK_{ow} 4.18 and 4.56) decreased with an increasing concentration of MPs. The logarithms of the sorption coefficients of PAHs with various MPs (logK_{MPs}, logK_{UV-MPs}, logK_{EMPs} and logK_{UV-EMPs}) were linearly correlated with logK_{ow}, suggesting that the sorption is hydrophobicity dependent. Compared with the results for pristine MPs (logK_{MP} 3.80-4.95), UV ageing only slightly enhanced the sorption of PAHs by MPs (logK_{UV-MPs} 3.71-4.98), whereas the plastic etching processes significantly enhanced sorption (logK_{EMPs} 3.85-5.18 and logK_{UV-EMPs} 3.90-5.28). The sorption of PAHs to MPs is mainly based on partitioning; however, a mechanism of adsorption also likely takes place in EMPs and UV-EMPs due to hydrogen bonding and pi-pi interactions. Desorption study indicated that PAH desorption from MPs are dominated by film diffusion. However, intraparticle diffusion also takes great part for the EMPs. These results suggest that modification of MPs in the natural environment will change the availability of HOCs.

Li, Z., et al. (2019). "Combined effect of polystyrene microplastics and dibutyl phthalate on the microalgae Chlorella pyrenoidosa." Environmental Pollution: 113604.

The combined effect of polystyrene microplastics (mPS) and dibutyl phthalate (DBP), a common plastic additive, on the microalgae Chlorella pyrenoidosa was investigated in the present study. The 96 h-IC₅₀ value of DBP was 2.41mgL⁻¹. Polystyrene microplastics exhibited size-dependent inhibitory effect to C. pyrenoidosa, with the 96 h-IC₅₀ at 6.90 and 7.19mgL⁻¹ for 0.1 and 0.55mum mPS respectively, but little toxicity was observed for 5mum mPS. The interaction parameter rho based on the response additive response surface (RARS) model varied from -0.309 to 5.845, indicating the interaction pattern varying with exposure concentrations of chemical mixtures. A modified RARS model (taking rho as a function of exposure concentration) was constructed and could well predict the combined toxicity of mPS and DBP. More than 20% reduction of DBP was observed at 20mgL⁻¹ mPS, while 1mgL⁻¹ mPS had no significant effect on the bioavailability of DBP at different sampling time points. Volume, morphological complexity and chlorophyll fluorescence intensity of microalgal cells were disturbed by both DBP and mPS. The antagonistic effect of high concentrations of mPS might be partially attributed to the combination of hetero- and homo-aggregation and the reduced bioavailability of DBP. The overall findings of the present study profiled the combined toxic effects of mPS and DBP on marine phytoplankton species which will be helpful for further evaluation of ecological risks of mPS and DBP in marine environment.

Lian, J., et al. (2019). "Effects of microplastics on wheat seed germination and seedling growth." Journal of Agro Environment Science **38**(4): 737-745.

To explore the effects of microplastics on seed germination and seedling growth of wheat (Triticum aestivum L.), three widely detected microplastics in agroecosystems Ethylene-vinyl acetate compolymer (EVA), Linear low-density polyethylene (LLDPE) and Poly (methyl methacrylate)(PMMA) were investigated by seed germination experiments. The results showed that all microplastics inhibited wheat seed germination at low and medium concentrations (<500 mg.L⁻¹) with inhibition rates ranging from 2.86% to 20%. At high concentrations (1000 mg.L⁻¹), the microplastics substantially promoted germination compared with that of the control group. In particular, the inhibitory effect of microplastics on wheat seed vigor index decreased in the following order: LLDPE > EVA > PMMA. The mean germination time of wheat seeds exposed to EVA and LLDPE at low and medium concentrations was higher than that at high concentration, and PMMA had no significant effect on wheat seed growth aspects. Overall, microplastics had no significant effect on wheat seedling length, root length and dry weight, but LLDPE significantly inhibited wheat bud length at 10 mg.L⁻¹ concentration.

Lian, J., et al. (2020). "Impact of polystyrene nanoplastics (PSNPs) on seed germination and seedling growth of wheat (Triticum aestivum L.)." Journal of Hazardous Materials **385**: 121620.

Microplastics and nanoplastics are emerging pollutants of global concern. However, the understanding of their ecological effects on terrestrial plants is still limited. We conducted the systematic research to reveal the impact of polystyrene nanoplastics (PSNPs) (0.01-10mg/L) on seed germination and seedling growth of wheat (Triticum aestivum L.). The results showed that PSNPs had no discernible effect on seed germination rate whereas significantly (p<0.01) increased root elongation by 88.6 %-122.6 % when compared with the control. Similarly, remarkable increases in carbon, nitrogen contents, and plant biomass were also observed after exposure to PSNPs. Moreover, PSNPs could reduce the shoot to root biomass ratio (S:R ratio) of wheat seedlings. Furthermore, the imagings of a 3D laser confocal scanning microscopy (LCSM) and scanning electron microscopy (SEM) indicated that PSNPs were taken up and subsequently down-top transported to shoot. The absorption and accumulation of four micronutrients (Fe, Mn, Cu and Zn) in wheat were generally reduced in varying degrees. Notably, metabolomics analysis revealed that all PSNPs treatments altered the leaf metabolic profiles mainly by regulating energy metabolisms and amino acid metabolisms. These findings are expected to provide new insights into the effects of PSNPs on crop plants.

Liang, C.-H. (2007). Biological applications of nanoscale materials.

The objective of my research work is to synthesize, characterize, design, and apply nanocrystals for biomedical use. Gold nanoparticles were synthesized in the presence of chitosan via reduction of HAuCl4 with sodium borohydride. The average particle size of gold nanoparticles was significantly affected with the concentration of chitosan added and was ranged between 5 and 30 nm. The gold-chitosan nanocomposites were formed by adsorbing chitosan molecules on the gold nanoparticles. CdSe/ZnS quantum dots were prepared by a solution phase synthetic method. A new route for the phase transfer of CdSe/ZnS quantum dots from non-polar solvents into aqueous solution was developed using hydrophobically modified polysaccharides, both chitosan and alginate. In addition, it was shown that CdSe/ZnS based polysaccharide nanoparticles effectively inhibited the proliferation of human ovarian cancer cell line SKOV-3 in vitro. The findings suggest that CdSe/ZnS quantum dot based polysaccharide nanoparticles not only act as a long-term biomarker but also have potential value in cancer therapy. A novel method for extracting magnetite nanoparticles from magnetotactic bacteria was developed by using co-surfactant. The problem of mass cultivation was solved by growing AMB-1 in Ca super(2+)-alginate microbeads. To apply magnetotactic bacterial in biomedical applications, uptake of chitosan-capped CdSe/ZnS quantum dots on magnetotactic bacteria and introducing fluorescent magnetotactic bacteria into mouse macrophage cells was achieved. A general strategy is described which allows for constructing multifunctional magnetic nanocomposites based on bacterial magnetite nanoparticles. Specifically, core-shell structures of bacterial magnetite-CdSe/ZnS and bacterial magnetite-gold nanocomplexes have been built in this way.

Furthermore, design and synthesis multimodal contrast agents which are ultrasound and photoacoustic active are achieved by utilizing biocompatible gold nanorods self assembling on liquid perfluorocarbon particles. The probe is likely to provide richer information for a better understanding of the target and subsequent diagnosis. In summary, nanocrystals including gold, CdSe/ZnS quantum dots, and bacterial magnetite and nanocomplexes including bacterial magnetite-quantum dots, bacterial magnetite-gold, gold-perfluorocarbon, quantum dots-chitosan, and quantum dots-alginate were successful synthesized. Some potential applications of these nanoparticles and nanocomplexes in biomedical engineering are explored.

Liang, P., et al. (2014). "Rapid and reagentless detection of microbial contamination within meat utilizing a smartphone-based biosensor." Scientific Reports **4**(1).

A smartphone-utilized biosensor was developed for detecting microbial spoilage on ground beef, without using antibodies, microbeads or any other reagents, towards a preliminary screening tool for microbial contamination on meat products, and potentially towards wound infection. Escherichia coli K12 solutions (10¹-10⁸ CFU/mL) were added to ground beef products to simulate microbial spoilage. An 880 nm near infrared LED was irradiated perpendicular to the surface of ground beef, and the scatter signals at various angles were evaluated utilizing the gyro sensor and the digital camera of a smartphone. The angle that maximized the Mie scatter varied by the E. coli concentration: 15 degrees for 10⁸ CFU/mL, 30 degrees for 10⁴ CFU/mL, and 45 degrees for 10 CFU/mL, etc. SEM and fluorescence microscopy experiments revealed that the antigens and cell fragments from E. coli bonded preferably to the fat particles within meat, and the size and morphologies of such aggregates varied by the E. coli concentration.

Liang, T. W., et al. (2016). "Application of Chitinous Materials in Production and Purification of a Poly(l-lactic acid) Depolymerase from Pseudomonas tamsuii TKU015." Polymers **8**(3): 22.

The management of fishery residues and plastics is considered to be a vital strategy for conserving resources and maintaining the quality of the environment. Poly(l-lactic acid) (PLA) is a commercially promising, renewable, and biodegradable plastic. In this study, a PLA depolymerase was produced in a squid pen powder (SPP) and recycled plastic waste (PLA powder)-containing medium by Pseudomonas tamsuii TKU015, a bacterial strain isolated from Taiwanese soil. This PLA depolymerase had a molecular weight of 58 kDa and was purified to homogeneity from the supernatant of a TKU015 culture. The optimum pH of TKU015 PLA depolymerase is 10, and the optimal temperature of the enzyme is 60 degreeC. In addition to PLA, TKU015 PLA depolymerase degraded fibrinogen and tributyrin, but did not hydrolyze casein, triolein, and poly(beta-hydroxybutyrate). Taken together, these data demonstrate that P. tamsuii TKU015 produces a PLA depolymerase to utilize SPP and polylactide as carbon/nitrogen sources.

Liang, Y., et al. (2019). "Increasing Temperature and Microplastic Fibers Jointly Influence Soil Aggregation by Saprobic Fungi." Frontiers in Microbiology **10**: 2018.

Microplastic pollution and increasing temperature have potential to influence soil quality; yet little is known about their effects on soil aggregation, a key determinant of soil quality. Given the importance of fungi for soil aggregation, we investigated the impacts of increasing temperature and microplastic fibers on aggregation by carrying out a soil incubation experiment in which we inoculated soil individually with 5 specific strains of soil saprobic fungi. Our treatments were temperature (ambient temperature of 25degreeC or temperature increased by 3degreeC, abruptly versus gradually) and microplastic fibers (control and 0.4% w/w). We evaluated the percentage of water stable aggregates (WSA) and hydrolysis of fluorescein diacetate (FDA) as an indicator of fungal biomass. Microplastic fiber addition was the main factor influencing the WSA, decreasing the percentage of WSA except in soil incubated with strain RLCS 01, and mitigated the effects of temperature or even caused more pronounced decrease in WSA under increasing temperature. We also observed clear differences between temperature change patterns. Our study shows that the interactive effects of warming and microplastic fibers are important to consider when evaluating effects of global change on soil aggregation and potentially other soil processes.

Liao, Q., et al. (2011). "Simultaneous detection of antibodies to five simian viruses in nonhuman primates using recombinant viral protein based multiplex microbead immunoassays." Journal of Virological Methods **178**(1-2): 143-152.

Routine screening for infectious agents is critical in establishing and maintaining specific pathogen free (SPF) nonhuman primate (NHP) colonies. More efficient, higher throughput, less costly reagent, and reduced sample consumption multiplex microbead immunoassays (MMIAs) using purified viral lysates have been developed previously to address some disadvantages of the traditional individual enzyme-linked immunosorbent assay (ELISA) methods. To overcome some of the technical and biosafety difficulties in preparing antigens from live viruses for viral lysate protein based MMIAs, novel MMIAs using recombinant glycoprotein D precursor (gD) protein of herpesvirus B and four viral gag proteins of simian immunodeficiency virus (SIV), simian T Cell lymphotropic virus (STLV), simian foamy virus (SFV), and simian betaretrovirus (SRV) as antigens have been developed in the current study. The data showed that the recombinant viral protein based MMIAs detected simultaneously antibodies to each of these five viruses with high sensitivity and specificity, and correlated well with viral lysate based MMIAs. Therefore, recombinant viral protein based MMIA is an effective and efficient routine screening method to determine the infection status of nonhuman primates. © 2011 Elsevier B.V.

Liao, Y., et al. (2017). "A high-performance and robust membrane with switchable super-wettability for oil/water separation under ultralow pressure." Journal of Membrane Science **543**: 123-132.

To separate oil/water mixtures and emlusions, superwetting membranes have been developed via synergy between surface chemistry and topography. However, challenges remain as most of them exhibit unsatisfactory performance, limited strength and durability. Herein, we report a novel membrane with switchable super-wettability for oil and water. This novel composite membrane was developed by electrospinning a hierarchically porous polyvinylidene fluoride (PVDF)-silica composite nano/micro-beaded top layer and a PVDF nanofibrous intermediate layer on a non-woven support. The surface of the composite membrane was modified to exhibit high surface free energy. The membrane is in-air superamphiphilic, underwater superoleophobic and under-oil superhydrophobic. It can treat various types of oil/water mixtures, from simple layered solutions to emulsions (including surfactant-free or surfactant-stabilized oil-in-water and water-in-oil emulsions) without external driving force or under an ultralow pressure (0.1 bar) in a cross-flow filtration process. It shows a flux up to 2000 L/m² h and high separation efficiency (> 99.99% in terms of water and oil purities in the permeation) in the cross-flow filtration process. The membrane also exhibits an excellent robustness under harsh conditions, including strong acidic or alkaline solutions, hot water and petroleum. In addition, it presents remarkable antifouling and easy-cleaning properties, which were demonstrated in a 50-h continuous operation. Copyright © 2017 Elsevier B.V.

Liao, Y. C., et al. (2019). "[Effects of Microplastics on the Growth, Physiology, and Biochemical Characteristics of Wheat (Triticum aestivum)]." Huanjing Kexue/Environmental Science **40**(10): 4661-4667.

The toxicological effects of microplastics in the soil environment have gradually attracted widespread attention, while less is known about the influence of microplastics on plants. The growth of wheat, photosynthetic pigment content, soluble protein content, and the antioxidant enzyme activities of leaves were investigated to explore the toxic effects of microplastics on wheat (Triticum aestivum). In this study, 100 nm and 5 mum polystyrene microplastics (PS-MPs) were used for soil culture treatment combined with hydroponic growth. The results showed that in hydroponic experiment, high concentrations (200 mg.L⁻¹) of PS-MPs significantly inhibited the elongation of wheat roots and stems, and 5 mum PS-MPs showed a greater toxicity effect than 100 nm PS-MPs. Roots and stem length inhibition rates were 67.15% and 56.45%, respectively. In the soil culture tests, 10 mg.kg⁻¹ PS-MPs had the most significant effect on wheat growth. Within the test content range (0-100 mg.kg⁻¹), with an increase in PS-MPs exposure, the content of photosynthetic pigment and soluble protein in wheat leaves increased first and then decreased. This indicated that PS-MPs damaged the photosynthetic pathway of wheat leaves and inhibited protein synthesis. SOD activity decreased, and CAT decreased first and then increased, indicating that the possible mechanism of toxicity to wheat involves oxidative stress. The results provide a basis for the ecological risk assessment of microplastics in the soil environment.

Liao, Y. L. and J. Y. Yang (2020). "Microplastic serves as a potential vector for Cr in an in-vitro human digestive model." Science of the Total Environment **703**: 134805.

Microplastics (MPs), polymer particles capable of adsorbing heavy metals from ambient environment, have been found in diverse human food resources. Through the consumption of MPs, heavy metals adsorbed on MPs might be transported into human body. This study aims to explore the behavior of heavy metal-contaminated MPs in human digestive system which is not previously researched. Firstly, a chromium (Cr) adsorption/desorption study was conducted with four commonly used nondegradable MPs [polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC) and polystyrene (PS)] as well as one degradable MP (polylactic, PLA). Then, the whole digestive system in-vitro method (WDSM), a systematic model including mouth, gastric, small intestine, and large intestine digestive phases, was conducted on the Cr-loaded MPs. Additionally, the bioaccessibilities and hazard quotients (HQs) of Cr(VI) and Cr(III) were evaluated. Among five MPs, although PLA showed the weakest adsorption capacity for Cr, the Cr(VI) bioaccessibilities for PLA reached the highest values of 19.9%, 15.6% and 3.9% in gastric, small intestinal and large intestinal phases, respectively. The bioaccessibilities of Cr(VI) in gastric phase were significantly higher than those in other phases, while no Cr release from MPs was detected in the mouth phase. In gastric phase, the bioaccessibilities of Cr(VI) were significantly higher than those of Cr(III) in the gastric phase, and both of them approached to a similar level in intestinal phases. In the WDSM, the HQs of Cr(VI) and Cr(III) on MPs were lower than the critical level for both adults and children. Based on the measured bioaccessibilities, the maximum daily total Cr intake for different human groups (female children, male children, female adults and male adults) through MP consumption was estimated from 0.50 to 1.18mug/day. In general, the five tested MPs were potential to serve as Cr vectors in the WDSM.

Liao, Z., et al. (2017). "Application of upconversion luminescent-magnetic microbeads with weak background noise and facile separation in ochratoxin A detection." Journal of Nanoparticle Research **19 (2) (no pagination)**(60).

Ochratoxin A (OTA), the most harmful and abundant ochratoxin, is chemically stable and commonly existed in foodstuffs. In this work, upconversion luminescent-magnetic microbeads (UCLMMs) -based cytometric bead array for OTA detection with a less reagent consumption and high sensitivity has been established and optimized. In UCLMMs, upconversion nanocrystals (UCNs) for optical code present a weak background noise and no spectral cross talk between the encoding signals and target labels under two excitation conditions to improve detection sensitivity. While the superparamagnetic Fe<inf>3</inf>O<inf>4</inf> nanoparticles (Fe<inf>3</inf>O<inf>4</inf> NPs) aim for rapid analysis. The results show that the developed method has a sensitivity of 9.553 ppt below HPLC with a 50-muL sample and can be completed in <2 h with good accuracy and high reproducibility. Therefore, different colors of UCLMMs will become a promising assay platform for multiple mycotoxins after further improvement. [Figure not available: see fulltext.] Copyright © 2017, Springer Science+Business Media Dordrecht.

Liboiron, M., et al. (2016). "Low plastic ingestion rate in Atlantic cod (Gadus morhua) from Newfoundland destined for human consumption collected through citizen science methods." Marine Pollution Bulletin **113**(1-2): 428-437.

Marine microplastics are a contaminant of concern because their small size allows ingestion by a wide range of marine life. Using citizen science during the Newfoundland recreational cod fishery, we sampled 205 Atlantic cod (Gadus morhua) destined for human consumption and found that 5 had eaten plastic, an ingestion prevalence rate of 2.4%. This ingestion rate for Atlantic cod is the second lowest recorded rate in the reviewed published literature (the lowest is 1.4%), and the lowest for any fish in the North Atlantic. This is the first report for plastic ingestion in fish in Newfoundland, Canada, a province dependent on fish for sustenance and livelihoods. Copyright © 2016 Elsevier Ltd

Liboiron, M., et al. (2019). "Low incidence of plastic ingestion among three fish species significant for human consumption on the island of Newfoundland, Canada." Marine Pollution Bulletin **141**: 244-248.

This study reports the first baselines of plastic ingestion for three fish species that are common commercial and sustenance food fish in Newfoundland. Species collections occurred between 2015 and 2016 for Atlantic cod (Gadus morhua), Atlantic salmon (Salmo salar), and capelin (Mallotus villosus). The frequency of occurrence (%FO) of plastic ingestion for both Atlantic salmon (n = 69) and capelin (n = 350) was 0%. Of the 1010 Atlantic cod individuals collected over two years, 17 individuals had ingested plastics, a %FO of 1.68%. This is the only multi-year investigation of plastic ingestion in Atlantic cod for the Northwest Atlantic, and the first baseline of plastic ingestion in Atlantic salmon and capelin on the island of Newfoundland. Considering the ecological, economic, and cultural importance of these fish species, this study is the beginning of a longitudinal study of plastic ingestion to detect any future changes in contamination levels. Copyright © 2019 Elsevier Ltd

Liebezeit, G. and F. Dubaish (2012). "Microplastics in beaches of the East Frisian islands Spiekeroog and Kachelotplate." Bulletin of Environmental Contamination & Toxicology **89**(1): 213-217.

Microplastic particles were quantified in beach transects of the East Frisian islands Spiekeroog and Kachelotplate and in two samples from a tidal flat. Both granules and fibres were present while fragments and polystyrene pellets were completely absent. On the Kachelotplate the highest number of granules (496/10 g sediment) was observed at the high water line while on Spiekeroog a sample from the dune area had the highest value (38/10 g sediment). The tidal flat samples hat 36 and 136 granules/10 g sediment with the higher number being associated with a blue mussel bank. Fibres were more homogeneously distributed and did not show any particular enrichment. In comparison with data from the Belgian coast the total numbers are higher which might be related to the exposure situation of the island beaches.

Liebezeit, G. and E. Liebezeit (2014). "Synthetic particles as contaminants in German beers." Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment **31**(9): 1574-1578.

A total of 24 German beer brands was analysed for the contents of microplastic fibres, fragments and granular material. In all cases contamination was found. Counts ranged from 2 to 79 fibres L⁻¹, from 12 to 109 fragments L⁻¹ and from 2 to 66 granules L⁻¹. The results show a high variability between individual samples and samples from different production dates. Possible sources of this contamination with foreign materials are discussed. © 2014 Taylor & Francis.

Liebmann, B., et al. (2008). "Formulation of poorly water-soluble substances using self-assembling spider silk protein." Colloids and Surfaces A: Physicochemical and Engineering Aspects **331**(1-2): 126-132.

In nature self-assembly of soluble monomeric proteins to defined supramolecular structures is an essential process in the formation of morphologically distinct biological materials like cells, tissues, diatoms or mollusk shells. Using these proteins, complex structures in the nanometer and micrometer scale can be generated that are hardly obtainable by other methods. The engineered ADF4(C16) spider silk protein is mimicking the sequence of the dragline silk protein ADF4 of the spider Araneus diadematus and can be synthesized by a biotechnological production process using Escherichia coli (E. coli) as host organism. From the soluble ADF4(C16) monomers assembly of nanofibers, microbeads and films is possible. The purified monomeric ADF4(C16) strongly interacts with hydrophobic surfaces and particles of poorly water-soluble substances. Based on this effect ADF4(C16) could be used for colloidal stabilization of hydrophobic particles in aqueous environment. Poorly water-soluble substances can also be encapsulated in ADF4(C16) microbeads during self-assembly. The release of the encapsulated ingredients was induced by proteolytic cleavage of the microbead structure. These results show that ADF4(C16) protein microbeads have a high potential as a storage and delivery system for poorly water-soluble active ingredients in several application fields like cosmetics, pharma or nutrition.

Liedermann, M., et al. (2018). "A methodology for measuring microplastic transport in large or medium rivers." Water **10**(4).

Plastic waste as a persistent contaminant of our environment is a matter of increasing concern due to the largely unknown long-term effects on biota. Although freshwater systems are known to be the transport paths of plastic debris to the ocean, most research has been focused on marine environments. In recent years, freshwater studies have advanced rapidly, but they rarely address the spatial distribution of plastic debris in the water column. A methodology for measuring microplastic transport at various depths that is applicable to medium and large rivers is needed. We present a new methodology offering the possibility of measuring microplastic transport at different depths of verticals that are distributed within a profile. The net-based device is robust and can be applied at high flow velocities and discharges. Nets with different sizes (41 micro m, 250 micro m, and 500 micro m) are exposed in three different depths of the water column. The methodology was tested in the Austrian Danube River, showing a high heterogeneity of microplastic concentrations within one cross section. Due to turbulent mixing, the different densities of the polymers, aggregation, and the growth of biofilms, plastic transport cannot be limited to the surface layer of a river, and must be examined within the

whole water column as for suspended sediments. These results imply that multipoint measurements are required for obtaining the spatial distribution of plastic concentration and are therefore a prerequisite for calculating the passing transport. The analysis of filtration efficiency and side-by-side measurements with different mesh sizes showed that 500 micro m nets led to optimal results.

Lien, K. Y., et al. (2010). "Rapid isolation and detection of cancer cells by utilizing integrated microfluidic systems." Lab on a Chip **10**(21): 2875-2886.

The present study reports a new three-dimensional (3D) microfluidic platform capable of rapid isolation and detection of cancer cells from a large sample volume (e.g. ~1 mL) by utilizing magnetic microbead-based technologies. Several modules, including a 3D microfluidic incubator for the magnetic beads to capture cancer cells, a microfluidic control module for sample transportation and a nucleic acid amplification module for genetic identification, are integrated into this microsystem. With the incorporation of surface-modified magnetic beads, target cancer cells can be specifically recognized and conjugated onto the surface of the antibody-coated magnetic microbeads by utilizing a swirling effect generated by the new 3D microfluidic incubator, followed by isolating and purifying the magnetic complexes via the incorporation of an external magnet and a microfluidic control module, which washes away any unbound waste solution. Experimental results show that over 90% of the target cancer cells can be isolated from a large volume of bio-samples within 10 min in the 3D microfluidic incubator. In addition, the expressed genes associated with ovarian and lung cancer cells can also be successfully amplified by using the on-chip nucleic acid amplification module. More importantly, the detection limit of the developed system is found to be 5 x 10(1) cells mL(-1) for the target cancer cells, indicating that this proposed microfluidic system may be adapted for clinical use for the early detection of cancer cells. Consequently, the proposed 3D microfluidic system incorporated with immunomagnetic beads may provide a promising automated platform for the rapid isolation and detection of cancer cells with a high sensitivity.

Lien, K. Y., et al. (2009). "Microfluidic system for detection of alpha-thalassemia-1 deletion using saliva samples." Analytical Chemistry **81**(11): 4502-4509.

This current study presents a new miniature, integrated system capable of rapid detection of genetic deletion from saliva samples. Several critical modules including a genomic DNA (gDNA) extraction module, a polymerase chain reaction (PCR) module, and an external optical detection module are integrated into the system. Silica-modified magnetic beads are first incubated with saliva in an extraction chamber with a cell lysis solution. This is followed by the collection of released gDNA onto the surface of the microbeads, which is then further purified and concentrated utilizing a magnetic field generated by an on-chip array of microcoils. Then, genetic deletion of human genes can be specifically amplified by the on-chip PCR module and is immediately detected using the optical detection module. Experimental results show that high-quality gDNA with an average concentration of 50.45 ng/microL can be extracted from 100 microL of saliva. The detection of a mutated alpha-globin gene associated with alpha-thalassemia-1 of southeast Asian (SEA)-type deletion can be completed within less than 1 h. Moreover, the detection limit of the system is found to be 12.00 pg/microL with a high sensitivity up to 90%. Consequently, the proposed saliva-based miniature system can provide a powerful platform for rapid DNA extraction and detection of genetic diseases.

Lien, K.-Y., et al. (2009). "Microfluidic system for detection of -thalassemia-1 deletion using saliva samples." Analytical Chemistry **81**(11): 4502-4509.

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Liffourrena, A. S. and G. I. Lucchesi (2018). "Alginate-perlite encapsulated Pseudomonas putida A (ATCC 12633) cells: Preparation, characterization and potential use as plant inoculants." Journal of Biotechnology **278**: 28-33.

Microbial immobilization can be used to prepare encapsulated inoculants. Here, we characterize and describe the preparation of Ca-alginate-perlite microbeads loaded with cells of plant growth-promoting Pseudomonas putida A (ATCC 12633), for their future application as agricultural inoculants. The microbeads were prepared by dropwise addition of a CaCl₂-paraffin emulsion mixture to an emulsion containing alginate 2% (w/v), perlite 0.1-0.4% (w/v) and bacterial suspension in 0.9% NaCl (10¹⁰CFU/mL). For all perlite concentrations used, microbead size was 90-120mum, the trapped population was 10⁸CFU/g microbeads and the increase in mechanical stability was proportional to perlite concentration. Microbeads containing 0.4% (w/v) perlite were able to release bacteria into the medium after 30 days of incubation. When we evaluated how P. putida A (ATCC 12633) entrapped in Ca-alginate-perlite (0.4% (w/v)) microbeads colonized the Arabidopsis thaliana rhizosphere, an increase in colonization over time was detected (from an initial 2.1x10⁴ to 9.2x10⁵CFU/g soil after 21 days). With this treatment, growth promotion of A. thaliana occurred with an increase in the amount of proteins, and in root and leaf biomass. It was concluded that the microbeads could be applied as possible inoculants, since they provide protection and a controlled release of microorganisms into the rhizosphere.

Lighthart, B., et al. (2000). "Bees Scavenge Airborne Bacteria." Microbial Ecology **39**(4): 314-321.

An air conditioned wind tunnel system was designed, fabricated, and tested to determine whether tethered bees scavenge microbeads or Bacillus subtilis var. niger spores from aerosols. Tests showed that microbeads and spores were scavenged by bumblebees and honeybees, respectively. Five independent variables and their interactions were used in a stepwise multiple regression. Two of them, the cube root of the electrostatic charge on the honeybee and the dose of the spore aerosol, accounted for most of the statistically significant fit to the model's two dependent variables: the percentage of the dose adsorbed by honeybees and the number of spores adsorbed by the same bees. Both dependent variables increased directly so that an increase in electrostatic charge on the bee (i.e., cube root 32 pC) resulted in an increase (i.e., approximately 1%) in the spore dose adsorbed and the number of spores adsorbed by the bees.

It was theorized that the spores were in an adsorption/desorption equilibrium that responded to the concentration "pressure" of the spore aerosol. Further, the charge on the bee affected the adsorption force on the bee's surface, as well as increasing the effective aerosol volume accessible for the bee's scavenging. In short, relating these findings to bees scavenging bacteria from the ambient atmosphere, it appears that the spore exposure (where exposure means the product of the ambient concentration, the time the bee is exposed, and air volume through which the bee flies) controls the number of spores adsorbed by a bee, and the static charge on the bee controls the adsorption/desorption equilibrium and presumably the scavenging volume.

Lim, M. C., et al. (2011). "Microbead-assisted PDA sensor for the detection of genetically modified organisms." Analytical & Bioanalytical Chemistry **400**(3): 777-785.

A simple and sensitive approach for the detection of marker protein, phosphinothricin acetyltransferase, from genetically modified crops was developed based on the colorimetric transition of polydiacetylene (PDA) vesicles in combination with silica microbeads. PDAs have attracted a great deal of interests as a transducing material due to their special features that allow colorimetric response to sensory signals, as well as their inherent simplicity. However, most PDA-based biosensors require additional analytical equipment such as a fluorescence microscope or UV-Vis spectrometer. In this study, we report a new approach to increase the degree of color transition by coupling antibody-conjugated PDA vesicles with silica microbeads in an effort to monitor the results with the unaided eye or simple RGB analysis. By immobilizing PDA vesicles on silica microbeads, we were able to overcome the disadvantages of colloidal PDA-based sensors and increase the degree of colorimetric changes in response to target molecules to a concentration as low as 20 nM. The additional stresses were given to PDA vesicles by antigen-antibody bridging of PDA vesicles coupled with microbeads, resulting in enhanced blue-red color transition. All the results showed that PDA vesicles in conjunction with silica microbeads will be a promising transducing material for the detection of target proteins in diagnostic and biosensing applications.

Lim, S. L., et al. (2019). "Targeted metabolomics reveals differential biological effects of nanoplastics and nanoZnO in human lung cells." Nanotoxicology **13**(8): 1117-1132.

Engineered nanomaterials are of public health concern. Recently, there has been an increasing attention on the toxicity of nanoplastics and nanoZnO because of their increasing utilization and presence in the environment. However, knowledge of their toxicological behavior and metabolic interactions with the cellular machinery that determine their potential health effects are extremely limited. In this study, the cellular uptake, cytotoxic effects, and metabolic responses of bronchus epithelial (BEAS-2B) cells exposed to nanopolystyrene (nanoPS) and a widely used metallic nanoparticle, nanoZnO, were investigated using a tandem mass spectrometry-based metabolomics approach. The results revealed that even with low cytotoxicity, these nanoparticles (NPs) affected cell metabolism. NanoPS exposure showed autophagic- and endoplasmic reticulum (ER) stress-related metabolic changes such as increased in amino acids and tricarboxylic acid cycle (TCA) intermediate metabolites, a process known to play a critical role in regulating cell resistance to cytotoxic effects. Both metabolomics profiling and ER-stress pathway, together with quantitative real-time RT-polymerase chain reaction (qRT-PCR) analyses, demonstrated that autophagy was reciprocally regulated to couple metabolic and transcriptional reprograming. In contrast, nanoZnO-induced ROS-mediated cell death was associated with mitochondrial dysfunction and interference in regulating energy metabolism. Collectively, these two types of NPs were observed to cause perturbations albeit differential in cellular metabolism associated with their cytotoxic effects. Our findings provided an in depth understanding of metabolic changes influenced by two different types of NPs, with contrasting molecular mechanisms for the adverse effects observed.

Lim, Y. F., et al. (2014). "Determination of Villous Rigidity in the Distal Ileum of the Possum (Trichosurus vulpecula)." PLoS ONE **9**(6).

We investigated the passive mechanical properties of villi in ex vivo preparations of sections of the wall of the distal ileum from the brushtail possum (Trichosurus vulpecula) by using a flow cell to impose physiological and supra-physiological levels of shear stress on the tips of villi. We directly determined the stress applied from the magnitude of the local velocities in the stress inducing flow and additionally mapped the patterns of flow around isolated villi by tracking the trajectories of introduced 3 µm microbeads with bright field micro particle image velocimetry (mPIV). Ileal villi were relatively rigid along their entire length (mean 550 µm), and exhibited no noticeable bending even at flow rates that exceeded calculated normal physiological shear stress (>0.5 mPa). However, movement of villus tips indicated that the whole rigid structure of a villus could pivot about the base, likely from laxity at the point of union of the villous shaft with the underlying mucosa. Flow moved upward toward the tip on the upper portions of isolated villi on the surface facing the flow and downward toward the base on the downstream surface. The fluid in sites at distances greater than 150 µm below the villous tips was virtually stagnant indicating that significant convective mixing in the lower intervillous spaces was unlikely. Together the findings indicate that mixing and absorption is likely to be confined to the tips of villi under conditions where the villi and intestinal wall are immobile and is unlikely to be greatly augmented by passive bending of the shafts of villi.

Lima, A. R. A., et al. (2015). "Seasonal distribution and interactions between plankton and microplastics in a tropical estuary." Estuarine, Coastal and Shelf Science **165**: 213-225.

The seasonal migration of a salt wedge and rainfall were the major factors influencing the spatiotemporal distribution of ichthyoplankton and microplastics along the main channel of the Goiana Estuary, NE Brazil. The most abundant taxa were the clupeids Rhinosardinia bahiensis and Harengula clupeola, followed by the achirid Trinectes maculatus (78.7% of the catch). Estuarine and mangrove larvae (e.g. Anchovia clupeoides, Gobionellus oceanicus), as well as microplastics were ubiquitous. During drier months, the salt wedge reaches the upper estuary and marine larvae (e.g. Cynoscion acoupa) migrated upstream until the zones of coastal waters influence. However, the meeting of waterfronts in the middle estuary forms a barrier that retains the microplastics in the upper and lower estuary most part of the year. During the late dry season, a bloom of zooplankton was followed by a bloom of fish larvae (12.74 ind. 100 m-3) and fish eggs (14.65 ind. 100 m-3) at the lower estuary. During the late rainy season, the high freshwater inflow flushed microplastics, together with the biota, seaward. During this season, a microplastic maximum (14 items 100 m-3) was observed, followed by fish larvae maximum (14.23 ind. 100 m-3) in the lower estuary. In contrast to fish larvae, microplastics presented positive correlation with high rainfall rates, being more strictly associated to flushing out/into the estuary than to seasonal variation in environmental variables. Microplastics represented half of fish larvae density. Comparable densities in the water column increase the chances of interaction between microplastics and fish larvae, including the ingestion of smaller fragments, whose shape and colour are similar to zooplankton prey.

Lima, A. R. A., et al. (2016). "Seasonal-Dial Shifts of Ichthyoplankton Assemblages and Plastic Debris around an Equatorial Atlantic Archipelago." Frontiers in Environmental Science.

Seasonality was a stronger influence in the ichthyoplankton assemblages around the Saint Peter

and Saint Paul Archipelago (SPSPA) than distance from the islands. Plastic debris were ubiquitous and although it presented diel trends, no other spatiotemporal patterns was showed. Larval Oxyporhamphus micropterus was the most important taxa (29.37% of the total catch), followed by Ceratoscopelus warmingii and Entomacrodus vomerianus. Exocoetidae eggs represented 41.01%. Mesopelagic fish larvae dominated the community. Myctophidae had the highest species richness (15). Four larval fish assemblages occured: (1) nighttime demersal/bathydemersal (Anguillidae, Congridae); (2) daytime mesopelagic/bathypelagic/epipelagic (Myctophidae, Cyclothone acclinidens); (3) daytime epipelagic (Exocoetidae, Coryphaena hippurus, Thunnus albacares) and (4) nighttime reef and demersal (Blennidae, Pomacentridae, Lutjanidae). The dry season (lower temperature, higher chlorophyll a and higher SW wind velocity) influenced the first two assemblages. The rainy season (higher temperatures and lower NW wind velocity) influenced the last two. Nighttime abundance of dominant species in the rainy season suggests diel vertical migration nearshore. Plastics were 2.12 times more abundant than the most abundant fish larvae. Comparable amounts of larvae and plastics in the water column increase the chances of interaction between these two compartments and might disturb the local marine food web and promote the transfer of microplastic from one habitat to another, especially when smaller taxa contaminated by ingested fragments are preyed by migratory animals such as marine birds and tuna. A study around the area concluded that at least a part of the plastic debris can have local source due to fishing activities. Small-scale oceanographic mechanisms such as the interaction between the topography and currents (SEC and EUC) seem to be responsible for the retention of fish eggs, fish larvae and plastics around SPSPA.

Lima, A. R. A., et al. (2014). "Distribution patterns of microplastics within the plankton of a tropical estuary." Environmental Research **132**: 146-155.

Abstract: The Goiana Estuary was studied regarding the seasonal and spatial variations of microplastics (<5mm) and their quantification relative to the zooplankton. The total density (n 100m^{-3}) of microplastics represented half of the total fish larvae density and was comparable to fish eggs density. Soft, hard plastics, threads and paint chips were found in the samples (n=216). Their origins are probably the river basin, the sea and fisheries (including the lobster fleet). In some occasions, the amount of microplastics surpassed that of Ichthyoplankton. The highest amount of microplastics was observed during the late rainy season, when the environment is under influence of the highest river flow, which induces the runoff of plastic fragments to the lower estuary. The density of microplastics in the water column will determine their bioavailability to planktivorous organisms, and then to larger predators, possibly promoting the transfer of microplastic between trophic levels. These findings are important for better informing researchers in future works and as basic information for managerial actions. [Copyright &y& Elsevier]

Limonta, G., et al. (2019). "Microplastics induce transcriptional changes, immune response and behavioral alterations in adult zebrafish." Scientific Reports **9**(1): 15775.

Microplastics have become pervasive environmental pollutants in both freshwater and marine

ecosystems. The presence of microplastics have been recorded in the tissues of many wild fish species, and laboratory studies have demonstrated that microplastics can exert adverse health effects. To further investigate the biological mechanisms underlying microplastics toxicity we applied an integrated approach, analyzing the effects of microplastics at transcriptomic, histological and behavioral level. Adult zebrafish have been exposed to two concentrations of high-density polyethylene and polystyrene microplastics for twenty days. Transcriptomic results indicate alterations in the expression of immune system genes and the down-regulation of genes correlated with epithelium integrity and lipid metabolism. The transcriptomic findings are supported by tissue alterations and higher occurrence of neutrophils observed in gills and intestinal epithelium. Even the daily rhythm of activity of zebrafish appears to be affected, although the regular pattern of activity is recovered over time. Considering the transcriptomic and histological findings reported, we hypothesize that the effects on mucosal epithelium integrity and immune response could potentially reduce the organism defense against pathogens, and lead to a different utilization of energy stores.

Lin, A., et al. (2013). "Multilaboratory validation of a luminex microbead-based suspension array for the identification of the 11 most clinically relevant Shiga toxin-producing Escherichia coli O serogroups." Journal of Food Protection **76**(5): 867-870.

Rapid and high-throughput identification and serotyping of Shiga toxin-producing Escherichia coli (STEC) O serogroups is important for detecting, investigating, and controlling STEC infection outbreaks and removing hazardous products from commerce. A Luminex microbead-based suspension array has been developed to identify the 11 most clinically relevant STEC serogroups: O26, O45, O91, O103, O104, O111, O113, O121, O128, O145, and O157. Here we present results of a blinded multilaboratory collaborative study involving 10 participants from nine laboratories using 55 unknown strains. From the total 495 analyses, two false-positive and three false-negative results were obtained, indicating the assay to be a rapid, high-throughput, and robust method for identifying clinically relevant STEC serogroups.

Lin, A., et al. (2011). "Rapid O serogroup identification of the ten most clinically relevant STECs by Luminex microbead-based suspension array." Journal of Microbiological Methods **87**(1): 105-110.

Identification and serotyping of Shiga toxin-producing Escherichia coli during foodborne outbreaks can aid in matching clinical, food, and environmental isolates when trying to identify the source of illness and ultimately food contamination. Herein we describe a Luminex microbead-based suspension array to identify the O serogroup of the ten most clinically relevant STECs: O26, O45, O91, O103, O111, O113, O121, O128, O145, and O157. The use of PCR followed by Luminex xMAP technology enables the detection of multiple analytes in a single multiplex reaction with high throughput capabilities. One hundred and fourteen STEC isolates were correctly identified with no false positives among forty-six other organisms using this assay. Assay performance was tested in multiple laboratories using a panel of eleven different STEC serogroups on the Bio-Plex 200 and MAGPIX instruments. The STEC microbead-based suspension array can be performed in a 96-well plate format for high throughput screening in less than 4h. Furthermore, it is expandable, allowing for the addition of O serogroups should the need arise.

Lin, C. H., et al. (2009). "Medium- to high-throughput SNP genotyping using VeraCode microbeads." Methods in Molecular Biology **496**: 129-142.

Recent breakthroughs in multiplexed SNP (single nucleotide polymorphism) genotyping technology have enabled global mapping of the relationships between genetic variation and disease. Discoveries made by such whole-genome association studies often spur further interest in surveying more focused subsets of SNPs for validation or research purposes. Here we describe a new SNP genotyping platform that is flexible in assay content and multiplexing (up to 384 analytes), and can serve medium- to high-throughput applications. The Illumina BeadXpress platform supports the GoldenGate Genotyping Assay on digitally inscribed VeraCode microbeads to allow streamlined workflow, rapid detection, unparalleled data reproducibility and consistency. Thus, it is a highly valuable tool for biomarker research and validation, pharmaceutical development, as well as the development of molecular diagnostic tests. [References: 6]

Lin, H., et al. (2019). "A novel nanoscaled chemo dye-based sensor for the identification of volatile organic compounds during the mildewing process of stored wheat." Food Analytical Methods **12**(12): 2895-2907.

This work presents a novel colorimetric sensor based on nanoscaled chemo dyes which can detect inert volatile organic compounds (VOCs) during the mildewing process of stored wheat. 1-Octen-3-ol and 3-octanone were selected as the marked compounds by gas chromatography mass spectrometry (GC-MS) analysis. In this work, poly(styrene-co-acrylic acid) microbeads were prepared by soap-free emulsion copolymerisation. Boron-dipyrromethene dyes with PSA were fabricated as a novel sensor to obtain digital data before and after exposure to VOCs, and the correlation coefficients (R²) between the digital data and the concentration of VOCs were 0.8078 and 0.8324, respectively. And root mean square errors (RMSEs) were 3.05 g L⁻¹ and 1.65 g L⁻¹, respectively. The data based on the identification of mouldy wheat samples were processed by principal component analysis (PCA) and linear discriminant analysis (LDA). The optimal performance obtained for the LDA model was 83.33% in the prediction set and 90% in the calibration set.

Lin, H.-T., et al. (2010). "Hydrocarbon fuels produced by catalytic pyrolysis of hospital plastic wastes in a fluidizing cracking process." Fuel Processing Technology **91**(11): 1355-1363.

A mixture of post-consumer polyethylene/polypropylene/polystyrene (PE/PP/PS) with polyvinyl chloride (PVC) waste was pyrolyzed over cracking catalysts using a fluidizing reaction system operating isothermally at ambient pressure. The influences of catalyst types and reaction conditions including reaction temperatures, ratios of catalyst to plastic feed, flow rates of fluidizing gas and catalyst particle sizes were examined. Experiments carried out with various catalysts gave good yields of valuable hydrocarbons with differing selectivity in the final products dependent on reaction conditions. A model based on kinetic and mechanistic considerations associated with chemical reactions and catalyst deactivation in the acid-catalyzed degradation of plastics has been developed. The model gives a good representation of experimental results from the degradation of commingled plastic waste. The results of this study are useful for determining the effects of catalyst types and reaction conditions on both the product distribution and selectivity from hospital plastic waste, and especially for the utilization of post-use commercial FCC catalysts for producing valuable hydrocarbons in a fluidizing cracking process.

Lin, K., et al. (2011). "Multiplex method for simultaneous serological detection of porcine reproductive and respiratory syndrome virus and porcine circovirus type 2." Journal of Clinical Microbiology **49**(9): 3184-3190.

Porcine circovirus type 2 (PCV2) and porcine reproductive and respiratory syndrome virus (PRRSV) are major contributors to the porcine respiratory disease complex (PRDC). Routine

serological diagnosis and surveillance play an important role in the prevention of PRDC, as it is a leading cause of economic losses to the swine industry. We herein describe an advanced microsphere-based immunoassay that permits the simultaneous detection of antibodies to PCV2 and PRRSV, thereby reducing the time and effort involved in testing. Recombinant PRRSV nucleoprotein antigen and the PCV2 capsid antigen were coupled to fluorophore-dyed beads with distinct spectral addresses. Weekly serum samples from 72 pigs that were experimentally exposed to either PCV2, PRRSV, or both PCV2 and PRRSV were used to validate the microbead assay (MBA) in comparison with the "gold standard" enzyme-linked immunosorbent assays. The kinetics of the PCV2- and PRRSV-specific antibody responses measured by the microbead assay were comparable to those of the standard assays; Spearman's rank correlations were 0.72 (P < 0.001) for PRRSV and 0.80 (P < 0.001) for PCV2. Diagnostic sensitivity and specificity were determined using field sera whose positive or negative status was determined by the standard tests. The diagnostic sensitivity and specificity were both 98% for PCV2 and were 91% and 93%, respectively, for PRRSV (kappa coefficients, 0.85 and 0.67 for PCV2 and PRRSV, respectively). Multiplexing did not interfere with assay performance or diagnostic sensitivity. Therefore, the described study demonstrates proof of concept for the development of more versatile and economical microbead array-based multiplex serological test panels for veterinary use. Copyright © 2011, American Society for Microbiology. All Rights Reserved.

Lin, K., et al. (2017). "Establishment of a novel quantum dots-encoded microbead-based flow cytometric method for quantification of soluble FcepsilonRIalpha in serum." Cytometry Part A: The Journal of the International Society for Analytical Cytology **91**(7): 686-693.

The soluble form of the transmembrane glycoprotein, FcepsilonRIalpha which corresponds to the high-affinity receptor for IgE, is found in serum. Growing evidence suggests the pathogenic role of IgE and FcepsilonRI in systemic lupus erythematosus (SLE). The goal of this study is to develop a sensitive and standardized cytometric assay for quantification of sFcepsilonRIalpha. A membrane emulsification technique was utilized to incorporate CuInS₂ /ZnS quantum dots and Fe₃ O₄ nanoparticles into poly (styrene-co-maleic anhydride) microbeads. The beads were then carboxylated and coated with capture antibody monoclonal anti-human FcepsilonRIalpha. This antibody binds to FcepsilonRIalpha but does not block the binding of FcepsilonRIalpha to IgE. After incubation with standards or serum samples, the microbeads were incubated with excessive native human IgE, followed by incubation with Phycoerythrin (PE) conjugated anti-human IgE. The resulting quantum dot microbeads were gated, and sFcepsilonRIalpha quantification was analyzed based on PE fluorescence intensity. The method exhibited good linearity (R² > 0.99), and the limit of detection was established at 0.29 ng/mL with the dynamic range of up to 200 ng/mL. The precision of the assay validated by intra- and inter-assay variability met the acceptance criteria with the mean recovery falling within 80-110% of the theoretical concentration and a corresponding CV < 20%. We tested 149 serum samples which 89 were from SLE patients and 60 were from healthy volunteers. For the first time, we detected an increased sFcepsilonRIalpha level in the serum of SLE patients, which was confirmed by a commercial ELISA kit. Compared to ELISA, this novel method is more sensitive and efficient. It allows for the simple comparative analysis of sFcepsilonRIalpha levels in health and disease. © 2017 International Society for Advancement of Cytometry.

Lin, K. N., et al. (2018). "Chemotherapeutic Drug-Conjugated Microbeads Demonstrate Preferential Binding to Methylated Plasmid DNA." Biotechnology Journal **13**(11): e1700701.

Plasmid DNA (pDNA) is an attractive therapeutic biomolecule in several diseases including

cancer, AIDS, cystic fibrosis, Parkinson's disease, and Alzheimer's disease. Increasing demand for plasmid DNA as a therapeutic biomolecule for transgene expression or vaccine applications necessitate novel approaches to bioprocessing. The synthesis, characterization and evaluation of aminoglycoside-derived hydrogel microbeads (Amikabeads) for pDNA binding is described previously. Here, the generation and evaluation of novel chemotherapeutic drug-conjugated microbeads for application in pDNA binding and recovery is described. Chemotherapeutic drug-conjugated Amikabeads demonstrate higher binding of methylated pDNA compared to unmethylated pDNA in presence of high salt concentrations. Desorption of plasmids from drug-conjugated microbeads is facilitated by the use of organic modifiers. The observed differences in binding methylated versus unmethylated DNA can make drug-conjugated microbeads useful in diagnostic as well as therapeutic applications. These results demonstrate that anti-cancer drugs represent a diverse set of ligands that may be exploited for molecular engineering of novel DNA binding materials for applications in delivery, diagnostics, and biomanufacturing.

Lin, L., et al. (2018). "Occurrence and distribution of microplastics in an urban river: a case study in the Pearl River along Guangzhou City, China." Science of the Total Environment **644**: 375-381.
Microplastics, as emerging contaminants in the global environment, have become a cause for concern for both academics and the public. The present understanding of microplastic pollution is primarily focused on marine environments, and less attention has been given to freshwater environments, in particular, to urban rivers. In this study, microplastics were sampled from surface water and sediments in 14 sites located in the lower course of the Pearl River. These sampling sites are located along Guangzhou of South China, with built-up areas being the dominant land use. The abundances of microplastics in surface water and sediments ranged from 379 to 7924 items.m⁻³ and 80 to 9597 items.kg⁻¹, respectively. Polyethylene and polypropylene were the common types of microplastics, together accounting for 64.3% and 73.8% of surface water and sediment samples, respectively. Fibers were the dominant microplastic shapes in both water and sediment samples. The abundances of microplastics varied in surface water and sediments with each site, which might be affected by multiple factors. Our results indicated that wastewater treatment plants (WWTP) could reduce microplastics from municipal sewage which was finally discharged into the Pearl River along Guangzhou.

Lin, M. X., et al. (2013). "Continuous labeling of circulating tumor cells with microbeads using a vortex micromixer for highly selective isolation." Biosensors & Bioelectronics **40**(1): 63-67.
Circulating tumor cells (CTCs) are identified in transit within the blood stream of cancer patients and have been proven to be a main cause of metastatic disease. Current approaches for the size-based isolation of CTCs have encountered technical challenges as some of the CTCs have a size similar to that of leukocytes and therefore CTCs are often lost in the process. Here, we propose a novel strategy where most of the CTCs are coated by a large number of microbeads to amplify their size to enable complete discrimination from leukocytes. In addition, all of the microbead labeling processes are carried out in a continuous manner to prevent any loss of CTCs during the isolation process. Thus, a microfluidic mixer was employed to facilitate the efficient and selective labeling of CTCs from peripheral blood samples. By generating secondary vortex flows called Taylor-Gortler vortices perpendicular to the main flow direction in our microfluidic device, CTCs were continuously and successfully coated with anti-epithelial cell adhesion molecule-conjugated beads. After the continuous labeling, the enlarged CTCs were perfectly trapped in a micro-filter whereas all of the leukocytes escaped.

Lin, Q. B., et al. (2011). "Determination of silver in nano-plastic food packaging by microwave digestion coupled with inductively coupled plasma atomic emission spectrometry or inductively coupled plasma mass spectrometry." Food Additives & Contaminants: Part A - Chemistry, Analysis, Control, Exposure & Risk Assessment **28**(8): 1123-1128.

The detection of silver in nano-plastic food packaging by microwave digestion coupled with either inductively coupled plasma atomic emission spectrometry (ICP-AES) or inductively coupled plasma mass spectrometry (ICP-MS) was investigated. Microwave digestion was optimised by trialling different acid mixtures. Both ICP-AES and ICP-MS showed good reproducibility, repeatability and recovery. For ICP-AES the limit of detection of the method (LODm) was 25.0 mu g g-1, the limit of detection of the instrument (LODi) was 30.0 ng ml-1, the linear range was 0.10-10.0 mu g ml-1. The average recoveries for blank samples spiked with silver at 100, 250 and 500 mu g g-1 ranged from 82.53% to 87.60%, and the relative standard deviations (RSDs) were from 1.79% to 8.30%. For ICP-MS analysis the LODm was 0.75 mu g g-1, the LODi was 0.04 ng ml-1, the linear range was 0.20-500.0 ng ml-1, the RSDs were 2.26-4.79%, and the recoveries were 78.09-92.72% (spiked concentrations of 2.5, 5.0 and 10.0 mu g g-1). These results indicate that the proposed method could be employed to analyse silver in nano-plastic food packaging.

Lin, V. S. (2016). "Research highlights: Impacts of microplastics on plankton." Environmental Sciences: Processes and Impacts **18**(2): 160-163.

Each year, millions of metric tons of the plastic produced for food packaging, personal care products, fishing gear, and other human activities end up in lakes, rivers, and the ocean. The breakdown of these primary plastics in the environment results in microplastics, small fragments of plastic typically less than 1-5 mm in size. These synthetic particles have been detected in all of the world's oceans and also in many freshwater systems, accumulating in sediment, on shorelines, suspended in surface waters, and being ingested by plankton, fish, birds, and marine mammals. While the occurrence of plastics in surface waters has been surveyed in a number of studies, the impacts of microplastics on marine organisms are still being elucidated. This highlight features three recent publications that explore the interactions of microplastics with planktonic organisms to clarify the effects of these pollutants on some of the ocean's smallest and most important inhabitants. Copyright © 2016 The Royal Society of Chemistry.

Lin, W., et al. (2019). "Investigating the toxicities of different functionalized polystyrene nanoplastics on Daphnia magna." Ecotoxicology and Environmental Safety **180**: 509-516.

Nanoplastics (NPs) spread widely with water and air current, and they can accumulate in aquatic organisms, even penetrating biofilms, which may cause persistent toxicity and potential hazards. This current study aimed to reveal the toxicological mechanism of different functionalized polystyrene (PS) NPs on Daphnia magna (D. magna) by investigating toxicity endpoints in individual level and biochemical level. In this study, acute toxicity, behavioral parameters and biomarker responses of D. magna was measured in the exposure of different functionalized PS NPs (plain PS, PS-p-NH₂, PS-n-NH₂ and PS-COOH). The results indicated that when exposed to the plain PS, ROS induction would activate MAPKs, thereby causing lethality and adverse behavior effects on D. magna; while the functionalized PS NPs were less toxic than the plain PS, especially for PS-p-NH₂ which was severely flocculated after exposure, thus showing no immobilization at the investigated concentrations. Also, the antioxidant system was mainly stimulated due to the direct interaction with the cell

surface receptor, which was different from the plain PS. Consequently, this work suggests significant effects of functional groups on NPs for environmental toxicity studies, and provides a better understanding of the toxicological mechanism on the toxicity of PS NPs toward D. magna.

Lin, W., et al. (2019). "Sorption properties of hydrophobic organic chemicals to micro-sized polystyrene particles." Science of the Total Environment **690**: 565-572.

It has been reported that microplastics (MPs) have strong affinity for hydrophobic organic chemicals (HOCs) and can be ingested accidentally by aquatic organisms, posing a potential threat to the environment. To date, the sorption data used in modelling to clarify the mechanism were mostly obtained in varied sampling durations and regions from different works, which might cause inevitable deviation in modelling results. The current study aimed to illustrate the sorption properties of HOCs to the micro-sized polystyrene (PS). The sorption behaviors of HOCs to the PS were investigated at a certain pre-equilibrium status, and the theoretical analysis was taken into consideration. A bottle-shaped passive dosing system was designed to measure the concentration ratio of HOCs in different phases of the exposure suspension at a certain time (loga_{MP}), including polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) with logK_{ow} ranging from 3.17 to 10.20, between water and PS MPs with different dimensions (diameters of 100nm, 1mum and 2mum, respectively). The calculated loga_{MP} ranged from 3.73 to 8.34, and a positive correlation was found between loga_{MP} and log1r₀ (r₀ is the MP radius). The results indicated that HOCs would diffuse into the PS particles, but the mass transfers inside the particles were slow and would be negligible in some environmental cases. Under theoretical considerations, the diffusion through the boundary layer of the particle was considered as the dominating process because it was fast, and the contributions of absorbed amounts on the particle surface were larger for smaller PS particles (i.e. 100-nm PS). This study could provide applicable data for further exploring the effects of micro-sized plastics on the HOCs in environmental samples.

Lin, W., et al. (2019). "Quantification of the combined toxic effect of polychlorinated biphenyls and nano-sized polystyrene on Daphnia magna." Journal of Hazardous Materials **364**: 531-536.

It has been reported that nanoplastics (NP) could cause serious toxicity and accumulative effects on aquatic organisms as well as interact with organic pollutants and influence potential hazards when exposed to biota. The current study aimed to quantitatively investigate the combined acute toxic effect of polychlorinated biphenyls (PCBs) and nano-sized polystyrene (PS) plastic on aquatic organisms based on analyte speciation. First, the combined acute toxicity of PCB-18 and 100 nm PS to Daphnia magna (D. magna) in water was evaluated. Then, speciation analysis of the exposure system was conducted by measuring the sorption coefficients (logK_{NP}) of PCBs to nano-sized PS (ranging from 5.28 to 6.56), which demonstrated the PS could substantially decrease the free concentrations of PCBs. The results showed that a low concentration of the PS could decrease the toxicity to D. magna., which might be originated from the decreased free concentration of PCB-18. However, when the PS concentration was high enough, an opposite effect was observed because the PS dominated the lethality instead of PCB-18. The current study is helpful to clarify the PCB occurrence in ecosystems and provide an in-depth understanding of the eco-toxicological effects of nanoscale plastics.

Lin, W., et al. (2018). "Brominated Flame Retardants, Microplastics, and Biocides in the Marine Environment: Recent Updates of Occurrence, Analysis, and Impacts." Advances in Marine Biology **81**: 167-211.

Emerging contaminants (ECs) may pose adverse effects on the marine ecosystem and human health. Based on the analysis of publications filed in recent years, this paper provides a comprehensive overview on three prominent groups of ECs, i.e., brominated flame retardants, microplastics, and biocides. It includes detailed discussions on: (1) the occurrence of ECs in seawater, sediment, and biota; (2) analytical detection and monitoring approaches for these target ECs; and (3) the biological impacts of the ECs on humans and other trophic levels. This review provides a summary of recent advances in the field and remaining knowledge gaps to address, to enable the assessment of risk and support the development of regulations and mitigation technologies for the control of ECs in the marine environment.

Lin, Y. H., et al. (2013). "Integrating solid-state sensor and microfluidic devices for glucose, urea and creatinine detection based on enzyme-carrying alginate microbeads." Biosensors & Bioelectronics **43**: 328-335.

A solid-state sensor embedded microfluidic chip is demonstrated for the detection of glucose, urea and creatinine in human serum. In the presented device, magnetic powder-containing enzyme-carrying alginate microbeads are immobilized on the surface of an electrolyte-insulator-semiconductor (EIS) sensor by means of a step-like obstacle in the microchannel and an external magnetic force. The sample is injected into the microchannel and reacts with the enzyme contained within the alginate beads; prompting the release of hydrogen ions. The sample concentration is then evaluated by measuring the resulting change in the voltage signal of the EIS sensor. The reaction time and alginate bead size are optimized experimentally using a standard glucose solution. The experimental results show that the device has a detection range of 2-8mM, 1-16mM and 10(-2)-10mM for glucose, urea and creatinine, respectively. Furthermore, it is shown that the device is capable of sequentially measuring all three indicators in a human serum sample. Finally, it is shown that the measured values of the glucose, urea and creatinine concentrations obtained using the device deviate from those obtained using a commercial kit by just 5.17%, 6.22% and 13.53%, respectively. This method can be extended to sequentially measure multiple blood indicators in the sample chip by replacing different types of enzyme in alginate bead and can address the enzyme preservation issue in the microfluidic device. Overall, the results presented in this study indicate that the microfluidic chip has significant potential for blood monitoring in point-of-care applications.

Lindmark, R., et al. (1982). "Immobilization of proteins by entrapment in polyacrylamide microbeads." Journal of Immunological Methods **49**(2): 159-177.

The immobilization of protein A and IgG by entrapment in polyacrylamide microbeads with a diameter of 1 mum was studied with the aim of optimizing the yield of immobilized protein. The microbeads were prepared by a modified emulsion polymerization technique. The small size of the beads resulted in an increase in immobilized protein available for interaction at the bead surface when compared with beads of larger diameter (100 mum). The increase was approximately proportional to the increase of the total bead surface. The increase in total bead surface was, however, accompanied by a slight decrease in the degree of immobilization. Optimal immobilization of protein A and IgG was obtained at monomer compositions of T-C 10-5 and 20-5, respectively (for definitions of T and C, see below). The fraction of immobilized protein available for interaction at the bead surface was almost constant over a wide range of protein concentrations tested. The yield of immobilized protein is generally rather low. The immobilization of IgG could be increased, by the presence of urea or by increasing the apparent molecular weight of IgG by addition of soluble protein A, thus forming soluble IgG protein A complexes. A large fraction of the non-immobilized protein (20-90%) could be recovered from

the washings by affinity chromatography. The entrapment seemed to be more related to the molecular weight than to the hydrodynamic properties of the protein. The density of the microbeads was determined in Percoll and was found to be dependent on the total monomer concentration (T). At high concentrations of cross-linker (C) the apparent density was increased, owing to diffusion of the density medium into the large pores of the gel.

Ling, S. D., et al. (2018). "Pollution signature for temperate reef biodiversity is short and simple." Marine Pollution Bulletin **130**: 159-169.

Pollution increasingly impacts healthy functioning of marine ecosystems globally. Here we quantify concentrations of major pollutant types (heavy metals/sewage/petrochemicals/plastics) as accumulated within marine sediments on and/or immediately adjacent to shallow reefs for 42 sites spanning coastal population centres across south-eastern Australia. Gradients in pollutants were revealed, but few pollutants co-varied, while increasing wave exposure ostensibly diluted concentrations of all pollutants except microplastics. Examination of reef biodiversity indicators revealed that maximum size of fauna and flora, a key life-history parameter summarised by the Community shortness index, plus declining functional and species richness, were the most sensitive bioindicators of pollutants - for which heavy metals and nutrient-enrichment were most pervasive. Results indicate that assemblages of biogenic habitat formers and associated fauna collapse from "long and complicated" to "short and simplified" configurations in response to increasing pollution, and this community signature may form an effective bioindicator to track human-driven degradation. Copyright © 2018

Ling, S. D., et al. (2017). "Ubiquity of microplastics in coastal seafloor sediments." Marine Pollution Bulletin **121**(1-2): 104-110.

Microplastic pollutants occur in marine environments globally, however estimates of seafloor concentrations are rare. Here we apply a novel method to quantify size-graded (0.038-4.0mm diam.) concentrations of plastics in marine sediments from 42 coastal and estuarine sites spanning pollution gradients across south-eastern Australia. Acid digestion/density separation revealed 9552 individual microplastics from 2.84l of sediment across all samples; equating to a regional average of 3.4 microplastics.ml⁻¹ sediment. Microplastics occurred as filaments (84% of total) and particle forms (16% of total). Positive correlations between microplastic filaments and wave exposure, and microplastic particles with finer sediments, indicate hydrological/sediment-matrix properties are important for deposition/retention. Contrary to expectations, positive relationships were not evident between microplastics and other pollutants (heavy metals/sewage), nor were negative relationships with neighbouring reef biota detected. Rather, microplastics were ubiquitous across sampling sites. Positive associations with some faunal-elements (i.e. invertebrate species richness) nevertheless suggest high potential for microplastic ingestion.

Ling, Y., et al. (2019). "Rapid Method for Detection of Staphylococcus aureus in Feces." Journal of Biomedical Nanotechnology **15**(6): 1290-1298.

Staphylococcus aureus is an opportunistic human pathogen causing food-borne diseases. Therefore, the goal of the present work was to develop a robust protocol for identification of small amounts of S. aureus DNA in order to establish a rapid, sensitive, and simple method of detect whether this species is present in the stool of patients. A protocol was developed for extraction of DNA by Fe3O4 @SiO2 microbeads and subsequent detection of S. aureus-specific DNA sequences by the loop-mediated isothermal amplification (LAMP). The LAMP technique was rapid and sensitive, which allowed the detect for bacteria at concentrations as low as 102 cells/mL. This level of detection was superior to that seen for conventional PCR and real-time PCR. Moreover, the LAMP protocol did not require specialized expensive instrumentation. These features of the novel assay developed here indicate that it may serve as an effective tool for point-of-care diagnosis of acute S. aureus infections.

Linnenkoper, K. (2019). "BIG INVESTMENT TO COUNTER OCEAN PLASTICS FROM ASIA." Recycling International: 22-22.

Linnenkoper, K. (2019). "Prada proves how to tackle plastic waste with style." Recycling International: 56-56.

Linnenkoper, K. (2019). "Transforming plastic waste into kayaks." Recycling International: 75-75.

Linsmaux, D., et al. (1979). "Lung scanning with Krypton 81m. [French]." Revue Medicale de Liege **34**(9): 390-399.

Pulmonary scintigraphy by means of perfusion of micro-beads labelled with Tc^{99m}, combined with ventilation scintigraphy with Kr^{81m} gas, is a brief, simple examination that yields valuable data in lung pathology. It facilitates the diagnosis of pulmonary embolism, and is an important element in the detection of bronchial and pulmonary tumors and the determination of their extension. In these cases, and in chronic bronchopneumopathy, the method is an original and highly valuable supplement to respiratory function testing. It is indicated in particular for the preoperative examination before chest operations. In the near future, use of a computer linked to a gamma camera will permit determination of the ventilation/perfusion ratio and quantitative determination of the regional ventilation and its variations under the influence of treatment. CV.

Liou, T. H. (2003). "Pyrolysis kinetics of electronic packaging material in a nitrogen atmosphere." Journal of Hazardous Materials **103**(1-2): 107-123.

The kinetics of pyrolysis of electronic packaging material are investigated under various heating rates (5, 10, 15, 20K/min) in an inert atmosphere using a thermogravimetric analysis (TGA) technique. The pyrolysis characteristics of samples are examined by SEM, XRD, FTIR, ICP-MS and EA. The effect of heating condition on the surface area and pore structure of samples is discussed. Two reaction stages are involved for the pyrolysis of electronic packaging material when nitrogen is present in the carrier gas. The corresponding kinetic parameters, including activation energy, pre-exponential factor and reaction order are presented. The apparent activation energies can be divided into three groups. The results will be useful in developing pyrolysis or incineration systems for plastic waste from electronic components. © 2003 Elsevier B.V. All rights reserved.

Lithner, D., et al. (2011). "Environmental and health hazard ranking and assessment of plastic polymers based on chemical composition." Science of the Total Environment **409**(18): 3309-3324.

Plastics constitute a large material group with a global annual production that has doubled in 15 years (245 million tonnes in 2008). Plastics are present everywhere in society and the environment, especially the marine environment, where large amounts of plastic waste accumulate. The knowledge of human and environmental hazards and risks from chemicals associated with the diversity of plastic products is very limited. Most chemicals used for producing plastic polymers are derived from non-renewable crude oil, and several are

hazardous. These may be released during the production, use and disposal of the plastic product. In this study the environmental and health hazards of chemicals used in 55 thermoplastic and thermosetting polymers were identified and compiled. A hazard ranking model was developed for the hazard classes and categories in the EU classification and labelling (CLP) regulation which is based on the UN Globally Harmonized System. The polymers were ranked based on monomer hazard classifications, and initial assessments were made. The polymers that ranked as most hazardous are made of monomers classified as mutagenic and/or carcinogenic (category 1A or 1B). These belong to the polymer families of polyurethanes, polyacrylonitriles, polyvinyl chloride, epoxy resins, and styrenic copolymers. All have a large global annual production (1-37 million tonnes). A considerable number of polymers (31 out of 55) are made of monomers that belong to the two worst of the ranking model's five hazard levels, i.e. levels IV-V. The polymers that are made of level IV monomers and have a large global annual production (1-5 million tonnes) are phenol formaldehyde resins, unsaturated polyesters, polycarbonate, polymethyl methacrylate, and urea-formaldehyde resins. This study has identified hazardous substances used in polymer production for which the risks should be evaluated for decisions on the need for risk reduction measures, substitution, or even phase out.

Liu, B., et al. (2019). "MiR-29b/Sp1/FUT4 axis modulates the malignancy of leukemia stem cells by regulating fucosylation via Wnt/beta-catenin pathway in acute myeloid leukemia." Journal of Experimental & Clinical Cancer Research **38**(1): 200.

BACKGROUND: Acute myeloid leukemia (AML) is initiated and maintained by a unique, small subset of leukemia stem cells (LSCs). LSCs are characterized by unrestricted self-renewal and contribute to the malignancy of leukemia. Aberrant protein fucosylation is associated with AML progression. However, it is still less understood that the miR-29b/Sp1/FUT4 crosstalk involved in the fucosylation-mediated LSCs malignancy in AML.

METHODS: AML cell lines were sorted by magnetic microbeads to obtain the CD34 + CD38- sub-population. The key biomarkers for LSCs were identified by flow cytometry. Fucosyltransferase genes were screened by qRT-PCR, and FUT4 was focused. Effect of FUT4 on LSCs malignancy was determined by CCK8 assay, sphere formation assay, immunofluorescence staining, apoptosis and in vivo xenografts experiments. The linkage of FUT4 promoter and Sp1 was confirmed by dual-luciferase reporter gene assay. ChIP-PCR assay was used to show the directly binding of Sp1 and FUT4 promoter. Activity of Wnt//beta-catenin pathway was determined by western blot. Overall survival curves were diagrammed by Kaplan-Meier analysis.

RESULTS: Here, the expressional profiles of 11 fucosyltransferase genes were different comparing LSCs and non-LSCs of KG-1a and MOLM13 cells, whereas CD34 + CD38- cells exhibited higher expression of FUT4. Functionally, alteration of FUT4 in CD34 + CD38- cells modulated LSCs malignant behaviors both in vitro and in vivo. Transcriptional inhibitor actinomycin D (Act D) or translational inhibitor cycloheximide (CHX) prevented LSCs progression, and Sp1 was identified as the efficient regulator of FUT4 transcription. Moreover, miR-29b directly affected the binding of Sp1 and FUT4 promoter region, which further mediated LSCs proliferation, apoptosis and drug-resistance through fucosylated-CD44 via activation of Wnt/beta-catenin pathway. Clinically, Sp1 and FUT4 were up-regulated and positively correlated with poor overall survival of AML patients.

CONCLUSION: These data indicated that miR-29b/Sp1/FUT4 axis promoted the malignant behaviors of LSCs by regulating fucosylated CD44 via Wnt/beta-catenin pathway. Identifying LSCs surface markers and targeting LSCs were important for the development of potential therapies in AML.

Liu, B. T., et al. (2011). "Strength of the interactions between light-scattering particles and resins affects the haze of anti-glare films." Colloids and Surfaces A: Physicochemical and Engineering Aspects **389**(1-3): 138-143.

In this study we evaluated the effects of the surface functional groups of light-scattering particles (LSPs) and the nature of the resin on the haze of anti-glare (AG) films. We fabricated LSPs with amino groups on their surfaces from commercial crosslinked polystyrene microbeads, and LSPs presenting aliphatic chains through reactions of these amino groups with stearic acid. X-ray photoelectron spectroscopy and contact angle analysis revealed that these surface-modified LSPs had different elemental compositions on their surfaces and different wettabilities, respectively. To fabricate AG films, we incorporated the LSPs presenting the different surface functional groups into resins having various affinities. At the same LSP concentration and with the same resin, the AG films incorporating LSPs with aliphatic chains exhibited greater outer haze than did those featuring amino groups. The outer haze increased upon decreasing the ratio of the viscosity of the mixture of LSPs and resin to that of the resin. We speculate that the outer haze was affected by the interactions between the LSPs and the resin. © 2011 Elsevier B.V.

Liu, C., et al. (2008). "Selective removal of copper and lead ions by diethylenetriamine-functionalized adsorbent: behaviors and mechanisms." Water Research **42**(6-7): 1511-1522.

The selective removal of copper and lead ions from aqueous solutions by diethylenetriamine (DETA)-functionalized polymeric adsorbent was investigated. The adsorbent was prepared by amination of the micro-beads synthesized from glycidyl methacrylate and trimethylolpropane trimethacrylate co-polymerization (denoted as P-DETA). In the single metal species system (only copper or lead ions present), P-DETA was found to adsorb copper ions or lead ions significantly (with a slightly higher adsorption uptake capacity for lead ions than copper ions). However, P-DETA displayed an excellent selectivity in the adsorption of copper ions over lead ions in the binary metal species system (with both copper and lead ions present). It was also found that initially (or previously) adsorbed lead ions on P-DETA were displaced, even completely, by subsequently adsorbed copper ions from the solution but the case was not vice versa. The greater electronegativity of copper ions than lead ions was identified as the major factor that caused P-DETA to selectively adsorb copper ions over lead ions during competitive adsorption in the binary metal species system. It was speculated that the displacement of already adsorbed lead ions on P-DETA by subsequently adsorbed copper ions was through an adjacent attachment and repulsion mechanism. P-DETA has been shown to have the potential to be used as an effective adsorbent for the removal as well as selective recovery of heavy metal ions in water or wastewater treatment.

Liu, C., et al. (2019). "Widespread distribution of PET and PC microplastics in dust in urban China and their estimated human exposure." Environment International **128**: 116-124.

Dust is a fate of many contaminants and may be an important medium for the human exposure to these contaminants. Microplastics (MPs) have been observed in dust in previous studies. However, the mass concentrations of dominant MPs in dust and the exposure risk to human remain unclear. In this study, indoor and outdoor dust samples were collected from 39 major cities of China. The mass concentrations of polyethylene terephthalate (PET) and polycarbonate (PC) MPs were determined through alkali-assisted thermal depolymerization-liquid chromatography-tandem mass spectrometry, and the shape and component distribution of MPs were analyzed by optical microscopy and micro-Fourier transform infrared spectroscopy. PET MPs were detected in all the samples at high concentrations of 1550-120,000mg/kg (indoor) and 212-9020mg/kg (outdoor) and PC MPs were detected in approximately 70% of the samples, with median concentrations of 4.6mg/kg (indoor) and 2.0mg/kg (outdoor). Fiber was the main shape of suspected MPs, and polyester (including PET) was identified as an important component in MPs from dust. Indoor dust is a non-negligible source of human exposure to MPs, accounting for a geomean daily intake of 17,300ng/kg-bw of PET MPs in children.

Liu, F., et al. (2019). "Microplastics in urban and highway stormwater retention ponds." Science of the Total Environment **671**: 992-1000.

Urban and highway stormwater runoff seems an obvious pathway for conveying microplastics from land-based sources to the aquatic environment. The significance of this pathway is however largely unknown. This study presents first results on microplastics in urban and highway stormwaters by analysing microplastics (10-2000 mum) in the water phase of stormwater treatment ponds in the North of Jutland, Denmark. The stormwater of seven ponds treating runoff drained from different landscapes were studied. Ponds serving highway and residential areas had the lowest microplastic concentration, while ponds serving areas with industry and commerce had the highest. The stormwater of the ponds contained 490-22,894 items m⁻³, corresponding to an estimated 85-1143 mug m⁻³. The dominating polymers were polypropylene, polyvinylchloride, polyester, polyethylene and polystyrene. There was a tendency towards polyvinylchloride particles being the largest in size, while a mixed group of less common polymers were the smallest. Residential ponds generally held the largest microplastic particles and were in many aspects quite comparable to one another, in terms of concentrations, sizes, and polymer composition. This study shows that land-based sources are significant contributors to MP in the environment. It demonstrates that the stormwater retention ponds act not only as pollution hotspots, but also play a role in the transport of MP from land to the aquatic environment. Copyright © 2019

Liu, F., et al. (2018). "Prolonged inhibition of class I PI3K promotes liver cancer stem cell expansion by augmenting SGK3/GSK-3beta/beta-catenin signalling." Journal of Experimental & Clinical Cancer Research **37**(1): 122.

BACKGROUND: Serum and glucocorticoid-regulated kinase 3 (SGK3) has been reported to play an important role in tumour progression, but its role in cancer stem cells (CSCs) remains obscure. The phosphoinositide 3-kinase (PI3K) pathway is considered a hallmark of cancer. Although many PI3K pathway-targeted therapies have been tested in oncology trials, the results are not satisfactory.

METHODS: We used spheroids cultured in serum-free culture medium and MicroBead isolation to obtain liver CSCs. Spheroid formation assay and flow cytometric analysis were performed to investigate liver CSC expansion. Real-time polymerase chain reaction (PCR), western blot and immunofluorescence were used to assess gene expression in cell lines.

RESULTS: We found that SGK3 is preferentially activated in liver CSCs. Upregulated SGK3 significantly increases the expansion of liver CSCs. Conversely, suppression of SGK3 in human hepatocarcinoma (HCC) cells had an opposite effect. Mechanistically, SGK3 promoted beta-catenin accumulation by suppressing GSK-3beta-mediated beta-catenin degradation in liver CSCs, and then promoting the expansion of liver CSCs. Prolonged treatment of HCC cells with class I PI3K inhibitors leads to activation of SGK3 and expansion of liver CSCs. Inhibition of hVps34 can block SGK3 activity and suppress liver CSC expansion induced by PI3K inhibitors. More importantly, we also found that prolonged treatment of HCC cells with PI3K inhibitors stimulates the beta-catenin signalling pathway via activation of SGK3.

CONCLUSIONS: Prolonged inhibition of class I PI3K promotes liver CSC expansion by augmenting

SGK3-dependent beta-catenin stabilisation, and effective inhibition of SGK3 signalling may be useful in eliminating liver CSCs and in PI3K pathway-targeted cancer therapies.

Liu, F. F., et al. (2019). "Interactions between microplastics and phthalate esters as affected by microplastics characteristics and solution chemistry." Chemosphere **214**: 688-694.

Microplastics have become a major concern in recent years as they can be recognized as the transport vectors for pollutants in environment. In this study, the sorption behavior of two phthalate esters (PAEs), including diethyl phthalate (DEP) and dibutyl phthalate (DBP), onto three types of microplastics (PVC: polyvinyl chloride, PE: polyethylene, and PS: polystyrene) was investigated. The sorption isotherms of both DEP and DBP on microplastics were highly linear, suggesting that the partition was the main sorption mechanism. The K_d values of DBP were much higher than those of DEP, demonstrating that hydrophobic interaction governed the partition mechanism. Sorption of the two PAEs on the three microplastics followed the order of PS>PE>PVC, indicating that chemical properties of microplastics played an important roles in their sorption behaviors. Solution pH and natural organic matter had no significant impact on PAEs sorption by microplastics. However, the presence of NaCl and CaCl₂ enhanced the sorption of both DEP and DBP because of the salting-out effect. The findings of the present study may have significant implications for the fate and transport assessment of both PAEs and microplastics.

Liu, G., et al. (2020). "Microplastic Impacts on Microalgae Growth: Effects of Size and Humic Acid." Environmental Science & Technology **14**: 14.

Research has already demonstrated the toxic effects of microplastics (MPs) on different biota. However, the underlying toxic mechanism of MPs remains to be elucidated, especially the effect of particle size and the presence of dissolved organic matter in water. This study investigated the impact on Scenedesmus obliquus exposed in five types of polystyrene particle suspensions with different sizes and surface charges, in the presence and absence of humic acid (HA).

Liu, G., et al. (2019). "Sorption behavior and mechanism of hydrophilic organic chemicals to virgin and aged microplastics in freshwater and seawater." Environmental Pollution **246**: 26-33.

Virgin microplastics undergo aging and form oxygen-containing functional groups when they enter the environment. Therefore, the sorption of organic pollutants onto microplastics is not limited to hydrophobic organic pollutants and can also occur with hydrophilic organic pollutants. Therefore, understanding the sorption behaviors and mechanism between aged microplastics and hydrophilic organic pollutants is essential for evaluating the real effects of microplastics in the environment. We investigated the impacts of the UV-accelerated aging of polystyrene (PS) and polyvinylchloride (PVC) on their sorption interactions with ciprofloxacin (CIP). The results of infrared spectroscopy (IR) and scanning electron microscopy (SEM) showed significant surface oxidation and localized microcracks on the aged microplastics. The sorption kinetics and isotherms models indicated that the sorption capacity of aged microplastics is higher than that of pristine microplastics, and their physical interactions, including partitioning, electrostatic interactions, and intermolecular hydrogen bonding, were the dominant mechanism, as demonstrated by FTIR analysis. Moreover, the sorption capacity of the pristine microplastics decreased as the degree of crystallinity increased, whereas the opposite trend was observed with aged microplastics, which means that the crystallinity is not the controlling factor. In addition, salinity suppressed adsorption on all the tested microplastics. The pH influences the electrostatic attraction between the microplastics and CIP because CIP has a different charge at different pH values. The results presented herein confirm the importance of studying the

adsorption between hydrophilic organic pollutants and aged microplastics because ultimately, all microplastics become aged. Moreover, the effects of aged microplastics with adsorbed hydrophilic chemicals on organisms need to be further studied.

Liu, H. and C. Ding (2017). "Establishment of an experimental glaucoma animal model: A comparison of microbead injection with or without hydroxypropyl methylcellulose." Experimental & Therapeutic Medicine **14**(3): 1953-1960.

The present study aimed to compare microbead injection with and without hydroxypropyl methylcellulose (HPM) in order to establish an experimental animal model of glaucoma. This model was established in C57BL/6 mice and transgenic mice expressing cyan fluorescent protein (CFP) under the control of the Thy1 promoter in retinal ganglion cells (RGCs). C57BL/6 mice aged between 12 and 20 weeks old were randomly separated into three groups, which received different injections into the anterior chamber of the eye. Group A (microbead) received 2 micro l microbeads (10x106 beads/ml) and 1 micro l air. Group B (microbeads + HPM) received 2 micro l microbeads and 1 micro l HPM. Group C (control group) received 2 micro l PBS and 1 micro l air. The intraocular pressure (IOP) was measured with a tonometer under topical anesthesia daily for 1 month. A single injection of microbeads, with or without HPM, induced consistent IOP elevation when compared with the control group. Thy1-CFP mice received an injection of 2 micro l microbeads and 1 micro l HPM into the anterior chamber of the eyes, and the number of CFP+ RGCs was subsequently assessed in vivo by confocal scanning laser microscopy in the same area of the retina weekly for 6 weeks. The results from in vivo imaging of Thy1-CFP mice were comparable with the immunohistochemical staining results from the C57BL/6 mice. The combined injection of microbeads and HPM induced longer and higher peaks of IOP elevation when compared with the microbeads alone. The rate of RGC loss following the administration of microbeads alone was 25.0+/-1.3% 6 weeks after the initial IOP elevation, while it was 33.2+/-1.9% following the administration of microbeads + HPM. These results indicate that the injection of microbeads + HPM is a more effective method of establishing a mouse model with chronic elevation of IOP. In addition, the in vivo imaging that can be used with this technique provides an effective and noninvasive approach for monitoring the progress of RGC loss.

Liu, H., et al. (2016). "Microfluidic synthesis of QD-encoded PEGDA microspheres for suspension assay." Journal of materials chemistry. B, Materials for biology and medicine. **4**(3): 482-488.

Uniform and size-controllable QD-encoded poly(ethylene glycol) diacrylate (PEGDA) microbeads were produced using a microfluidic device followed by in situ photopolymerization. An S-shaped and gradually widening channel was designed to allow optimized UV exposure for photopolymerization and to prevent coalescence. The as-obtained PEGDA microbeads exhibited well-defined sphericity and excellent monodispersity with a coefficient of variation (CV) below 5%. The size varied from 7 mu m to 120 mu m and can be selectively achieved by simply adjusting the experimental parameters. The fluorescence performance of the QDs was well preserved without significant peak broadening or distortion. Seven barcode libraries were realized with bright fluorescence and distinguishing coding signals which could be conveniently decoded by a flow cytometer. Furthermore, a very facile strategy to conjugate biomolecules on the bead surfaces was developed using polydopamine (PDA). A sandwich immunoassay of rabbit IgG was performed and the applicability of the QD-encoded microbeads for suspension assay was demonstrated.

Liu, H., et al. (2019). "Interactive effects of microplastics and glyphosate on the dynamics of soil dissolved organic matter in a Chinese loess soil." Catena **182**(104177).

The increased use of plastic films and pesticides on agricultural soil leads to the accumulation of plastic debris and pesticide residues in soil. This accumulation has become a serious environmental issue, as it threatens life of earthworms, inhibits the enzyme activities and microbial diversity, and contributes to the loss of soil microbial carbon and nitrogen. However, little information is available regarding the effects of pesticides on soil dissolved organic matter (DOM). It is also unknown how plastic debris, especially small-sized particles called microplastics, influences the effects of pesticides on soil DOM. In this study, we performed a 30-day soil incubation experiment. Three levels of the common herbicide glyphosate were applied to soil: 0 (control, CK), 3.6 kg ha⁻¹ (G1) and 7.2 kg ha⁻¹ (G2). We also tested four levels of glyphosate and microplastics (homopolymer polypropylene powder) co-addition: 3.6 kg ha⁻¹ +7% (w/w) (M1 G1), 3.6 kg ha⁻¹ +28% (w/w) (M2 G1), 7.2 kg ha⁻¹ +7% (w/w) (M1 G2), and 7.2 kg ha⁻¹ +28% (w/w) (M2 G2). Glyphosate addition slightly increased soil fluorescein diacetate hydrolase (FDAse) and phenol oxidase (PO) activities. Although the glyphosate addition significantly promoted the accumulation of dissolved organic phosphorus (DOP) within the first 14 days, the M2 treatment decreased DOP at day 30. M2 G1 and M2 G2 increased soil FDAse activity and promoted the accumulation of DOC and DOP relative to G1 and G2 respectively while M1 G1 and M1 G2 benefited DON accumulation. Our results highlighted that the interaction between glyphosate and low microplastics content negatively affected DOC and DOP dynamics, leading to the loss of bioavailable C and P loss. The interaction between glyphosate and high content microplastics negatively affected DON compared with glyphosate addition, possibly decreasing DON.

Liu, H., et al. (2017). "Response of soil dissolved organic matter to microplastic addition in Chinese loess soil." Chemosphere **185**: 907-917.

Plastic debris is accumulating in agricultural land due to the increased use of plastic mulches, which is causing serious environmental problems, especially for biochemical and physical properties of the soil. Dissolved organic matter (DOM) plays a central role in driving soil biogeochemistry, but little information is available on the effects of plastic residues, especially microplastic, on soil DOM. We conducted a soil-incubation experiment in a climate-controlled chamber with three levels of microplastic added to loess soil collected from the Loess Plateau in China: 0% (control, CK), 7% (M1) and 28% (M2) (w/w). We analysed the soil contents of dissolved organic carbon (DOC), dissolved organic nitrogen (DON), NH₄⁺, NO₃⁻, dissolved organic phosphorus (DOP), and PO₄³⁻ and the activities of fluorescein diacetate hydrolase (FDAse) and phenol oxidase. The higher level of microplastic addition significantly increased the nutrient contents of the DOM solution. The lower level of addition had no significant effect on the DOM solution during the first seven days, but the rate of DOM decomposition decreased in M1 between days 7 and 30, which increased the nutrient contents. The microplastic facilitated the accumulation of high-molecular-weight humic-like material between days 7 and 30. The DOM solutions were mainly comprised of high-molecular-weight humic-like material in CK and M1 and of high-molecular-weight humic-like material and tyrosine-like material in M2. The Microplastic stimulated the activities of both enzymes. Microplastic addition thus stimulated enzymatic activity, activated pools of organic C, N, and P, and was beneficial for the accumulation of dissolved organic C, N and P.

Liu, J., et al. (2018). "Polystyrene Nanoplastics-Enhanced Contaminant Transport: Role of Irreversible

Adsorption in Glassy Polymeric Domain." Environmental Science & Technology **52**(5): 2677-2685.

Nanoplastics (NPs) are becoming an emerging pollutant of global concern. A potential risk is that NPs may serve as carriers to increase the spreading of coexisting contaminants. In this study, we examined the effects of polystyrene nanoplastics (PSNPs, 100 nm), used as a model NP, on the transport of five organic contaminants of different polarity in saturated soil. The presence of low concentrations of PSNPs significantly enhanced the transport of nonpolar (pyrene) and weakly polar (2,2',4,4'-tetrabromodiphenyl ether) compounds, but had essentially no effects on the transport of three polar compounds (bisphenol A, bisphenol F, and 4-nonylphenol). The strikingly different effects of NPs on the transport of nonpolar/weakly polar versus polar contaminants could not be explained with different adsorption affinities, but was consistent with the polarity-dependent extents of desorption hysteresis. Notably, desorption hysteresis was only observed for nonpolar/weakly polar contaminants, likely because nonpolar compounds tended to adsorb in the inner matrices of glassy polymeric structure of polystyrene (resulting in physical entrapment of adsorbates), whereas polar compounds favored surface adsorption. This hypothesis was verified with supplemental adsorption and desorption experiments of pyrene and 4-nonylphenol using a dense, glassy polystyrene polymer and a flexible, rubbery polyethylene polymer. Overall, the findings of this study underscore the potentially significant environmental implication of NPs as contaminant carriers.

Liu, J., et al. (2019). "Aging Significantly Affects Mobility and Contaminant-Mobilizing Ability of Nanoplastics in Saturated Loamy Sand." Environmental Science & Technology **53**(10): 5805-5815.

Plastic debris, in particular, microplastics and nanoplastics, is becoming an emerging class of pollutants of global concern. Aging can significantly affect the physicochemical properties of plastics, and therefore, may influence the fate, transport, and effects of these materials. Here, we show that aging by UV or O₃ exposure drastically enhanced the mobility and contaminant-mobilizing ability of spherical polystyrene nanoplastics (PSNPs, 487.3 +/- 18.3 nm in diameter) in saturated loamy sand. Extended Derjaguin-Landau-Verwey-Overbeek calculations and pH-dependent transport experiments demonstrated that the greater mobility of the aged PSNPs was mainly the result of surface oxidation of the nanoplastics, which increased not only the surface charge negativity, but more importantly, hydrophilicity of the materials. The increased mobility of the aged PSNPs significantly contributed to their elevated contaminant-mobilizing abilities. Moreover, aging of PSNPs enhanced the binding of both nonpolar and polar contaminants, further increasing the contaminant-mobilizing ability of PSNPs. Interestingly, aging enhanced binding of nonpolar versus polar compounds via distinctly different mechanisms: increased binding of nonpolar contaminants (tested using pyrene) was mainly the result of the modification of the polymeric structure of PSNPs that exacerbated slow desorption kinetics; for polar compounds (4-nonylphenol), aging induced changes in surface properties also resulted in irreversible adsorption of contaminants through polar interactions, such as hydrogen bonding. The findings further underline the significant effects of aging on environmental fate and implications of nanoplastics.

Liu, J., et al. (2018). "Application value of TIMP-4 suspension microbead chip in diagnosis of gastric cancer: A validation study." Journal of Digestive Diseases **19 (Supplement 1)**: 97.

Objective Our previous study showed that there was a significant difference in serum TIMP-4 between gastric cancer (GC) and nonneoplastic gastric diseases (NGD) patients. To test its ability and feasibility for the diagnosis of GC, this study was performed. Methods Serum samples from 40 GC and 38 gender and age matched NGD patients were collected from March 2017 to June 2017. TIMP bead-based assay using the Luminex technology was applied to quantitative

measurement of TIMP-4 (Figure 1A-B). Its expression level was compared between the GC and NGD groups and its diagnostic value was assessed by ROC curve. Additionally, the levels of 4 conventional serological tumor markers in GC patients were determined by electrochemiluminescence assay. Results The levels of TIMP-4 in GC and NGD groups were 1101.2+/-703.3 pg/mL and 890.1+/-454.7 pg/mL, respectively. Compared with the NGD group, the level of TIMP-4 tended to increase in the GC group, and the difference was critical statistical significance (t=1.568, P=0.122) (Figure 1C). Its AUC value was 0.574 (95% CI, 0.444-0.704) for the diagnosis of GC. At the optimal cutoff value of 1292.7 pg/mL, its sensitivity, specificity and accuracy were 38.5%, 89.5% and 63.6%, respectively (Figure 1D). Nevertheless, the positive rates of alpha fetoprotein (AFP), carcinoembryonic antigen (CEA), carcinoma antigen 125 (CA125), and carbohydrate antigen 19-9 (CA19-9) for the diagnosis of GC were 0, 18.9%, 8.3% and 10.8%, respectively. Conclusions Serum TIMP-4 has a certain reference value for the diagnosis of GC. Whether it can be used as a novel diagnostic marker for GC requires further investigation.

Liu, J., et al. (2019). "Microdeformation of RBCs under oxidative stress measured by digital holographic microscopy and optical tweezers." Applied Optics **58**(15): 4042-4046.

This paper utilized digital holographic microscopy and optical tweezers to study microdeformation of red blood cells (RBCs) dynamically under oxidative stress. RBCs attached with microbeads were stretched by dual optical tweezers to generate microdeformation. Morphology of RBCs under manipulation were recorded dynamically and recovered by off-axis digital holographic microscopy method. RBCs treated with H₂O₂ at different concentrations were measured to investigate the mechanical properties under oxidative stress. Use of optical tweezers and off-axis digital holographic microscopy enhanced measuring accuracy compared with the traditional method. Microdeformation of RBCs is also more consistent with the physiological situation. This proposal is meaningful for clinical applications and basic analysis of Parkinson's disease research.

Liu, J. Y., et al. (2004). "Bioreactor microcarrier cell culture system (Bio-MCCS) for large-scale production of autologous melanocytes." Cell Transplantation **13**(7-8): 809-816.

Restoration of cutaneous pigmentation can be achieved in stable vitiligo by autologous cultured melanocyte transplantation. It was the goal of this study to construct a bioreactor microcarrier cell culture system (Bio-MCCS) to produce autologous melanocytes in large scale. In this Bio-MCCS, porcine gelatin microbeads were used as microcarriers, spinning bottle as fermented tank. Autologous melanocytes were able to attach to and proliferate on the gelatin microbeads in serum-free melanocyte medium in the Bio-MCCS, reaching up to 24-fold the cells seeded on day 15 (MTT assay). These autologous melanocytes cultured on gelatin microbeads could leave the microbeads and proliferate on the bottom of tissue culture flasks. Although Pluronic F68 has been widely used to protect animal cells from hydrodynamic stress in animal cell bioreactors, Pluronic F68 at a concentration of 0.25-1.0% showed no significant protective effects on the autologous melanocytes cultured on the microbeads and subjected to mechanical stress in the Bio-MCCS. This Bio-MCCS using porcine gelatin microbeads as microcarriers enabled large-scale production of autologous melanocytes, offering a potential treatment for large-area stable vitiligo by direct administration of the melanocytes cultured on the gelatin microbeads to the vitiliginous site.

Liu, J. Y., et al. (2006). "High yields of autologous living dermal equivalents using porcine gelatin microbeads as microcarriers for autologous fibroblasts." Cell Transplantation **15**(5): 445-451.

Permanent skin replacement requires a dermal component to ensure adequate long-term graft stability and to prevent wound contraction. This study was to construct a bioreactor microcarrier cell culture system (Bio-MCCS) to produce autologous living dermal equivalents on a large scale. Autologous fibroblasts were isolated from split-thickness skin biopsy from a leg ulcer patient, inoculated onto macroporous porcine gelatin microbeads, and incubated in a bioreactor (Cellspin) in serum-free fibroblast growth medium or in DMEM medium containing 10% fetal calf serum (FCS). Fibroblasts rapidly adhered to and actively proliferated on the microbeads in the bioreactor in both serum-free and serum-containing medium. MTT assay showed the number of fibroblasts on the microbeads reached up to 5.3- or 4.0-fold the cells seeded in DMEM medium containing 10% FCS or serum-free medium, respectively. When removed from Bio-MCCS and cultured under static conditions, fibroblasts were able to leave the microbeads and proliferate to confluence on the bottom of tissue culture flasks. When stored at room temperature in DMEM containing 10% FBS, fibroblast cultured on the microbeads retained highest viabilities for at least 3 weeks, up to 82% of originals. This Bio-MCCS using porcine gelatin microbeads as carriers for fibroblasts offers a new option of mass production of autologous living dermal equivalents.

Liu, J. Y., et al. (2004). "Autologous cultured keratinocytes on porcine gelatin microbeads effectively heal chronic venous leg ulcers." Wound Repair & Regeneration **12**(2): 148-156.

We have established a specific bioreactor microcarrier cell culture system using porcine gelatin microbeads as carriers to produce autologous keratinocytes on a large scale. Moreover, we have shown that autologous keratinocytes can be cultured on porcine collagen pads, thereby forming a single cell layer. The objective of this study was to compare efficacy and safety of autologous cultured keratinocytes on microbeads and collagen pads in the treatment of chronic wounds. Fifteen patients with recalcitrant venous leg ulcers were assigned to three groups in a single-center, prospective, uncontrolled study: five underwent a single treatment with keratinocyte monolayers on collagen pads (group 1); another five received a single grafting with keratinocyte-microbeads (group 2); and the last five received multiple, consecutive applications of keratinocyte-microbeads 3 days apart (group 3). All patients were followed for up to 12 weeks. By 12 weeks, there was a mean reduction in the initial wound area of 50, 83, and 97 percent in the three groups, respectively. The changes in wound size were statistically significant between the first and third groups (p= 0.0003). Keratinocyte-microbeads proved to be more effective than keratinocyte monolayers on collagen pads when the former were applied every 3 days. Rapid availability within 10-13 days after skin biopsy and easy handling represent particular advantages.

Liu, J. Y., et al. (2004). "Original Research Articles - Clinical Science: Autologous cultured keratinocytes on porcine gelatin microbeads effectively heal chronic venous leg ulcers." Wound Repair and Regeneration **12**(2): 148-156.

We have established a specific bioreactor microcarrier cell culture system using porcine gelatin microbeads as carriers to produce autologous keratinocytes on a large scale. Moreover, we have shown that autologous keratinocytes can be cultured on porcine collagen pads, thereby forming a single cell layer. The objective of this study was to compare efficacy and safety of autologous cultured keratinocytes on microbeads and collagen pads in the treatment of chronic wounds. Fifteen patients with recalcitrant venous leg ulcers were assigned to three groups in a single-center, prospective, uncontrolled study: five underwent a single treatment with keratinocyte monolayers on collagen pads (group 1); another five received a single grafting with keratinocyte-microbeads (group 2); and the last five received multiple, consecutive applications of keratinocyte-microbeads 3 days apart (group 3). All patients were followed for up to 12 weeks. By 12 weeks, there was a mean reduction in the initial wound area of 50, 83, and 97 percent in the three groups, respectively. The changes in wound size were statistically significant between the first and third groups (p= 0.0003). Keratinocyte-microbeads proved to be more effective than keratinocyte monolayers on collagen pads when the former were applied every 3 days. Rapid availability within 10-13 days after skin biopsy and easy handling represent particular advantages.

Liu, K., et al. (2019). "Source and potential risk assessment of suspended atmospheric microplastics in Shanghai." Science of the Total Environment **675**: 462-471.

A growing body of research has recently revealed that airborne microplastics could be an important source of microplastic pollution in marine environments. However, the origins and spatial distributions of suspended atmospheric microplastics (SAMPs) are poorly understood. Further, SAMPs abundances have only been observed using passive sampling devices that could lead to underestimates of abundances. To address these knowledge-gaps, the current study investigated the potential source and spatial distribution of SAMPs in Shanghai during May 2018 using an active suspended particulate sampler. SAMPs abundances from filtered air ranged from 0 to 4.18 n/m³ (items per cubic meter of air). Microfibers comprised 67% of all SAMPs, followed by fragments and granules comprising 30% and 3% of SAMPs, respectively. mu-FT-IR analysis revealed that the SAMPs consisted of polyethylene terephthalate (PET), polyethylene (PE), polyester (PES), polyacrylonitrile (PAN), poly(N-methyl acrylamide) (PAA), rayon (RY), ethylene vinyl acetate (EVA), epoxy resin (EP), and alkyd resin (ALK). Synthetic compounds comprised 54% of the observed particles, of which PET, PE, PES, PAN, PAA, and RY comprised 91% of the microplastics. Our preliminary evaluation indicated that textile clothes are likely major source of the airborne microplastics. Modeling estimated that approximately 120.7kg of SAMPs are annually transported through Shanghai air. Moreover, an estimation of the ecological risk from SAMPs indicated that a minor ecological consequence was present, necessitating further evaluation of SAMPs pollution. In addition, modeling estimated that approximately 21 particles of microplastics are inhaled daily by people in Shanghai from outdoor environments. Given the prevalence of airborne microfibers, it is critically urgent to reevaluate procedures for sampling, transporting, and processing microplastic field samples. Future investigations should seek to develop more rigorous and conclusive methods to evaluate these types of samples.

Liu, K., et al. (2019). "Accurate quantification and transport estimation of suspended atmospheric microplastics in megacities: Implications for human health." Environment International **132**: 105127.

Although atmospheric microplastics have been found to be ubiquitous even on untraversed mountains and have potential impacts on human health, little information concerning their sampling methodology and transport is currently available. Until a realistic quantification of suspended atmospheric microplastics (SAMPs) is obtained, however, any potential health risk assessment for this pollutant will be open to criticism for using an ambiguous dataset. To address this knowledge gap, in May 2019 a trial experiment was performed to explore the potential relationship between sampling volume and SAMP abundance. A significant logarithmic regression between SAMP abundance and the sampling volume of filtrated air was found and the sufficient volume of filtrated air for accurate SAMP quantification was recommended. Investigation results indicated that fibrous and fragment-shaped SAMPs comprised 91% of all of the identified synthetic particles. Interestingly, for the first time, plastic microbeads were also observed in the collected air, constituting 9% of the all of the SAMPs by quantity. Spectral analysis revealed that these SAMPs consisted of polyethylene terephthalate (PET), epoxy resin (EP), polyethylene (PE), alkyd resin (ALK), rayon (RY), polypropylene (PP), polyamide (PA), and polystyrene (PS). PET, EP, PE, and ALK constituted the majority (90%) of all of the polymer types, with quantitative percentages of 51%, 19%, 12%, and 8%, respectively. Based on our numerical modeling simulation, the approximate transport flux of SAMPs during June in Shanghai was estimated, ranging from 9.94x10⁴n/(m.d) to 6.52x10⁵n/(m.d), with a mean of 3.00+/-1.58x10⁵n/(m.d). The goal of our study was to provide an essential methodological aid for the accurate determination of SAMPs in the environment and a better understanding of terrestrial microplastic transport in megacities.

Liu, K., et al. (2019). "Consistent Transport of Terrestrial Microplastics to the Ocean through Atmosphere." Environmental Science & Technology **53**(18): 10612-10619.

Although atmospheric transport and deposition could be an important pathway of terrestrial pollutants to the ocean, little information concerning the presence and distribution of these suspended atmospheric microplastics in marine air is available. We investigated, for the first time, the occurrence and distribution of suspended atmospheric microplastics (SAMPs) in the west Pacific Ocean. In this study, the spatial distribution, morphological appearance, and chemical composition of suspended atmospheric microplastics were studied through continuous sampling during a cruise. SAMPs abundance ranged from 0 to 1.37 n/m³, the median of 0.01 n/m³. Fiber, fragment, and granule SAMPs quantitively constituted 60%, 31%, and 8% of all MPs, respectively. Interestingly, plastic microbeads with numerical proportion of 5% were also observed. A high suspended atmospheric microplastics abundance was found in the coastal area (0.13 +/- 0.24 n/m³), while there was less amount detected in the pelagic area (0.01 +/- 0.01 n/m³). The amount of suspended atmospheric microplastics collected during the daytime (0.45 +/- 0.46 n/m³) was twice the amount collected at night (0.22 +/- 0.19 n/m³), on average. Our observations provide field-based evidence that suspended atmospheric microplastics are an important source of microplastics pollution in the ocean, especially the pollution caused by textile microfibers.

Liu, L., et al. (2016). "Sorption of polycyclic aromatic hydrocarbons to polystyrene nanoplastic." Environmental Toxicology & Chemistry **35**(7): 1650-1655.

Microplastic has become an emerging contaminant of global concern. Bulk plastic can degrade to form smaller particles down to the nanoscale (<100 nm), which are referred to as nanoplastics. Because of their high surface area, nanoplastic may bind hydrophobic chemicals very effectively, increasing their hazard when such nanoplastics are taken up by biota. The present study reports distribution coefficients for sorption of polycyclic aromatic hydrocarbons (PAHs) to 70 nm polystyrene in freshwater, and PAH adsorption isotherms spanning environmentally realistic aqueous concentrations of 10−5 μg/L to 1 μg/L. Nanopolystyrene aggregate state was assessed using dynamic light scattering. The adsorption isotherms were nonlinear, and the distribution coefficients at the lower ends of the isotherms were very high, with values up to 109 L/kg. The high and nonlinear sorption was explained from π-π interactions between the planar PAHs and the surface of the aromatic polymer polystyrene and was higher than for micrometer-sized polystyrene. Reduction of nanopolystyrene aggregate sizes had no significant effect on sorption, which suggests that the PAHs could reach the sorption sites on the pristine nanoparticles regardless of the aggregation state. Pre-extraction of the nanopolystyrene with C18 polydimethylsiloxane decreased sorption of PAHs, which could be explained by removal of the most hydrophobic fraction of the nanopolystyrene. Environ Toxicol Chem

2016;35:1650-1655. © 2015 SETAC [ABSTRACT FROM AUTHOR]

Liu, L., et al. (2016). "Inclusion of Strep-tag II in design of antigen receptors for T-cell immunotherapy." Nature Biotechnology **34**(4): 430-434.

Adoptive immunotherapy with genetically engineered T cells has the potential to treat cancer and other diseases. The introduction of Strep-tag II sequences into specific sites in synthetic chimeric antigen receptors or natural T-cell receptors of diverse specificities provides engineered T cells with a marker for identification and rapid purification, a method for tailoring spacer length of chimeric receptors for optimal function, and a functional element for selective antibody-coated, microbead-driven, large-scale expansion. These receptor designs facilitate cGMP manufacturing of pure populations of engineered T cells for adoptive T-cell therapies and enable in vivo tracking and retrieval of transferred cells for downstream research applications.

Liu, L., et al. (2016). "Bead-based microarray immunoassay for lung cancer biomarkers using quantum dots as labels." Biosensors & Bioelectronics **80**: 300-306.

In this study, we developed a multiplex immunoassay system that combines the suspension and planar microarray formats within a single layer of polydimethylsiloxane (PDMS) using soft lithography technology. The suspension format was based on the target proteins forming a sandwich structure between the magnetic beads and the quantum dot (QD) probes through specific antibody-antigen interactions. The planar microarray format was produced by fabricating an array of micro-wells in PDMS. Each micro-well was designed to trap a single microbead and eventually generated a microbead array within the PDMS chamber. The resultant bead-based on-chip assay could be used for simultaneously detecting three lung cancer biomarkers-carcinoembryonic antigen (CEA), fragments of cytokeratin 19 (CYFRA21-1) and neuron-specific enolase (NSE)-in 10 mul of human serum, with a wide linear dynamic range (1.03-111 ng/mL for CEA and CYFRA21-1; 9.26-1000 ng/ml for NSE) and a low detection limit (CEA: 0.19 ng/ml; CYFRA21-1: 0.97 ng/ml; NSE: 0.37 ng/ml; S/N=3). Our micro-well chip does not require complex e-beam lithography or the reactive ion etching process as with existing micro-well systems, which rely on expensive focused ion beam (FIB) milling or optical fiber bundles. Furthermore, the current approach is easy to operate without extra driving equipment such as pumps, and can make parallel detection for multiplexing with rapid binding kinetics, small reagent consumption and low cost. This work has demonstrated the importance of the successful application of on-chip multiplexing sandwich assays for the detection of biomarker proteins.

Liu, M., et al. (2018). "Microplastic and mesoplastic pollution in farmland soils in suburbs of Shanghai, China." Environmental Pollution **242**(Pt A): 855-862.

Microplastics are emerging pollutants which have been extensively detected in water environments. However, little is known about microplastic pollution in soil environments. In this study, we investigated microplastics and mesoplastics in farmland soils from twenty vegetable fields around the suburbs of Shanghai. In each site, three duplicate soil samples were collected from shallow (0-3cm) and deep soils (3-6cm), respectively. Microplastics (sizes of 20mum -

5mm) and mesoplastics (5mm - 2cm) were detected using methods of density extraction, 30% H₂O₂ digestion and micro-fourier transform infrared spectroscopy. The abundance of microplastics was 78.00+/-12.91 and 62.50+/-12.97 items kg⁻¹ in shallow and deep soils, respectively. While, mesoplastics were found with abundance of 6.75+/-1.51 and 3.25+/-1.04 items kg⁻¹ in shallow and deep soils. Among these micro(meso)plastics, 48.79% and 59.81% were in size of <1mm in shallow and deep soils. The main morphotypes of microplastics included fiber, fragment and film, mostly in color of black or transparent. Moreover, we found that topsoil contained higher concentrations and larger sizes of micro(meso)plastics than deep soil. In addition, the vast majority of micro(meso)plastics were polypropylene (50.51%) and polyethylene (43.43%). This study reveals occurrence and characteristics of microplastic pollution in typical farmland soils. It provides important data for subsequent research on microplatics in the terrestrial ecosystem.

Liu, M., et al. (2019). "A method for extracting soil microplastics through circulation of sodium bromide solutions." Science of the Total Environment **691**: 341-347.

Microplastics (MP) have been recently found in soil environments. These MP might have adverse effects at high concentrations and thus efficient extraction and analysis of MP from soil is needed. Here we propose a new method of NaBr solution circulation for extracting soil MP. A device for the circular extraction of soil MP was developed. This device included a separation, vacuum filtration, and solution recovery system. It was then utilized to test separation efficiency of soil MP with three economic and environmentally friendly extraction reagents: NaCl, CaCl₂ and NaBr solutions. The separation was tested with ten different types of polymers, three different size classes and three different shapes of MP. Extraction with NaBr showed the highest recovery rates ranging from 85% to 100%. After extraction the samples were treated with H₂O₂ and analyzed by micro-Fourier transform infrared spectroscopy. The developed method was assessed for its potential influence on MP and no significant changes in the integrity of multiple MP were found. Finally, the established method was used to analyze MP in four types of soil: farmland, yellow-brown, paddy and floodplain soil from the suburb of Shanghai.

Liu, N., et al. (2013). "Simultaneous and combined detection of multiple tumor biomarkers for prostate cancer in human serum by suspension array technology." Biosensors and Bioelectronics **47**: 92-98.

Tumor markers (TMs) play an important role in clinical rapid screening and diagnosis for prostate cancer (PCa). In this study, we describe a competitive method to establish the multiplex suspension array by tumor biomarkers coated on distinguishable microbeads which competing with free biomarkers for their complementary antibodies (Ab) in one single reaction system for simultaneous and combined detection of prostate TMs in human serum. The volumes of the targets coupled onto the beads and their complementary Abs were optimized. The suspension array standard curves correlated well with PCa biomarkers (R²>0.9968). PCa biomarker levels were qua2013ntified using median fluorescent intensities. The working ranges of prostate-specific antigen (PSA), prostate stem cell antigen (PSCA), prostate-specific membrane antigen (PSMA) and prostatic acid phosphatase (PAP) were 0.47-502.94, 1.00-923.35, 1.00-524.79, and 1.73-176.07ngmL⁻¹ in serum samples, respectively. This method was compared to indirect competitive enzyme linked immunosorbent assay. It was found that high concordance between the two technologies resulted from serum samples of the eight PCa patients. The multiplex suspension array technology is specific to PCa biomarkers, displayed no significant cross-reactivity, and remains stable for 6 months. We also characterized the bead surface microstructures under different conditions employing a field emission scanning electron microscope. The suspension array is a straightforward and reliable method for analysis of multiple TMs with simple operation, high sensitivity at a low cost. © 2013 Elsevier B.V.

Liu, N., et al. (2018). "Detection of biomarkers of acute myocardial infarction by high-throughput suspension array technology in serum sample." Bioanalysis **10**(1): 47-58.

AIM: In order to assist and support early diagnosis of acute myocardial infarction (AMI), suspension array technology was established for multiplexed, rapid and accurate measurement of AMI biomarkers in serum samples. Methodology & results: It was developed by coating AMI biomarkers on distinguishable microbeads and competing with free biomarkers for complementary antibodies. The limits of detection of three AMI biomarkers were 2.5- to 50-times lower than that of the previous methods and the working ranges were four to five orders of magnitude. Accuracy and stability also met satisfying acceptance criteria in both of the intra- and interbatch testing. The variation coefficients and relative standard deviations were all less than 10%.

CONCLUSION: Suspension array technology is completely applicable for requirements of rapid clinical diagnosis in serum sample.

Liu, P., et al. (2020). "Effect of aging on adsorption behavior of polystyrene microplastics for pharmaceuticals: Adsorption mechanism and role of aging intermediates." Journal of Hazardous Materials **384**: 121193.

In the environment, aging obviously changes physicochemical properties of microplastics (MPs), but the effects of aging process on adsorption behavior of MPs are not fully understood. In this study, the aging of polystyrene (PS) was accelerated by photo-Fenton reaction. The adsorption mechanism of different aged PS toward atorvastatin (ATV) and amlodipine (AML) and the role of PS-derived intermediates in adsorption process were investigated.

Liu, P., et al. (2020). "Effect of weathering on environmental behavior of microplastics: Properties, sorption and potential risks." Chemosphere **242**: 125193.

Microplastic (MP) pollution is a raising global concern in recent years due to its wide distribution. Additionally, most of the MPs have undergone extensive weathering in the environment, and weathered MPs may exhibit different physicochemical properties from pristine ones. The review reveals the change in physicochemical properties (e.g. size, color, crystallinity, mechanical property and oxygen-containing groups) and the release of additives and MP-derived intermediates (i.e. oligomers and oxygenated compounds) during weathering processes. Weathering further affects the sorption behavior of MPs for environmental pollutants because of the changed crystallinity, specific surface area and oxygen functional groups. The interaction mechanisms of pristine and weathered MPs with pollutants are summarized, and how weathering processes affect sorption behavior is critically revealed. Because of the changed size, color and surface charges, weathered MPs might be ingested by aquatic organisms in different ways from the pristine ones. The detailed effects of weathering on the ingestion of MPs are discussed, and the potential toxicity of leachates from weathering processes is evaluated. In addition, the environmental components (e.g. natural organic matter and salinity) and biofilm correlated to the sorption behavior of MPs are reviewed. As for the knowledge gap, further studies should focus on the long-term weathering of MPs and the relationships between weathering properties and sorption capacities toward pollutants. The potential risks of weathered MPs and leachates on organisms should be explored.

Liu, Q. Y., et al. (2011). "Astragalus polysaccharides regulate T cell-mediated immunity via CD11c

^{high}CD45RB^{low} DCs in vitro." <u>Journal of Ethnopharmacology</u> **136**(3): 457-464.

Ethnopharmacological relevance: Astragalus polysaccharides (APS) isolated from one of the Chinese herbs, Astragalus mongholicus, are known to have a variety of immunomodulatory activities. However, it is not yet clear whether APS can induce the activation and differentiation of dendritic cells (DCs) and subsequently activate T cells. Aim of the study: This study was carried out to investigate the effect of APS on the differentiation of splenic DCs and its influence on T cell-mediated immunity through interleukin (IL)-12-producing CD11c^{high}CD45RB^{low} DCs in vitro. Methodology: MACS microbeads were used to isolate splenic DCs, CD11c^{high}CD45RB ^{low} DCs, CD11c^{low}CD45RB^{high} DCs and CD4 ⁺ T cells. Phenotypes were analyzed by flow cytometry, and cytokine levels were determined with cytometric bead array or ELISA. Result(s): The percentage of CD11c^{high}CD45RB^{low} DCs was significantly increased after treatment with APS compared to their counterparts. The cytokine secretion pattern of CD11c^{high}CD45RB^{low} DCs and CD11c ^{low}CD45RB^{high} DCs was detected, and it was found that unlike the stable IL-10 secretion pattern of CD11c^{low}CD45RB ^{high} DCs induced by APS, CD11c^{high}CD45RB^{low} DCs showed a dose-dependent relationship between IL-12 production and APS stimulation. In order to verify whether the activation of CD4⁺ T was associated with the differentiation of splenic DCs mediated by APS to CD11c ^{high}CD45RB^{low} DCs, anti-IL-12 receptor (IL-12R) as well as anti-IL-10R monoclonal antibody was used to inhibit the effect of CD11c ^{high}CD45RB^{low} DCs and CD11c^{low}CD45RB ^{high} DCs in CD4⁺ T mixed lymphocyte reaction culture. After treatment with anti-IL-12R or anti-IL-10 monoclonal antibody in CD4 ⁺ T+CD11c^{high}CD45RB^{low} DCs or CD11c ^{low}CD45RB^{high} DCs mixed lymphocyte reaction, the inductions of these DCs on T cells were inhibited dramatically. Conclusion(s): APS might induce the differentiation of splenic DCs to CD11c ^{high}CD45RB^{low} DCs followed by shifting of Th2 to Th1 with enhancement of T lymphocyte immune function in vitro. Also, the effect of APS on T-cell differentiation to Th1 was not associated with the inhibition of IL-10 production in CD11c^{low}CD45RB^{high} DCs. © 2010 Elsevier Ireland Ltd All rights reserved.

Liu, R., et al. (2015). "Fluorometric flow-immunoassay for alkylphenol polyethoxylates on a microchip containing a fluorescence detector comprised of an organic light emitting diode and an organic photodiode." <u>Talanta</u> **134**: 37-47.

A compact fluorescence detector was constructed on a microchip from an organic light emitting diode (OLED) as the light source and an organic photodiode (OPD) as the photo-detector and was used in an immunoassay for alkylphenol polyethoxylates (APE). The OLED based on a terbium complex emitted a sharp light at the main wavelength of 546 nm with a full width at half maximum of 9 nm. The incident photo-to-current conversion efficiency (IPCE) of the OPD fabricated with Fullerene 70 (C70) and tris[4-(5-phenylthiopen-2-yl)phenyl]-amine (TPTPA) was approximately 44% for light at a wavelength of 586 nm. The performance of the fluorescence detector was evaluated for the determination of resorufin (lambda(em)=586 nm) and the photocurrent of the OPD due to the fluorescence of resorufin was proportional to the concentration of resorufin in the range from 0 to 18 micro M with a detection limit (S/N=3) of 0.6 micro M. The fluorescence detector was successfully utilized in a competitive enzyme-linked immunosorbent assay for APE, where an anti-APE antibody was immobilized on the surface of the channel of the Polydimethylsiloxane (PDMS) microchip or on the surface of magnetic microbeads. After an immunoreaction with a sample solution of APE containing a horse radish peroxidase (HRP)-labeled APE, the fluorescence of resorufin generated just after introduction of a mixed solution of Amplex Red and H2O2 was measured using the fluorescence detector. The calibration curve for the photocurrent signals of the OPD due to the fluorescence of resorufin against the logarithmic concentration of APE was sigmoidal in shape. The detection limits defined as IC80 were ca. 1 ppb and ca. 2 ppb, respectively, for the methods using the anti-APE antibody immobilized on the surface of the microchannel and in the case where the antibody was immobilized on the surface of magnetic microbeads.

Liu, S., et al. (2019). "Research progress on environmental behavior and ecological toxicity of microplastics." Journal of Agro Environment Science **38**(5): 957-969.

The ubiquitous micro-plastics pollution has received global attention in recent years. In this review, the sources, migration, distribution and ecological toxicity challenges of micro-plastics in various environment matrices are discussed and evaluated. Micro-plastics mainly originate from two sources: (1) a significant direct input of primary micro-plastics and (2) secondary micro-plastics resulting from the fragmentation of larger plastic materials. Microplastics can migrate through atmospheric, freshwater, marine and terrestrial environments. In future, uniform methods for monitoring and investigating micro-plastics should be developed and combined with the source tracking technology, to explore its environmental effects. Microplastics (including additives) can be accidentally ingested by organisms, which may cause physical damage, a wide range of biological and physiological behavior and molecular effects. Micro-plastics can pose a combined toxicity to organism, owing to its role as a vector of chemical pollutants in ecosystems. Future studies on microplastics should focus on investigating their bio-accumulation and trophic transfer up the food chain by combined isotope tracing and new molecular biology techniques, especially for the potential health risk of microplastics for human. This review will provide a rationale for the ecological risk assessment of microplastics.

Liu, S., et al. (2019). "Distribution and characteristics of microplastics in the sediments of Poyang Lake, China." Water Science and Technology **79**(10): 1868-1877.

Microplastics are considered to be a widespread environmental contaminant, posing a serious threat to the aquatic environment. We addressed this issue based on field observations and laboratory analysis of samples from Poyang Lake. We collected sediment samples from 10 sites across Poyang Lake during 2017. Data were analyzed by one-way analysis of variance (ANOVA). Results showed that the abundance of microplastics ranged from 11 to 3,153 items/kg dw in the sediment samples. Except at Nanjishan, the amount of microplastics in different periods decreased in the order: December > April > July. Microplastics with a size <1 mm were the most abundant fraction in sediments, reaching over 50%. Observations under microscope revealed four types of microplastics in Poyang Lake: fragments, films, foams and fibers. Fragments were more common in sediments. Microplastics have complex surface topography, typically including rough surfaces, porous structures, cracks and extensive damage. Energy dispersive X-ray analysis indicated that most microplastics contained Si, Na, Ca, Cl and Al. Overall, the results provided strong evidence of high levels of microplastics in Poyang Lake, suggested that the microplastics pollution status in Poyang Lake should continue to be monitored.

Liu, T., et al. (2007). "Construction of eukaryotic expression plasmid human transforming growth factor beta3 and its transfection into precartilaginous stem cells." Chinese Journal of Traumatology - English Edition **10**(5): 288-293.

Objective: To obtain seed cells for cartilage repair through constructing recombinant human transforming growth factor beta3 vector (hTGF-beta3) and transfecting it into rat's precartilaginous stem cells (PSCs). Method(s): Gene engineering technique was introduced to construct eukaryotic expression plasmid pcDNA3. 1 (+)-hTGF-beta3. PSCs of rats were isolated and purified with method of immunomagnetic microbeads. Then PSCs were cotransfected with plasmid hTGF-beta3 and pcDNA3. 1 (+)-enhanced green fluorescence protein (EGFP) by liner polyethyleneimine (PEI). And 48 hours later the transient expression of EGFP was observed under a fluorescence microscope, and the expression of hTGF-beta3 was detected with reverse transcription-polymerase chain reaction (RT-PCR) and enzyme linked immunosorbent assay (ELISA). Result(s): The sequences of the recombinants were consistent with that from Genebank. Cotransfection of EGFP provided fast visual confirmation of successful transduction. The hTGF-beta3 mRNA and protein expression could be detected by RT-PCR and ELISA. Conclusion(s): The recombinant plasmid is correctly constructed and successfully transfected into rat's PSCs, which is an important step to treat epiphyseal injury or other osteo-cartilage diseases with transgenic therapy.

Liu, X. and U. J. Krull (2006). "DNA hybridization on silica microbeads that are physically adsorbed as arrays on glass surfaces." Analytica Chimica Acta **562**(1): 1-8.

Detection of DNA hybridization was done on silica microbeads that were physically adsorbed onto glass surfaces. DNA oligonucleotide probes of approximately 20 mer size were immobilized on beads of 5 mum diameter after the microbeads were first silanized with 3-glycidoxypropyltrimethoxysilane. The suspension of silica microbeads in aqueous solution was spotted on the glass slides. After drying, the glass surface was washed with water and 1 x SSC buffer. Significant numbers of microbeads remained physically adsorbed onto the glass surfaces even after vigorous washing with buffer solution. After hybridization using approximately 200 mer PCR targets strands, the glass slides were scanned using a standard laser confocal fluorescence microscope microarray reader. The total time for completion of hybridization assays was less than 20 min for 100 nM samples of target oligonucleotide. The clinical utility of the method was demonstrated by detection of single base pair mutations in the survival motor neuron gene that is associated with the childhood disease Spinal Muscular Atrophy. The method proved to provide a readily adaptable strategy for immobilization of different probes in an array format, and provided for SNP detection on a disposable slide without cross contamination. © 2006 Elsevier B.V. All rights reserved.

Liu, X., et al. (2017). "Simultaneous photodegradation of multi-herbicides by oxidized carbon nitride: performance and practical application." Applied Catalysis. B, Environmental **219**: 194.

This work focuses on photodegradation of multi-herbicides simultaneously with series oxidized carbon nitrides (OCN), which were synthesized via a rapid acid-assisted method. Carbon nitrides, after treating with nitric acid solution at several concentrations, revealed variant oxygen content, surface morphology and structure characteristic. The photocatalytic activity was verified by degradation of ten typical herbicides in water. The influence of microplastics on the photocatalytic performance of OCN sample was investigated for the first time. Experimental results showed that microplastics contained in environmental matrix significantly influenced the photodegradation ratio. Moreover, holes (h+) and OW radicals were found to be the main reactive species during this process. The OCN-10 sample demonstrated favourable reusability in recycling tests and exhibited satisfactory degradative capability for ten investigated herbicides both in soil and aqueous phase under simulated diurnal cycle.

Liu, X., et al. (2009). "Fabrication of a microfluidic enzyme reactor utilizing magnetic beads." Electrophoresis **30**(12): 2129-2133.

An enzyme-catalyzed microfluidic assay using magnetic micro-beads is described. Here, diaphorase (DI) (E.C. 1.6.99) is covalently attached to the magnetic micro-beads (2.7 mum) and integrated into a short section of a microchip fabricated from PDMS. DI converts non-fluorescent resazurin to fluorescent resorufin in the presence of nicotinamide adenine dinucleotide phosphate (NADH). In this work, an embedded magnet holds the micro-beads in place within the microchannel while a solution of resazurin and NADH in buffer is flowed through the beads. Incorporation of the micro-beads into the microchannel requires only a few minutes and offers well-defined spatial resolution and reproducibility. At a flow rate of 41.2 microL/h, a stable state for the enzyme reaction in the microfluidic format was achieved within 50 s. The maximum conversion of the reaction was obtained at a concentration of 1.25 mM NADH. The reaction yield is affected by ZnCl(2) and at concentrations in excess of 90.0 mM, the activity of DI was almost double without ZnCl(2). At 5.2 mM potassium chloride, the activity of DI reached its maximum value. Overall, the conversion of resazurin in microfluidic format was more than twice than that in a batch assay.

Liu, X., et al. (2019). "Microplastics as Both a Sink and a Source of Bisphenol A in the Marine Environment." Environmental Science and Technology **53**(17): 10188-10196.

Microplastics were demonstrated to be an environmental sink for hydrophobic organic pollutants, while they can also serve as a potential source of such pollutants. In this study, the sorption and release of bisphenol A in marine water were investigated through laboratory experiments. Sorption and desorption isotherms were developed, and the results reveal that sorption and desorption depend on the crystallinity, elasticity, and hydrophobicity of the polymer concerned. The adsorption and partition of bisphenol A can be quantified using a dual-mode model of the sorption mechanisms. Polyamide and polyurethane were found to exhibit the highest sorption capacity for bisphenol A, and it was almost irreversible, probably due to hydrogen bonding. Polyethylenes and polypropylene exhibited high and reversible sorption without noticeable desorption hysteresis. Glassy polystyrene, poly(vinyl chloride), poly(methyl methacrylate), and poly(ethylene terephthalate) exhibited low sorption capacity and only partial reversibility. Low-density polyethylene and polycarbonate microplastic particles were for the first time proved to be a persistent source releasing bisphenol A into aquatic environments. Salinity, pH, coexisting estrogens, and water chemistry influence the sorption/desorption behaviors to different degrees. Plastic particles can serve as transportation vectors for bisphenol A, which may constitute an ecological risk. Copyright © 2019 American Chemical Society.

Liu, X., et al. (2018). "Construction of High Sensitive CD133 Immune PLGA Magnetic Spheres Platform for Lung Cancer Stem Cells Isolation and Its Property Evaluation." Journal of Biomedical Nanotechnology **14**(6): 1066-1074.

High sensitive immune CD133 PLGA magnetic spheres platform is constructed to isolate and enrich lung cancer stem cells in order to study their biological characteristics, such as their proliferation, self-renewal and invasion and metastasis in vitro. The expression of the specific transcription factors Oct 4 and Nanog genes of stem cells were detected by immunofluorescence and RT-PCR. The tumorigenic capacity of lung cancer cells were studied using the tumorigenesis experiment in nude mice in vivo. The results indicated that the CD133 immune PLGA magnetic beads (with diameter 356.25 +/- 0.64 nm) can effectively separate more lung cancer stem cells under the serum-free suspension culture compared with MACS CD133

MicroBead Kit. Some A549 cells sorted magnetically could form stable tumor suspended spheres that were able to undergo passage stably after 3 to 6 days. The self-renewal, clonal formation and invasion and metastasis capacities of the suspended spheres were higher than those of the parent cells (P < 0.05). The expressions of Oct 4 and Nanog mRNA in stem cells were significantly elevated (P < 0.05), and the A549 suspended spheres could significantly improve the in vivo tumorigenic capacity of nude mice. Among the peripheral blood of 20 patients with lung adenocarcinoma, CD133+ cells were isolated from the peripheral blood of 14 (70%), and CD133+ cells sorted from 11 (55%) patients were cultured into spheres.

Liu, X., et al. (2019). "Hydrophobic sorption behaviors of 17 beta -estradiol on environmental microplastics." Chemosphere **226**: 726-735.

Microplastics (MPs) have been regarded as a vector for contaminants and greatly affect the migration and fate of hydrophobic organic compounds (HOCs) in marine water. In this study, the sorption behavior of 17 beta -estradiol (E2) on MPs was investigated in marine water system. The sorption capacity of E2 varied greatly with the chemical structures of MPs. The adsorption or partition contribution of E2 sorption on MPs was well quantified with adsorption-partition dual-mode model mechanism. The hydrophobic partition dominantly regulates the sorption of E2 due to the high crystallinity of MPs and high accessibility of amorphous domain of rubbery MPs. Smaller particle size benefits the sorption of E2 on same kind of MPs. The salinity and dissolved organic matter (DOM) have minor effect on E2 sorption by MPs in real marine water. The result shows that the MPs greatly influence the transportation of E2 and cause potential environmental risk to marine ecosystem.

Liu, X., et al. (2019). "Transfer and fate of microplastics during the conventional activated sludge process in one wastewater treatment plant of China." Chemical Engineering Journal **362**: 176-182.

Municipal wastewater treatment plants (WWTP) are considered as a significant point source of microplastics (MPs) in the aquatic environment. The objective of this study was to investigate the transport and fate of MPs particles in one WWTP of China based on the conventional activated sludge process. The results exhibited that the abundance of MPs in wastewater declined sharply, from 79.9 n L⁻¹ in the influent to 28.4 n L⁻¹ in the effluent, with a removal rate of 64.4%. MPs removed were mostly transferred and stored into the sludge, and the abundance of MPs in dewatered sludge was 240.3+or-31.4 n g⁻¹ (dry sludge) with an average size of 222.6 micro m. Larger size fraction of MPs in the effluent was reduced compared to that in the influent due to mechanical erosion and sedimentation into sludge. Fiber and fragment were main MPs particles in four wastewater sampling sites, with the average percentage ranged from 33.5 to 56.7% and 30.4 to 45.6%, respectively. An interesting finding is that the ellipses with the size ranged from 100 to 800 micro m (average size of 348.1 micro m), seldom reported before, were abundantly seen in the influent with a percentage of 4.4%, but not observed in the effluent. A higher fraction of microbead and foam in sludge (17.1% and 12.9%) indicates MPs with the smaller size (average size of 90.3 and 240.1 micro m, respectively) in wastewater are prone to be adsorbed and transferred into sludge. Polyamide (nylon) was found to be the main plastic component in wastewater with 54.8% based on Raman spectra, indicating that the MPs particles are primarily originated from the wastewater discharged by washing clothes and polymer manufacturing and processing industries, followed by personal care products.

Liu, X., et al. (2018). "Sorption behaviors of tris-(2,3-dibromopropyl) isocyanurate and hexabromocyclododecanes on polypropylene microplastics." Marine Pollution Bulletin **135**: 581-586.

In recent years, microplastics in oceans have become a serious environmental problem and the focus of attention. In the present study, the sorption of TBC and HBCDs by microplastics in simulated seawater is examined. The effects of particle size, temperature, salinity, and concentration on the adsorption of TBC and HBCDs by microplastics are studied.

Liu, Y., et al. (2017). "Design of a Modular DNA Triangular-Prism Sensor Enabling Ratiometric and Multiplexed Biomolecule Detection on a Single Microbead." Analytical Chemistry **89**(6): 3590-3596.

DNA nanostructures have emerged as powerful and versatile building blocks for the construction of programmable nanoscale structures and functional sensors for biomarker detection, disease diagnostics, and therapy. Here we integrated multiple sensing modules into a single DNA three-dimensional (3D) nanoarchitecture with a triangular-prism (TP) structure for ratiometric and multiplexed biomolecule detection on a single microbead. In our design, the complementary hybridization of three clip sequences formed TP nanoassemblies in which the six single-strand regions in the top and bottom faces act as binding sites for different sensing modules, including an anchor module, reference sequence module, and capture sequence module. The multifunctional modular TP nanostructures were thus exploited for ratiometric and multiplexed biomolecule detection on microbeads. Microbead imaging demonstrated that, after ratiometric self-calibration analysis, the imaging deviations resulting from uneven fluorescence intensity distribution and differing probe concentrations were greatly reduced. The rigid nanostructure also conferred the TP as a framework for geometric positioning of different capture sequences. The inclusion of multiple targets led to the formation of sandwich hybridization structures that gave a readily detectable optical response at different fluorescence channels and distinct fingerprint-like pattern arrays. This approach allowed us to discriminate multiplexed biomolecule targets in a simple and efficient fashion. In this module-designed strategy, the diversity of the controlled DNA assembly coupled with the geometrically well-defined rigid nanostructures of the TP assembly provides a flexible and reliable biosensing approach that shows great promise for biomedical applications.

Liu, Y., et al. (2017). Profiling multiple cytokine levels in a mixing-enhanced microfluidic immunoassay. 2017 IEEE 12th International Conference on Nano/Micro Engineered and Molecular Systems, NEMS 2017.

We report a microfluidic immunoassay consisting of multiple precise and efficient mixing units for transient multi-cytokine detections secreted by lymphocytes. This device has an array of detection micro-chambers with each included a Taylor dispersion-based mixing unit. The sub-pico-liter bio-samples are extracted from cell culture media and mixed with cytokine-sensitive fluorescence micro-beads, which offer fluorescent signals to quantify the bound cytokines on beads, are embedded in the chambers for quantitative detection of the target cytokines. We perform experiments to verify the mixing scheme on its robustness and sensitivity. We first calibrate labeling fluorescence intensity profiles of 6 independent cytokine-sensitive beads, each conjugated with a specific antibody, using a confocal microscope for measuring the intensity. We demonstrate the high detection sensitivity for cytokine concentrations released by a human leukemic cell line (THP-1). We propose a highly integrated microfluidic immunoassay consisting the 4 × 4 independently operated detection micro-chambers that achieve high-Throughput detection functionality. Altogether, further development of this device can lead to the profiling of multiple cytokine dynamics of lymphocytes for deeper understandings of the human immune system as well as the immune diseases. © 2017 IEEE.

Liu, Y., et al. (2019). "Aggregation kinetics of UV irradiated nanoplastics in aquatic environments." Water Research **163**: 114870.

Nanoplastics (NPs) derived from degradation of macroplastics and microplastics possess potential threat to aquatic biota and human health. Their fate and transport in aquatic systems are mainly governed by aging processes and aggregation behavior. In this study, we simulated plastic aging process using UV-irradiation and compared the aggregation kinetics of fresh versus aged polystyrene NPs (PSNPs) under aqueous conditions. The results showed that fresh PSNPs had strong negative surface charge and exhibited both reaction- and diffusion-limited aggregation regimes, in agreement with classic Derjaguin-Landau-Verwey-Overbeek (DLVO) theory. Divalent electrolytes were 10-15 times more effective in inducing PSNP aggregation than monovalent electrolytes. The aging process inhibited PSNP aggregation in NaCl solutions by increasing the negative charge on PSNP surface and the organic matter content in solution, while promoted PSNP aggregation in CaCl₂ solutions due to interactions between Ca²⁺ and carboxyl groups formed on aged PSNP surface. Such distinct behaviors were consistent with characterizations by contact angle measurements, potentiometric titration, total organic carbon (TOC) analysis, Fourier Transform Infrared Spectroscopy (FTIR), and X-ray photoelectron spectroscopy (XPS). Hamaker constants obtained from DLVO fitting decreased from 3.5x10⁻²¹J for fresh PSNPs to 1.5x10⁻²¹J for aged PSNPs. This study indicated that UV-irradiation plays a vital role in governing the fate, transport, and potential hazards of PSNPs in aquatic environments.

Liu, Y., et al. (2015). "MiR-200b modulates the properties of human monocyte-derived dendritic cells by targeting WASF3." Life Sciences **122**: 26-36.

AIMS: The aim of the study was to explore the effect of miR-200b on the development of human peripheral blood monocyte-deriveddendritic-cell (DC) and its mechanisms.

MAIN METHODS: Expression levels of miR-200b and its predicted targets were measured by real time-PCR. Protein expression of WASF3 was determined by Western blot and immunohistochemistry. Human peripheral blood mononuclear cells (PBMCs) were isolated by Ficoll-Hypaque density gradient centrifugation from the buffy coat fraction of anticoagulated blood. Monocytes were purified from PBMCs using anti-CD14 microbeads. The immunophenotypes of DCs were tested by flow cytometry.

KEY FINDINGS: A strong reduction in miR-200b expression was associated with human peripheral blood monocyte-derivedDC differentiation. The overexpression of miR-200b significantly reduced the numbers of protruding veils in mature DCs (mDCs) that are critical for promoting antigen-specificT-cell activation. Further experiments showed that miR-200b could regulate the function of DCs by targeting WASF3, a protein involved in cell movement and invasion.

SIGNIFICANCE: Our results define an important function of miR-200b in the negative regulation of DC development and provide a potential form of miRNA-mediated cell therapy for diseases that range from auto-immunity to graft-versus-host disease.

Liu, Y. and Y. Li (2002). "Detection of Escherichia coli O157:H7 using immunomagnetic separation and absorbance measurement." Journal of Microbiological Methods **51**(3): 369-377.

An assay system for detection of Escherichia coli O157:H7 was developed based on immunomagnetic separation of the target pathogen from samples and absorbance measurement of p-nitrophenol at 400 nm from p-nitrophenyl phosphate hydrolysis by alkaline phosphatase (EC 3.1.3.1) on the "sandwich" structure complexes (antibodies coated onto micromagnetic beads--E. coli O157:H7-antibodies conjugated with the enzyme) formed on the microbead surface. The effects of immunoreaction time, phosphate buffer concentration, pH and temperature on the immunomagnetic separation of E. coli O157:H7 from samples were determined and the conditions used for the separation were 1-h reaction time, 1.0 x 10(-2) M PBS, pH 8.0 and 33 degrees C in this system. The effects of MgCl(2) concentration, Tris buffer concentration, pH and temperature on the activity of alkaline phosphatase conjugated on the immuno-"sandwich" structure complexes were investigated after immunomagnetic separation of the target pathogen and the conditions used for the enzymatic amplification were 1.0 x 10(-4) M MgCl(2), 1.0 M Tris buffer, pH 8.0, 28 degrees C and 30-min reaction time during the assay. The selectivity of the system was examined and no interference from the other pathogens including Salmonella typhimurium, Campylobacter jejuni and Listeria monocytogenes was observed. Its working range was from 3.2 x 10(2) to 3.2 x 10(4) CFU/ml, and the relative standard deviation was 2.5-9.9%. The total detection time was less than 2 h.

Liu, Y., et al. (2016). "Quantum-dots-encoded-microbeads based molecularly imprinted polymer." Biosensors & Bioelectronics **77**: 886-893.

Quantum dots encoded microbeads have various advantages such as large surface area, superb optical properties and the ability of multiplexing. Molecularly imprinted polymer that can mimic the natural recognition entities has high affinity and selectivity for the specific analyte. Here, the concept of utilizing the quantum dots encoded microbeads as the supporting material and the polydopamine as the functional monomer to form the core-shell molecular imprinted polymer was proposed for the first time. The resulted imprinted polymer can provide various merits: polymerization can complete in aqueous environment; fabrication procedure is facile and universal; the obvious economic advantage; the thickness of the imprinting layer is highly controllable; polydopamine coating can improve the biocompatibility of the quantum dot encoded microbeads. The rabbit IgG binding and flow cytometer experiment result showed the distinct advantages of this strategy: cost-saving, facile and fast preparation procedure. Most importantly, the ability for the multichannel detection, which makes the imprinted polydopamine modified encoded-beads very attractive in protein pre-concentration, recognition, separation and biosensing.

Liu, Y., et al. (2005). "LPS receptor (CD14): a receptor for phagocytosis of Alzheimer's amyloid peptide." Brain **128**(Pt 8): 1778-1789.

The amyloid beta peptide 42 (Abeta(42)) plays a key role in neurotoxicity in Alzheimer's disease. Mononuclear phagocytes, i.e. microglia, have the potential to clear Abeta by phagocytosis. Recently, the lipopolysaccharide (LPS) receptor CD14 was shown to mediate phagocytosis of bacterial components and furthermore to contribute to neuroinflammation in Alzheimer's disease. Here, we investigated whether this key innate immunity receptor can interact with Abeta(42) and mediate phagocytosis of this peptide. Using flow cytometry, confocal microscopy and two-photon fluorescence lifetime imaging (FLIM) combined with fluorescence resonance energy transfer (FRET), we demonstrated a direct molecular interaction in the range of a few nanometers between Abeta(42) and CD14 in human CD14-transfected Chinese hamster ovary cells. Investigations using cells that were genetically deficient for this receptor showed that in <30 minutes exogenous Abeta(42) added to cultured primary microglial cells was phagocytosed into the cytoplasmic compartment in a CD14-dependent manner. This phagocytosis occurred at Abeta(42) concentration ranges that were considerably lower than the threshold to activate a cellular inflammatory reaction. In contrast, there was no association of CD14 to microglial internalization of microbeads. In complementary clinical experiments, we detected a pronounced CD14 immunoreactivity on parenchymal microglia spatially correlated to characteristic Alzheimer's disease lesion sites in brain sections of Alzheimer's disease patients but not in brain sections of control subjects. By showing a close interaction between CD14 and Abeta(42), demonstrating a direct role of CD14 in Abeta(42) phagocytosis, and detecting CD14-specific staining in brains of Alzheimer's disease patients, our results indicate a role of the LPS receptor in the pathophysiology of Alzheimer's disease, which could be of therapeutic relevance.

Liu, Y., et al. (2019). "Ecotoxicological effects on Scenedesmus obliquus and Danio rerio Co-exposed to polystyrene nano-plastic particles and natural acidic organic polymer." Environmental Toxicology & Pharmacology **67**: 21-28.

The importance of attention to unravel the interaction of nano-plastic particles (NPs) with natural acidic organic polymer (NAOP) in freshwater environment should not be neglected. However, toxicological data available for the interaction between NPs and NAOP remain limited. Here, we investigate the toxicological effects of three model polystyrene (PS) NPs with different functional groups (unmodified, amino- and carboxyl-modified PS NPs) on two freshwater organisms of different trophic levels (Scenedesmus obliquus and Danio rerio) in the absence and presence of two classes of NAOP, namely fulvic acid and humic acid. The NAOP interaction with the NPs is shown to alter oxidative stress and disturb membrane function in S. obliquus cells to a certain extent. Combined oxidative stress responses to the NPs and NAOP in D. rerio as a function of their mixture levels showed inhibition, alleviation, and reinforce. Changes in cellular oxidative stress and membrane function depended on the concentration and types of both NPs and NAOP. Furthermore, the characterization parameters of the NPs were important for the explanation of the ecotoxicological mechanism of the NPs in the presence of NAOP. Our findings emphasized the critical role of NAOP in the fate and toxicity of plastic particles in freshwater environment. [ABSTRACT FROM AUTHOR]

Liu, Y., et al. (2006). "Highly selective determination of methylmercury with methylmercury-imprinted polymers." Analytica Chimica Acta **575**(2): 159-165.

Methylmercury-imprinted and non-imprinted polymers were prepared by formation monomer complex of methylmercury with (4-ethenylphenyl)-4-formate-6-phenyl-2,2'-bipyridine and thermally polymerizing with divinylbenzene (crosslinker) in the presence of 2,2'-azobisisobutyronitrile as initiator and subsequently leached with the acidic thiourea solution (1.0 mol L(-1) of thiourea and 4.0 mol L(-1) of HCl). In the same way, non-imprinted copolymers were prepared without methylmercury chloride added. The separation and preconcentration characteristics of the polymers for methylmercury were investigated by batch and column procedures. The results demonstrated that the methylmercury-imprinted polymers had higher adsorption capacity (170 micromol g(-1) of dry microbeads) and good selectivity for methylmercury compared to non-imprinted polymers. The distribution ratio (D) values of the methylmercury-imprinted polymers increased for methylmercury with respect to both D values of Hg(II), Cu(II), Zn(II), Cd(II) and non-imprinted polymers. The relatively selective factor (alpha(r)) values of CH3Hg+/Hg(II), CH3Hg+/Cu(II), CH3Hg+/Zn(II), and CH3Hg+/Cd(II) are 24.0, 46.7, 50.7, and 40.2, which are greater than 1. The methylmercury-imprinted polymers can be used at least twenty times with recoveries no less than 95%. Based on the packed columns with

methylmercury-imprinted polymers, a highly selective solid-phase extraction (SPE) and preconcentration method for methylmercury was developed. The metal ion imprinted polymer solid-phase extraction (MIIP-SPE) preconcentration procedure showed a linear calibration curve within concentration range from 0.093 to 22 microg L(-1). The detection limit and quantification limit were 0.041 and 0.093 microg L(-1) (3sigma) for cold vapor atomic absorption spectrometry (CVAAS). The relative standard deviation of the 10 replicate determinations was 3.5% for the determination of methylmercury in human hair sample. Determination of methylmercury in certified human hair sample (IAEA-086) and soil certified reference material (CRM 580) demonstrated that the interfering substances in matrix had been almost removed during preconcentration. The methylmercury-imprinted polymers were good enough for methylmercury determination in matrixes containing components with similar chemical property such as Hg(II), Cu(II), Zn(II), and Cd(II).

Liu, Y. Q., et al. (2018). "[Effect of HIF-2alpha on the biological characteristics of breast cancer stem cells]." Chung-Hua i Hsueh Tsa Chih [Chinese Medical Journal] **98**(4): 269-273.

Objective: To explore the effect of hypoxia inducible factor (HIF)-2alpha on biological characteristics of breast cancer stem cells (BCSCs). Methods: Stem cells were isolated and purified from MCF-7 cells by using the immunomagnetic microbeads. HIF-2alpha ORF/shRNA lentiviral vectors were transduced into MCF-7 stem cells respectively, and then the stable stem cell lines were detected and gained. Using the method of Cell Counting Kit-8 (CCK-8) and flow cytometry, the effect of HIF-2alpha on cell vitality and apoptosis of MCF-7 cancer stem cells (CSCs) were tested. Serum-free suspension culture was used on MCF-7 cells to get breast CSCs microspheres. The expression of CD44(+) in different groups were detected by flow cytometry. Tumor-bearing nude mice model was established to compare tumor growth rate and pulmonary metastasis probability of MCF-7 CSC HIF-2alpha knock up/down in vivo. Results: Compared with MCF-7 CSC group, the apoptosis rate of MCF-7 CSCs HIF-2alpha knockup group decreased obviously and cell proliferation activity increased significantly (all P<0.05). However, the MCF-7 CSCs HIF-2alpha knock down group had the opposite trend.

Liu, Z., et al. (2018). "Are exports of recyclables from developed to developing countries waste pollution transfer or part of the global circular economy?" Resources, Conservation and Recycling **136**: 22-23.

CE has benefitted the global economy for years, including China. For example, developed countries benefitted from cost savings associated with exporting waste to China where there were less stringent Chinese environmental laws, but developed countries failed to incorporate true environmental costs. China also benefitted by importing recyclable waste to supplement its domestic manufacturing industries, yet imported plastic waste was considered inferior, and often unusable (i.e., generating more waste), compared to domestic waste by China's manufacturing industries. In future, the key will be to establish fair-trading systems for waste reutilization across countries globally to reduce waste generation. Firstly, we argue that to reduce waste generation in developed countries, reduced consumption is imperative, since current per capita waste generation in developed countries is much higher than in developing countries. Developed countries, like Canada, need to adopt zero plastic waste strategies by reducing and recycling single-use plastics (Walker and Xanthos, 2018). Secondly, developed countries need to help developing countries deal with their environmental issues, caused by waste reutilization, by transferring waste management and recycling technologies, investing in R&D and training local employees to mitigate potential environmental risks. Thirdly, from a global perspective, implementing extended producer responsibility (EPR) systems across developed and developing countries to help reshape and rebalance the global CE should be undertaken. Copyright © 2018 Elsevier B.V.

Liu, Z., et al. (2020). "Effects of nanoplastics at predicted environmental concentration on Daphnia pulex after exposure through multiple generations." Environmental Pollution **256**: 113506.

The biological effects of nanoplastics are a growing concern. However, most studies have focused on exposure to high concentrations or short-term exposure. The potential effects of exposure to low environmental nanoplastic concentrations over the long-term and across multiple generations remain unclear. In the present study, Daphnia pulex was exposed over three 21-day generations to a typical environmental nanoplastic concentration (1mug/L) and the effects were investigated at physiological (growth and reproduction), gene transcription and enzyme activity levels. Chronic exposure did not affect the survival or body length of D. pulex, whereas the growth rate and reproduction were influenced in the F2 generation. Molecular responses indicated that environmental nanoplastic concentrations can modulate the response of antioxidant defenses, vitellogenin synthesis, development, and energy production in the F0-F1 generations, and prolongation resulted in inhibitory effects on antioxidant responses in F2 individuals. Some recovery was observed in the recovery group, but reproduction and stress defenses were significantly induced. Taken together, these results suggest that D. pulex recovery from chronic exposure to nanoplastic may take several generations, and that nanoplastics have potent long-term toxic effects on D. pulex. The findings highlight the importance of multigenerational and chronic biological evaluations to assess risks of emerging pollution.

Liu, Z., et al. (2018). "Age-dependent survival, stress defense, and AMPK in Daphnia pulex after short-term exposure to a polystyrene nanoplastic." Aquatic Toxicology **204**: 1-8.

The widespread occurrence and accumulation of micro- and nanoplastics in aquatic environments has become a growing global concern. Generally, natural aquatic populations are characterized by a variety of multi-structured age groups, for which physiological and biochemical responses typically differ. The freshwater cladoceran, Daphnia pulex, is a model species used extensively in environmental monitoring studies and ecotoxicology testing. Here, the effects of a polystyrene nanoplastic on the physiological changes (i.e., survival) and expression levels of stress defense genes (i.e., those encoding antioxidant-mediated and heat shock proteins) in this freshwater flea were measured. Results from acute bioassays were used to determine the respective nanoplastic LC50 values for five age groups (1-, 4-, 7-, 14- and 21-day-old individuals): the obtained values for the 1- and 21-day-old D. pulex groups were similar (i.e., not significantly different). The expression levels of genes encoding key stress defense enzymes and proteins - SOD, CAT, GST, GPx, HSP70, and HSP90 - were influenced by the nanoplastic in all the age groups, but not in the same way for each. Significant differences were observed among all age groups in their expression of the gene encoding the energy-sensing enzyme AMPK (adenosine monophosphate-activated protein kinase) alpha , beta , and gamma following exposure to the nanoplastic. Moreover, the expression of AMPK alpha was significantly increased in the 1-, 7-, and 21-day-old individuals exposed to nanoplastic relative to the control group. Together, these results indicate that age in D. pulex affects the sensitivity of its individuals to pollution from this nanoplastic, primarily via alterations to vital physiological and biochemical processes, such as cellular energy homeostasis and oxidation, which were demonstrated in vivo. We speculate that such age-related effects may extend to other nanoplastics and forms of pollution in D. pulex and perhaps similar marine organisms.

Liu, Z., et al. (2019). "Effects of microplastics on the innate immunity and intestinal microflora of juvenile

Eriocheir sinensis." Science of the Total Environment **685**: 836-846.

The effects of microplastic exposure on the non-specific immune responses and intestinal microflora remain unclear. In this study, juveniles of the Chinese mitten crab (Eriocheir sinensis) were exposed to different concentrations of microplastics (0, 0.04, 0.4, 4, and 40 mg/L) for 7, 14, and 21 days to explore their effects. Under microplastic-induced stress, the contents or activities of most immune-related factors [haemocyanin (Hc), alkaline phosphatase (AKP), phenoloxidase (PO), lysozyme (LSZ), and acid phosphatase (ACP)] decreased after an initial increase in the low-dose or short exposure times in the haemolymph and hepatopancreas. The trends in Hc and LSZ gene expression were consistent with the corresponding changes in enzyme activities. Moreover, the haemocyte expression of caspase and MyD88 in the groups with microplastic-induced stress was higher than that in the control group, whereas the expression levels in the hepatopancreas were first increased and then decreased. Furthermore, the relative abundance of Firmicutes and Bacteroidetes decreased following exposure to 40 mg/L microplastics, whereas that of Fusobacteria and Proteobacteria increased. These results indicate that microplastics affect immune enzyme activity and immune-related gene expression and change the diversity and composition of the intestinal microflora in E. sinensis.

Liu, Z., et al. (2019). "Polystyrene nanoplastic exposure induces immobilization, reproduction, and stress defense in the freshwater cladoceran Daphnia pulex." Chemosphere **215**: 74-81.

The widespread occurrence and accumulation of plastic waste have been globally recognized as a critical issue. However, there is limited information on the adverse effects of nanoplastics on freshwater invertebrates. In this study, the effects of a polystyrene nanoplastic on physiological changes (e.g., survival, growth, and reproduction) and expression levels of stress defense genes (oxidative stress-mediated and heat shock proteins) in the freshwater flea Daphnia pulex were measured. The results showed that the digestive organs of D. pulex were strongly fluorescent after exposure to the nanoplastic particles, and the 48-h median lethal concentration (LC 50) of the nanoplastic was determined to be 76.69 mg/L. In the 21-day chronic toxicity test, dose- and time-dependent relationships were observed for body length, and the time to first eggs was significantly prolonged in the 0.5 and 1 mg/L groups. The time to clutch was delayed, and total offspring per female and number of clutches were decreased in all the treatment groups. In addition, the offspring per clutch were significantly decreased in the 0.1 mg/L group. As the nanoplastic concentration increased, expression of stress defense genes (SOD, GST, GPx, and CAT) was first induced and then inhibited. The gene expressions of heat shock proteins (HSP70 and HSP90) were induced in all the treatment groups. Our results suggest that nanoplastics can be ingested by the freshwater cladoceran D. pulex and affect its growth and reproduction as well as induce stress defense.

Liu, Z., et al. (2010). "Magnetic microbead-based enzyme-linked immunoassay for detection of Schistosoma japonicum antibody in human serum." Analytical Biochemistry **404**(2): 127-134.

A specific and sensitive immunoassay based on magnetic microbead separation for schistosomiasis japonica screening is presented in this article. So far as we know, this is the first time that magnetic microbead-based enzyme-linked immunoassay (MEIA) has been used for the determination of Schistosoma japonicum (Sj) antibody in human serum. Fluorescein isothiocyanate (FITC)-labeled soluble egg antigen (SEA) and polymer-coated magnetic beads, to which anti-FITC monoclonal antibodies were immobilized, were used as separation support in MEIA. Immunoassay parameters were optimized based on a direct immunoreaction of SEA on the magnetic microbead and Sj antibody in serum samples. The laboratory experimental results showed that the MEIA method was more sensitive and more precise than traditional SEA-ELISA

(enzyme-linked immunosorbent assay). In the field test, human sera collected from 513 infected humans and 2260 uninfected humans were tested with indirect hemagglutination assay (IHA), dipstick dye immunoassay (DDIA), and MEIA. IHA and DDIA were then compared with MEIA, and a lower false negative rate (0.97%) was obtained.

Liubartseva, S., et al. (2018). "Tracking plastics in the Mediterranean: 2D Lagrangian model." Marine Pollution Bulletin **129**(1): 151-162.

Drift of floating debris is studied with a 2D Lagrangian model with stochastic beaching and sedimentation of plastics. An ensemble of >10¹⁰ virtual particles is tracked from anthropogenic sources (coastal human populations, rivers, shipping lanes) to environmental destinations (sea surface, coastlines, seabed). Daily analyses of ocean currents and waves provided by CMEMS at a horizontal resolution of 1/16 degrees are used to force the plastics. High spatio-temporal variability in sea-surface plastic concentrations without any stable long-term accumulations is found. Substantial accumulation of plastics is detected on coastlines and the sea bottom. The most contaminated areas are in the Cilician subbasin, Catalan Sea, and near the Po River Delta. Also, highly polluted local patches in the vicinity of sources with limited circulation are identified. An inverse problem solution, used to quantify the origins of plastics, shows that plastic pollution of every Mediterranean country is caused primarily by its own terrestrial sources.

Livun, A., et al. (2010). "Significant up-regulation of CXCR4 in CD34⁺ and CD34⁻ mesenchymal stromal cells in patients with primary myelofibrosis." Haematologica **2)**: 660-661.

Background: Primary myelofibrosis (PMF) is the most aggressive stem cell derived Philadelphia chromosome-negative chronic myeloproliferative neoplasia (MPN), with average survival of 5-7 years and no effective therapy. It is characterized by bone marrow (BM) fibrosis, cytopenias, leukoerythroblastosis, teardrop poikilocytosis, extramedullary hematopoiesis, splenomegaly and elevated number of CD34⁺ cells in peripheral blood (PB). Understanding of biological abnormalities in PMF may lead to the development of new targeted therapies. Discovery of a single point mutation in the tyrosine kinase JAK2 (JAK2V617F) in MPN has revealed an abnormality contributing to the existence to these diseases, and JAK2 inhibitors are being developed clinically. Mobilization of hematopoietic progenitors from BM to spleen and liver in PMF suggests that alternations in the cross talk between hematopoietic and mesenchymal stromal cells (MSC) may also participate in disease biology. Aim(s): To assess the expression of selected group of genes in CD34⁺ BM cells, as well as BM-derived MSC, from patients with PMF, which may have a role in the biology of this disease. The genes examined included those involved in cell-stromal adhesion (SPARC, CXCR4), metabolism (COX-2, HIF1alpha), and differentiation and signaling (Pax5 and Socs3). Materials and methods. Mononuclear cells (MNC) from BM aspirates from 20 PMF patients and five healthy donors (used as a control) were cultured in aMEM medium containing 20% fetal bovine serum for 2 weeks. Adherent MSC, as well as nonadherent cells, were then collected and sorted using CD34 microbeads. Total RNA was isolated from sorted CD34⁺ and CD34⁻ cells and Q-RT-PCR was performed to measure the expression levels of SPARC, COX-2, CXCR4, FOS, Pax5 and HIF1 transcripts, with b-actin as internal control. Results were analyzed using GraphPad Prism (Kruskal-Wallis test and Dunns test). Result(s): (Table 1). There was no significant change in FOS and HIF1a expression between control and patients' MSC. COX-2 was down-regulated in CD34⁺ patients' nonadherent cells in comparison to CD34⁻ adherent patients' MSC, but in comparison to control cells there was no significant change. (Table presented) SPARC was down-regulated in patients' CD34⁺

adherent MSC in comparison to CD34⁻ control nonadherent cells. Pax5 showed statistically significant (P>0.0001) up-regulation in patients' CD34⁻ adherent MSC vs. CD34⁺ nonadherent cells. CXCR4 was significantly (P>0.0001) up-regulated in patients' CD34- and CD34⁺ adherent cells vs. patients' nonadherent MSC CD34- and CD34⁺. Conclusion. The expression ofselected genes differs in CD34⁺ and CD34⁻ adherent MSC and nonadherent cells from patients with PMF as compared to expression in cells from healthy controls. In particular, patients' MSC have significantly higher expression of CXCR4 gene that encodes a CXC chemokine receptor specific for stromal cell-derived factor-1, suggesting its role in the mobilization of hematopoietic progenitors from BM. CXCR4 is also involved in haematopoiesis, angiogenic activity, apoptosis, T-cell differentiation and phagocyte activation. Further investigation of the CXCR4 gene regulation in both adherent MSC and nonadherent mononuclear cells in PMF is warranted.

Lizard, G., et al. (2003). "Microbeads, nanobeads and cytometry: Applications to the analysis and purification of cells and biomolecules. [French]." Pathologie Biologie **51**(7): 418-427.

Nano and microspheres are important tools in cytometry. They have been used in first to optimize fluorescent signals detected by flow cytometry and to evaluate phagocytosis. Some antigens were also detected by using nanospheres covalently coupled to antibodies. Specifically dedicated microspheres are now widely used for antigenic quantitation by flow cytometry, and magnetic nano and micropheres are very usefull for cellular and molecular purifications. To date, analytical methods based on the use of microspheres are developed to detect proteins, nucleic acids, and ions. To this end, antibodies, oligonucleotides, or chelating agents are bound to microspheres characterized by different fluorescences. The applications of these multiplexed microspheres assays allow to identify and quantify simultaneously some macromolecules and ions, but they also permit to analyze enzymatic activities and to perform polymorphism analyses. With microspheres used as reactive support, molecular analyses are therefore possible by flow cytometry. Nano and microspheres are also usefull tools for calibration in confocal microscopy as well as for micromanipulations of biomolecules and of living cells. Inovative methods based on the use of nano and microspheres are expected in the fields of biology, medicine, food industry, and environmental sciences. © 2003 Editions scientifiques et medicales Elsevier SAS. Tous droits reserves.

Llorca, M., et al. (2018). "Adsorption of perfluoroalkyl substances on microplastics under environmental conditions." Environmental Pollution **235**: 680-691.

Plastic debris has become an environmental problem during recent years. Among the plastic debris, microplastics (<5mm; MPLs) imply an extra problem due to their capacity to enter into the fauna through ingestion. In this work, we study the capacity of three MPLs, that include high-density polyethylene (HDPE), polystyrene (PS) and polystyrene carboxylate (PS-COOH), to sorb 18 perfluoroalkyl substances (PFASs; including carboxylic acids, sulphonates and one sulphonamide) from the surrounding waters (freshwater and seawater).

Llorent-Martinez, E. J., et al. (2008). "Fast determination of salicylic acid in pharmaceuticals by using a terbium-sensitized luminescent SIA optosensor." Journal of Pharmaceutical Sciences **97**(2): 791-797.

In this article, we report the coupling of sequential injection analysis (SIA) and solid phase lanthanide-sensitized luminescence as a detection technique; in this technique, the energy absorbed by the analyte (retained on a solid support) is transferred to the lanthanide ion, which finally emits the luminescence signal. By using this automatic system, the determination of salicylic acid (SA) is easily, rapidly, and selectively achieved. Microspheres of commercial solid support, Sephadex-QAE A-25, are used to fill the flow-through cell and retain analyte and terbium ions; after the signal from SA-terbium complex is obtained, the solid support is easily regenerated by using an ethylenediaminetetraacetic acid disodium salt 2-hydrate (EDTA) solution. Over 200 determinations can be carried out without replacing the resin microbeads. The proposed method shows a 0.045 microg mL(-1) detection limit, with an R.S.D. lower than 3% and a sampling frequency up to 30 samples per hour. The system has been applied to the determination of SA in pharmaceuticals obtained from the Spanish Pharmacopoeia, with satisfactory results; an additional recovery study has been carried out with recoveries close to 100%.

Llorent-Martinez, E. J., et al. (2019). "Automated fluorimetric sensor for the determination of zearalenone mycotoxin in maize and cereals feedstuff." Talanta **191**: 89-93.

Zearalenone (ZEA), a mycotoxin produced by several Fusarium molds, can be found in many cereals and related products. The toxicity of ZEA has been reported for both humans and animals. Therefore, many countries have adopted regulations in foods and feed materials to limit the exposure to this contaminant. In this paper, we propose a multicommutated flow-through optosensor to quantify ZEA in different cereal samples. ZEA was retained and pre-concentrated on C₁₈ silica gel, and the use of the multicommutated flow manifold allowed the automated retention/desorption of ZEA on the solid microbeads by the use of appropriate carrier/eluting solutions, hence increasing the selectivity and sensitivity of the system. The native fluorescence of ZEA was recorded on the solid phase at lambda_{exc}/lambda_{em} of 265/465nm/nm. A QuEChERS procedure was used to carry out the extraction of ZEA from different cereal samples (feedstuff materials). Recovery studies were performed to assess the accuracy of the method, obtaining recovery yields between 93% and 107% in all the analyzed samples. LC-MS was employed as reference method. The quantitation limit of the proposed method was low enough to fulfill the maximum residue levels established by the Commission of the European Communities, thus demonstrating its potential use for the analysis of ZEA in feedstuffs.

Lloyd, J. S. (2019). "Expanding safe waste management to public health systems." The Lancet **393**(10168): 225.

Lo, H. and K. Chan (2018). "Negative effects of microplastic exposure on growth and development of Crepidula onyx." Environmental Pollution **233**: 588-595.

Microplastics exposure could be detrimental to marine organisms especially under high concentrations. However, few studies have considered the multiphasic nature of marine invertebrates' life history and investigated the impact of experiencing microplastics during early development on post-metamorphic stages (legacy effect). Many planktonic larvae can feed selectively and it is unclear whether such selectivity could modulate the impact of algal food-sized microplastic. In this two-stage experiment, veligers of Crepidula onyx were first exposed to additions of algae-sized micro-polystyrene (micro-PS) beads at different concentrations, including ones that were comparable their algal diet. These additions were then either halted or continued after settlement. At environmentally relevant concentration (ten 2-micro m microplastic beads ml⁻¹), larval and juvenile C. onyx was not affected. At higher concentrations, these micro-PS fed larvae consumed a similar amount of algae compared to those in control but grew relatively slower than those in the control suggesting that ingestion and/or removal of microplastic was/were energetically costly. These larvae also settled earlier at a smaller size compared to the control, which could negatively affect post-settlement success.

Juvenile C. onyx receiving continuous micro-PS addition had slower growth rates. Individuals only exposed to micro-PS during their larval stage continued to have slower growth rates than those in the control even if micro-PS had been absent in their surroundings for 65 days highlighting a legacy effect of microplastic exposure.

Lo, H. S., et al. (2019). "Spatial distribution and source identification of hydrophobic organic compounds (HOCs) on sedimentary microplastic in Hong Kong." Chemosphere **219**: 418-426.

The spatial distribution, composition and source of hydrophobic organic compounds (HOCs) including polyaromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organochlorinated pesticides (OCPs) of the sedimentary microplastics (0.25-5mm) in Hong Kong were investigated. The concentration of SIGMAPAHs ranged between 70.8 and 1509ngg⁻¹ with inter-site differences although the regional difference was insignificant, indicating localised pyrolytic and petrogenic input of PAHs. The concentration of SIGMAPCBs (13-1083ngg⁻¹) varied with both study sites and regions with higher concentrations obtained in the western waters, possibly due to the input from Pearl River. Significantly higher concentrations of OCPs on eastern shores highlighted fishing and aquaculture activities in South China Sea a potential major source of OCPs. DDT and its metabolites (DDX, ranged from 1.96 to 626ngg⁻¹) were the dominant forms of OCPs (45%-80%). Since most of the DDX existed as DDT, this suggested that there was a fresh input of DDT into the microplastics. As microplastics and HOCs cannot be removed effectively from the environment, reduction of potential ecotoxicological risks should rely on minimizing the use of plastics and HOCs.

Löder, M. G. J., et al. (2017). "Enzymatic Purification of Microplastics in Environmental Samples." Environmental Science & Technology **51**(24): 14283-14292.

Micro-Fourier transform infrared (micro-FTIR) spectroscopy and Raman spectroscopy enable the reliable identification and quantification of microplastics (MPs) in the lower micron range. Since concentrations of MPs in the environment are usually low, the large sample volumes required for these techniques lead to an excess of co-enriched organic or inorganic materials. While inorganic materials can be separated from MPs using density separation, the organic fraction impedes the ability to conduct reliable analyses. Hence, the purification of MPs from organic materials is crucial prior to conducting an identification via spectroscopic techniques. Strong acidic or alkaline treatments bear the danger of degrading sensitive synthetic polymers. We suggest an alternative method, which uses a series of technical grade enzymes for purifying MPs in environmental samples. A basic enzymatic purification protocol (BEPP) proved to be efficient while reducing 98.3 ± 0.1% of the sample matrix in surface water samples. After showing a high recovery rate (84.5 ± 3.3%), the BEPP was successfully applied to environmental samples from the North Sea where numbers of MPs range from 0.05 to 4.42 items m-3. Experiences with different environmental sample matrices were considered in an improved and universally applicable version of the BEPP, which is suitable for focal plane array detector (FPA)-based micro-FTIR analyses of water, wastewater, sediment, biota, and food samples. [ABSTRACT FROM AUTHOR]

Loepp, D. (2009). "Is plastics recycling a cynical strategy?" Plastics News **21**(28): 6-1NULL.

The article presents the author's comments on the issues related to plastics recycling. He refers to the article "Recycling Plastic: What a Waste," by Lisa Kaas Boyle, co-founder of the Plastic Pollution Coalition. He says that Boyle criticizes the American Chemistry Council (ACC) for promoting recycling as the solution to plastic pollution. However, she says that only 5-7 percent of plastics are being recycled and the industry continues to produce single-use products, not designed to be recycled.

Lohmann, R. (2017). "Microplastics are not important for the cycling and bioaccumulation of organic pollutants in the oceans--but should microplastics be considered POPs themselves?" Integrated Environmental Assessment and Management **13**(3): 460-465.

The role of microplastic particles in the cycling and bioaccumulation of persistent organic pollutants (POPs) is discussed. Five common concepts, sometimes misconceptions, about the role of microplastics are reviewed. While there is ample evidence that microplastics accumulate high concentrations of POPs, this does not result in microplastics being important for the global dispersion of POPs. Similarly, there is scant evidence that microplastics are an important transfer vector of POPs into animals, but possibly for plastic additives (flame retardants). Last, listing microplastics as POPs could help reduce their environmental impact. Integr Environ Assess Manag 2017;13:460-465. © 2017 SETAC Key Points Microplastics accumulate POPs relative to their surroundings, acting as passive samplers, yet there are insufficient microplastic particles to affect the global cycling of POPs. Laboratory experiments exposing clean animals to POP-contaminated microplastics observe the transfer of POPs into the animals but cannot demonstrate that this pathway is relevant in the field. Field observations of POPs in animals show little evidence that the ingestion of microplastics contributed much to their body burden with the exception of plastic additives. Microplastics should be considered as POPs as they share persistence, long-range transport, potential for bioaccumulation, and adverse effects with other POPs.

Loisi, R. V., et al. (2017). "Land analysis of agricultural plastic waste production in a South Italy area by means of a geographical information system." Acta Horticulturae.

Plastic materials have been worldwide applied in agriculture for soil mulching, greenhouse covering, irrigation and drainage pipes, bags, containers, pots, and agrochemical containers. All of these plastic materials require, at the end of their lifetime, suitable collection and treatment systems. Agricultural activities in some areas of the Apulia Region, Southern Italy, are characterized by huge quantities of plastic wastes and local authorities and farmers associations have been interested in solving this problem by applying modern land management tools such as Geographical Information System (G.I.S.). In this paper a G.I.S. methodology is applied to an area of 10,200 ha in the Trani municipality, included in the Province of Barletta, Andria, Trani (BAT) - Apulia Region, in order to assess the agricultural plastic waste generation. The use of plastics at the agricultural farms has been investigated and related to the land use by applying statistical analysis, orthophoto analysis and remote sensing surveys. These data were introduced in a specific geo-database, and the agricultural plastic waste quantity and localization were defined. Vineyards and olive groves are scattered in this area, so the agricultural plastic waste mostly consists in irrigation pipes, after-use covering films and anti-hail nets used on vineyards. The analysis carried out showed that up to 614 kg ha⁻¹ of covering films waste are yearly produced in some areas while the estimation of waste from the anti-hail nets was up to 159 kg ha⁻¹ and the waste yearly produced from irrigation pipes was up to 83 kg ha⁻¹. Through the use of the G.I.S., the areas with high density of plastic wastes were pointed out thus allowing to determine the suitable location of temporary storage areas and collecting points, in order to optimize the transport of agricultural plastic waste from the farms to the collecting points and to the recycling firms.

Long, M., et al. (2017). "Interactions between polystyrene microplastics and marine phytoplankton lead to species-specific hetero-aggregation." Environmental Pollution **228**: 454-463.

To understand the fate and impacts of microplastics (MP) in the marine ecosystems, it is essential to investigate their interactions with phytoplankton as these may affect MP bioavailability to marine organisms as well as their fate in the water column. However, the behaviour of MP with marine phytoplanktonic cells remains little studied and thus unpredictable. The present study assessed the potential for phytoplankton cells to form hetero-aggregates with small micro-polystyrene (micro-PS) particles depending on microalgal species and physiological status. A prymnesiophycea, Tisochrysis lutea, a dinoflagellate, Heterocapsa triquetra, and a diatom, Chaetoceros neogracile, were exposed to micro-PS (2 mum diameter; 3.96 mug L⁻¹) during their growth culture cycles. Micro-PS were quantified using an innovative flow-cytometry approach, which allowed the monitoring of the micro-PS repartition in microalgal cultures and the distinction between free suspended micro-PS and hetero-aggregates of micro-PS and microalgae. Hetero-aggregation was observed for C. neogracile during the stationary growth phase. The highest levels of micro-PS were "lost" from solution, sticking to flasks, with T. lutea and H. triquetra cultures. This loss of micro-PS sticking to the flask walls increased with the age of the culture for both species. No effects of micro-PS were observed on microalgal physiology in terms of growth and chlorophyll fluorescence. Overall, these results highlight the potential for single phytoplankton cells and residual organic matter to interact with microplastics, and thus potentially influence their distribution and bioavailability in experimental systems and the water column.

Long, M., et al. (2011). "Advances in experiments and modeling in micro-and nano-biomechanics: A mini review." Cellular and Molecular Bioengineering **4**(3): 327-339.

Recent advances in micro-and nano-technologies and high-end computing have enabled the development of new experimental and modeling approaches to study biomechanics at the micro- and nano-scales that were previously not possible. These new cutting-edge approaches are contributing toward our understanding in emerging areas such as mechanobiology and mechanochemistry. Another important potential contribution lies in translational medicine, since biomechanical studies at the cellular and molecular levels have direct relevance in areas such disease diagnosis, nano-medicine and drug delivery. Thus, the developed experimental and modeling approaches are critical in elucidating important mechanistic insights in both basic sciences and clinical treatment. While it is hard to cover all the recent advances in this mini-review, we focus on several important approaches. For experimental techniques, we review the assays involving shear flow, cellular imaging, microbead, microcontact printing, and micropillars at the micro-scale, and micropipette aspiration, optical tweezers, parallel flow chamber, and atomic force microscopy at the nano-scale. In modeling and simulations, we outline the theoretical modeling for actin dynamics in migrating cell and actin-based cell motility in cellular mechanics, as well as the receptor-ligand binding in cell adhesion and the application of free, steered, and flow molecular dynamics simulations in molecular biomechanics. Relevant scientific issues and applications are also discussed. © 2011 Biomedical Engineering Society.

Long, R. F., et al. (2017). "The effects of weight percent solids and hydrogen ion activity on three

common mucus systems." Pediatric Pulmonology **52 (Supplement 47)**: 279.

Mucociliary clearance (MCC) is diminished in cystic fibrosis patients. Of the many factors that can contribute to poor MCC, we propose an examination of two of the parameters that have been reported to affect the rheological properties of airway mucus; free hydrogen ion activity (pH) and the weight percent solids of the mucus. In these studies, we investigated the effect of a physiological pH range (pH 6-8) over a range of mucus concentrations (% solid) of human bronchial epithelial (HBE) mucus harvested from cultured, donor cells. We anticipate that our data will help to frame the discussion of the relative importance of both factors on MCC, drug delivery and innate immunity. We present the biophysical properties of the mucus systems from the nanoscale, using fluorescence recovery after photobleaching (FRAP), to the microscale with passive microbead rheology data and a modified capillary diffusion experiment, then finally to the macroscale with a traditional rheometer. As a reference on the properties of HBE over these length scales, we also show results from two commercially available mucus research substitutes, porcine gastric mucus (PGM) and bovine submaxillary mucus (BSM) along with industry standards. In these studies, we explored multiple methodologies to adjust the pH in these three mucus systems, each with certain pros and cons that may be exploited. We have demonstrated that each type of mucus can respond drastically to pH changes. However, physiologically-relevant changes in pH (from pH 6 to 8) did not result in appreciable changes in rheology or in the diffusion of microbeads and fluorescently labelled dextrans with masses up to 70 kD. In this work, we show that the complex viscosity of the HBE mucus is largely insensitive to physiological pH changes with minimal bulk rheological property changes. We also show that, of the two parameters investigated, weight percent solids had a greater influence than pH on the bulk complex viscosity, the mean squared displacement of microbeads and the diffusion coefficients of fluorescently labelled complexes. Therefore, we conclude that weight percent solids plays a larger role in the biophysical properties of mucus than pH.

Long, Z., et al. (2019). "Microplastic abundance, characteristics, and removal in wastewater treatment plants in a coastal city of China." Water Research **155**: 255-265.

Studying the abundance, characteristics, and removal of microplastics (MPs) in wastewater treatment plants (WWTPs) in coastal cities is of great significance for understanding the impacts of human activities on the marine environment, but currently, little information on this topic is available in China. Therefore, the abundance, characteristics, and removal of MPs in seven WWTPs of Xiamen, a typical coastal city in China, are studied. Sixty samples were collected using an improved sampling method involving an electromagnetic flowmeter and a fast digital camera. The influent MPs concentration is 1.57-13.69 items/L, and it is reduced to 0.20-1.73 items/L in the effluent, indicating that 79.3-97.8% MPs is removed. Based on the daily effluent discharge and MPs removal rate, it is estimated that ~6.5x10⁸MPs are released from the seven WWTPs into the Xiamen Bay each day. The light microscopic and micro-Raman spectroscopic analysis indicates that ~62.68% of particles are plastic polymers, including polypropylene (31.6%), polyethylene (21.9%), polystyrene (10.1%), propylene/ethylene copolymer (9.2%), and polyethylene terephthalate (7.5%). The color of MPs is mainly composed of white (27.3%) and clears (25.8%). Our results show that granules (41.1%) are the dominant shape of MPs, followed by fragments (31.3%), fibers (23.7%), and pellet (3.9%). The characteristics of MPs such as sizes, shapes, and types affect the MPs removal in WWTPs. Our findings show that MPs concentration in the influent is positively correlated with the suspended solids (SS), however, in the effluent, it is associated with the WWTPs operating load, as reflected by obviously higher MP abundance in overloaded ones.

Longo, B. M. (2019). "NNA Environmental Health Committee. Microplastics & Our Health." Nevada RNformation **28**(4): 8-9.

Lonnstedt, O. M. and P. Eklov (2016). "Environmentally relevant concentrations of microplastic particles influence larval fish ecology." Science **352**(6290): 1213-1216.

Microplastic's triple threatThe billions of tons of plastics that we release into the environment for the most part do not biodegrade. But they do degrade, breaking into ever smaller particles that end up in the oceans. Lonnstedt et al. show that the impacts of these microplastics are multifold (see the Perspective by Rochman). Eurasian perch larvae exposed to microplastics were less active, less responsive to predator cues, more likely to be eaten, and less likely to thrive-preferring to eat plastic rather than their natural prey.Science, this issue p. 1213; see also p. 1172 The widespread occurrence and accumulation of plastic waste in the environment have become a growing global concern over the past decade. Although some marine organisms have been shown to ingest plastic, few studies have investigated the ecological effects of plastic waste on animals. Here we show that exposure to environmentally relevant concentrations of microplastic polystyrene particles (90 micrometers) inhibits hatching, decreases growth rates, and alters feeding preferences and innate behaviors of European perch (Perca fluviatilis) larvae. Furthermore, individuals exposed to microplastics do not respond to olfactory threat cues, which greatly increases predator-induced mortality rates. Our results demonstrate that microplastic particles operate both chemically and physically on larval fish performance and development.

Loo, J. F. C., et al. (2017). "Sample-to-answer on molecular diagnosis of bacterial infection using integrated lab--on--a--disc." Biosensors & Bioelectronics **93**: 212-219.

Sepsis by bacterial infection causes high mortality in patients in intensive care unit (ICU). Rapid identification of bacterial infection is essential to ensure early appropriate administration of antibiotics to save lives of patients, yet the present benchtop molecular diagnosis is time-consuming and labor-intensive, which limits the treatment efficiency especially when the number of samples to be tested is extensive. Therefore, we hereby report a microfluidic platform lab-on-a-disc (LOAD) to provide a sample-to-answer solution. Our LOAD customized design of microfluidic channels allows automation to mimic sequential analytical steps in benchtop environment. It relies on a simple but controllable centrifugation force for the actuation of samples and reagents. Our LOAD system performs three major functions, namely DNA extraction, isothermal DNA amplification and real-time signal detection, in a predefined sequence. The disc is self-contained for conducting sample heating with chemical lysis buffer and silica microbeads are employed for DNA extraction from clinical specimens. Molecular diagnosis of specific target bacteria DNA sequences is then performed using a real-time loop-mediated isothermal amplification (RT-LAMP) with SYTO-9 as the signal reporter. Our LOAD system capable of bacterial identification of Mycobacterium tuberculosis (TB) and Acinetobacter baumanii (Ab) with the detection limits 10³cfu/mL TB in sputum and 10²cfu/mL Ab in blood within 2h after sample loading. The reported LOAD based on an integrated approach should address the growing needs for rapid point-of-care medical diagnosis in ICU.

Loos, U., et al. (2018). "New technology for improvement of sensitivity and specificity of IVDTests." Clinical Chemistry **64 (Supplement 1)**: S124-S125.

Background: Some test systems are lacking of high sensitivity and specificity which otherwise enable early and accurate diagnosis and treatment being beneficial for the course of the

disease. This is known for Graves' disease (GD), which is caused by thyroid stimulating immunoglobulins (TSI) directed against the thyrotropin receptor (TSHR). Current TSH or M22 displacement assays (TDA) quantify indirectly all TSHR autoantibodies (Ab). We developed a direct epitope recognition assay (DERA) for sensitive detection of TSI in which the extracted capture human(h) wtTSHR chimera is anchored on microtiter plates (sTRAb) and stimulatory epitope binding TSI are bridging to a soluble signalling chimeric extracellular domain (ECD) of the hTSHR. Here we show a Bridge assay in which a novel truncated capture hTSHR can be anchored on paramagnetic microbeads (PMB). Method(s): PMB DERA is performed by bridge technology were an antibody anchors to PMB the solitary chimeric ECD of hTSHR-rLH/CG receptor fused with a secretory protein. The TSI binds with one arm to the immobilised chimeric capture hTSHR, and the second arm bridges to a chimeric hTSHR ECD fused with secretory alkaline phosphatase or HRP. Applying chemiluminescence substrate sTRAb were quantified using a plate luminometer. The PMB assay was performed manually with a 12-tube magnet. For further development, we used PMB on microtiter plates. Result(s): The chimeric ECD of hTSHR-rLH/CG receptor shows a functionality/half life of 12/15 days at 4degreeC. ROC analysis of sTRAB DERA with 274 GD positive and 325 GD negative show a criterion for positivity > 0.54 IU/L with a sensitivity of 99.8 % and a specificity of 99.1 % in the assay. The PMB assay performed manually with a 12-tube magnet enabled ROC analysis of 190 samples (136 GD positive, 54 GD negative) and shows a criterion for positivity > 1.5 IU/L with a sensitivity of 94.1% and a specificity of 98.2%. In comparison the sensitivity/specificity/cut off from the following tests: Roche Elecsys, cobas anti-TSHR 97.0%/99.0%/>1.75 IU/L; Thermo Brahms Kryptor: 96.3%/98.1%/>1.80 IU/L; Immunite 2000/XPi TSI: 98.3%/99.7%/>0.55 IU/L; sTRAb-DERA: 99.8%/99.1%/>0.54 IU/L; PMB-Bridge-assay 94.1%/98.2%/>1.50 IU/L. Further preliminary experiments with PMB performed on microtiter plates using the signaling hTSHR-ECD-HRP as detection receptor show a calibration curve reaching a clinical cut off of 0.2 IU/L. These results on microtiter plates are a basis for the development of automation for the PMB Bridge assay. Conclusion(s): For the first time an immobilized chimeric hTSHR ECD is shown to be excellently used on PBM in a Bridge assay which as a further innovation works with two secreted TSHR ECDs. Further improvement of technical statistics (sensitivity and specificity) is expected by transferring this prototype to fully automatic systems. Together with the good stability data automatization will improve sensitivity and specificity in comparison to other current IVD-assays by a novel technology. Further, we wish to apply this method for other autoimmune diseases such as diabetes type 1 in future cooperative studies. Also in diabetes type 1, early diagnosis and treatment will lead to less severe course of the disease.

Lopalco, A., et al. (2020). "Taste masking of propranolol hydrochloride by microbeads of EUDRAGIT R E PO obtained with prilling technique for paediatric oral administration." International Journal of Pharmaceutics **574**: 118922.

The purpose of this study was to develop a new solid paediatric formulation for propranolol hydrochloride (PR). This drug is used to treat various paediatric diseases, and recently received clearance to treat haemangioma. However, PR has a bitter salty taste that does not facilitate high rates of compliance among children, especially in liquid formulations. In addition, the solid formulations are designed for adults and often their dosage is not suitable for children that require a flexible dose based on their weight. Therefore, matrix microbeads of EUDRAGIT R E PO containing PR were manufactured to overcome these limitations. Nine different samples were prepared using the prilling-congealing technique with high yield. Using 2 nozzles, 300 and 450 mum (code n), the diameters obtained of microbeads (from 333 to 699 mum) were homogenous and appropriate to be swallowed by children. In this study, the ratio drug:matrix for the microbeads was also examined in detail: 1:25 (F₁), 1:15 (F₂) and 1:10 (F₃) in aqueous and tert-butyl alcohol/aqueous (code t) media. Most of the examined microbeads were characterized by high percentage of encapsulation efficiency (22-100%) and drug loading (22-77 mg of drug per g of matrix) effective for the administration of low and high doses of PR. SEM analysis revealed a matrix with a radial or a spongy structure, with numerous pores that generated soft floating microbeads in aqueous solution. Release studies confirmed a low release and dissolution of the drug in artificial saliva, mainly F_{1n} > F₁ > F_{2nt}, and a prompt dissolution in simulated gastric media. Finally, electronic tongue measurements revealed the ability of these formulations to mask the bitter drug taste, especially for the sample with a ratio 1:25 (F_{1n} and F₁). These samples were chemically and physically stable for six months. In conclusion, the projected microbeads F₁, and F_{1n} reached the goal of the study, and could be proposed as new solid oral formulations dedicated to use by children.

Lopes, L. B., et al. (2010). "Impact of using different laboratory assays to detect human leukocyte antigen antibodies in female blood donors." Transfusion **50**(4): 902-908.

BACKGROUND: HLA antibodies passively transferred to transfused recipients may cause transfusion reactions such as transfusion-related acute lung injury (TRALI), but in many of the reported TRALI incidents, no white blood cell antibodies have been identified. We investigated whether a higher number of anti-HLA would be detected in donor's plasma by using a method with potential higher sensitivity rate.

STUDY DESIGN AND METHODS: Sera from 300 previously pregnant female blood donors were screened for anti-HLA using a solid-phase mixed-antigen assay (enzyme-linked immunosorbent assay [ELISA]). Samples from 60 women with three or more pregnancies with a negative ELISA were further tested using microbead-flow assays (LABScreen mixed, panel-reactive antibodies [PRA], and single antigen).

RESULTS: Anti-HLA Class I and/or Class II were detected by ELISA in 26.7% (80/300) of all women and in 37.0% (37/100) of women with three or more pregnancies. The LABScreen assays detected additional anti-HLA specificities (44 Class I and 17 Class II) in 28.3% (17/60) of ELISA-negative donors with three or more pregnancies. HLA antibodies were detected in 8.3% (5/60), 18.3% (11/60), and 21.7% (13/60) of ELISA-negative women by LABScreen mixed, PRA, or single antigen, respectively.

CONCLUSION: Our data showed that the microbead-flow detected more HLA antibodies than ELISA, but the clinical significance of these antibodies is currently unknown. Detecting anti-HLA is useful for donor management and could contribute to the decision to definitively defer blood donors involved in TRALI incidents. However, further studies are necessary to better determinate the relative risk of TRALI induced by anti-HLA detected only by techniques with higher sensitivity rate.

Lopes, L. B., et al. (2017). "Evaluation of labscreen multi in the detection of antibodies against the HNA-3 system." Vox Sanguinis **112 (Supplement 1)**: 235.

Background: Antibodies directed to human neutrophil antigens 3a (HNA-3a) have been involved in fatal transfusion-associated acute lung injury (TRALI) reactions. For the HNA-3a antibody detection, the gold-standard method is the Granulocyte Agglutination Test (GAT); however, it is a time-consuming methodology. The new generation LABScreen-MULTI assay (LSM) kit (One Lambda, Inc.) is suitable for high-throughput testing and automating, using microbeads coated with HLA and all HNA antigens, including HNA-3a and -3b. Aim(s): Considering that the LSM is a recently developed commercial platform, this study aimed to evaluate its ability to detect anti-HNA-3a and -3b. Method(s): Thirty-six samples, tested by the LSM (Lots 005 and 007), were included in the study, comprising 13 pregnant women, 12 multiparous blood donors, 4 alloimmunized patients with multiple antibodies, and 7 mothers whose newborns had neonatal neutropenia. The cutoff value was set to 5 NBG (Normalized Background Ratio) for the HNA-3a and -3b beads. Results of the LSM were confirmed by the HNA-3 genotyping and by the GAT, using a panel specific for HNA-3 antigens. Result(s): LSM screening resulted in 31 samples with positive results for 3a and/or 3b beads, and 5 samples with negative results. 28/31 samples were considered falsepositive because they presented negative results in the GAT and, in some cases, also presented discordant results with the genotyping. The false-positive reactions were observed on 3a and -3b beads, and in 10 samples occurred for both beads concomitantly. 24/28 false-positive samples presented NBG of 5 to 15 and Mean Fluorescence Intensity (MFI) values below 1,000; and 4/28 presented high NBG values, between 20 and 80, and MFI values, between 1,150 and 3,900. 3/31 samples were considered true-positive, and the antibodies were confirmed by positive results in 1 sample for anti-HNA-3a, and in 2 samples for anti-HNA-3b in the GAT. It is important to highlight that the anti-HNA-3a sample had a false-positive result with 3b bead (NBG = 17.6, MFI = 1,711), and 1 sample with anti-HNA-3b presented a falsepositive result with 3a bead (NBG = 83, MFI = 4,313). False-negative results in the LSM were observed in 5 samples, since anti-HNA-3b was detected by the GAT, and their results were compatible with the HNA-3 genotyping. Summary/Conclusions: HNA-3 antibodies are highly agglutinating, therefore, the GAT was chosen as a parameter to evaluate the results obtained in the LSM. Anti-HNA-3 was confirmed by the GAT in only 3/36 (8.3%) samples. False-negative results were observed just for the 5/36 (13.9%) samples tested with Lot 005. Considering that most samples (28/36 - 77.8%) presented false-positive reactions, we suggest a careful analysis of the results presenting an NBG variation from 5 to 15 and MFI less than 1,000. The analysis of the discordant results between the GAT and the LSM lead us to two possible conclusions: (i) Really false-positive results in the LSM due to inconsistencies with genotyping; and (ii) False-negative results in the GAT due to low titre and/or low agglutinating capacity. These antibodies cannot be disregarded in view of their possibility to induce TRALI by directly binding to the pulmonary endothelium.

Lopez, C. A., et al. (2010). "Characterization of HIV-1 RNA forms in the plasma of patients undergoing successful HAART." Archives of Virology **155**(6): 895-903.

An assay to characterize plasma human immunodeficiency virus 1 (HIV-1) sequences for patients with low viral loads was developed by combining the selective binding of anti-CD44 MicroBeads with a nested RT-PCR targeting the env C2V4 region. Sequences were obtained from 10 of 20 HIV+ patients who had viral loads below 48 copies/ml. Sequences derived from plasma were compared to those from CD14+ CD16 +monocytes and CD4+ T cells. The plasma sequences were most closely related to those amplified from monocytes, suggesting that during successful antiretroviral therapy, the predominant plasma virus originates from myeloid cells. By characterizing HIV-1 RNA sequences from 8 ml of plasma while avoiding multiple steps, which can lead to contamination and deterioration, this method can help elucidate the viral forms in patients with therapeutically suppressed HIV-1. Understanding the source of residual viremia is crucial in developing approaches for viral eradication.

Lopez de Dicastillo, C., et al. (2016). "Antioxidant films based on cross-linked methyl cellulose and native Chilean berry for food packaging applications." Carbohydrate Polymers **136**: 1052-1060.

Development of antioxidant and antimicrobial active food packaging materials based on biodegradable polymer and natural plant extracts has numerous advantages as reduction of synthetic additives into the food, reduction of plastic waste, and food protection against microorganisms and oxidation reactions. In this way, active films based on methylcellulose (MC) and maqui (Aristotelia chilensis) berry fruit extract, as a source of antioxidants agents, were studied. On the other hand, due to the high water affinity of MC, this polymer was firstly cross-linked with glutaraldehyde (GA) at different concentrations. The results showed that the addition of GA decreased water solubility, swelling, water vapor permeability of MC films, and the release of antioxidant substances from the active materials increased with the concentration of GA. Natural extract and active cross-linked films were characterized in order to obtain the optimal formulation with the highest antioxidant activity and the best physical properties for latter active food packaging application.

Lopez Zambrano, M., et al. (2013). "Thrombin modulates the expression of a set of proinflammatory genes including tissue factor in human monocytes." Journal of Thrombosis and Haemostasis **2)**: 741.

Background: Besides its role in blood coagulation, thrombin is known to act as a cell signaling molecule via activation of protease-activated receptors (PAR), thereby connecting this coagulation protease to specific cellular/inflammatory responses. Previous studies demonstrated that thrombin is capable of modulating chemotaxis of monocytes and also inducing expression of monocyte chemotactic protein (MCP-1), plasminogen activator inhibitor type 2 (PAI-2), matrix metalloproteinase- 9 (MMP-9) or interleukin (IL) eight in monocytes. However, no study has analyzed the gene expression changes of thrombin-stimulated monocytes in a systematic way using microarray experiments. Aim(s): The aim of this work was to evaluate the gene expression profile of thrombin-stimulated monocytes by microarray technology. Method(s): Peripheral blood mononuclear cells (PBMC) were isolated from human blood by density gradient centrifugation using Ficoll- Paque PLUS and affinity adsorption using anti-CD14 monoclonal antibody-coated microbeads combined with a magnetic cell separation system. Monocytes were stimulated with 10 U/mL human alphathrombin at 37 degreeC for 5 h, and after washing cells, total RNA was isolated using the RNeasy mini Kit (Qiagen). Labeled cRNAs were hybridized to the Whole Human Genome Oligo Microarray Kit 4x44K v2), including cRNA fragmentation, hybridization (Agilent Technologies, protocol V5.7). Slides were scanned on the Agilent Micro Array Scanner G2565CA. DAVID database (http://david.abcc. ncifcrf.gov) was used to dynamically assign gene expression data to the Gene Ontology (GO) biological-process categories. Result(s): Eighty-three genes were selected which showed differential expression changes; 68 genes were up-regulated whereas 15 genes were down-regulated. Near 30% of the upregulated genes were related to the inflammatory response. Thus, genes encoding several cytokines and chemokines, associated with the recruitment and activation of leukocytes, were differentially expressed in monocytes in response to thrombin. Moreover, the gene for tissue factor was also up-regulated. Real-time reverse transcriptase polymerase chain reaction (RT-PCR) was used to confirm the microarray results of some of these genes. Moreover, higher expression of tissue factor in monocytes exposed to thrombin was also demonstrated by immunofluorescence and by shortening of clotting time. Conclusion(s): Our results provide new evidences to the thrombin-mediated link between coagulation and inflammation through changes in gene expression in monocytes.

Lopez-Hernandez, R., et al. (2015). "Killer immunoglobulin-like receptor (KIR) repertoire and HLA class i ligands analysis in a caucasian spanish population with inflammatory bowel diseases." Tissue Antigens **85 (5)**: 390.

Alterations in several immunological molecules are implicated in inflammatory disorders, including IBD (Inflammatory Bowel Disease) [Crohn s disease (CD) and ulcerative colitis (UC)]. A further group of genetically variable proteins involved in immune function are the killer cell immunoglobulin-like receptors (KIRs). These are expressed by NK cells and certain T lymphocytes where they regulate specificity and function by interaction with HLA Class I molecules. KIRs may either be inhibitory or activating and are polymorphic both in terms of alleles and haplotype gene content. Genetic associations of activating KIRs with certain autoimmune and inflammatory diseases have been demonstrated. There are several conflicting articles of KIR association with IBD and their relationships seem to be unclear. The aim of this study was to determine the relationship between KIR repertoire and the IBD pathologies in a Spanish population. KIR and HLA-C variability analysis was performed using PCR-SSOP by using a microbeads Luminex assay. We found an increase in activating KIR2DL5 in UC and IBD patient groups respect to Controls (P=0.028 and P=0.01, respectively) and in the same manner an increase in inhibitory KIR2DS1 (P=0.02, UC vs Controls; P=0.001, IBD vs Controls; P=0.01, Controls vs CR), KIR2DS5 (P=0.0028, Controls vs UC; P=0.0001, Controls vs IBD; P=0.01, Controls vs CR) and KIR3DS1 (P=0.012, Controls vs IBD). Our data suggest that the imbalance between activating and inhibitory KIR and HLA ligands may contribute, at least in part, to the differential pathogenesis of these inflammatory bowel diseases.

Lopez-Hernandez, R., et al. (2011). "Study of SNPS (-238G/A and -308G/A) in the tumour necrosis factor alpha (TNF-A) promoter gene and response to the TNF-alpha inhibitor infliximab in patients with inflammatory bowel disease." Tissue Antigens **77 (5)**: 495.

TNF-alpha is a key cytokine known to play a role in inflammatory response, and the locus for the gene is found in the IBD3 region on chromosome 6p21, known to be associated with an increased risk for inflammatory bowel disease (IBD). TNFalpha/ TNF receptor interactions not only play a pivotal role in the pathogenesis of the inflammatory response, but also cause apoptosis, cell proliferation and differentiation. Alterations in the regulation of TNF-alpha, especially TNF-alpha over-production, have been implicated in a variety of symptoms associated with autoimmune disorders, including IBD, and especially Crohn disease (CD). Indeed, a common treatment of CD is the use of TNF-alpha inhibitors such as the monoclonal antibody, infliximab (IFX). Several Single Nucleotide Polymorphisms (SNPs) in the TNF-alpha promoter region are known to affect the level of gene expression (e.g., -238GA and -308GA). Such variations in the TNF-a promoter region have previously been associated with susceptibility to a range of autoimmune disorders, including asthma, psoriasis and rheumatoid arthritis. The -238G/A SNP is associated with lower production of TNF-a in patients with Ulcerative colitis (UC). Conversely, the -308A allele is associated with enhanced TNF-alpha production in cells in vitro and in CD patients. Thus, the aim was to investigate the role that these SNPs in the TNF-a promoter gene play in the risk of IBDs in a Spanish population and the individual response to IFX treatment. DNA samples from 90 patients with IBD and 154 randomly selected controls from the Murcia Region (Spain) were screened for TNF-a -238G/A and -308G/A SNPs by PCR-SSOP method using a microbeads luminex assay (Gen-Probe, San Diego, CA). There were not any statistical differences in individual -238G/A and -308G/A allele and genotype frequencies between patients with CD, UC, IBD and healthy control groups for each studied polymorphism. The study of combinations between the two polymorphisms and the different pathologies were also not statistically significant. Indeed, the comparisons of allele and genotypes frequencies with respect to the treatment with the TNF-a inhibitor, IFX, were also not significant. In conclusion, TNF-a promoter gene polymorphism does not seem play a role in susceptibility and response to TNF-a inhibitor IFX treatment in IBD patients.

Lopez-Hernandez, R., et al. (2015). "Pro- and anti-inflammatory cytokine gene single-nucleotide polymorphisms in inflammatory bowel disease." International Journal of Immunogenetics **42**(1): 38-45.

Anti-inflammatory cytokines have an important role in disease, tumour and transplant processes. Alterations in the regulation of several cytokines have been implicated in a variety of inflammatory disorders, including IBD (inflammatory bowel disease) [Crohn's disease (CD) and ulcerative colitis (UC)]. Cytokine polymorphisms are also known to affect the level of gene expression. Thus, the aim of this study was to determine the relationship between cytokine polymorphisms and the IBD pathologies in a Spanish population. Polymorphisms analysis was performed using PCR-SSOP using a microbeads luminex assay. The following polymorphisms were determined: TNFalpha [-238G/A (rs361525) and -308G/A (rs1800629)], IFNgamma [+874A/T (rs62559044)], TGFbeta [+869C/T (rs1982073) and +915G/C (rs1800471)], IL10 [-1082A/A (rs1800896), -592A/C (rs1800872), -819C/T (rs1800871)], IL6 [-174C/G (rs1800795)], IL12p40 [3'UTR -1188A/C (rs3212227)], IL1alpha [-889C/T (rs1800587)], IL1beta [-511C/T (rs1143634) and +3962C/T (rs1143633)], IL1R [Pst-1 1970C/T] and IL1RA [Mspa-1 11100C/T]. No statistical differences in TNFalpha, IFNgamma, TGFbeta, IL10, IL6, IL1alpha, IL1beta, IL1R and IL1Ra genotypes and allele distributions between the IBD groups and healthy controls were found. However, we observed significant differences in the 3'UTR -1188A/C polymorphism of IL12p40. So -1188A allele was increased in patients with UC and the -1188C allele (high IL12p40 production) was increased in patients with CD with respect to controls. These data are in concordance with the fact that CD has been shown to be associated with a Th1 T-cell-mediated inflammation model and high IL12/IFNgamma production at histological affected sites. These data suggest that cytokine polymorphisms in TNFalpha, IFNgamma, TGFbeta, IL10, IL6 and IL1alpha, IL1beta, IL1R and IL1Ra cytokine gene do not seem to be relevant in IBD susceptibility and IL12p40 3'UTR -1188A/C polymorphism seems to be associated with a differential IBD development.

Lopez-Hernandez, R., et al. (2014). "Genetic polymorphisms of tumour necrosis factor alpha (TNF-alpha) promoter gene and response to TNF-alpha inhibitors in Spanish patients with inflammatory bowel disease." International Journal of Immunogenetics **41**(1): 63-68.

Tumour necrosis factor alpha (TNF-alpha) has an important role in inflammatory response. Alterations in the regulation of TNF-alpha have been implicated in a variety of inflammatory disorders, including Inflammatory bowel disease (IBD). Indeed, a common treatment for IBD is the use of TNF-alpha inhibitors. Polymorphisms in the TNF-alpha promoter region are known to affect the level of gene expression. Our aim was to investigate the influence of these single nucleotide polymorphisms (SNPs) in TNF-alpha promoter gene play in the risk of IBD in a Spanish population and their individual response to anti-TNF-alpha treatment. DNA samples from patients with IBD and controls were screened for TNF-alpha -238G/A (rs361525) and -308G/A (rs1800629) SNPs by PCR-SSOP using a microbeads luminex assay and compared with response to TNF-alpha inhibitors. There were not statistical differences in -238G/A and -308G/A allele and genotype frequencies between patients. However, we found an increased frequency of -308A allele and -308GA genotype in these nonresponders patients to TNF-alpha inhibitors with respect to responders patients ($P_c < 0.05$). This -308GA genotype has been classified as high producer of this cytokine. This fact could actually be interesting to explain the different response of patients with IBD with respect to TNF-alpha inhibitors. TNF-alpha promoter gene polymorphism does not seem to play a role in IBD susceptibility, but particular TNF-alpha genotypes may be involved in the different responses to TNF-alpha inhibitor treatment in Spanish patients with IBD.

Lopez-Iglesias, A. A., et al. (2015). "Prognostic implications of PIM-2 expression in samples from patients with chronic lymphocytic leukemia and impact in the sensitivity to the pan-PIM kinase inhibitor PIM447." Blood **126 (23)**: 2923.

Background and objectives. PIM kinases (PIM1, PIM2, PIM3) are proteins known to be overexpressed in several hematological malignancies. In particular, in chronic lymphocytic leukemia (CLL) they are involved in cell survival, resistance to apoptosis (especially PIM2 and PIM3) and interactions with the microenvironment (PIM1). The aim of this study was dual: I) to evaluate the preclinical efficacy of PIM447, a pan PIM kinase inhibitor, in CLL and to study potential synergies with other drugs; and II) to evaluate the expression of PIM-kinases in different stages of the disease and correlate it with the prognosis and the sensitivity to the drug. Methods. Peripheral blood samples from untreated patients with different stages of the disease (monoclonal B lymphocytosis (MBL), stable CLL not requiring treatment (sCLL), and active CLL requiring treatment (aCLL)) were collected after informed consent. The ex vivo efficacy of PIM447 was analyzed by flow cytometry with annexin V in these samples. Moreover, PIM447 efficacy was also analyzed in two cell lines (MEC-1 and JVM-2) by MTT assay. Synergy with other drugs effective in CLL (bendamustine and fludarabine) was evluated with the calcusyn software. Protein levels of PIM Kinase proteins were evaluated by capillary electrophoresis immunoassay (WESTM ProteinSimple) in monoclonal B cells purified by CD19 selection with anti-CD19 magnetic microbeads and the autoMacs Cell separator (both from Miltenyi Biotec) from a subset of patients. Results. The pan PIM inhibitor, PIM447 was active in both cell lines tested, MEC-1 (IC50 5muM) and JVM2 (IC50 7muM), and also in monoclonal B cells from freshly isolated patients samples (sCLL=11; aCLL=5), with no difference in sensitivity between the different stages of the disease (IC50 of 4,8 muM and 4,7 muM for sCLL and aCLL respectively). There was a clear therapeutic window as treatment with PIM447 at doses toxic for monoclonal B cells, preserved T lymphocytes (figure 1) (median % of apoptosis for B cells and T lymphocytes respectively of 23 vs 20 at 5muM and 87 vs 35 at 10 muM). Moreover, PIM447 demonstrated to potentiate the activity of both bendamustine and fludarabine, being especially synergistic with this last one (combination index 0.1-0.6). A second objective was to analyze PIM2 protein expression by western blot in monoclonal B cells from these samples and correlate it with clinical and biological features. Up to now, it has been evaluated in 18 samples (MBL=4; sCLL=8; aCLL=6,). All of them expressed PIM-2. Expression levels of this protein were significantly higher in active CLL as compared with indolent stages of the disease (p=0,012). Patients with an unmutated IGHV status also displayed higher levels of PIM2 (p=0,01). Finally, samples with high PIM2 levels were slightly more resistant to PIM447 as compared with samples with lower protein levels (IC50 of 7,7 muM vs 5 muM, respectively). We are currently completing the analysis of the PIM2 levels of remaining samples and we are also measuring the levels of PIM1 protein, what will be available at the meeting. Conclusion(s): PIM-Kinase inhibition with PIM447 is effective in vitro in CLL cell lines and ex vivo in samples from patients. It synergizes with other agents especially fludarabine. PIM2 protein levels correlated with the clinical activity of CLL and with the mutational state of IGHV. Although all patients appear sensitive ex vivo to PIM447, further work is required to define PIM2 expression as a marker of sensitivity. (Figure Presented).

Lopez-Marin, J., et al. (2012). "Study of degradable materials for soil mulching in greenhouse-grown lettuce." Acta Horticulturae **952**: 393-398.

The benefits associated with use of plastic mulches include higher yields, earlier harvests, improved weed control and increased efficiency in the use of water and fertilizers. However, the plastic has a negative effect on the environment. After the crop is picked, the plastic waste must be removed from the field. In the last few years, the use of starch-based biodegradable and

oxo-biodegradable films have been introduced as an alternative to conventional mulches. These materials can be incorporated into the soil at the end of the crop season and undergo biodegradation by soil microorganisms. A year study was conducted to determine the response of a lettuce crop to six mulch materials (2 low density polyethylene films (LDPE), 2 oxo-biodegradable and 2 biodegradable) in a greenhouse in South East Spain. Harvest was carried out 45 days after transplanting and the following variables were determined: fresh and dry weight of the aerial part, number of leaves per plant, plant height and the longitudinal and transverse diameters of the plant. Biodegradable and oxo-biodegradable films showed an agronomic behaviour equal to LDPE. The degradation time of oxo-biodegradable films was longer than biodegradable films. The evaluation of the performance in the field showed that the biodegradable films are as suitable for protected cultivation as LDPE.

Lopez-Rojo, N., et al. (2019). "Microplastics have lethal and sublethal effects on stream invertebrates and affect stream ecosystem functioning." Environmental Pollution **259**: 113898.

Microplastics (MPs) are contaminants of increasing concern due to their abundance, ubiquity and persistence over time. However, knowledge about MP distribution in fresh waters and their effects on freshwater organisms is still scarce, and there is virtually no information about their potential influence on ecosystem functioning. We used a microcosm experiment to examine the effects of MPs (fluorescent, 10-mum polystyrene microspheres) at different concentrations (from 0 to 10³ particles mL⁻¹) on leaf litter decomposition (a key process in stream ecosystems) and associated organisms (the caddisfly detritivore Sericostoma pyrenaicum), and the extent to which MPs were attached to leaf litter and ingested and egested by detritivores, thus assessing mechanisms of MP trophic transfer. We found that MPs caused detritivore mortality (which increased 9-fold at the highest concentration) but did not affect their growth. Analysis of fluorescence in samples suggested that MPs were rapidly ingested (most likely through ingestion of particles attached to leaf litter) and egested. Leaf litter decomposition was reduced as a result of increasing MP concentrations; the relationship was significant only in the presence of detritivores, but microbially-mediated decomposition showed a similar trend. Our findings provide novel evidence of harmful effects of MPs on aquatic insects and stream ecosystem functioning, and highlight the need for the standardization of methods in future experiments with MPs in order to allow comparisons and generalizations.

Lorenz, C., et al. (2019). "Spatial distribution of microplastics in sediments and surface waters of the southern North Sea." Environmental Pollution **252**: 1719-1729.

Microplastic pollution within the marine environment is of pressing concern globally. Accordingly, spatial monitoring of microplastic concentrations, composition and size distribution may help to identify sources and entry pathways, and hence allow initiating focused mitigation. Spatial distribution patterns of microplastics were investigated in two compartments of the southern North Sea by collecting sublittoral sediment and surface water samples from 24 stations. Large microplastics (500-5000 mum) were detected visually and identified using attenuated total reflection (ATR) Fourier transform infrared (FTIR) spectroscopy. The remaining sample was digested enzymatically, concentrated onto filters and analyzed for small microplastics (11-500 mum) using Focal Plane Array (FPA) FTIR imaging. Microplastics were detected in all samples with concentrations ranging between 2.8 and 1188.8 particles kg⁻¹ for sediments and 0.1-245.4 particles m⁻³ for surface waters. On average 98% of microplastics were <100 mum in sediments and 86% in surface waters. The most prevalent polymer types in both compartments were polypropylene, acrylates/polyurethane/varnish, and polyamide. However, polymer composition differed

significantly between sediment and surface water samples as well as between the Frisian Islands and the English Channel sites. These results show that microplastics are not evenly distributed, in neither location nor size, which is illuminating regarding the development of monitoring protocols. Capsule: Microplastic concentrations and compositions differ significantly between environmental compartments. Geographic distribution patterns are revealed by a statistical approach. Microplastics <500 mum are more abundant and diverse than >500 mum ones, rendering the exclusive analysis of later ones insufficient for environmental risk assessment. Copyright © 2019 Elsevier Ltd

Lorenzi, L., et al. (2020). "Plastic floating debris along a summer-winter estuarine environmental gradient in a coastal lagoon: how does plastic debris arrive in a conservation unit?" Environmental Science & Pollution Research **15**: 15.

Improper management of plastic waste is an important contributor to the pollution in water bodies. However, how floating plastic debris is transported to coastal lagoons and marine conservation units is still poorly understood. This work determined the level of contamination due to floating plastic debris in Acarai Lagoon by establishing density distribution patterns along the lagoon ecocline in the winter and summer. Four areas were chosen that followed the estuarine gradient of the lagoon (external, lower, middle, and upper), and in each area, three samples of were collected by trawling with a plankton net. The plastic debris was classified into paint fragments, hard solids, plastic filaments, and soft plastics, and the plastic debris density and surface area were determined in each sampling area. The concentrations of the plastics in the downstream and upstream areas resulted from the high density of debris that occurred during the winter due to the absence of rain and the entry of coastal waters into the lagoon. The reduced abundance and surface area of the plastics in the summer were related to the substantial output of water from the interior of the lagoon to the mouth of the lagoon due to high rainfall during this season. The absence of plastic waste management actions and developed areas at the mouth of the lagoon that were associated with the spatial and temporal fluctuations in the environmental variables favored the occurrence and high abundance of plastic debris in the water column, contaminating the entire system of Acarai State Park.

Losada, C., et al. (2012). "Can MACS as a sperm preparation technique improve clinic results in patients with Kartagener syndrome?" Human Reproduction. Conference: 28th Annual Meeting of the European Society of Human Reproduction and Embryology, ESHRE **27**(SUPPL. 2).

Introduction: Kartagener syndrome (KS) is an autosomal recessive genetic disorder, affecting approximately one out of every 15,000 live births. This congenital disease belongs to Ciliary Dyskinesia Syndromes (CDS), characterized by the presence of several symptoms, such as chronic sinusitis, bronchiectasis, situs inversus and infertility, secondary to structural or functional defects in the action of the motile cilia. Male infertility is due to partial or total immotility of the spematozoon flagellum by verified mutations in at least two genes that encode dynein protein, DNAH5 and DNAI1, located on chromosomes 5 and 9 respectively. Recently, a novel procedure called Magnetic-Activated Cell Sorting (MACS) has been used as a non-invasive method in different fields to reduce the percentage of apoptotic cells. This sperm selection technique is based on the high affinity of Annexin V for phosphatidylserine, which is located on pre-apoptotic spermatozoa membrane. This publication describes a case in which an ongoing pregnancy has been achieved for the first time in a patient with KS, after applying the MACS technique to ejaculated sperm. Our aim was to reduce the percentage of apoptotic spermatozoa and DNA fragmentation rate, and thus, increase the chance of selecting sperm with higher viability for intracytoplasmic sperm injection (ICSI). Material(s) and Method(s): A couple with

history of two years of primary infertility due to male factor came to our fertility centre. The male was under suspicion of KS, because of the presence of symptoms such us, situs inversus totalis and abnormal sperm analisys characterized by total astenozoospermy and teratozoospermy (according to Kruger strict criteria). Sperm viability assessed by the Eosin test, revealed 40% of alive spermatozooa. Morphology of sperm flagella was evaluated under electron microscopy showing the absence of dynein connections. Mutations in DNAH5 and DNAI1 genes were not found in the genetic study performed on blood sample. Both Karyotype and FISH sperm were normal. Ovarian stimulation was carried out in October of 2011 using a GnRH antagonist multiple dose protocol and recombinant follicle-stimulating hormone. Ovulation induction was triggered with recombinant chorionic gonadotropin (rCG). MACS technique was applied to eyaculated sperm. Annexin V protein conjugated with super-paramagnetic microbeads is closed to the separation column when exposed to a magnetic field. Non-apoptotic spermatozoa with intact membranes went through the column and were used for ICSI. Result(s): On the day of the oocyte retrieval, fresh semen evaluation showed that sperm count was 32 x 106 /ml and 1.3 ml. Total absence of motility was confirmed even after incubation with pentoxifylline. Vitality test showed 55% of alive spermatozoa. ICSI was performed after applying MACS to sperm aliquot. Ten out of fourteen oocytes recovered were metaphase II (71.4%) and six out of ten oocytes (60%) were appropriately fertilized. Embryos were scored according to classical morphology criteria. Embryo transfer was carried out on day 3 and two even 8 and 6 cells good quality embryos were transferred into the uterus. In addition, one cavitated blastocyst was frozen on day 5. Thirteen days after the embryo transfer beta-hCG blood test was 112.64 IU and nowadays, the pregnancy satisfactorily progresses. Conclussion: To the best of our knowledge this is the first time that MACS is reported to improve the outcome of ICSI procedure using immotile sperm of male with KS. By doing so, we increased the chance of better selection of viable sperm in a case showing total astenozoospermy. Taking this into consideration and based on our good results, we conclude that MACS technique may be an alternative tool in routine IVF practice in these patients, not only improving reproductive outcomes, but also minimizing the need for invasive interventions such as testicular biopsy.

Lots, F. A. E., et al. (2017). "A large-scale investigation of microplastic contamination: Abundance and characteristics of microplastics in European beach sediment." Marine Pollution Bulletin **123**(1-2): 219-226.

Here we present the large-scale distribution of microplastic contamination in beach sediment across Europe. Sediment samples were collected from 23 locations across 13 countries by citizen scientists, and analysed using a standard operating procedure. We found significant variability in the concentrations of microplastics, ranging from 72+/-24 to 1512+/-187 microplastics per kg of dry sediment, with high variability within sampling locations. Three hotspots of microplastic accumulation (>700 microplastics per kg of dry sediment) were found. There was limited variability in the physico-chemical characteristics of the plastics across sampling locations. The majority of the microplastics were fibrous, <1mm in size, and blue/black in colour. In addition, using Raman spectrometry we identified particles as polyester, polyethylene, and polypropylene. Our research is the first large spatial-scale analysis of microplastics on European beaches giving insights into the nature and extent of the microplastic challenge.

Lourenco, P. M., et al. (2017). "Plastic and other microfibers in sediments, macroinvertebrates and shorebirds from three intertidal wetlands of southern Europe and west Africa." Environmental Pollution **231**(Part 1): 123-133.

Microplastics are widespread in aquatic environments and can be ingested by a wide range of

organisms. They can also be transferred along food webs. Estuaries and other tidal wetlands may be particularly prone to this type of pollution due to their particular hydrological characteristics and sewage input, but few studies have compared wetlands with different anthropogenic pressure. Furthermore, there is no information on microplastic transfer to secondary intertidal consumers such as shorebirds. We analysed intertidal sediments, macroinvertebrates and shorebirds, from three important wetlands along the Eastern Atlantic (Tejo estuary, Portugal; Banc d'Arguin, Mauritania and Bijagos archipelago, Guinea-Bissau), in order to evaluate the prevalence and transfer of microplastics along the intertidal food web. We further investigated variables that could explain the distribution of microplastics within the intertidal areas of the Tejo estuary. Microfibers were recorded in a large proportion of sediment samples (91%), macroinvertebrates (60%) and shorebird faeces (49%). micro -FTIR analysis indicated only 52% of these microfibers were composed of synthetic polymers (i.e. plastics). Microfiber concentrations were generally higher in the Tejo and lower in the Bijagos, with intermediate values for Banc d'Arguin, thus following a latitudinal gradient. Heavier anthropogenic pressure in the Tejo explains this pattern, but the relatively high concentrations in a pristine site like the Banc d'Arguin demonstrate the spread of pollution in the oceans. Similar microfiber concentrations in faeces of shorebirds with different foraging behaviour and similar composition of fibres collected from invertebrate and faeces suggest shorebirds mainly ingest microfibers through their prey, confirming microfiber transfer along intertidal food webs. Within the Tejo estuary, concentration of microfibers in the sediment and bivalves were positively related with the percentage of fine sediments and with the population size of the closest township, suggesting that hydrodynamics and local domestic sewage are the main factors influencing the distribution of microfibers.

Loutsios, C., et al. (2015). "SPECT/CT to quantify eosinophil migration into the lungs." Journal of Nuclear Medicine. Conference: Society of Nuclear Medicine and Molecular Imaging Annual Meeting, SNMMI **56**(SUPPL. 3).

Objectives Eosinophils are key mediators of allergic inflammation. The ability to localise and quantify eosinophilic inflammation is important both clinically and to test the efficacy of novel therapeutics. Existing biomarkers are indirect or invasive so there remains a need for a less invasive method to localise eosinophilic inflammation in the lungs. Methods Granulocytes were isolated from autologous peripheral blood by plasma-Percoll density gradient separation. Eosinophils were then isolated by negative selection using anti-CD16 magnetic microbeads, labelled with ^{99m}Tc- HMPAO [1,2] and injected into 9 healthy subjects, 10 asthmatics and 3 patients with focal eosinophilic lung inflammation. Initial cell distribution was monitored by dynamic imaging over the chest for 40 min post-injection. Frequent serial peripheral blood samples were taken and lung activity determined from 3 sequential SPECT images obtained up to 9 h post-injection. Activity was anatomically co-registered from a single low-dose CT scan. The rate of eosinophil clearance into the lungs was measured by Patlak analysis, using peripheral blood for input function, and multiplied by the blood eosinophil count to give the rate of eosinophil migration into the lungs. Results Labelled cells displayed rapid first-pass transit through the lungs before localising in the liver, spleen and bone marrow. Lung eosinophil migration was 194 +/- 66 cells/min/ml in asthmatics (p<0.1) and 6051 +/- 4593 in patients with focal pulmonary inflammation (p<0.01), compared with 46 +/- 22 in healthy subjects. Conclusions Autologous radiolabelled eosinophils coupled to SPECT/CT are able to localise pulmonary eosinophilic inflammation in humans and therefore have the potential for testing novel therapeutics.

Lowry, A. (2013). "Material goals." Green Futures(89): 42-42.

The article offers the author's insights regarding environmental values and their aesthetics, along with management of plastic waste. The author states that the people should choose between their environmental values and their aesthetics. He says that the most toxic products in the grocery store could be found in the cleaning category. He relates that there are billions of tonnes of plastics in circulation; however other brands are rejecting post-consumer waste as a material.

Lu, B., et al. (2018). "Dual-channel-coded microbeads for multiplexed detection of biomolecules using assembling of quantum dots and element coding nanoparticles." Analytica Chimica Acta **1024**: 153-160.

To achieve the dual-channel (analog and digital) encoding, microbeads assembled with quantum dots (QDs) and element coding nanoparticles (ECNPs) have been prepared. Dual-spectra, including fluorescence generated from quantum dots (QDs) and laser induced breakdown spectrum obtained from the plasma of ECNPs, including AgO, MgO and ZnO nanoparticles, has been adopted to provide more encoding amounts and more accurate dual recognition for encoded microbeads in multiplexed utilization. The experimental results demonstrate that the single microbead can be decoded in two optical channels. Multiplexed analysis and contrast adsorption experiment of anti-IgG verified the availability and specificity of dual-channel-coded microbeads in bioanalysis. In gradient detection of anti-IgG, we obtained the linear concentration response to target biomolecules from 3.125 x 10⁻¹⁰ M to 1 x 10⁻⁸ M, and the limit of detection was calculated to be 2.91 x 10⁻¹¹ M. Copyright © 2018 Elsevier B.V.

Lu, B. and M. M. Maharbiz (2019). "Ion concentration polarization (ICP) of proteins at silicon micropillar nanogaps." PLoS ONE [Electronic Resource] **14**(11): e0223732.

Fast detection of low-abundance protein remains a challenge because detection speed is limited by analyte transport to the detection site of a biosensor. In this paper, we demonstrate a scalable fabrication process for producing vertical nanogaps between micropillars which enable ion concentration polarization (ICP) enrichment for fast analyte detection. Compared to horizontal nanochannels, massively paralleled vertical nanogaps not only provide comparable electrokinetics, but also significantly reduce fluid resistance, enabling microbead-based assays. The channels on the device are straightforward to fabricate and scalable using conventional lithography tools. The device is capable of enriching protein molecules by >1000 fold in 10 min. We demonstrate fast detection of IL6 down to 7.4 pg/ml with only a 10 min enrichment period followed by a 5 min incubation. This is a 162-fold enhancement in sensitivity compared to that without enrichment. Our results demonstrate the possibility of using silicon/silica based vertical nanogaps to mimic the function of polymer membranes for the purpose of protein enrichment.

Lu, H., et al. (2007). "[Hyperinsulinemia induced immune maturation of human monocyte derived dendritic cells: bridging between diabetes and atherosclerosis]." Chung-Hua Hsin Hsueh Kuan Ping Tsa Chih [Chinese Journal of Cardiology] **35**(12): 1151-1154.

OBJECTIVE: Dendritic cells an hyperinsulinemia are both implicated in the pathogenesis of atherosclerosis. The aim of this study is to explore the effect of high concentration of insulin on the maturation of monocyte-derived dendritic cells (MoDCs) and related signal transduction pathways.

METHODS: Human monocytes were purified (over 98%) using Anti-CD14 micro-beads and cultured for 5 days with DC Cellgro medium containing rhGM-CSF (100 microg/L) and rhIL-4 (20 microg/L). Immature DC were then incubated with insulin of various concentrations (0, 1, 10, 100 nmol/L)

for 24 hours in the presence or absence of LY294002 (PI3K inhibitor) or PD98059 (MAPK inhibitor). Immunophenotypic expression of CD86 and CD83 were detected using flow cytometry. Endocytosis function of the MoDCs was evaluated using FITC-Dextran and MoDCs secretion IL-12, IFN-gamma and TNF-alpha were measured by ELISA.
RESULTS: Insulin induced significantly higher CD83 and CD86 expressions on MoDCs in a dose-dependent manner. The endocytosis function of MoDCs were significantly inhibited and cytokine secretions of IL-12, IFN-gamma and TNF-alpha significantly increased by 10 nmol/L and 100 nmol/L insulin. These effects could be blocked by the LY294002 and PD98059.
CONCLUSION: Hyperinsulinemia contributed to atherosclerosis via stimulating immune maturation of MoDCs via both PI3K and MAPK pathways.

Lu, J., et al. (2020). "Adsorption and Desorption of Steroid Hormones by Microplastics in Seawater." Bulletin of Environmental Contamination & Toxicology **07**: 07.

This study evaluated the adsorption and desorption of 17beta-estradiol (E2) and 17alpha-ethynylestradiol (EE2) on microplastics in seawater. The effects of microplastic materials and particle sizes on adsorption of E2 and EE2 were explored. Moreover, effects of salinity, pH, humic acid (HA) concentrations, and initial E2/EE2 concentrations on adsorption were also discussed. Increase in salinity, HA concentration, and initial E2/EE2 concentration would enhance adsorption of E2/EE2 on microplastics. Adsorption capacity of E2/EE2 firstly increased to reach the highest at pH of 8.0 and then decreased when pH further increased. Pseudo-second-order kinetics better fitted adsorption data of E2 while pseudo-first-order model yielded better fitting results for EE2. Freundlich isotherm was better to fit the adsorption data of E2 while Langmuir isotherm yielded better fitting results for EE2. Desorption capacity of E2/EE2 on microplastics was over 40% of its adsorption capacity. This study provides new insights on microplastics and endocrine disrupting chemicals.

Lu, J., et al. (2019). "Effects of microplastics on distribution of antibiotic resistance genes in recirculating aquaculture system." Ecotoxicology and Environmental Safety **184**(109631).

Microplastics and antibiotic resistance genes (ARGs) are two kinds of emerging contaminants with frequent detection in coastal regions. However, rare information on co-occurrence of microplastics and ARGs in coastal recirculating aquaculture system (RAS) is available. This study performed field sampling and laboratory analysis to investigate the distribution of microplastics and ARGs in a typical RAS farm. The results showed that microplastics were detected in all water samples with the abundances ranging from 58 to 72 items/m³. Absolute abundances of total 10 ARGs in water samples ranged from 3.24x10⁵ to 7.83x10⁵ copies/mL while those on microplastic samples were in the range of 1.59x10⁹-1.83x10⁹ copies/g. Microbial communities of microplastics and water showed significant difference at both phylum and genus levels. Microbial community diversity of microplastics was higher than that of water. ARGs including tetG, qnrS, sul1, sul2, and ermF possessed relatively more active relationships with bacterial community in water and on microplastics of the RAS farm. The results suggested that microplastics might be an important reservoir of ARGs in RAS farms. The findings of this study will provide useful information on pollution control and environmental management for both microplastics and ARGs in coastal aquaculture systems.

Lu, K., et al. (2018). "Influence of microplastics on the accumulation and chronic toxic effects of cadmium in zebrafish (Danio rerio)." Chemosphere **202**: 514-520.

As the accumulation of microplastics (MPs) in the environment continues to rise, more concerns

focus on the health risk of combined exposure to MPs and other contaminants. The aim of this study is to investigate the influences of MPs on the tissue-accumulation of cadmium (Cd) in zebrafish and explore the related chronic toxic effects induced by combined exposure of Cd and MPs. After co-exposure to MPs and Cd for 3 weeks, 20 and 200 micro g/L MPs increased the accumulation of Cd in zebrafish livers (46% and 184%), guts (10% and 25%) and gills (9% and 46%). The Cd accumulation was gill > gut > liver. Comprehensive analyzes of biochemical biomarkers, histopathological observation and functional gene expression firstly demonstrated that the presence of MPs enhanced the toxicity of Cd on zebrafish and the combined exposure caused oxidative damage and inflammation in zebrafish tissues. Collectively, our results highlight the chronic effects of combined exposure to MPs and heavy metals.

Lu, L., et al. (2019). "Interaction between microplastics and microorganism as well as gut microbiota: A consideration on environmental animal and human health." Science of the Total Environment **667**: 94-100.

Microplastics (MPs) has gradually become a global environmental pollution problem and may harm human and animal health. In recent years, a large number of studies had shown that MPs had various toxicological effects on different organisms. At the same time, a number of studies had also shown that gut microbiota was closely related to host health and as a toxicity target for certain environmental pollutants including MPs. The fact is that more and more studies proved that MPs not only could interact with microorganism directly but also serve as a carrier for other pollutants and interacted with microorganism indirectly. In this review, we summarized the interactions between MPs and microorganisms as well as gut microbiota, and considered the possible impacts of MPs on environmental animal and human health, suggesting that the environmental microorganisms and the gut microbiota of animals were also the very important target for MPs. We hope that more studies pay more attention to focus on the relationship between MPs, gut microbiota, and environmental animals and human health in the future.

Lu, L., et al. (2018). "Polystyrene microplastics induce gut microbiota dysbiosis and hepatic lipid metabolism disorder in mice." Science of the Total Environment **631**(632): 449-458.

Microplastic (MP) has become a concerning global environmental problem. It is toxic to aquatic organisms and can spread through the food chain to ultimately pose a threat to humans. In the environment, MP can interact with microbes and act as a microbial habitat. However, effects of polystyrene MP on the gut microbiota in mammals remain unclear. Here, male mice were exposed to two different sizes of polystyrene MP for 5 weeks to explore its effect. We observed that oral exposure to 1000 micro g/L of 0.5 and 50 micro m polystyrene MP decreased the body, liver and lipid weights in mice. Mucus secretion in the gut decreased in both sizes of polystyrene MP-treated groups. Regarding the gut microbiota, at the phylum level, polystyrene MP exposure decreased the relative abundances of Firmicutes and alpha -Proteobacteria in the feces. Furthermore, high throughput sequencing of the V3-V4 region of the 16S rRNA gene revealed significant changes in the richness and diversity of the gut microbiota in the cecums of polystyrene MP-treated mice. At the genus level, a total of 6 and 8 types of bacteria changed in the 0.5 and 50 micro m polystyrene MP-treated groups, respectively. Furthermore, an operational taxonomic unit (OTU) analysis identified that 310 and 160 gut microbes were changed in the 0.5 and 50 micro m polystyrene MP-treated groups, respectively. In addition, the hepatic triglyceride (TG) and total cholesterol (TCH) levels decreased in both 1000 micro g/L 0.5 and 50 micro m polystyrene MP-treated groups. Correspondingly, the relative mRNA levels of some key genes related to lipogenesis and TG synthesis decreased in the liver and epididymal fat. These results indicated that polystyrene MP could modify the gut microbiota composition and induce hepatic lipid disorder in mice; while the mouse is a common mammal model, consequently, the health risks of MP to animals should not be ignored.

Lu, P., et al. (2012). "The inhibitory effect of CD8 alpha ⁻CD11c⁺ dendritic cells on asthma in schistosoma japonicum infected mice." Tianjin Medical Journal **40**(7): 695-697.

Objective: To study the inhibitory effect of CD8 alpha ⁻CD11c⁺ dendritic cells (DC) on allergic asthma in schistosoma japonicum-infected mice.

Lu, S., et al. (2019). "Prevalence of microplastics in animal-based traditional medicinal materials: Widespread pollution in terrestrial environments." Science of the Total Environment **709**: 136214.

Microplastics (MPs) pollution is an emerging environmental and health concern. MPs have been extensively observed in the aquatic environment, yet rarely investigated in the terrestrial ecosystem, especially in relation to health risks. To evaluate potential MPs pollution in land-dwelling animal medicine materials, we collected 20 types of small animal-based medicinal materials and 10 types of available fresh terrestrial animals from eight different regions in China. MPs were found in all medicinal materials with an average incidence rate of 94.67%. The abundance of MPs was in the range of 1.80 +/- 0.38 to 7.80 +/- 0.83 items/individual or 1.59 +/- 0.33 to 43.56 +/- 9.22 items/g (dry weight), with polymer distribution by polyethylene terephthalate (40.45%), rayon (30.64%), polyethylene (10.11%), nylon (7.35%), polypropylene (5.93%), and polyvinyl chloride (5.52%). The majority of MPs were microfibers (84.68%), with 15.32% of fragments. Moreover, MPs were directly observed in the intestine, detected in all ten types of fresh medicinal animals with the abundance of 0.83 +/- 0.35 to 3.42 +/- 0.46 items/individual. Furthermore, significant positive correlations (R: 0.32-0.99, p < 0.05) of MPs characteristics were found between medicinal materials and fresh animals, including shape, size, color, and polymer distribution of MPs. The results support that MPs in the medicinal materials were likely derived from living animals. This study demonstrates the prevalence of MPs in animal-based, traditional medicinal materials, and also suggests widespread MPs pollution in terrestrial environments and latent health risks.

Lu, S., et al. (2018). "Impact of water chemistry on surface charge and aggregation of polystyrene microspheres suspensions." Science of the Total Environment **630**: 951-959.

The discharge of microplastics into aquatic environment poses the potential threat to the hydrocoles and human health. The fate and transport of microplastics in aqueous solutions are significantly influenced by water chemistry. In this study, the effect of water chemistry (i.e., pH, foreign salts and humic acid) on the surface charge and aggregation of polystyrene microsphere in aqueous solutions was conducted by batch, zeta potentials, hydrodynamic diameters, FT-IR and XPS analysis. Compared to Na⁺ and K⁺, the lower negative zeta potentials and larger hydrodynamic diameters of polystyrene microspheres after introduction of Mg²⁺ were observed within a wide range of pH (2.0-11.0) and ionic strength (IS, 0.01-500mmol/L). No effect of Cl⁻, HCO₃⁻ and SO₄²⁻ on the zeta potentials and hydrodynamic diameters of polystyrene microspheres was observed at low IS concentrations (<5mmol/L), whereas the zeta potentials and hydrodynamic diameters of polystyrene microspheres after addition of SO₄²⁻ were higher than that of Cl⁻ and HCO₃⁻ at high IS concentrations (>10mmol/L). The zeta potentials of polystyrene microspheres after HA addition were decreased at pH2.0-11.0, whereas the lower hydrodynamic diameters were observed at pH<4.0. According to FT-IR and XPS analysis, the change in surface properties of polystyrene microspheres after addition of hydrated

Mg²⁺ and HA was attributed to surface electrostatic and/or steric repulsions. These investigations are crucial for understanding the effect of water chemistry on colloidal stability of microplastics in aquatic environment.

Lu, X. M., et al. (2019). "Fate and abundance of antibiotic resistance genes on microplastics in facility vegetable soil." Science of the Total Environment **709**: 136276.

Microplastics (MPs) and antibiotic resistance genes (ARGs) coexist widely in farmland soils, but the fate and abundance of ARGs on MPs is rarely explored. In this study, high-throughput fluorescent quantitative polymerase chain reaction was used to determine ARGs on MPs in facility vegetable soil. The results indicated that when the particle size of the MPs was larger, the weathering was more serious, or the MPs came from soils with a long vegetable cultivation period, the levels of antibiotics and heavy metals on the MPs were higher. The distribution of the detected ARGs types on distinct MPs showed changes. Compared with weakly weathered MPs, the detected beta lactamase and aminoglycoside resistance genes on strongly weathered MPs were decreased by 2.6% and 1.7%, while the detected sul-ARGs and Macrolide-Lincosamide-Streptogramin B (MLSB) resistance genes were increased by 1.5% and 2.8%. Compared with smaller MPs, the detected MLSB and vancomycin resistance genes on larger MPs were decreased by 2.0% and 1.4%, while the detected fluoroquinolone, quinolone, florfenicol, chloramphenicol, and amphenicol (FCA) resistance genes and sul-ARGs were increased by 1.2% and 1.0%. Compared with MPs in soil after three years of vegetable cultivation, the detected FCA resistance genes and sul-ARGs on MPs in soil after ten years of vegetable cultivation were decreased by 1.3% and 1.6%, while the detected beta lactamase and aminoglycoside resistance genes were increased by 1.0% and 1.7%. This study suggests that MPs with larger size, stronger weathering or from soil after long-term vegetable cultivation adsorb more antibiotics and heavy metals and cause more mobile genetic elements, which can contribute to antibiotic resistance on the MPs.

Lu, Z., et al. (2016). "Amplified voltammetric detection of miRNA from serum samples of glioma patients via combination of conducting magnetic microbeads and ferrocene-capped gold nanoparticle/streptavidin conjugates." Biosensors & Bioelectronics **86**: 502-507.

MicroRNA (miRNA) plays a key regulatory role in many biological processes, emerging as an important biomarker for a large variety of cancer diseases. Employing gold nanoparticle (AuNP)-coated magnetic microbeads (AuNP-MMBs) as an immobilization matrix for higher loading density of hairpin-structured DNA probes and then ferrocene (Fc)-capped gold nanoparticle/streptavidin conjugates, amplified electrochemical assay of miRNA has been performed. In the presence of target miRNA, a novel assembly was formed via linking biotinylated hairpin DNA probe-covered AuNP-MMBs with Fc-capped gold nanoparticle/streptavidin conjugates and then collected by magnetic electrodes for voltammetric detection. The enlarged surface area, good conductivity of AuNP-MMBs and the multiple Fc tags on the electrode surface ensure high sensitivity of the method. The oxidation peak current of Fc tags is proportional to the concentrations of miRNA ranging from 5 fM to 100 fM, and a detection limit of 0.14 fM was achieved. The proposed assay is highly selective and reproducible, serving as a viable alternative for the detection of miRNA-182 from serum samples of glioma patients.

Luca, G., et al. (2007). "Encapsulation, in vitro characterization, and in vivo biocompatibility of sertoli cells in alginate-based microcapsules." Tissue Engineering **13**(3): 641-648.

A method for microencapsulation of isolated neonatal porcine Sertoli cells is described. Using a

conventional alginate-poli-L-ornithine encapsulation procedure, which has been used in our laboratory for almost two decades to envelop pancreatic islets, we observed significant loss of Sertoli cell viability, possibly due to excessive Ca²⁺ ion exposure. Replacing calcium with barium, or shortening the incubation period in the presence of Ca ions, we obtained barium or calcium alginate gel microbeads that did not alter morphology and viability of the encapsulated Sertoli cells. The procedure might permit access to a novel approach to immunologically alter cell graft acceptance. © Mary Ann Liebert, Inc.

Lucas, D., et al. (2018). "Methods of Responsibly Managing End-of-Life Foams and Plastics Containing Flame Retardants: Part II." Environmental Engineering Science **35**(6): 588-602.

This is Part II of a review covering the wide range of issues associated with all aspects of the use and responsible disposal of foam and plastic wastes containing toxic or potentially toxic flame retardants. We identify basic and applied research needs in the areas of responsible collection, pretreatment, processing, and management of these wastes. In Part II, we explore alternative technologies for the management of halogenated flame retardant (HFR) containing wastes, including chemical, mechanical, and thermal processes for recycling, treatment, and disposal. © Copyright 2018, Mary Ann Liebert, Inc. 2018.

Luchese, C. L. (2019). "Intelligent packaging for monitoring food quality." CAB Reviews **14**(049): 1-11.

Synthetic plastics derived primarily from fossil carbon sources (such as crude oil and natural gas) are one of the main constituents of urban solid waste that present an increasing problem of disposal and environmental pollution due to its recalcitrant nature. Growing environmental concerns over the uncontrolled use of traditional synthetic plastics and a desire related to reducing the use of non-renewable resources have led to several looking for alternative packaging materials. An alternative to minimize the problem related to plastic waste disposal is the production of biodegradable films. Currently, dynamic information and constant monitoring of food quality, shelf life, safety and convenience are required for the most demanding consumer news. Intelligent packaging systems are those that monitor the condition of packaged foods to provide information about die quality of packaged food during transportation and storage. In the current context, smart (active and intelligent) packaging is a potential area for future research. The development and improvement of processing technologies and the raw materials used in the manufacture of this type of packaging can help to preserve products of animal origin (chicken meat, beef and pork) and vegetables (minimally processed), as the different characteristic of the material can be obtained.

Lucia, G. A. d., et al. (2018). "Sea water contamination in the vicinity of the Italian minor islands caused by microplastic pollution." Water **10**(8).

The abundance and distribution of microplastics (MP) were evaluated in six "clean" sites (Italian minor islands) and in two "polluted" areas (near the mouth of two major Italian rivers). Samples of MP, plankton and persistent organic pollutants (POPs) were collected using a manta trawl (MA) and a plankton net (WP2), both lined with a 333 micro m mesh net. MP have been confirmed to be ubiquitous since they were found at each site, showing an average density of 0.3+or-0.04 items/m³ (values ranged from 0.641 to 0.119). When comparing the clean sites with the polluted ones, a significantly higher value of MP was found near the river mouths. The most common types of MP were synthetic filaments (50.24%), followed by fragments (30.39%), thin plastic films (16.98%) and spheres (2.39%). Infrared spectroscopy analysis highlighted that the most abundant polymers were polyethylene (PE-26%), polypropylene (PP-11%), polyethylene-terephthalate/polyester (PET/PEST-8%) and

ethylene-vinyl-acetate (EVA-5%). Polychlorinated biphenyls and organochlorine pesticides were detected in all the samples with a high variability among sites and depths. This study adds to the existing information on the distribution of contaminants across the Mediterranean Sea, and is useful to policy makers who wish to implement effective measures to reduce MP pollution.

Luciani, M., et al. (2016). "Rapid detection and isolation of Escherichia coli O104:H4 from milk using monoclonal antibody-coated magnetic beads." Frontiers in Microbiology **7**(June).

Monoclonal antibodies (MAbs) specific for the lipopolysaccharide (LPS) of Escherichia coli O104:H4 were produced by fusion of Sp2/O-Ag-14 mouse myeloma cells with spleen cells of Balb/c mice, immunized with heat-inactivated and sonicated E. coli O104:H4 bacterial cells. Four MAbs specific for the E. coli O104:H4 LPS (1E6 G6, 1F4C9, 3 G6 G7, and 4 G10D2) were characterized and evaluated for the use in a method for the detection of E. coli O104:H4 in milk samples that involves antibody conjugation to magnetic microbeads to reduce time and increase the efficiency of isolation. MAb 1E6 G6 was selected and coupled to microbeads, then used for immuno-magnetic separation (IMS); the efficiency of the IMS method for E. coli O104:H4 isolation from milk was evaluated and compared to that of the EU RL VTEC conventional culture-based isolation procedure. Milk suspensions also containing other pathogenic bacteria that could potentially be found in milk (Campylobacter jejuni, Listeria monocytogenes, and Staphylococcus aureus) were also tested to evaluate the specificity of MAb-coated beads. Beads coated with MAb 1E6 G6 showed a good ability to capture the E. coli O104:H4, even in milk samples contaminated with other bacteria, with a higher number of E. coli O104:H4 CFU reisolated in comparison with the official method (121 and 41 CFU, respectively, at 10³ E. coli O104:H4 initial load; 19 and 6 CFU, respectively, at 10² E. coli O104:H4 initial load; 1 and 0 CFU, respectively, at 10¹ E. coli O104:H4 initial load). The specificity was 100%.

Luck, S., et al. (2016). "Tailored and biodegradable poly(2-oxazoline) microbeads as 3D matrices for stem cell culture in regenerative therapies." Biomaterials **79**: 1-14.

We present the synthesis of hydrogel microbeads based on telechelic poly(2-oxazoline) (POx) crosslinkers and the methacrylate monomers (HEMA, METAC, SPMA) by inverse emulsion polymerization. While in batch experiments only irregular and ill-defined beads were obtained, the preparation in a microfluidic (MF) device resulted in highly defined hydrogel microbeads. Variation of the MF parameters allowed to control the microbead diameter from 50 to 500 mum. Microbead elasticity could be tuned from 2 to 20 kPa by the POx:monomer composition, the POx chain length, net charge of the hydrogel introduced via the monomer as well as by the organic content of the aqueous phase. The proliferations of human mesenchymal stem cells (hMSCs) on the microbeads were studied. While neutral, hydrophilic POx-PHEMA beads were bioinert, excessive colonization of hMSCs on charged POx-PMETAC and POx-PSPMA was observed. The number of proliferated cells scaled roughly linear with the METAC or SPMA comonomer content. Additional collagen I coating further improved the stem cell proliferation. Finally, a first POx-based system for the preparation of biodegradable hydrogel microcarriers is described and evaluated for stem cell culturing.

Luczkowska, K., et al. (2017). "The role of neurotrophins and angiogenic cytokines in the pathophysiology of peripheral neuropathy in patients with multiple myeloma." Haematologica **102 (Supplement 2)**: 773.

Background: The introduction of new treatment modalities have changed significantly the prognosis of multiple myeloma (MM) patients. The novel drugs and schemes of treatment of

MM have contributed to substantial extend of the overall survival time of patients. However, the administration of some of the treatments, e.g. thalidomide or bortezomib, is also associated with occurrence of a serious and common side-effect problem, which is the drug-induced peripheral neuropathy. The mechanism of the development of the peripheral neuropathy is poorly understood. Nevertheless, one of its potential cause, could be inadequate concentrations of crucial trophic factors, including neurotrophic and/or angiogenic factors, which are responsible for proliferation, differentiation, survival and death of neuronal and nonneuronal cells. Aim(s): The aim of this study was to elucidate the potential relationship between concentration of neurotrophic and angiogenic factors and development of peripheral neuropathy in the natural clinical course of the disease and, especially, induced by treatment regimen: VMP (bortezomib, melphalan, prednisone) or VTD (bortezomib, thalidomide,dexamethason) in patients with MM. Method(s): Peripheral blood samples were collected from patients classified into two groups: i) patients with multiple myeloma, without neuropathy and before therapy; and ii) patients with peripheral neuropathy 3oor 4o induced in the course of VMP or VTD therapy. The control group consisted healthy aged matched subjects. Assessment of concentrations of neurotrophins (BDNF, NSE) and angiogenic factor (PDGF) were performed using Luminex technology, which utilize microbeads coated with fluorescently labeled antibodies. Result(s): Concentration of BDNF, PDGF and NSE were significant decreased in patients after treatment regimen involving VMP or VTD who have developed peripheral neuropathy grade 3 or 4, compared with patients with newly diagnosed MM without neuropathy, before therapy and control healthy group. Additionally, plasma levels of both neurotrophins and PDGF in patients before therapy were higher, then in control group. Obtained results may be caused by the changes in an activity of the transcription factor NF-kappaB during the treatment of MM, since reduction of NF-kB concentration is associated with decrease in the transcription of genes encoding BDNF, NSE and PDGF. Summary/Conclusions: Alterations in the concentration of BDNF, PDGF and NSE suggest the cause and effect relationship between these factors and the development of neuropathy in patients with MM. Comprehensive elucidation of this phenomenon may contribute to the extension of the knowledge concerning the pathogenesis of neuropathy, and might well lead to reduction of the incidence of polyneuropathy in MM patients in the future.

Luijsterburg, B. J., et al. (2016). "Solid-state drawing of post-consumer isotactic poly(propylene): Effect of melt filtration and carbon black on structural and mechanical properties." Waste Management **54**: 53-61.

Post-consumer plastic waste obtained via mechanical recycling is usually applied in thick-walled products, because of the low mechanical strength due to the presence of contaminants. In fact, sorted post-consumer isotactic poly(propylene) (i-PP) can be considered as a blend of 95% i-PP and 5% poly(ethylene), with traces of poly(ethylene terephthalate) (PET). By applying a treatment such as solid-state drawing (SSD) after melt extrusion, the polymer chains can be oriented in one direction, thereby improving the stiffness and tensile strength. In this research, molecular processes such as crystal break-up and chain orientation of these complex blends were monitored as a function of draw ratio. The melt filter mesh size - used to exclude rigid PET particles - and the addition of carbon black (CB) - often added for coloration in the recycling industry - were varied to investigate their influence on the SSD process. This research shows that despite the blend complexity, the molecular processes during SSD compare to virgin i-PP and that similar draw ratios can be obtained (lambdamax=20), albeit at reduced stiffness and strength as a result of the foreign polymers present in post-consumer i-PP. It is observed that the process stability improves with decreasing mesh size and that higher draw ratios can be obtained. The addition of carbon black, which resides in the dispersed PE phase, also stabilizes the SSD process. Compared to isotropic post-consumer i-PP, the stiffness can be improved by a factor 10 to over 11GPa, while the tensile strength can be improved by a factor 15-385MPa, which is approx. 70% of the maximum tensile strength achieved for virgin i-PP.

Luis, L. G., et al. (2015). "Does the presence of microplastics influence the acute toxicity of chromium(VI) to early juveniles of the common goby (Pomatoschistus microps)? A study with juveniles from two wild estuarine populations." Aquatic Toxicology **164**: 163-174.

Toxicological interactions between microplastics (MP) and other environmental contaminants are of grave concern. Here, the potential influence of MP in the short-term toxicity of chromium to early juveniles of Pomatoschistus microps was investigated. Three null hypotheses were tested: (1) exposure to Cr(VI) concentrations in the low ppm range does not induce toxic effects on juveniles; (2) the presence of microplastics in the water does not influence the acute toxicity of Cr(VI) to juveniles; (3) the environmental conditions of the natural habitat where fish developed do not influence their sensitivity to Cr(VI)-induced acute stress. Fish were collected in the estuaries of Minho (M-est) and Lima (L-est) Rivers (NW Iberian Peninsula) that have several abiotic differences, including in the water and sediment concentrations of various environmental contaminants. After acclimatization to laboratory conditions, two 96 h acute bioassays were carried out with juveniles from both estuaries to: (i) investigate the effects of Cr(VI) alone; (ii) investigate the effects of Cr(VI) in the presence of MP (polyethylene spheres 1-5 micro m O). Cr(VI) alone induced mortality (96 h-LC₅₀s: 14.4-30.5 mg/l) and significantly decreased fish predatory performance (<=74%). Thus, in the range of concentrations tested (5.6-28.4 mg/l) Cr(VI) was found to be toxic to P. microps early juveniles, therefore, we rejected hypothesis 1. Under simultaneous exposure to Cr(VI) and MP, a significant decrease of the predatory performance (<=67%) and a significant inhibition of AChE activity (<=31%) were found. AChE inhibition was not observed in the test with Cr(VI) alone and MP alone caused an AChE inhibition <=21%. Mixture treatments containing Cr(VI) concentration >=3.9 mg/l significantly increased LPO levels in L-est fish, an effect that was not observed under Cr(VI) or MP single exposures. Thus, toxicological interactions between Cr(VI) and MP occurred, therefore, we rejected hypothesis 2. In the presence of MP, the negative effect caused by high concentrations of Cr(VI) on the predatory performance was significantly reduced in L-est fish but not in M-est fish, and Cr(VI) concentrations higher than 3.9 mg/l caused oxidative damage in L-est fish but not in M-est fish. The acclimatization and test conditions were similar for fish from the two estuaries and these ecosystems have environmental differences. Thus, long-term exposure to distinct environmental conditions in the natural habitat during previous developmental phases influenced the sensitivity and responses of juveniles to Cr(VI), therefore, we rejected hypothesis 3. Overall, the results of this study indicate toxicological interactions between MP and Cr(VI) highlighting the importance of further investigating the combined effects of MP and other common contaminants.

Lukic, A., et al. (2006). "Production of interleukin-8 in vitro by mononuclear cells isolated from human periapical lesions." Oral Microbiology & Immunology **21**(5): 296-300.

INTRODUCTION: Interleukin-8 (IL-8) is an important mediator of inflammation. However, little is known about its production in chronic dental periapical lesions and this was the main aim of this work.

METHODS: Inflammatory cells were isolated from clinically different periapical lesions and analyzed by morphological criteria. The mononuclear cells were isolated, phenotypically analyzed by immunocytochemistry and cultivated in vitro. IL-8 was measured in culture supernatants of

these periapical lesion mononuclear cells (PL-MNC) using a microbeads fluorescence assay.
RESULTS: We found a relatively high production of IL-8 in 19 out of 21 periapical lesions included in the study. The level of IL-8 and the proportion of neutrophil granulocytes were significantly higher in the group of symptomatic lesions, compared to the asymptomatic lesions, but there was no statistically significant correlation between these parameters. According to the predominance of CD3(+) T cells and Ig(+)/CD19(+) B cells and plasma cells, lesions were divided into T-type and B-type lesions, respectively. The levels of IL-8 were significantly higher in the culture supernatants of PL-MNC in the T-type lesions and were positively correlated with the proportion of macrophages/dendritic cells (CD11c(+) cells) and CD4(+) T cells. Such a correlation was not shown in B-type lesions.
CONCLUSION: These results suggest that PL-MNC are a significant source of IL-8, which is probably an important chemokine for the migration and function of different cell types at the site of chronic inflammation.

Lum, F., et al. (2017). "Zika virus infects human fetal brain microglia and induces inflammation." Clinical Infectious Diseases **64**(7): 914-920.
Background. The unprecedented reemergence of Zika virus (ZIKV) has startled the world with reports of increased microcephaly in Brazil. ZIKV can infect human neural progenitors and impair brain growth. However, direct evidence of ZIKV infection in human fetal brain tissues remains elusive. Methods. Investigations were performed with brain cell preparations obtained from 9 donors. Virus infectivity was assessed by detection of virus antigen by flow cytometry together with various hematopoietic cell surface markers. Virus replication was determined by viral RNA quantification. Cytokine levels in supernatant obtained from virus-infected fetal brain cells were measured simultaneously in microbead-based immunoassays. Results. We also show that ZIKV infection was particularly evident in hematopoietic cells with microglia, the brain-resident macrophage population being one of the main targets. Infection induces high levels of proinflammatory immune mediators such as interleukin 6 (IL-6), tumor necrosis factor alpha (TNF- alpha), interleukin 1 beta (IL-1 beta), and monocyte chemotactic protein 1 (MCP-1). Conclusions. Our results highlight an important role for microglia and neuroinflammation during congenital ZIKV pathogenesis.

Lum, F. M., et al. (2018). "Longitudinal Study of Cellular and Systemic Cytokine Signatures to Define the Dynamics of a Balanced Immune Environment During Disease Manifestation in Zika Virus-Infected Patients." Journal of Infectious Diseases **218**(5): 814-824.
Background: Since its unexpected reemergence, Zika virus (ZIKV) has caused numerous outbreaks globally. This study characterized the host immune responses during ZIKV infection.
Methods: Patient samples were collected longitudinally during the acute, convalescence and recovery phases of ZIKV infection over 6 months during the Singapore outbreak in late 2016. Plasma immune mediators were profiled via multiplex microbead assay, while changes in blood cell numbers were determined with immunophenotyping.
Results: Data showed the involvement of various immune mediators during acute ZIKV infection accompanied by a general reduction in blood cell numbers for all immune subsets except CD14+ monocytes. Importantly, viremic patients experiencing moderate symptoms had significantly higher quantities of interferon gamma-induced protein 10, monocyte chemotactic protein 1, interleukin 1 receptor antagonist, interleukin 8, and placental growth factor 1, accompanied by reduced numbers of peripheral CD8+ T cells, CD4+ T cells, and double-negative T cells. Levels of T-cell associated mediators, including interferon gamma-induced protein 10, interferon gamma, and interleukin 10, were high in recovery phases of ZIKV infection, suggesting a functional role

for T cells. The identification of different markers at specific disease phases emphasizes the dynamics of a balanced cytokine environment in disease progression.

Conclusions: This is the first comprehensive study that highlights specific cellular changes and immune signatures during ZIKV disease progression, and it provides valuable insights into ZIKV immunopathogenesis.

Lumachi, F., et al. (2017). "Predictive markers of survival in patients with pulmonary metastases and malignant pleural effusion." Annals of Oncology **28 (Supplement 2)**: iii53-iii54.

Background: Lung metastases (LMs) can be identified in up to 30-50% of all cancer patients and represent the result of metastatic spread to the lungs from the several cancers. The presence of LMs seriously affects overall survival (OS), and the onset of pleural effusion further reduces the life expectancy of the patients. The aim of this retrospective study was to evaluate the usefulness of carcinoembryonic antigen (CEA), lactate dehydrogenase (LDH), and C-reactive protein (CRP) measurement in the pleural fluid of patients with LMs and malignant pleural effusion (MPE). Method(s): The medical records of 22 patients (median age 68 years, range 46-86) with LMs (mainly from breast, urinary tract, and colorectal cancers) and MPE were analyzed. There were 13 (59.1%) males and 9 (40.9%) females. All patients underwent video-assisted thoracoscopic (VAT)-assisted thoracentesis and subsequent pleural fluid examination, including CEA, LDH, and CRP, which were measured using a chemiluminescent (CLIA) immunoassay (sandwich CLIA with native CEA coated to magnetic microbeads), a spectrophotometric assay (L-lactate as substrate), and an immunonephelometric assay (polystyrene particles coated with anti-human CRP monoclonal antibodies), respectively. Result(s): The OS was 6.765.2 months (range 1-23 months), and the levels of pleural markers were 10.4621.6 ng/mL (CEA), 418.46342.9 U/L (LDH), and 6.269.1 mg/L (CRP). No relationship was found between OS and the age of the patients (R=0.14 p=0.542), LDH (R=-0.31, p=0.169) or CRP (R=-0.33, p=0.136). There was a significant direct correlation between OS and CEA (R=0.66, p=0.0007). The relative regression line equations are reported in the table. Conclusion(s): In patients with MPE and LMs, only CEA pleural levels significantly related to OS, and can be considered a useful predictive factor. Further studies will eventually confirm our results.

Luna-Jorquera, G., et al. (2019). "Marine protected areas invaded by floating anthropogenic litter: An example from the South Pacific." Aquatic Conservation **29**: 245-259.

Oceanic marine protected areas (MPAs) that are close to the litter accumulation zones in the subtropical gyres receive large amounts of plastic litter, both as micro- and as macroplastics.The macro-litter accumulating on the islands in the Easter Island Ecoregion (Rapa Nui and Salas y Gómez) can be traced back to the high seas industrial fishery operating in the South Pacific.Seabirds nesting in the MPAs in the South Pacific are affected by both microplastic ingestion and macroplastic in their nests, but there was no evidence of entangled birds.Conservation of seabirds (and other species) in these oceanic MPAs requires efficient measures to reduce plastic contamination in the ocean.Observations made in the South Pacific coincide with those from other oceanic MPAs, calling for global actions. [ABSTRACT FROM AUTHOR]

Lund, A. W. (2009). The three-dimensional microenvironment as a regulatory cue during mesenchymal stem cell osteogenic differentiation.

The bidirectional interaction between cells and their surrounding matrix provides structural and organizational cues for tissue development. It is this intimate interaction that is required for the appropriate and controlled functioning of stem cells within both natural and engineered three dimensional (3D) environments. Elucidation of the mechanisms that govern this interaction are required to guide the induction and maintenance of specific stem cell differentiation in engineered tissues. 3D culture facilitates external mechanical cues, solute concentration gradients and cell-mediated remodeling of the extracellular matrix (ECM) that are required to form many physiologic structures. This work demonstrates that mesenchymal stem cell (MSC) osteogenic differentiation potential is enhanced in 3D type I collagen hydrogel culture as a result of an increase in expression and localization of the discoidin domain receptor 1 (DDR1) that suppresses ERK phosphorylation and enhances type I collagen remodeling. Knockdown of DDR1 results in the reversion of stem cells from a physiologic 3D morphology to a two dimensional (2D) one, thereby inhibiting their ability to upregulate their osteogenic potential in response to the 3D environment. Given its inductive role in MSC differentiation, the ECM can be applied as an instructive cue for differentiating stem cells to promote their ability to regenerate tissue in vivo. To demonstrate this application we created defined protein microenvironments using a microbead encapsulation procedure. MSC encapsulated within these environments exhibited osteogenic potential both in vitro and in vivo and presents a way to engineer the local microenvironment of the stem cell niche for specific lineage commitment. External remodeling and internal signaling, therefore, couple to promote 'tissue' morphogenesis by generating crosstalk between signaling pathways that are geometrically separate in 2D. MSC use DDR1 to sense the three dimensionality of their microenvironment; and changes in cell shape that result from these dynamic matrix adhesions allow cells to integrate their signals in response to local changes in the ECM. MSC responding to injury and the disorganized matrix that they encounter within the wound site must interact through an iterative feedback loop to robustly regenerate mature tissue structure and function. Engineering of MSC function will consequently require continued elucidation of biological mechanisms and novel biomaterial development to define local, 3D microenvironments that replicate the control present in native tissue.

Luo, H., et al. (2019). "Effects of accelerated aging on characteristics, leaching, and toxicity of commercial lead chromate pigmented microplastics." Environmental Pollution: 113475.

It is of environmental significance to study the leaching performance of additives from microplastics (MPs) and further evaluate the toxicity of leachate to microalgae. Here, we investigated the effects of accelerated aging on characteristics, leaching, and toxicity of commercial lead chromate pigmented MPs.

Luo, H., et al. (2019). "Leaching behavior of fluorescent additives from microplastics and the toxicity of leachate to Chlorella vulgaris." Science of the Total Environment **678**: 1-9.

Chemical additives leaching from microplastics and their effects on physiology of microalgae are of environmental significance. So far, these issues remain unclear. Here, the leaching behavior of fluorescent additives from polyurethane sponge microplastics in simulated (acidic, saline, and basic water) and natural waters (river, lake, wetland, and sea water) was investigated. Release amount of additives increased with increasing solution pH and leaching time. The maximum release amount was reached at the leaching time of 12-24h and the 3,3'-diaminobenzidine-like substances were identified in the leachate. The leached concentrations of fluorescent additives

in simulated and natural waters followed the order of basic water>saline water>seawater>West Lake>River>Wetland. Effects of leachate and microplastics on growth and photosynthesis of Chlorella vulgaris were further evaluated. The maximum quantum efficiency of photosystem II (F_v/F_m) decreased with increasing leachate concentrations. Only high content (1.6gL⁻¹) of microplastics exerted significant inhibitory influence on cell photosynthesis when microalgae were exposed to microplastics alone. Retention of algal cells inside the porous sponge microplastics did not change their photosynthetic efficiency. These findings indicate that leaching process of additives from microplastics depends mainly on water environments and the leached chemicals may pose ecological risks to aquatic organisms.

Luo, T., et al. (2019). "Maternal Polystyrene Microplastic Exposure during Gestation and Lactation Altered Metabolic Homeostasis in the Dams and Their F1 and F2 Offspring." Environmental Science & Technology **53**(18): 10978-10992.

Microplastics (MPs) are considered as a pollutant of marine environments and have become a global environmental problem in recent years. A number of studies have demonstrated that MPs can enter the human food chain, and MPs have even been detected in human stools. Therefore, there is increasing concern about the potential risks of MPs to human and animal health. Here, we investigated maternal polystyrene MPs exposure during gestation and lactation and evaluated the potential effects on dams and the F1 (both PND 42 and 280) and F2 (PND 42) generations. The results of transcriptome and 16S rRNA sequencing indicated that MPs caused the metabolic disorder in maternal MPs associated with gut microbiota dysbiosis and gut barrier dysfunction. Simultaneously, maternal MPs exposure also had the intergenerational effects and even caused long-term metabolic consequences in the F1 and F2 generations. In addition, in F1 (PND 42), the composition of gut microbiota did not change significantly, while the hepatic transcriptome and serum metabolite changes showed the potential risk in metabolic disorder. Then, the potential of hepatic lipid accumulation was observed in adult F1 mice (PND 280), especially in the female mice. Our results demonstrated that maternal MPs exposure during gestation and lactation increases the risk of metabolic disorder, and these results provide new insight into the potential long-term hazards of MPs.

Luo, T., et al. (2019). "Maternal exposure to different sizes of polystyrene microplastics during gestation causes metabolic disorders in their offspring." Environmental Pollution **255**(Pt 1): 113122.

Microplastics (MPs) are highly concerned environmental pollutants that are ubiquitous in the environmental and might affect human and animal health. In this study, we exposed pregnant mice to 0.5 and 5mum with 100 and 1000 mug/L polystyrene MPs, then investigated maternal MPs exposure during gestation and evaluated the potential effects on the mice offspring (PND42). In the F1 offspring, the serum triglyceride (TG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) levels and hepatic TC, TG levels were altered, while some of them were only significant in 5mum MPs-treated group. Various serum metabolites including amino acids and acyl-carnitines were carried out by nonderivatized tandem mass spectrometry, there were 11 and 15 kinds of metabolites changes significantly in 0.5 and 5 mum MPs-treated groups, respectively. Furthermore, the changes of C0 and C0/(C16 + 18) indicators suggested the potential risk of fatty acid metabolism disorder, which was verified by hepatic genes expression. These results indicated that maternal exposure of two different sizes of polystyrene MPs increased risks of metabolic disorder in their offspring, and greater effects were observed in 5 mum MPs-treated groups. The data provides a preliminary exploration of the potential relationship between MPs and the risk metabolic disorder even in the next generation, which might offer new insights into the health risk assessment of MPs.

Luo, W., et al. (2018). "miR-27a is highly expressed in H1650 cancer stem cells and regulates proliferation, migration, and invasion." Journal of Cancer Research & Therapeutics **14**(Supplement): S1004-S1011.

Background: Cancer stem cells (CSCs) are responsible for tumor relapse after chemotherapy and radiotherapy in non-small cell lung cancer (NSCLC). The aim of this study is to explore the profile and role of microRNA (miRNA) in CSC of NSCLC.

Materials and Methods: We studied the expression of stem cell marker in side population cells and serum-free cultured spheres of NSCLC. We identified that CD133⁺ CD34⁻ cells are NSCLC stem cell. We isolated CD133⁺ CD34⁻ cells and CD133⁻ CD34⁺ cells with MicroBead Kit. We verified that H1650 CD133⁺ CD34⁻ cells have CSC characteristics with doxorubicin, radiation, and xenograft. We studied miRNA expression profile in H1650 and HCC827 CD133⁺ CD34⁻ cells with microarray analysis. We detected proliferation, migration, and invasion with 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide assay, scratch test, and Transwell chamber invasion assay, respectively.

Results: CD133 and CD34 are CSC markers in H1650. We demonstrated that H1650 CD133⁺ CD34⁻ cells have CSC characteristics and found that miR-27a was highly expressed in H1650 CD133⁺ CD34⁻ cells. In addition, we showed that miR-27a regulates proliferation, migration, and invasion in H1650 cell line and demonstrated that miR-27a expression was positively related to epidermal growth factor receptor in NSCLC cell lines.

Conclusions: CD133⁺ CD34⁻ is a CSC marker in H1650. miR-27a is highly expressed in H1650 CSCs and regulates cancer development in H1650. miR-27a may be a potential target for NSCLC therapy.

Luo, Y., et al. (2014). "IL-37, an inhibitor of innate inflammation and adaptive immunity, is elevated in the blood of melanoma patients and is related with poor prognosis." Journal of Investigative Dermatology **1)**: S100.

Developing methodologies to identify biomarkers in easily accessible body fluids is valuable for the early diagnosis and management of cancer patients. Here, using microarray analysis, we identified 6 highly upregulated transcripts in melanoma blood samples compared with healthy blood samples (>5-fold; P<0.01). Of particular interest was IL-37, a member of IL-1 family. IL-37 reduces innate inflammation and adaptive immune responses. We examined IL-37 gene expression of whole blood cells from 14 healthy individuals and 45 melanoma patients (5 from stage I, 8 from stage II, 11 from stage III and 21 from stage IV). While IL-37 expression was very low in healthy individuals, the level was 6.3-fold increased in melanoma patient samples (P<0.001). IL-37 levels among melanoma patients from different stages were overall constant. Fourteen melanoma patients whose blood samples were analyzed for IL-37 levels were clinically followed for up to 22 months. Whereas 100% (5 out of 5) of melanoma patients whose IL-37 expression was high showed disease progression, 66.7% (6 out of 9) of melanoma patients whose IL-37 expression was low remained stable, suggesting that elevated IL-37 levels were related with poor prognosis. To understand cell subsets responsible for the elevated IL-37 in blood, we used microbeads to fractionate blood samples into CD3, CD14, CD15, CD19, CD45 and CD56. IL-37 was almost exclusively expressed in CD45+ cells but undetectable in CD45- cells. Among CD45+ cells, higher levels of IL-37 were detected in CD3+ cells and CD19+ cells in melanoma blood samples, suggesting IL-37-mediated suppression of adaptive immunity in

melanoma patients. In conclusion, IL-37 may not only be a biomarker of melanoma but also serve as a therapeutic target in melanoma.

Luo, Y. D., et al. (2019). "Distribution Characteristics of Microplastics in Qingdao Coastal Beaches. [Chinese]." Huan jing ke xue= Huanjing kexue **40**(6): 2631-2638.

Microplastics (MPs, plastic fibers, debris, or particles that are generally smaller than 5 mm in diameter) can serve as carriers for hazardous substances, which are ingested by organisms in the ocean and can affect their growth and metabolism. Moreover, MPs will spread with ocean currents, and MP pollution has become a global problem. In this study, the MP abundance distribution of four typical beaches near the coast of Qingdao was studied by the combination of ordinary microscope and fluorescence microscope methods. In addition, the distribution of MPs collected from various beaches in different particle size ranges, shapes, and chemical compositions was discussed. Abundances on the sea surface varied between 5.05x103 particles.m-3 and 1.25x104 particles.m-3, and the concentration of MPs in sand varied between 1.91x103 particles.m-2 and 4.35x103 particles.m-2, with no significant differences detected among the four beaches examined. The results show the pervasiveness of MP pollution in coastal environments of Qingdao. The size of particles found in this study ranged from 5 mm to 50 mum, and increases in abundance were detected with the decreasing particle size. Polypropylene (PP), polyethylene (PE), polystyrene (PS), polyethylene terephthalate (PET), polyvinyl chloride (PVC), 96% polystyrene+4% butadiene copolymer (SB), polymethyl acrylate (PMA), and polyamide (PA) were present in seawater in coastal environments of Qingdao, and compared with the seawater samples, no PA or PMA were found in sand. Research results indicated that fiber was dominant in seawater and sand. MPs in the sand were similar to those in seawater in terms of the particle size, shape, and composition, thus indicating that the seawater and sand of the bathing beaches in Qingdao may have the same pollution sources, e. g., the packaging industry, clothing textile industry, and tourism. This paper studies the distribution and sources of MPs in the bathing beaches of Qingdao, and it provides basic data for research and supervision of environmental MP pollution in Chinese coastal zones.

Luo, Y. D., et al. (2019). "[Distribution Characteristics of Microplastics in Qingdao Coastal Beaches]." Huanjing Kexue/Environmental Science **40**(6): 2631-2638.

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present in seawater in coastal environments of Qingdao, and compared with the seawater samples, no PA or PMA were found in sand. Research results indicated that fiber was dominant in seawater and sand. MPs in the sand were similar to those in seawater in terms of the particle size, shape, and composition, thus indicating that the seawater and sand of the bathing beaches in Qingdao may have the same pollution sources, e. g., the packaging industry, clothing textile industry, and tourism. This paper studies the distribution and sources of MPs in the bathing beaches of Qingdao, and it provides basic data for research and supervision of environmental MP pollution in Chinese coastal zones.

Luostarinen, A., et al. (2017). "Low IL-2 concentration favors generation of early memory T cells over terminal effectors during CAR T-cell expansion." Cytotherapy **19 (5 Supplement 1)**: S8.

Adoptive T-cell therapy offers new options for cancer treatment. The therapeutic efficacy of T-cell therapy is linked to the persistence of administrated T cells, which is dependent on T-cell memory. Hence, the need for cells possessing early memory phenotypes in T-cell products is evident. The amount of interleukin-2 (IL-2) supplementation during in vitro expansion affects T-cell proliferation and effector differentiation. Here, we present a simplified and costeffective expansion method for the production of chimeric antigen receptor (CAR) T cells with potentially improved therapeutic capacity. Lymphocytes were transduced with third generation lentiviral vectors encoding CD19-targeted CARs, and expanded using CD3/CD28 microbeads and differing IL-2 concentrations (range from 0 to 300 IU/mL). After expanding the cells for 10 to 20-days, the effects of altering IL-2 levels and duration of expansion on the phenotype and functionality of the T-cell products were assessed. High IL-2 concentrations favored the generation of more differentiated effector T-cell phenotypes and decreased the proportion of early T memory (TM) cells. TM stem cells (TSCM, CD95+CD45RO-CD45RA+CD27+), which represent the most primitive T-cell memory phenotype with possibly the highest potential to provide long-term persistence, were not present in all expansions, but their existence was independent of IL-2 and could be linked to expansion kinetics. All CD19-CAR T-cell products demonstrated in vitro response against CD19+ leukemia cell lines, and the effector function was enhanced when T cells were expanded in high IL-2 concentration. In summary, production of CAR T cells without any cytokine supplementation yielded the highest proportion of early TM cells, provided a tenfold cell expansion, and the cells were functionally potent. The memory T cell composition of T-cell preparations can be adjusted to favor of TM cells by limiting the length of expansion and using a low level of supplemental IL-2 in T-cell expansion. This method yields early memory T cells with potentially improved in vivo effectiveness. These findings are significant for robust and cost-effective T-cell manufacturing.

Luoto, T. P., et al. (2019). "Biogeochemical cycling and ecological thresholds in a High Arctic lake (Svalbard)." Aquatic Sciences **81**(2): 1-16.

Lakes are a dominant feature of the Arctic landscape and a focal point of regional and global biogeochemical cycling. We collected a sediment core from a High Arctic Lake in southwestern Svalbard for multiproxy paleolimnological analysis. The aim was to find linkages between the terrestrial and aquatic environments in the context of climate change to understand centennial-long Arctic biogeochemical cycling and environmental dynamics. Two significant thresholds in elemental cycling were found based on sediment physical and biogeochemical proxies that were associated with the end of the cold Little Ice Age and the recent warming. We found major shifts in diatom, chironomid and cladoceran communities and their functionality that coincided with increased summer temperatures since the 1950s. We also discovered paleoecological evidence that point toward expanded bird (Little Auk) colonies in the catchment alongside climate warming. Apparently, climate-driven increase in glacier melt water delivery as well as a prolonged snow- and ice-free period have increased the transport of mineral matter from the catchment, causing significant water turbidity and disappearance of several planktonic diatoms and clear-water chironomids. We also found sedimentary accumulation of microplastic particles following the increase in Little Auk populations suggesting that seabirds potentially act as biovectors for plastic contamination. Our study demonstrates the diverse nature of climate-driven changes in the Arctic lacustrine environment with increased inorganic input from the more exposed catchment, larger nutrient delivery from the increased bird colonies at the surrounding mountain summits and subsequent alterations in aquatic communities.

Lupo, B., et al. (2014). "Preparation of alginate microspheres by emulsification/internal gelation to encapsulate cocoa polyphenols." Food Hydrocolloids **38**: 56-65.

Encapsulation of cocoa extract was performed by emulsification/internal gelation in alginate microspheres. A suitable gelling was determined with a minimum of 1.8x10⁻⁴ mol of Ca⁺²/g alginate. The pH influence in alginate gels showed similar viscoelastic properties in the range of pH 3.5-10. Citrate and carbonate salts were uses as calcium sources, obtaining smaller spheres with citrate source. Moreover, SEM of microbeads made with citrate show uniform surface while the carbonate ones seem rough. Emulsions were formulated with several concentrations of Span 80, Span 85, Span 80-Tween 80 and polyglycerol polyricinoleate (PGPR). The most stable, also with the smallest microspheres were that prepared with PGPR. A shrinkage gelation factor of 0.8 was observed between drop size of emulsions and blank microspheres obtained, maintaining the shape and size distribution. When cocoa extract was encapsulated in microspheres, around 60% of retention was easily reached. The Peppas-Sahlin model fitted polyphenols release from microbeads, suggesting the existence of a relaxation/dissolution mechanism. The obtained cocoa microbeads could increase the daily intake of antioxidants when implemented in a food product.

Lusher, A. L., et al. (2018). "Incidence of marine debris in cetaceans stranded and bycaught in Ireland: recent findings and a review of historical knowledge." Environmental Pollution **232**: 467-476.

Interactions between marine mammals and plastic debris have been the focus of studies for many years. Examples of interactions include entanglement in discarded fishing items or the presence of ingested debris in digestive tracts. Plastics, including microplastics, are a form of marine debris globally distributed in coastal areas, oceanic waters and deep seas. Cetaceans which strand along the coast present a unique opportunity to study interactions between animals with macro- and microplastics. A combination of novel techniques and a review of historical data was used to complete an extensive study of cetaceans interacting with marine debris within Irish waters. Of the 25 species of marine mammals reported in Irish waters, at least 19 species were reported stranded between 1990 and 2015 (n=2934). Two hundred and forty-one of the stranded cetaceans presented signs of possible entanglement or interactions with fisheries. Of this number, 52.7% were positively identified as bycatch or as entangled in fisheries items, 26.6% were classified as mutilated and 20.7% could not be related to fisheries but showed signs of entanglement. In addition, 274 cetaceans were recorded as by-catch during observer programmes targeting albacore tuna. Post-mortem examinations were carried out on a total of 528 stranded and bycaught individuals and 45 (8.5%) had marine debris in their digestive tracts: 21 contained macrodebris, 21 contained microdebris and three had both macro- and microdebris. Forty percent of the ingested debris were fisheries related items. All 21 individuals investigated with the novel method for microplastics contained microplastics, composed of fibres (83.6%) and fragments (16.4%). Deep diving species presented more incidences of

macrodebris ingestion but it was not possible to investigate this relationship to ecological habitat. More research on the plastic implications to higher trophic level organisms is required to understand the effects of these pollutants.

Lusher, A. L., et al. (2015). "Microplastic and macroplastic ingestion by a deep diving, oceanic cetacean: the True's beaked whale Mesoplodon mirus." Environmental Pollution **199**: 185-191.
When mammals strand, they present a unique opportunity to obtain insights into their ecology. In May 2013, three True's beaked whales (two adult females and a female calf) stranded on the north and west coasts of Ireland and the contents of their stomachs and intestines were analysed for anthropogenic debris. A method for identifying microplastics ingested by larger marine organisms was developed. Microplastics were identified throughout the digestive tract of the single whale that was examined for the presence of microplastics. The two adult females had macroplastic items in their stomachs. Food remains recovered from the adult whales consisted of mesopelagic fish (Benthosema glaciale, Nansenia spp., Chauliodius sloani) and cephalopods, although trophic transfer has been discussed, it was not possible to ascertain whether prey were the source of microplastics. This is the first study to directly identify microplastics <5 mm in a cetacean species.

Lusher, A. L., et al. (2013). "Occurrence of microplastics in the gastrointestinal tract of pelagic and demersal fish from the English Channel." Marine Pollution Bulletin **67**(1-2): 94-99.
Microplastics are present in marine habitats worldwide and laboratory studies show this material can be ingested, yet data on abundance in natural populations is limited. This study documents microplastics in 10 species of fish from the English Channel. 504 Fish were examined and plastics found in the gastrointestinal tracts of 36.5%. All five pelagic species and all five demersal species had ingested plastic. Of the 184 fish that had ingested plastic the average number of pieces per fish was 1.90. +/-. 0.10. A total of 351 pieces of plastic were identified using FT-IR Spectroscopy; polyamide (35.6%) and the semi-synthetic cellulosic material, rayon (57.8%) were most common. There was no significant difference between the abundance of plastic ingested by pelagic and demersal fish. Hence, microplastic ingestion appears to be common, in relatively small quantities, across a range of fish species irrespective of feeding habitat. Further work is needed to establish the potential consequences. © 2012 Elsevier Ltd.

Lusher, A. L., et al. (2016). "Microplastic interactions with North Atlantic mesopelagic fish." ICES Journal of Marine Science **73**(4): 1214-1225.
Microplastics in the marine environment are well documented, and interactions with marine biota have been described worldwide. However, interactions with vertically migrating fish are poorly understood. The diel vertical migration of mesopelagic fish represents one, if not the largest, vertical migration of biomass on the planet, and is thus an important link between the euphotic zone, transporting carbon and other nutrients to global deep sea communities. Knowledge of how mesopelagic fish interact and distribute plastic as a marine contaminant is required as these populations have been identified as a potential global industrial fishery for fishmeal production. Ingestion of microplastic by mesopelagic fish in the Northeast Atlantic was studied. Approximately 11% of the 761 fish examined had microplastics present in their digestive tracts. No clear difference in ingestion frequency was identified between species, location, migration behaviour, or time of capture. While ingesting microplastic may not negatively impact individual mesopelagic fish, the movement of mesopelagic fish from the euphotic zone to deeper waters could mediate transfer of microplastics to otherwise unexposed species and regions of the world's oceans.

Lusher, A. L., et al. (2017). "Sampling, isolating and identifying microplastics ingested by fish and invertebrates." Analytical Methods **9**(9): 1346-1360.

Microplastic debris (5 mm) is a prolific environmental pollutant, found worldwide in marine, freshwater and terrestrial ecosystems. Interactions between biota and microplastics are prevalent, and there is growing evidence that microplastics can incite significant health effects in exposed organisms. To date, the methods used to quantify such interactions have varied greatly between studies. Here, we critically review methods for sampling, isolating and identifying microplastics ingested by environmentally and laboratory exposed fish and invertebrates. We aim to draw attention to the strengths and weaknesses of the suite of published microplastic extraction and enumeration techniques. Firstly, we highlight the risk of microplastic losses and accumulation during biotic sampling and storage, and suggest protocols for mitigating contamination in the field and laboratory. We evaluate a suite of methods for extracting microplastics ingested by biota, including dissection, depuration, digestion and density separation. Lastly, we consider the applicability of visual identification and chemical analyses in categorising microplastics. We discuss the urgent need for the standardisation of protocols to promote consistency in data collection and analysis. Harmonized methods will allow for more accurate assessment of the impacts and risks microplastics pose to biota and increase comparability between studies. 2017 The Royal Society of Chemistry.

Luz, M. R., et al. (2014). "Abiotic and Biotic Degradation of Oxo-Biodegradable Plastic Bags by Pleurotus ostreatus: e107438." PLoS ONE **9**(11).

In this study, we evaluated the growth of Pleurotus ostreatus PLO6 using oxo-biodegradable plastics as a carbon and energy source. Oxo-biodegradable polymers contain pro-oxidants that accelerate their physical and biological degradation. These polymers were developed to decrease the accumulation of plastic waste in landfills. To study the degradation of the plastic polymers, oxo-biodegradable plastic bags were exposed to sunlight for up to 120 days, and fragments of these bags were used as substrates for P. ostreatus. We observed that physical treatment alone was not sufficient to initiate degradation. Instead, mechanical modifications and reduced titanium oxide (TiO_2) concentrations caused by sunlight exposure triggered microbial degradation. The low specificity of lignocellulolytic enzymes and presence of endomycotic nitrogen-fixing microorganisms were also contributing factors in this process.

Luz, M. R., et al. (2013). "Degradation of Oxo-Biodegradable Plastic by Pleurotus ostreatus. e69386." PLoS ONE **8**(8).

Growing concerns regarding the impact of the accumulation of plastic waste over several decades on the environmental have led to the development of biodegradable plastic. These plastics can be degraded by microorganisms and absorbed by the environment and are therefore gaining public support as a possible alternative to petroleum-derived plastics. Among the developed biodegradable plastics, oxo-biodegradable polymers have been used to produce plastic bags. Exposure of this waste plastic to ultraviolet light (UV) or heat can lead to breakage of the polymer chains in the plastic, and the resulting compounds are easily degraded by microorganisms. However, few studies have characterized the microbial degradation of oxo-biodegradable plastics. In this study, we tested the capability of Pleurotus ostreatus to degrade oxo-biodegradable (D2W) plastic without prior physical treatment, such as exposure to UV or thermal heating. After 45 d of incubation in substrate-containing plastic bags, the oxo-biodegradable plastic, which is commonly used in supermarkets, developed cracks and small holes in the plastic surface as a result of the formation of hydroxyl groups and carbon-oxygen bonds. These alterations may be due to laccase activity. Furthermore, we observed the degradation of the dye found in these bags as well as mushroom formation. Thus, P. ostreatus degrades oxo-biodegradable plastics and produces mushrooms using this plastic as substrate.

Lv, L., et al. (2019). "A simple method for detecting and quantifying microplastics utilizing fluorescent dyes - safranine T, fluorescein isophosphate, Nile red based on thermal expansion and contraction property." Environmental Pollution **255**(Part 2).

Microplastics (particle size <5 mm) are an emerging contaminant for aquatic environmental, which have attracted increasing attention in worldwide range. In this study, an improved fluorescent staining method for detection and quantification of microplastics was developed based on thermal expansion and contraction. This method is effective in detection of polyethylene, polystyrene, polyvinyl chloride and polyethylene terephthalate plastic particles. In order to avoid error statistics caused by pretreatment, various characterizations of microplastics were measured after heated, such as microstructure, compositions and thermostability. The results showed that there was no significant damage to microplastics even under heating condition at 75 degrees C for 30 min, and the stained microplastics had strong stability for up to two months. Moreover, this method has been successfully applied to the quantification of microplastics in biological samples and result showed there were about 54 particles g⁻¹ (dry weight) microplastics in the Sipunculus nudus. This new method provides a reliable method for quantitative analysis of microplastics in environment and biological tissue.

Lv, S., et al. (2018). "Physicochemical evolutions of starch/poly (lactic acid) composite biodegraded in real soil." Journal of Environmental Management **228**: 223-231.

Plastic pollution is a major environmental problem and the waste disposal is a challenge in this case. Poly (lactic acid) (PLA) based biodegradable materials is one of the most attractive polymers which can fulfill the current demand. In this work, the degradation of starch/PLA composite was investigated in real soil environment. The weight loss results demonstrated that the degradation rate of PLA could be accelerated by starch. Scanning electrical microscopy (SEM) and Fourier transform infrared (FTIR) results showed that the samples degraded faster with the presence of starch. The mechanical strengths had an abrupt decrease for the starch/PLA composite while that of PLA only decreased in a low degree. The distribution of carboxyl group intensity and carbon atomic percent reflected the heterogeneity of biodegradation for starch/PLA composite in soil. Moreover, the variation of internal carbon atomic percent was higher than that on the surface, demonstrating that the degradation of starch/PLA composite was bulk degradation. Based on the role of starch played in starch/PLA composite and the physicochemical performance evolutions during biodegradation, it should create a scientific basis for people interested in studying the biodegradation of PLA, and provide some knowledge about controlling the biodegradation rate of PLA through adjusting the content of starch in the composite.

Lv, W., et al. (2019). "Microplastic pollution in rice-fish co-culture system: a report of three farmland stations in Shanghai, China." Science of the Total Environment **652**: 1209-1218.

Microplastics are emerging contaminants of increasing concern. Despite the occurrence of microplastics in farmland soils, the knowledge on microplastics in rice-fish co-culture ecosystems is limited. In this study, we investigated the distribution of microplastics in three rice-fish culture stations in Shanghai. During non-rice and rice-planting periods, microplastics in water, soils and aquatic animals (eel, loach and crayfish) were systematically assayed using

methods of NaCl density extraction, H₂O₂ digestion and micro-Fourier transform infrared spectroscopy. Results showed that average microplastic abundances were 0.4+or-0.1 items L⁻¹, 10.3+or-2.2 items kg⁻¹, 1.7+or-0.5 items individual⁻¹ in water, soils and aquatic animal samples, respectively. We found an increasing trend in microplastic abundances in water, soil and animal samples from non-rice period to rice-planting period. Almost all of microplastics were found in digestive tracts of animals. Major microplastics were small (<1 mm) polyethylene and polypropylene fibers, with color of white and translucent. Size, shape, color and polymer type distributions of microplastics were similarly found in environmental and animal samples. Moreover, microplastic abundances in aquatic animals correlated to abundance in farmland soils. This study, for the first time, reveals the occurrence and characteristics of microplastic pollution in rice-fish culture ecosystem which suggests the potential ecological risks of microplastics in the agroecosystem.

Lwanga, E. H., et al. (2017). "Incorporation of microplastics from litter into burrows of Lumbricus terrestris." Environmental Pollution **220**(Part A): 523-531.

Pollution caused by plastic debris is an urgent environmental problem. Here, we assessed the effects of microplastics in the soil surface litter on the formation and characterization of burrows built by the anecic earthworm Lumbricus terrestris in soil and quantified the amount of microplastics that was transported and deposited in L. terrestris burrows. Worms were exposed to soil surface litter treatments containing microplastics (Low Density Polyethylene) for 2 weeks at concentrations of 0%, 7%, 28%, 45% and 60%. The latter representing environmentally realistic concentrations found in hot spot soil locations. There were significantly more burrows found when soil was exposed to the surface treatment composed of 7% microplastics than in all other treatments. The highest amount of organic matter in the walls of the burrows was observed after using the treatments containing 28 and 45% microplastics. The highest microplastic bioturbation efficiency ratio (total microplastics (mg) in burrow walls/initial total surface litter microplastics (mg)) was found using the concentration of 7% microplastics, where L. terrestris introduced 73.5% of the surface microplastics into the burrow walls. The highest burrow wall microplastic content per unit weight of soil (11.8+or-4.8 g kg⁻¹) was found using a concentration of 60% microplastics. L. terrestris was responsible for size-selective downward transport when exposed to concentrations of 7, 28 and 45% microplastics in the surface litter, as the fraction <=50 micro m microplastics in burrow walls increased by 65% compared to this fraction in the original surface litter plastic. We conclude that the high biogenic incorporation rate of the small-fraction microplastics from surface litter into burrow walls causes a risk of leaching through preferential flow into groundwater bodies. Furthermore, this leaching may have implications for the subsequent availability of microplastics to terrestrial organisms or for the transport of plastic-associated organic contaminants in soil.

Lwanga, E. H., et al. (2018). "Decay of low-density polyethylene by bacteria extracted from earthworm's guts: a potential for soil restoration." Science of the Total Environment **624**: 753-757.

Low-density polyethylene (LDPE) is the most abundant source of microplastic pollution worldwide. A recent study found that LDPE decay was increased and the size of the plastic was decreased after passing through the gut of the earthworm Lumbricus terrestris (Oligochaeta). Here, we investigated the involvement of earthworm gut bacteria in the microplastic decay. The bacteria isolated from the earthworm's gut were Gram-positive, belonging to phylum Actinobacteria and Firmicutes. These bacteria were used in a short-term microcosm experiment performed with gamma-sterilized soil with or without LDPE microplastics (MP). We observed that the LDPE-MP particle size was significantly reduced in the presence of bacteria. In addition,

the volatile profiles of the treatments were compared and clear differences were detected. Several volatile compounds such as octadecane, eicosane, docosane and tricosane were measured only in the treatments containing both bacteria and LDPE-MP, indicating that these long-chain alkanes are byproducts of bacterial LDPE-MP decay.

Lyons, B. P., et al. (2020). "Marine plastic litter in the ROPME Sea Area: Current knowledge and recommendations." Ecotoxicology & Environmental Safety **187**: N.PAG-N.PAG.
The impact of marine litter, particularly plastic waste, is widely acknowledged as a growing global concern. Marine litter is an understudied issue in the Regional Organisation for Protection of the Marine Environment (ROPME) Sea Area where rapid economic growth has already placed considerable stress on infrastructure and coastal ecosystems. This paper outlines some of the drivers for waste generation in region and reviews the available literature to summarise the current state of knowledge on the environmental fate, behaviour and impact of marine litter within the ROPME Sea Area. While data is limited, those studies conducted demonstrate marine litter is posing a clear and growing threat to the environmental and socioeconomic prosperity of the ROPME Sea Area. The development of regional and national marine litter reduction plans are clearly a priority to focus and coordinate activity across multiple stakeholders. Discussion of the potential environmental impacts arising as a result of marine litter are presented together with a roadmap for establishing and implementing a ROPME Sea Area Marine Litter and Single-Use Plastic Action Plan. • Marine litter is understudied across the Regional Organisation for Protection of the Marine Environment (ROPME) Sea Area. • Economic growth and poor waste management in region has led to an increase in marine litter, particularly plastic based. • Small, but growing body of scientific literature now showing widespread plastic contamination of the ROPME Sea Area. • A roadmap for establishing and implementing a ROPME Sea Area Marine Litter and Single-Use Plastic Action Plan is presented. [ABSTRACT FROM AUTHOR]

Lyu, R., et al. (2015). "Leaching characteristics and groundwater health risk assessment of PBDEs from consumer plastic product waste." Environmental Chemistry - Huanjing Huaxue **34**(1): 37-43.
Leaching characteristics of PBDEs from some consumer plastic product waste and health risk were investigated in a typical disposal scenario. The results showed that after reaching the equilibrium, the concentrations of the capital sigma sub(21), PBDEs leached from the crushed plastic waste were 20.00 mu g times kg super(-1), 63.65 mu g times kg super(-1), 125.60 mu g times kg super(-1) in solutions of sulfuric acid/ nitric acid, acetic acid and humic acid respectively, and BDE209 was the dominant congener. The dissolution rate of the capital sigma sub(21), PBDEs in waste landfill site was higher than those in stockpiling and non-standard landfill site. The highest concentration of the capital sigma sub(21), PBDEs in groundwater 500 meters downstream the landfill was 39.67 mu g times L super(-1). The non-cancer risk from PBDEs was 2.11 x 10 super(-1) when the waste was put into the landfill, while the non-cancer risk from BDE209 was 1.85 x 10 super(-1). The non-cancer risk (hazard index, HI) were below the value accepted from the US EPA (1.0). This consumer plastic product waste could he put into the waste landfill site.

Ma, B., et al. (2019). "Removal characteristics of microplastics by Fe-based coagulants during drinking water treatment." Journal of Environmental Sciences (China) **78**: 267-275.

Microplastics have caused great concern worldwide recently due to their ubiquitous presence within the marine environment. Up to now, most attention has been paid to their sources, distributions, measurement methods, and especially their eco-toxicological effects. With microplastics being increasingly detected in freshwater, it is urgently necessary to evaluate their behaviors during coagulation and ultrafiltration (UF) processes. Herein, the removal behavior of polyethylene (PE), which is easily suspended in water and is the main component of microplastics, was investigated with commonly used Fe-based salts.

Ma, B., et al. (2019). "Characteristics of microplastic removal via coagulation and ultrafiltration during drinking water treatment." Chemical Engineering Journal **359**: 159-167.

Microplastics have garnered much attention worldwide as a new emerging pollutant, especially because of their eco-toxicological effects in marine environments. As they are gradually detected in freshwaters, understanding how microplastics, with their small particle size and low density, will behave during current drinking water treatment processes is urgently needed. In this study, Al- and Fe-based salts were used in the presence of polyethylene (PE), which is suspended/floats easily in water and is the main constituent of microplastics. Results showed that Al-based salts performed better in PE removal efficiency than Fe-based salts. The smaller the PE particle size, the higher the removal efficiency. However, a low removal efficiency was observed, even with a high Al-based salt dosage of 15 mM (below 40%). Additionally, water conditions, such as ionic strength, turbidity level, barely influenced the removal efficiency. In comparison to pH, polyacrylamide (PAM) addition played an important role in removing PE; especially anionic PAM addition, because of the positively charged Al-based flocs it generates under neutral conditions. For ultrafiltration, although PE particles can be completely rejected, slight membrane fouling was induced after coagulation with conventional Al-based salts. With increasing dosage, membrane fouling was gradually aggravated owing to the thick cake layer formed. However, the larger the PE particles, the greater the roughness of the Al-based floc cake layer, leading to less severe membrane fouling. Based on this investigation, the microplastic removal behaviors exhibited during coagulation and ultrafiltration processes have potential application in drinking water treatment.

Ma, D., et al. (2018). "Quantitative detection of exosomal microRNA extracted from human blood based on surface-enhanced Raman scattering." Biosensors & Bioelectronics **101**: 167-173.

Since the nature of the exosomal lipid bilayer can allow miRNAs to be protected from degradation by cellular RNAses in body fluids, exosomal microRNA (miRNA) has become an ideal source of non-invasive biomarkers for the early diagnosis and prognosis. In this paper, a new surface-enhanced Raman scattering (SERS) analysis strategy combining stable SERS reporter element and duplex-specific nuclease (DSN)-assisted signal amplification for quantitative detection of exosomal miRNA extracted from human blood is proposed. Firstly, we prepared SERS signal reporter of Au@R6G@AgAu nanoparticles (R6G attachment on the gold nanoparticles, then encapsulated in AgAu alloy shell nanoparticles named as ARANPs) with an inter small nanogap to generate stable SERS signal. Then, ARANPs and separating substrate of silicon microbead (SiMB) were then covalently attached to the 3'- and 5'- end of capture probe (CP) targeting exosomal miRNA. Upon target miRNA binding, DNA in heteroduplexes could be specifically cleaved by DSN and resulted in the release of ARANPs from the surface of SiMB. Meanwhile, target miRNA remained intact and subsequently involved in the next round of target-recycling amplification. The combination of stable SERS intensity and signal amplification

significantly improved the sensitivity of the sensing systems, resulting in detection limits of 5 fM. More importantly, this method also could be used for the detection of exosomal miRNAs extracted from the blood collected from patients of recurrence in non-small-cell lung cancer (NSCLC), with a detection of 5.0muL of sample volume, which has potential for point-of-care testing (POCT) in clinical analysis.

Ma, J., et al. (2020). "Do combined nanoscale polystyrene and tetracycline impact on the incidence of resistance genes and microbial community disturbance in Enchytraeus crypticus?" Journal of Hazardous Materials **387**: 122012.

It has been proved that nanoplastics can effectively adsorb pollutants and thus influence their behavior and availability. The combined toxic effects of nanoplastic and its adsorbed pollutant on the soil fauna are still not well known. We used high-throughput quantitative PCR to explore the effects of oral nanoscale polystyrene and tetracycline exposure on antibiotic resistance genes in the soil invertebrate Enchytraeus crypticus, and used bacterial 16S rRNA gene amplification sequencing to examine the response of the microbiome of E. crypticus. After 14 days of tetracycline and nanoscale polystyrene exposure, we terminated exposure and monitored the restoration of ARGs and microbiome in the E. crypticus.

Ma, J., et al. (2019). "Effect of microplastic size on the adsorption behavior and mechanism of triclosan on polyvinyl chloride." Environmental Pollution **Part B. 254 (no pagination)**(113104).

Microplastics in water environment and its ability to load various environmental pollutants have attracted wide attention in recent years. However, effect of microplastic size on the adsorption behavior of environmental pollutants and interaction mechanism has not been thoroughly explored. In this study, triclosan (TCS) was selected as model pollutant, and polyvinyl chloride (PVC) with different particle sizes (small size (<1 mum) is recorded as PVC-S and PVC-L means large particle size of about 74 mum) were used as the typical microplastics, the adsorption behavior of TCS on PVC was investigated by studying kinetics, isotherms, and other influencing factors, such as pH and salinity. The results indicate PVC-S has greater distribution coefficient k<inf>d</inf> values of TCS (1.35 L/g > 1.05 L/g) and stronger adsorption capacity (12.7 mg/g > 8.98 mg/g) compared with PVC-L, which may be due to higher specific surface area, stronger hydrophobicity and relatively small electronegative property of PVC-S. Moreover, the initial pH value and salinity of the solution played crucial role in the adsorption process. The distribution diffusion mechanisms (including liquid-film diffusion and intra-particle diffusion), hydrophobic interaction, electrostatic interaction, halogen bonding, and hydrogen bonding may be the important reasons for adsorption. These findings show that MPs with different particle sizes have vary adsorption behaviors and load capacities for environmental pollutants, which deserve our further concerned. Copyright © 2019 Elsevier Ltd

Ma, X., et al. (2015). "Safety and efficacy of third-party umbilical cord blood-derived regulatory T cells." Xenotransplantation **1)**: S89.

Background: More and more studies have shown the potential clinical application of Treg from umbilical cord blood (UCB) could not only to reduce the risk of acute GvHD after allogeneic transplantation but also to suppress graft rejection after solid organ transplantation and the treatment of autoimmune disease. If Treg from third party UCB would not induce immune response by themselves it would make UCB as an excellent source of regulatory T cells. The goal of our study is to demonstrate the safety and efficacy of third-party, ex-vivo-expanded, UCBderived Treg in cell therapies. Method(s): Treg was isolated from UCB with one step way and the phenotyping was analyzed by flow cytometry (FACS). Fresh isolated Treg was then cultured with CD3/CD28 microbeads in vitro for 3 weeks. MLR assay was used to identify the function of Treg in vitro. To determine the immunogenicity of Treg from UCB stimulation assay was performed. In stimulation assay T responder cells and Treg were human leukocyte antigen (HLA) mismatch or partial match. A xenogenic GvHD mouse model was used to test whether Treg from the third party could prevent GvHD. Result(s): With the use of magnetic cell sorting, natural Treg was isolated from CD25 by one step positive selection and the range of CD25+ cells were 2.4%~5% among cord blood mononuclear cells (CBMC). For 60 ml cord blood 5~9 x 106 Treg could be enriched. The phenotype of fresh isolated Treg was with high expression of CD4, CD25 and Foxp3. After 3 weeks expansion UCB derived Treg retained Treg phenotype but had a significantly increased expression of HLA-DR, and CD45RO when compared with the fresh isolated Treg. MLR assay also showed remarkably higher suppression ability of expanded Treg in vitro compared to the fresh isolated Treg. By luminex-R-SSO assay the expanded Treg from cord blood or adult PBMC and T responder cells from adult PBMC were distributed into partial match or mismatch group. At partial match group Treg and T responder cells were at least 2-4/6 HLA-A, B, DR match. At mismatch group there was only 1-0/6 HLA-A, B, DR match. CFSE labeled T responder cells were stimulated by irradiated Treg at low responder: Treg ratio of 1 : 1 and high responder: Treg ratio of 10 : 1. The results showed at low responder: Treg ratio the proliferation of T responder cells stimulated by partial matched Treg isolated from PBMC was 11.34%. However its proliferation was only 0.28% when stimulated by partial matched Treg from cord blood. In mismatch group the proliferation of T responder cells was 12.54% and 8.03%, respectively stimulated by Treg isolated from PBMC and CBMC. At high responder: Treg ratio of 10 : 1, the proliferation of T responder cells stimulated by Treg from PBMC or CBMC was very low and showed no difference not only in partial match group but also in mismatch group. NOD-SCID IL-2Rcnull mice with sublethal irradiation followed by injection of 1 x 107 PBMC was explored as GvHD model. In our NOD-SCID IL-2Rcnull model of GvHD, Treg from third party cord blood has more potent at improving GvHD score and significantly superior overall survival compared to Treg from the third party PBMC. Conclusion(s): Third party umbilical cord blood derived Treg would be a viable source of human Treg for cellular therapy not only because of its high yield and good suppressive ability but also for its low immunogenicity.

Ma, Y., et al. (2016). "Effects of nanoplastics and microplastics on toxicity, bioaccumulation, and environmental fate of phenanthrene in fresh water." Environmental Pollution **219**: 166-173.

Contamination of fine plastic particles (FPs), including micrometer to millimeter plastics (MPs) and nanometer plastics (NPs), in the environment has caught great concerns. FPs are strong adsorbents for hydrophobic toxic pollutants and may affect their fate and toxicity in the environment; however, such information is still rare. We studied joint toxicity of FPs with phenanthrene to Daphnia magna and effects of FPs on the environmental fate and bioaccumulation of ¹⁴C-phenanthrene in fresh water. Within the five sizes particles we tested (from 50 nm to 10 micro m), 50-nm NPs showed significant toxicity and physical damage to D. magna. The joint toxicity of 50-nm NPs and phenanthrene to D. magna showed an additive effect. During a 14-days incubation, the presence of NPs significantly enhanced bioaccumulation of phenanthrene-derived residues in daphnid body and inhibited the dissipation and transformation of phenanthrene in the medium, while 10- micro m MPs did not show significant effects on the bioaccumulation, dissipation, and transformation of phenanthrene. The differences may be attributed to higher adsorption of phenanthrene on 50-nm NPs than 10- micro m MPs. Our findings underlined the high potential ecological risks of FPs, and suggested that NPs should be given more concerns, in terms of their interaction with hydrophobic pollutants in the environment.

Maass, S., et al. (2017). "Transport of microplastics by two collembolan species." Environmental Pollution **225**: 456-459.

Plastics, despite their great benefits, have become a ubiquitous environmental pollutant, with microplastic particles having come into focus most recently. Microplastic effects have been intensely studied in aquatic, especially marine systems; however, there is lack of studies focusing on effects on soil and its biota. A basic question is if and how surface-deposited microplastic particles are transported into the soil. We here wished to test if soil microarthropods, using Collembola, can transport these particles over distances of centimeters within days in a highly controlled experimental set-up. We conducted a fully factorial experiment with two collembolan species of differing body size, Folsomia candida and Proisotoma minuta, in combination with urea-formaldehyde particles of two different particle sizes. We observed significant differences between the species concerning the distance the particles were transported. F. candida was able to transport larger particles further and faster than P. minuta. Using video, we observed F. candida interacting with urea-formaldehyde particles and polyethylene terephthalate fibers, showing translocation of both material types. Our data clearly show that microplastic particles can be moved and distributed by soil microarthropods. Although we did not observe feeding, it is possible that microarthropods contribute to the accumulation of microplastics in the soil food web.

Mabilleau, G., et al. (2004). "Biodegradability of poly (2-hydroxyethyl methacrylate) in the presence of the J774.2 macrophage cell line." Biomaterials **25**(21): 5155-5162.

The degradation of cross-linked and linear poly(2-hydroxyethyl methacrylate) (pHEMA), was examined in vitro with J774.2 cells. pHEMA microbeads were prepared with both types of polymers. Only cells in contact with the microbeads increased their production of lysosomal enzymes (TRAcP and ANAE) and released large amounts of reactive oxygen species with both types of pHEMA microbeads. Electron microscopy showed that macrophages were able to erode the surface of linear pHEMA but unable to erode the surface of the cross-linked polymer. Cells appeared wrapped by the linear pHEMA surface, but those cultured on the cross- linked polymer were only laying at the surface. After cell culture, the surface roughness of pHEMA slices was observed by atomic force microscopy (AFM). There was a significant increase in roughness (R sub(a)) of the surface of linear pHEMA slices cultured with J774.2 cells whereas no difference in R sub(a) between the surface of cross-linked pHEMA slices could be measured. AFM image of the hydrated materials were done: the surface of linear pHEMA swelled considerably in saline whereas the hydrated cross-linked polymer did not differ from the air-dried appearance. In conclusion, linear pHEMA swells in biological fluids, activates macrophages in close contact with the polymer and can be progressively eroded.

Macali, A., et al. (2018). "Episodic records of jellyfish ingestion of plastic items reveal a novel pathway for trophic transference of marine litter." Scientific Reports **8**(1).

Invertebrates represent the most plentiful component of marine biodiversity. To date, only few species have been documented for marine litter intake. Here, we report for the first time the presence of macroplastic debris in a jellyfish species. Such novel target to plastic pollution highlights an under studied vector of marine litter along marine trophic web, raising further concern over the impact on marine wildlife.

Machado, A. A. d. S., et al. (2018). "Microplastics as an emerging threat to terrestrial ecosystems." Global Change Biology **24**(4): 1405-1416.

Microplastics (plastics <5 mm, including nanoplastics which are <0.1 micro m) originate from the fragmentation of large plastic litter or from direct environmental emission. Their potential impacts in terrestrial ecosystems remain largely unexplored despite numerous reported effects on marine organisms. Most plastics arriving in the oceans were produced, used, and often disposed on land. Hence, it is within terrestrial systems that microplastics might first interact with biota eliciting ecologically relevant impacts. This article introduces the pervasive microplastic contamination as a potential agent of global change in terrestrial systems, highlights the physical and chemical nature of the respective observed effects, and discusses the broad toxicity of nanoplastics derived from plastic breakdown. Making relevant links to the fate of microplastics in aquatic continental systems, we here present new insights into the mechanisms of impacts on terrestrial geochemistry, the biophysical environment, and ecotoxicology. Broad changes in continental environments are possible even in particle-rich habitats such as soils. Furthermore, there is a growing body of evidence indicating that microplastics interact with terrestrial organisms that mediate essential ecosystem services and functions, such as soil dwelling invertebrates, terrestrial fungi, and plant-pollinators. Therefore, research is needed to clarify the terrestrial fate and effects of microplastics. We suggest that due to the widespread presence, environmental persistence, and various interactions with continental biota, microplastic pollution might represent an emerging global change threat to terrestrial ecosystems.

Machado, N. P., et al. (2007). "Plastic packages and cold storage on the postharvest preservation of jabuticaba fruits." Revista Brasileira de Fruticultura **29**(1): 166-168.

The objective of this study was to evaluate the efficiency of the plastic packages use in cold storage on the preservation of jabuticabas (Myrciaria spp.) for fresh consumption and processing. Two experiments were carried out at Embrapa Clima Temperado Research Centre, Pelotas, Rio Grande do Sul, with the following treatments: T₁ - control (open package); T₂ - 200 g capacity plastic box (dimensions: 18 cm of length, 12 cm of width and 3 cm of height) with perforated cover (two holes of 1 mm diameter each one); and T₃ - 15 micro thick perforated plastic sac (0,5 mm holes). In the Experiment 1, the fruits (for fresh consumption) with these packaging treatments were kept during eight days in a cold storage chamber under temperature of 0 degrees C and 90% relative humidity (RH) containing 0.03-0.09 ppm of ionized oxygen, and after being taken out from the cold storage, the fruits of the three pack kinds were left two days in room temperature (20-22 degrees C) and 70-75% RH. In the Experiment 2 (fruit for processing), it were evaluated the same treatments and cold storage conditions as it was referred in the first experiment, except that it was not simulated shelf life of the fruits which, in this experiment, were kept in the cold storage chamber of 0 and 90 degrees C RH for 10 days, since the fruits were supposed to be used for processing. In both experiments, the variables evaluated were: loss of weight (%); total soluble solids (TSS); pH; tritable acidity, TA (% citric acid); and ratio TSS/TA. It was concluded that for both purposes of fruit consumption the best packing treatment was the 15 micro plastic sac, which maintained the quality better during eight days in cold storage plus two days of simulated shelf life, as well as the quality of fruits for processing kept in cold storage for 10 days.

Maciel, A. d. S., et al. (2004). "Particleboards of Pinus elliottii Engelm. wood, polystyrene and polyethylene therephthalate particles." Revista Arvore **28**(2): 257-266.

This study determined the properties of wood particleboards containing particles of polystyrene (PS) and polyethylene therephthalate (PET). Three amounts of polystyrene (0, 25 and 50%), two amounts of PET/PS (5/20 and 10/40%), three amounts (0, 4 and 6%) of urea-formaldehyde or

phenol-formaldehyde adhesive and three amounts of polystyrene in toluene solution (0, 4 and 6%), combined with 50, 75 or 100% of particles of Pinus elliottii wood were used. Layer boards measuring approximately 400x400x10 mm with density approximately equal to 0.60 g/cm³ were produced. Internal bond, modulus of rupture and modulus of elasticity, screw withdrawal, water absorption and thickness swelling after 24 h of immersion were determined. The mechanical properties of all the boards were superior to the established by ANSI/A 208.1-1993 standard. All wood/plastic particleboards absorbed more water than those observed in commercial boards. However, the observed thickness swelling was quite similar to the values of commercial wood particleboards. Boards in which the solution of polystyrene was applied presented, in general, the best values for all the properties.

Macintosh, A., et al. (2020). "Plastic bag bans: Lessons from the Australian Capital Territory." Resources, Conservation and Recycling **154 (no pagination)**(104638).

Bans on single-use plastic shopping bags are amongst the most popular policy interventions taken by governments to address the harms associated with plastics. Yet, there are few published studies on their effectiveness and durability. This article addresses this gap, presenting the results of a study on the impacts of a ban on single-use plastic bags introduced in the Australian Capital Territory in 2011. The study assessed whether the ban has reduced plastic bag consumption and litter, and whether community support for the ban was sustainable. The results suggests the ban has not been overly effective in reducing plastic bag consumption or litter. Over the almost seven-year study period, between 2011 and 2018, the ban reduced consumption of single-use conventional polyethylene bags by ~2600 tonnes. However, these reductions were largely offset by increases in the consumption of other bags. The net effect of the ban on plastic consumption over the period was relatively minor; a 275 t reduction. Notwithstanding this, the ban is widely supported. When it was first introduced, 58 % of the community supported the ban. By 2018, this had increased to 68 %. The article explores the implications of the results and the need for better information on plastic bag consumption. Copyright © 2019 Elsevier B.V.

Maczko, J. (1988). "Extrusion system recycles contaminated plastic waste." Plastics Engineering **44**(6): 39-41.

The scarcity and cost of raw materials, as well as the environmental issue, make reclamation of plastics an attractive consideration. Recycling contaminated plastics waste, commercial and consumer, into a broad-based material addresses all three issues and opens new retail markets for the plastics industry.

Madsen, H. and O. Winding (1996). "Release of foreign bodies (particles) by clinical use of intravenous infusion sets." Biomaterials **17**(7): 663-666.

In clinical practice, stripping the plastic tubes of intravenous (i.v.) infusion sets with a scissor blade is a commonly used method for re-establishing flow in malfunctioning i.v. sets. The present investigation concludes that this procedure results in release of plastic particles from the luminal wall of the tube. Particles are subsequently flushed into the patient. The average amount of particles released exclusively from the i.v. infusion sets under these circumstances may exceed the standards for acceptable particle content per millilitre in large volume i.v. injectable fluids, according to the British Pharmacopoeia and the United States Pharmacopoeia.

Madsen, J. L. and L. Hendel (1992). "Gastrointestinal transit times of radiolabeled meal in progressive systemic sclerosis." Digestive Diseases & Sciences **37**(9): 1404-1408.

Gastrointestinal transit times were measured in 12 patients with progressive systemic sclerosis. The CREST syndrome (calcinosis, Raynaud's phenomenon, esophageal dysmotility, sclerodactyly, and telangiectasia) was found in all patients. None of the patients reported complaints referable to specific gastric, small intestinal, or colonic involvement. The patient group had an increased mean gastric emptying time of 99mTc-labeled cellulose fiber when compared with 16 healthy controls [1.17 (0.89-1.38) hr [median (range)] vs 0.84 (0.56-1.88) hr; P less than 0.02], whereas mean gastric emptying time of 2- to 3-mm 111In-labeled plastic particles was unaffected [1.86 (0.99-2.74) hr vs 1.50 (0.92-2.51) hr; NS]. No difference was observed in mean small intestinal transit time of cellulose fiber [4.33 (0.50-7.04) hr vs 3.74 (2.09-7.59) hr; NS] or plastic particles [4.21 (2.00-6.25) hr vs 3.53 (1.50-6.70) hr; NS] between patients and controls. The patient group had an increased mean colonic transit time of plastic particles [47 (24-116) hr vs 29 (18-46) hr; P less than 0.01]. These findings suggest that asymptomatic delay in gastric emptying and colonic transit is frequent in patients with progressive systemic sclerosis.

Madsen, J. L. and M. Jensen (1989). "Gastrointestinal transit of technetium-99m-labeled cellulose fiber and indium-111-labeled plastic particles." Journal of Nuclear Medicine **30**(3): 402-406.

We introduce two new nondigestible solid markers for gastrointestinal transit measurements. One is technetium-99m-labeled cellulose fiber [^{99m}Tc]CF, the other is indium-111-labeled plastic particles [¹¹¹In]PP of 2- to 3-mm diameter. In six healthy male volunteers gastric emptying and small intestinal transit of the two markers were obtained simultaneously. Large intestinal transit of [¹¹¹In]PP was also obtained. Technetium-99m CF had acceptable stability properties in the proximal gastrointestinal segments. Indium-111 PP was almost completely stable in all segments. Mean gastric emptying time was 1.13 +/- 0.24 hr (mean +/- s.d.) for [^{99m}Tc]CF and 1.94 +/- 0.78 hr for [¹¹¹In]PP. The difference was significant (p < 0.05). Mean small intestinal transit time was 3.85 +/- 0.61 hr (mean +/- s.d.) for [^{99m}Tc]CF and 4.03 +/- 0.34 hr for [¹¹¹In]PP. The difference was not significant (p < 0.5). Mean large intestinal transit time of [¹¹¹In]PP was 23 +/- 11 hr (mean +/- s.d.) We also suggest a simple deconvolution principle for the interpretation of the small intestinal and the large intestinal transit data.

Madzovska, I., et al. (2012). "Investigation of copper-alginate microbeads as antimicrobial materials for potential biomedical applications." Journal of Tissue Engineering and Regenerative Medicine **1)**: 325.

Alginate hydrogels cross-linked with copper ions are promising biomaterials for biomedical applications due to their biocompatibility, bioinductivity and antimicrobial properties. While highly-hydrophilic alginate matrices can serve as cell carriers or wound dressing, Cu ions provide antimicrobial activity and as essential micronutrients and cofactors for many enzymes, promote angiogenesis and healing processes. In this study, we have optimized production of Cu-alginate microbeads (~ 500 lm) by electrostatic extrusion of 1.9%w/v Naalginate solution into 0.135 M CuSO<inf>4</inf> gelling solution. Release kinetics of Cu ions in saline solution (0.9% w/v NaCl) as well as in distilled water were investigated in conjunction with studies of antimicrobial activity of the microbeads in suspensions of E. coli and S. aureus. Experiments were performed in shaken flasks at 37degreeC for 24 h (4 g of microbeads in 10 ml of solution). It was found that Cu ions quickly induced alginate gelation resulting in the Cu concentration of 0.157 mM/g in the hydrogel. However, when Cu-alginate microbeads were placed in water or saline solution, Cu ions were released over 5 h period to the final concentration in solution of ~20 mM. This release trend was found to be very efficient inducing quick bactericidal effects in both cultures even after 1 h of incubation. These results suggest that copper release rate and antimicrobial activity

of Cu-alginate could be optimized for each particular application.

Madzovska-Malagurski, I., et al. (2016). "Towards antimicrobial yet bioactive Cu-alginate hydrogels." Biomedical Materials (Bristol) **11 (3) (no pagination)**(035015).

The simplest approach to enhance alginate hydrogel characteristics and functional properties is to replace the calcium in the process of alginate gelation with other metallic ions which are essential for living systems. Gelling of alginate with other ions and using modern encapsulation techniques can provide new delivery systems with required properties. Hence, in this study Cu-alginate hydrogels in the form of microbeads were produced by electrostatic extrusion using gelling solutions with Cu(II) concentrations in the range 13.5-270 mM and comprehensively characterized in vitro. The variation of gelling solution concentration influenced the microbead Cu(II) content, size, biomechanical properties, Cu(II) release and subsequently potential biomedical application. The formulations chosen for biomedical evaluation showed potential for antimicrobial and tissue engineering applications. Microbeads with higher Cu(II) loading (~100 mumol g⁻¹) induced immediate bactericidal effects against Escherichia coli and Staphylococcus aureus. Conversely, Cu(II) release from microbeads with the Cu(II) content of ~60 mumol g⁻¹ was slower and they were suitable for promoting and maintaining chondrogenic phenotype of bovine calf chondrocytes in 3D culture. Results of this study have shown possibilities for tuning Cu-alginate properties for potential biomedical applications such as antimicrobial wound dressings, tissue engineering scaffolds or articular cartilage implants. Copyright © 2016 IOP Publishing Ltd.

Maeng, Y. J., et al. (2010). "Culture of human mesenchymal stem cells using electrosprayed porous chitosan microbeads." Journal of Biomedical Materials Research. Part A **92**(3): 869-876.

The aim of this study was to fabricate porous chitosan microbeads using an electrospraying method into liquid nitrogen, then thawing and refreezing. The microbeads were then used to evaluate their potential for tissue engineering of human mesenchymal stem cells (hMSCs). Scanning electron microscopy (SEM) and a mercury porosimeter were used to show the morphology of the scaffolds formed and to determine their pore size and porosity. As the chitosan concentration increased (0.5, 1, 1.5, and 2 wt %), the diameter of the porous microbead increased from 350 to 890 microm, and the average pore size and the porosity decreased from 65 to 21 microm and 95 to 38%, respectively. The hMSCs were cultured onto the porous microbeads in a spinner flask. SEM images and methyl tetrazolium salt assays at 3, 7, 14, and 21 days of culture revealed that hMSCs had successfully attached and proliferated inside the porous microbeads. This study demonstrated that electrosprayed porous chitosan microbeads can be used as three-dimensional scaffolds for tissue engineering.

Maes, T., et al. (2018). "Below the surface: Twenty-five years of seafloor litter monitoring in coastal seas of North West Europe (1992-2017)." Science of the Total Environment **630**: 790-798.

Marine litter presents a global problem, with increasing quantities documented in recent decades. The distribution and abundance of marine litter on the seafloor off the United Kingdom's (UK) coasts were quantified during 39 independent scientific surveys conducted between 1992 and 2017. Widespread distribution of litter items, especially plastics, were found on the seabed of the North Sea, English Channel, Celtic Sea and Irish Sea. High variation in abundance of litter items, ranging from 0 to 1835 pieces km⁻² of seafloor, was observed. Plastic tems such as bags, bottles and fishing related debris were commonly observed across all areas. Over the entire 25-year period (1992-2017), 63% of the 2461 trawls contained at least one plastic litter item. There was no significant temporal trend in the percentage of

trawls containing any or total plastic litter items across the long-term datasets. Statistically significant trends, however, were observed in specific plastic litter categories only. These trends were all positive except for a negative trend in plastic bags in the Greater North Sea - suggesting that behavioural and legislative changes could reduce the problem of marine litter within decades. Copyright © 2018

Magara, G., et al. (2018). "Single contaminant and combined exposures of polyethylene microplastics and fluoranthene: accumulation and oxidative stress response in the blue mussel, Mytilus edulis." Journal of Toxicology and Environmental Health. Part A **81**(16): 761-773.

The microplastic "vector effect" has received increasing attention. The aim of this study was to investigate the influence of polyethylene microplastic beads (PE MP) on accumulation and associated oxidative stress responses attributed to fluoranthene (Flu) in blue mussels, Mytilus edulis. Blue mussels were exposed for 96 h to four treatment groups: Flu-only, MP-only, Flu and MP coexposure, and Flu-incubated MP. Treatments were conducted at a low and high concentration (50 micro g/L and 100 Flu micro g/L and 100, and 1000 MP/mL). Results demonstrated that in both the gill and digestive gland, coexposure did not markedly affect Flu uptake, but this treatment significantly decreased tissue Flu concentrations. Antioxidant responses including activities of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidases (GPx), and levels of total glutathione (GSH) in both gills and digestive glands were significantly altered suggesting a perturbation of redox state induced by the exposure conditions. Although individual biomarkers varied, the biomarker profile enabled certain generalizations to be made. Antioxidant responses occurred more likely in gill tissue than in digestive gland. Individual contaminant exposures to Flu or MP led to varying responses, but coexposures and incubated exposures did not result in additive or synergistic effects. Exposure concentrations (i.e., low or high treatments) were not a consistent a predictor of response; and the internal Flu dose did not consistently predict outcome of various biomarkers. Importantly, MP-only exposure appeared to be capable of eliciting direct effects on the oxidative stress system as demonstrated by the activities of CAT and GPx. These findings warrant further investigation.

Magara, G., et al. (2019). "Effects of combined exposures of fluoranthene and polyethylene or polyhydroxybutyrate microplastics on oxidative stress biomarkers in the blue mussel (Mytilus edulis)." Journal of Toxicology & Environmental Health Part A **82**(10): 616-625.

A growing interest in developing and commercialization of new eco-friendly plastic polymers is occurring attributed to the impact of marine plastics debris and microplastics that result from the degradation of oil-based polymers as these substances adversely affect ecosystem health. Recently, polyhydroxybutyrate (PHB) has become of interest due to its biodegradability and physicochemical properties. However, biological consequences resulting from bioplastics exposure remain to be determined. Further, few data are apparently available regarding the potential for bioplastics to act as a vector for exogenous chemicals in the environment. The aim of the study was to compare the effects of polyethylene (PE MPs) and polyhydroxybutyrate (PHB MPs) microplastics administered alone or in combination with fluoranthene (Flu) on detoxifying enzymes in digestive glands and gills of Mytilus edulis. Blue mussels were exposed for 96h to eight experimental groups: control, Flu-only, PE MPs-only, PHB MPs-only, PE MPs-Flu co-exposure, PHB MPs-Flu co-exposure, Flu-incubated PE MPs, and Flu-incubated PHB MPs. Activities of superoxide dismutase (SOD), catalase (CAT), glutathione peroxidases (GPx), glutathione S-transferase (GST), and glutathione reductase (GR) were found to be significantly susceptible to Flu and plastics in both tissues. Interestingly, a single exposure to PHB MPs led to decreased activity levels of CAT and GST in gills, SOD in digestive glands and SeGPx in both tissues. In co-exposure and incubation treatments, biochemical responses were generally comparable with those exerted by PE MPs or PHB MPs only, suggesting an apparent absence of combined effects of microplastics with the pollutant. Data demonstrated the ecotoxicological impact of bioplastics materials on digestive glands and gills of Mytilus edulis.

Magni, S., et al. (2019). "First evidence of protein modulation by polystyrene microplastics in a freshwater biological model." Environmental Pollution **250**: 407-415.

Microplastics (MPs) are now one of the major environmental problems due to the large amount released in aquatic and terrestrial ecosystems, as well as their diffuse sources and potential impacts on organisms and human health. Still the molecular and cellular targets of microplastics' toxicity have not yet been identified and their mechanism of actions in aquatic organisms are largely unknown. In order to partially fill this gap, we used a mass spectrometry based functional proteomics to evaluate the modulation of protein profiling in zebra mussel (Dreissena polymorpha), one of the most useful freshwater biological model. Mussels were exposed for 6 days in static conditions to two different microplastic mixtures, composed by two types of virgin polystyrene microbeads (size=1 and 10mum) each one. The mixture at the lowest concentration contained 5x105MP/L of 1mum and 5x105MP/L of 10mum, while the higher one was arranged with 2x106MP/L of 1mum and 2x106MP/L of 10mum. Proteomics' analyses of gills showed the complete lack of proteins' modulation after the exposure to the low-concentrated mixture, while even 78 proteins were differentially modulated after the exposure to the high-concentrated one, suggesting the presence of an effect-threshold. The modulated proteins belong to 5 different classes mainly involved in the structure and function of ribosomes, energy metabolism, cellular trafficking, RNA-binding and cytoskeleton, all related to the response against the oxidative stress.

Magni, S., et al. (2018). "Evaluation of uptake and chronic toxicity of virgin polystyrene microbeads in freshwater zebra mussel Dreissena polymorpha (Mollusca: Bivalvia)." Science of the Total Environment **631**(632): 778-788.

Microplastics (MPs), plastic debris smaller than 5 mm, are widely found in both marine and freshwater ecosystems. However, few studies regarding their hazardous effects on inland water organisms, have been conducted. For this reason, the aim of our research was the evaluation of uptake and chronic toxicity of two mixtures (MIXs) of virgin polystyrene microbeads (PMs) of 10 micro m and 1 micro m in size (MIX 1, with 5x10⁵ of 1 micro m size PMs/L and 5x10⁵ of 10 micro m size PMs/L, and MIX 2 with 2x10⁶ of 1 micro m size PMs/L and 2x10⁶ of 10 micro m size PMs/L) on freshwater zebra mussel Dreissena polymorpha (Mollusca: Bivalvia) during 6 exposure days. The PM uptake in the mussel body and hemolymph was assessed using confocal microscopy, while the chronic toxicity of PMs was evaluated on exposed mussels using a comprehensive battery of biomarkers of cellular stress, oxidative damage and neuro- genotoxicity. Confocal microscopy analyses showed that MPs concentrated in the gut lumen of exposed mussels, absorbed and transferred firstly in the tissues and then in the hemolymph. The results revealed that PMs do not produce oxidative stress and genetic damage, with the exception of a significant modulation of catalase and glutathione peroxidase activities in mussels exposed to MIX 1. Regarding neurotoxicity, we observed only a significant increase of dopamine concentration in mussels exposed to both MIXs, suggesting a possible implication of this neurotransmitter in an elimination process of accumulated PMs. This research represents a first study about the evaluation of virgin MP toxicity in zebra mussel and more research is warranted concerning the long term neurological

effects of virgin MPs.

Magri, D., et al. (2018). "Laser Ablation as a Versatile Tool To Mimic Polyethylene Terephthalate Nanoplastic Pollutants: Characterization and Toxicology Assessment." Acs Nano **12**(8): 7690-7700.

The presence of micro- and nanoplastics in the marine environment is raising strong concerns since they can possibly have a negative impact on human health. In particular, the lack of appropriate methodologies to collect the nanoplastics from water systems imposes the use of engineered model nanoparticles to explore their interactions with biological systems, with results not easily correlated with the real case conditions. In this work, we propose a reliable top-down approach based on laser ablation of polymers to form polyethylene terephthalate (PET) nanoplastics, which mimic real environmental nanopollutants, unlike synthetic samples obtained by colloidal chemistry. PET nanoparticles were carefully characterized in terms of chemical/physical properties and stability in different media. The nanoplastics have a ca. 100 nm average dimension, with significant size and shape heterogeneity, and they present weak acid groups on their surface, similarly to photodegraded PET plastics. Despite no toxic effects emerging by in vitro studies on human Caco-2 intestinal epithelial cells, the formed nanoplastics were largely internalized in endolysosomes, showing intracellular biopersistence and long-term stability in a simulated lysosomal environment. Interestingly, when tested on a model of intestinal epithelium, nano-PET showed high propensity to cross the gut barrier, with unpredictable long-term effects on health and potential transport of dispersed chemicals mediated by the nanopollutants.

Mahadappa, P., et al. (2020). "Effect of plastic foreign body impaction on rumen function and heavy metal concentrations in various body fluids and tissues of buffaloes." Ecotoxicology & Environmental Safety **189**: 109972.

Rumen impaction by plastic waste (PW) is a common condition in the developing countries where ruminants are reared under extensive grazing. As heavy metals (HM) are used in the manufacture of plastic, we hypothesized that buffaloes with PW impaction would have suboptimal rumen function and higher content of HM in the rumen fluid, sera and body tissues. Buffaloes at an abattoir were categorized into impacted with PW or not (Group C and B, respectively; n = 30/group). From the animals of group C and B, rumen fluid and sera were collected ante-mortem, while muscle, liver and kidney were collected after exsanguination. Blood and rumen fluid of stall-fed buffaloes (Group A; n = 15) served as known negative control. Rumen function was assessed by protozoal density, motility, pH, methylene blue reduction time (MBRT) and sedimentation activity time (SAT). Concentration of HM such as mercury (Hg), lead (Pb), cadmium (Cd), chromium (Cr) and copper (Cu) in the body fluids, tissues and impacted PW was estimated by atomic absorption spectrometry (AAS). A significant decrease in the rumen protozoal density, motility and increase ($P < 0.05$) in the rumen fluid pH, MBRT and SAT were observed in group C as compared to group A and B. Concentration of Pb, Hg and Cd showed a moderate to strong significant negative correlation with rumen function indicators. Quantitatively, Cu content (ppm) was highest in PW with 0.9 +/- 0.04. The concentration of HM in the body fluids and tissues was significantly ($P < 0.05$) elevated in group C, but was below the toxic levels. In stall-fed buffaloes, Hg, Pb and Cd were undetectable in body fluids. Collectively, the results indicate that long term exposure of buffaloes to HM from PW affect the health, productivity and increase the risk of entering the food chain.

Mahalakshmi, V., et al. (2012). "Analysis of polyethylene degrading potentials of microorganisms isolated from compost soil." International Journal of Pharmaceutical and Biological Archives **3**(5):

1190-1196.

Plastic play important role for many "short live" applications such as packaging, disposable gloves, garbage bags etc and these represent the major part of plastic waste. Because of their persistence in our environment, improperly disposed plastic materials are significant source of environment pollution, potentially harming life. Among the synthetic plastics, one of the most problematic plastics in this regard is polyethylene (PE). In the absence of appropriate disposal methods polyethylene waste is usually burned, causing grave air pollution. Polyethylene-considered to be inert-can be biodegraded if the right microbial strains are used. In the present study microorganisms able to degrade polyethylene were isolated from compost soil and characterized. Physicochemical analysis of PE was done by Scanning electron Microscopy (SEM) & Fourier Infrared Spectroscopy (FTIR). The degraded products were analyzed by Gas Chromatography-Mass-Spectrometer (GC-MS).

Maharana, D., et al. (2019). "Assessment of micro and macroplastics along the west coast of India: Abundance, distribution, polymer type and toxicity." Chemosphere **246**: 125708.

Considering the magnitude of pollution caused by marine plastics, the present study assessed their abundance, distribution, surface morphology and polymer type in ten sandy beaches spread across three states (Maharashtra, Karnataka and Goa) along the west coast of India (WCI). The total abundance of plastics (~1-100 mm) in the studied beaches ranged from 4.1 to 23.4% (19+/-1-346 +/- 2 items/m²). Location-wise, the abundances of both micro (43.6 +/- 1.1-346 +/- 2 items/m²) and macroplastics (21.6+/-3-195 +/- 6 items/m²) were relatively higher in beaches along the Maharashtra coast. Surface morphology-wise, fragments were predominantly abundant in both micro (76+/-2-346 +/- 2 items/m²) and macroplastics (50.6 +/- 1.5-195 +/- 6 items/m²) followed by pellets (43.3 +/- 2.5-245.6 +/- 2 items/m²). Fourier-transform infrared spectroscopy (FT-IR) analysis of plastics revealed a dominance of polyethylene (PE) followed by polypropylene (PP). IR spectra of the collected plastics at absorption band at 1750-1700 cm⁻¹ reflect minimal surface oxidation. White-colored plastics were observed most frequently, followed by pale-yellow, dark-brown, green, blue, transparent and red. A short-term (72 h) experimental study to assess the toxicity of PE microbeads (~1 mm) in a commercially important shrimp species, Litopenaeus vannamei revealed toxicological changes. An elevated level of lipid peroxidation (LPX)-the tagged biochemical marker, was recorded only at the maximum dose (0.15 mg/L) of PE microbeads. A moderate increase in the levels of enzymatic antioxidants (catalase and glutathione S-transferase) was also recorded at the same dose. Comprehensive information on marine plastics, including ecotoxicity provided in this study, would help in evolving strategies in minimizing plastic pollution along the WCI.

Mahesh Kumar, G., et al. (2016). "Waste management in food packaging industry." Environmental Science and Engineering (Subseries: Environmental Science) **0**(9783319272269): 265-277.

The increasing amount of food packaging waste is perceived as a problem in urgent need of solution in all industrialized countries. According to the environment protection act, waste is any substance which constitutes scrap material, an effluent, unwanted surplus substance, article which requires disposing of as being broken, worn out, contaminated or otherwise spoiled. Waste leads to the production of significant greenhouse gas, methane which is over 20 times more potent than carbon dioxide. Source reduction, reuse and recycle are the most powerful and effective thing we can do to manage waste. Plastic Waste Management has assumed great significance in view of the urbanization activities. Plastic waste generated by the polymer manufacturers at the production, extrusion, quality control and laboratory testing etc., stages, as well as, by the consumers require urgent disposal and recycling to avoid health hazards. Various strategies are being devised to mitigate the impact of plastic waste in India. 2016, Springer International Publishing Switzerland.

Mahmoodi, F., et al. (2012). "An experimental evaluation of an effective medium based compaction equation." European Journal of Pharmaceutical Sciences **46**(1-2): 49-55.

Tablet production involves compression of free flowing powder in an enclosed cavity of defined geometry. The complexity of the powder bed system necessitates that a way be found to better understand what occurs during compression. One such approach is by means of compaction equations, of which, the Heckel and Kawakita equations are the best known. This work attempts to experimentally evaluate the applicability of the effective medium (EM) equation introduced by Frenning et al. (2009) to powder systems. Two powder types (sodium chloride and lactose monohydrate), each consisting of three size fractions (<40, 125-212 and 212-300mum) were characterised and compressed to a pressure of 500MPa. These powders were chosen because of their differing mechanical properties. An invariance which is inherent in the EM equation is exposed by varying the starting points of compression, and can yield insights into compression mechanisms. Such invariant regions were observed once plastic particle deformation started to dominate the compression behaviour, and enabled the determination of the point where particle rearrangement stops.

Mahmoud, W., et al. (2010). "Emerging applications of fluorescent nanocrystals quantum dots for micrometastases detection." Proteomics **10**(4): 700-716.

The occurrence of metastases is one of the main causes of death in many cancers and the main cause of death for breast cancer patients. Micrometastases of disseminated tumour cells and circulating tumour cells are present in more than 30% of breast cancer patients without any clinical or even histopathological signs of metastasis. Low abundance of these cell types in clinical diagnostic material dictates the necessity of their enrichment prior to reliable detection. Current micrometastases detection techniques are based on immunocytochemical and molecular methods suffering from low efficiency of tumour cells enrichment and observer-dependent interpretation. The use of highly fluorescent semiconductor nanocrystals, also known as "quantum dots" and nanocrystal-encoded microbeads tagged with a wide panel of antibodies against specific tumour markers offers unique possibilities for ultrasensitive micrometastases detection in patients' serum and tissues. The nanoparticle-based diagnostics provides an opportunity for highly sensitive parallel quantification of specific proteins in a rapid and low-cost method, thereby providing a link between the primary tumour and the micrometastases for early diagnosis. © 2010 WILEY-VCH Verlag GmbH & Co. KGaA.

Mahon, A. M., et al. (2017). "Microplastics in Sewage Sludge: Effects of Treatment." Environmental Science & Technology **51**(2): 11-11.

Waste water treatment plants (WWTPs) are receptors for the cumulative loading of microplastics (MPs) derived from industry, landfill, domestic wastewater and stormwater. The partitioning of MPs through the settlement processes of wastewater treatment results in the majority becoming entrained in the sewage sludge. This study characterized MPs in sludge samples from seven WWTPs in Ireland which use anaerobic digestion (AD), thermal drying (TD), or lime stabilization (LS) treatment processes. Abundances ranged from 4196 to 15-385 particles kg-1 (dry weight). Results of a general linear mixed model (GLMM) showed significantly higher abundances of MPs in smaller size classes in the LS samples, suggesting that the treatment process of LS shears MP particles. In contrast, lower abundances of MPs found in the AD

samples suggests that this process may reduce MP abundances. Surface morphologies examined using scanning electron microscopy (SEM) showed characteristics of melting and blistering of TD MPs and shredding and flaking of LS MPs. This study highlights the potential for sewage sludge treatment processes to affect the risk of MP pollution prior to land spreading and may have implications for legislation governing the application of biosolids to agricultural land. [ABSTRACT FROM AUTHOR]
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Mahon, H. K. and D. M. Dauer (2005). "Organic coatings and ontogenetic particle selection in Streblospio benedicti Webster (Spionidae: Polychaeta)." Journal of Experimental Marine Biology and Ecology **323**(1): 84-92.

Surface deposit feeders select food particles based upon characteristics including size, texture, specific gravity, and organic coatings. Spionid polychaetes feed at the sediment-water interface using a pair of ciliated palps and switch between surface deposit feeding and suspension feeding primarily as a function of water flow. Juveniles and adults of some spionid species have different stable isotopic carbon signals, indicating the ingestion of different food sources and potentially the ability to differentiate organic cues ontogenetically. In the present study, the feeding responses of juvenile and adult Streblospio benedicti Webster to seven organic coatings bound to glass microbeads were tested using five amino acids and two carbohydrates. Coated versus uncoated particles were presented in equal proportions based upon surface area. Juveniles and adults were highly selective for all seven types of organically coated beads - 87.1% of all beads ingested were organically coated beads. For two of the organic coatings, there were ontogenetic differences; juveniles were more selective of threonine and adults were more selective of proline. These differences may result in ontogenetic diet shifts that allow maximization of energy and/or essential nutrients during critical early life- history stages. Particle selection in tentaculate surface deposit feeders is generally thought to occur primarily during particle contact and transport to the mouth, and is typically characterized as a passive process. Active particle selection at the site of the everted pharynx was observed and quantified for S. benedicti. Organically coated particles represented 50% of the ambient experimental treatment, 64.4% of the particles transported along the palp after contact, and 81.8% of the particles ingested after pharyngeal rejection behavior. Of the beads reaching the pharynx, 26.9% were rejected by ciliary sorting on the pharynx before ingestion, and 81.8% of the rejected beads at the site of the pharynx were uncoated. Our study demonstrates that microphagous feeders that generally handle food particles in bulk are capable of significant levels of active selection for organically coated particles.

Mahony, J., et al. (2007). "Development of a respiratory virus panel test for detection of twenty human respiratory viruses by use of multiplex PCR and a fluid microbead-based assay." Journal of Clinical Microbiology **45**(9): 2965-2970.

Virology laboratories historically have used direct fluorescent-antibody assay (DFA) and culture to detect six or seven respiratory viruses. Following the discovery of five new human respiratory viruses since 2000, there is an increasing need for diagnostic tests to detect these emerging viruses. We have developed a new test that can detect 20 different respiratory virus

types/subtypes in a single 5-h test. The assay employs multiplex PCR using 14 virus-specific primer pairs, followed by a multiplexed target-specific primer extension (TSPE) reaction using 21 primers for specific respiratory virus types and subtypes. TSPE products were sorted and identified by using a fluid microsphere-based array (Universal Array; TmBioscience Corporation, Toronto, Canada) and the Luminex x-MAP system. The assay detected influenza A and B viruses; influenza A virus subtypes H1, H3, and H5 (including subtype H5N1 of the Asian lineage); parainfluenza virus types 1, 2, 3, and 4; respiratory syncytial virus types A and B; adenovirus; metapneumovirus; rhinovirus; enterovirus; and coronaviruses OC43, 229E, severe acute respiratory syndrome coronavirus, NL63, and HKU1. In a prospective evaluation using 294 nasopharyngeal swab specimens, DFA/culture detected 119 positives and the respiratory virus panel (RVP) test detected 112 positives, for a sensitivity of 97%. The RVP test detected an additional 61 positive specimens that either were not detected by DFA/culture or were positive for viruses not tested for by DFA/culture. After resolution of discordant results by using a second unique PCR assay and by using a combined reference standard of positivity, the RVP test detected 180 of 183 true positives, for a sensitivity of 98.5%, whereas DFA and culture detected only 126 of 183 true positives, for a sensitivity of 68.8%. The RVP test should improve the capabilities of hospital and public health laboratories for diagnosing viral respiratory tract infections and should assist public health agencies in identifying etiologic agents in respiratory tract infection outbreaks.

Mahou, R., et al. (2011). "Alginate-PEG hybrid microspheres for biomedical applications." European Cells and Materials **4)**: 6.

INTRODUCTION: Hydrogel microspheres with sodium alginate (Na-alg) as major component are among the most suitable materials for cell immobilization. Ionotropic gelation of Na-alg in presence of divalent cations yields such hydrogels. However, they suffer from mechanical stability deficiency, limited durability, and permeability drawbacks. Frequently used reinforcement with polycations requires multi-step processes and can have a negative impact on the biocompatibility. Our approach combines ionotropic gelation of Na-alg and covalent cross-linking of PEG derivatives in one step and yields alginate-PEG hybrid microspheres (Alg-PEG-M) convertible into PEG beads (PEG-M) [1]. METHOD(S): Alg-PEG-M and PEG-M were prepared at 37degreeC under physiological conditions using a coaxial airflow droplet generator (Fig.1). (Figure presented) RESULTS AND DISSCUSSION: The precursor quality and concentration govern the mechanical resistance. Dissolution of Ca-alg slightly raises the mechanical resistance to compression (Fig.2). The permeability can be tailored by adequate choice of the arm length of PEG-VS. The MWCO was tuneable in a range of 70 to 150 kg/mol. (Figure presented) Cell toxicity of Alg-PEG-M assessed for EC219 rat endothelial cells, ECp23 murine endothelial cells, and RAW264.7 murine macrophages did not reveal cytotoxic effects (examples in Fig.3). (Figure presented) The immune response upon intraperitoneal implantation into mice was comparable to the control and pure Ca-alg microbeads (Fig.4). Encapsulated human islets continued insulin secretion upon stimulation. CONCLUSION(S): Combining ionotropic gelation and chemical cross-linking in a one-step process yields Alg-PEG-M with well-controllable physical properties. Significant toxic effects were observed neither in vivo nor in vitro.

Mai, L., et al. (2018). "Polycyclic aromatic hydrocarbons affiliated with microplastics in surface waters of Bohai and Huanghai Seas, China." Environmental Pollution **241**: 834-840.

Microplastics (MPs) sized between 0.33 and 5 mm were collected using Manta trawls from ten surface seawater sites in Bohai and Huanghai Seas, China. A total of 1024 (Bohai Sea) and 132 (Huanghai Sea) microplastic pieces were classified, including polystyrene foams, polyethylene

films and lines, and other plastic pellets, with concentrations of MPs ranging from 3 to 162 particles per 100 m 3 (0.012–2.96 mg m −3). A pretreatment of MPs with 30% H 2 O 2 in water did not significantly lower polycyclic aromatic hydrocarbon (PAH) concentrations on MPs compared to no H 2 O 2 pretreatment. Measurements of PAHs carried on the collected MPs indicated that the concentrations of the sum of 16 PAHs were in the range of 3400−119,000 ng g −1 . The sources of PAHs in Bohai and Huanghai Seas were highly similar, with petroleum and gasoline probably as the dominant sources. The present study shows the relative importance of MPs in regards to chemical transport in the marine environment. The combination of high concentrations of PAHs affiliated with MPs and the increasing magnitude of plastic pollution in the world's oceans demonstrates the considerable importance of MPs to the fate of PAHs in marine environments. [ABSTRACT FROM AUTHOR]
Copyright of Environmental Pollution is the property of Elsevier B.V. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use. This abstract may be abridged. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material for the full abstract. (Copyright applies to all Abstracts.)

Mai, L., et al. (2019). "Riverine Microplastic Pollution in the Pearl River Delta, China: Are Modeled Estimates Accurate?" Environmental Science & Technology **53**(20): 11810.
Plastic pollution has caused increasing global concern. Currently, model estimates of the riverine plastic inputs to the global oceans based on the concept of Mismanaged Plastic Waste (MPW) varied substantially, and no field measurements of riverine inputs were available. We conducted sampling at the eight major river outlets of the Pearl River Delta, South China with rapid economic growth and urbanization to provide field measured data for fine-tuning modeling results. Floating microplastics (MPs) were collected with a Manta net (mesh size of 0.33 mm) five times during 2018. Microplastic particles (0.3–5.0 mm) widely occurred in all sampling sites. The number and mass concentrations of MPs were in the ranges of 0.005–0.7 particles m–3 and 0.004–1.28 mg m–3 and were positively correlated with water discharges. The annual riverine input of MPs from the Pearl River Delta was estimated at 39 billion particles or 66 tons, which converts to 2400–3800 tons of plastic debris based on calculations described in Text S2. These values were substantially below the MPW-based model estimates (91,000–170,000 tons). The large difference between measured and modeling results may have derived from the large uncertainty in the MPW values assigned to the world's countries/regions.

Mai, T. D., et al. (2015). "Magneto-immunocapture with on-bead fluorescent labeling of amyloid-beta peptides: towards a microfluidized-bed-based operation." Analyst **140**(17): 5891-5900.
A new sample treatment approach for sensitive determination of three amyloid-beta peptides (Abeta 1-42, Abeta 1-40 and Abeta 1-38) with capillary electrophoresis coupled with laser induced fluorescent detection is reported herein. These Abeta peptides are considered an important family of biomarkers in the cerebrospinal fluid (CSF) for early diagnosis of Alzheimer's disease (AD). Due to their extremely low abundance in CSF (down to sub nM ranges), batch-wise preconcentration via magneto-immunocapture with enrichment factors up to 100 was implemented. The Abeta peptides were first captured onto magnetic micro-beads. Then, on-beads fluorescent labeling of the captured Abeta peptides were carried out to avoid the unwanted presence of extra fluorescent dye in the eluent as in the case of in-solution labeling. Finally thermal elution was performed and eluted labeled peptides were analyzed off line with CE-LIF. The Abeta-capturing efficiencies of different commercially available antibodies grafted

onto magnetic beads were tested. Abeta peptides in CSF samples collected from AD's patients and healthy persons (used as controls) were measured and evaluated. As a proof of concept, the developed strategy was adapted into a miniaturized fluidized bed configuration that has the potential for coupling with a microchip separation system.

Maity, S., et al. (2020). "Cytogenotoxic potential of a hazardous material, polystyrene microparticles on Allium cepa L." Journal of Hazardous Materials **385**: 121560.

Plastic pollution represents a global concern for the biodiversity conservation, ecosystem and public health. The polystyrene is one of the dominant pollutants in both terrestrial and aquatic ecosystem. This work measured the hazardous nature of 100nm micropolystyrene (MPS) using 25, 50, 100, 200, and 400mg/L concentrations in terms of oxidative stress, morphotoxicity and cytogenotoxicity in Allium cepa. The results were compared with the positive control (PC) (400mg/L chlorpyrifos). MPS significantly (p<0.05) reduced the root length while induced the production of hydroxyl, superoxide radicals with a concomitant increase in DPPH scavenging activity and lipid peroxidation as compared to the negative control. The significant decrease in mitotic index with respect to the negative control (MI: 23.855+/-5.336 %; lowest MI: 3.88+/-1.042 %) showed the cytotoxic nature of MPS. Genotoxicity was assessed by various chromosomal and nuclear aberrations. The highest 3.029+/-0.403 % (PC: 3.09+/-0.535 %) chromosomal abnormality index and 2.31+/-0.338 % (PC: 1.178+/-0.095 %) nuclear abnormality index were observed. MPS down-regulated the expression of plant CDKA encoding gene: cdc2, an important cell cycle regulator. The overall results indicated that MPS could induce cytogenotoxicity through the exacerbation of ROS production and inhibition of cdc2.

Majewsky, M., et al. (2016). "Determination of microplastic polyethylene (PE) and polypropylene (PP) in environmental samples using thermal analysis (TGA-DSC)." Science of the Total Environment **568**: 507-511.

Microplastics are increasingly detected in the environment and the consequences on water resources and ecosystems are not clear to date. The present study provides a cost-effective and straightforward method to determine the mass concentrations of polymer types using thermal analysis. Characteristic endothermic phase transition temperatures were determined for seven plastic polymer types using TGA-DSC. Based on that, extracts from wastewater samples were analyzed. Results showed that among the studied polymers, only PE and PP could be clearly identified, while the phase transition signals of the other polymers largely overlap each other. Subsequently, calibration curves were run for PE and PP for qualitative measurements. 240 and 1540 mg/m³ of solid material (12micro m to 1mm) was extracted from two wastewater effluent samples of a municipal WWTP of which 34% (81 mg/m³) and 17% (257 mg/m³) could be assigned to PE, while PP was not detected in any of the samples. The presented application of TGA-DSC provides a complementary or alternative method to FT-IR analyses for the determination of PE and PP in environmental samples. Copyright © 2016 Elsevier B.V.

Mak, C., et al. (2019). "Acute toxic effects of polyethylene microplastic on adult zebrafish." Ecotoxicology and Environmental Safety **182**(109442).

To identify the physical effects, behavioral changes, and gene expression profiles of the phase 1 detoxification-related gene (cyp 1a) and oogenesis-related gene (vtg 1) induced by microplastics, high-density polyethylene microplastics of various sizes were used because of their dominance in coastal areas and effluent samples in Hong Kong. Adult zebrafish were used as the model organism to identify the upper and lower boundaries of microplastics ingestion and were

exposed to individual polyethylene microplastics in five size ranges (10-22 micro m, 45-53 micro m, 90-106 micro m, 212-250 micro m, and 500-600 micro m) at a concentration of 2 mg/L for 96 h. To study behavioral changes and targeted gene expression profiles via real-time PCR (qPCR), a mixture of microplastics in three size ranges at effluent-related (11 particles/L), moderate (110 particles/L), and high concentrations (1,100 particles/L) were applied for 96 h. The zebrafish behavior was recorded by a video camera and by two observers (interrater reliability, >85%). The results implied that the upper and lower size boundaries for microplastic ingestion were 558.4+or-26.2 micro m (yellow) and 19.7+or-3.1 micro m (red), respectively. In addition, 61+or-10% of fish in medium concentration treatments and 61+or-10% of fish in high concentration treatments were found with the microplastic ingestion and remaining in their intestine. In addition, 28+or-10% of fish in high concentration treatments were found with microplastic retaining in their gills (No. of fishes=18 in each treatment). The presence of microplastics, which occupied 89+or-6% of intestine area, reduced the voids inside the intestine for feed. The expression of cyp1a in the intestine (medium concentration) and vtg1 in the liver (medium and high concentration) showed significant up-regulation, and abnormal behavior (i.e., seizures and tail bent downward) was observed (medium and high concentration). In summary, the effects on the aryl hydrocarbon receptor (AHR) pathway, disruption of the oogenesis process, and neurotoxicity could be caused by acute exposure of adult zebrafish to microplastics.

Makar, R. S., et al. (2011). "Analysis of cutoffs for screening sensitized blood donors for HLA alloantibodies using a cytometric microbead assay." Transfusion **51**(1): 166-174.

BACKGROUND: Cytometric-based microbead assays for HLA alloantibodies may be effective tools for transfusion-related acute lung injury (TRALI) risk reduction. However, the optimal cutoff for donor screening is unclear.

STUDY DESIGN AND METHODS: To optimize the screening test cutoff in sensitized donors, sera were screened with a cytometric microbead assay. Confirmatory testing was performed on samples with a normalized background (NBG) ratio of 2.4 or more.

RESULTS: Sera with a NBG of 2.4 to 9.9 had positive predictive values (PPVs) of 78.2% (95% confidence interval [CI], 67.8%-86.0%) and 71.1% (95% CI, 56.5%-82.4%) for Class I and II antibodies, respectively. Sera with a NBG of 10 or more had PPVs of 98.9% (95% CI, 93.3%-100%) and 99.1 (95% CIs, 94.7%-100%) for Class I and II, respectively. The percent panel-reactive antibody (PRA) of confirmed HLA alloantibodies from sera with a NBG of 2.4 to 9.9 was 29.3+/-17% (mean+/-standard deviation) for Class I and 22.3+/-16.7% for Class II, but for antibodies from sera with a NBG of 10 or more the PRAs were 65.3+/-24.0 and 64.1+/-25.2% for Class I and II, respectively (p<0.00001). Serial dilution studies comparing the screening test with antiglobulin-enhanced lymphocytotoxicity suggested that NBG correlated with antibody titer. In our center, deferral for prior pregnancy or transfusion would result in loss of 28.8% of apheresis platelet (PLT) donors. Using the screening test at a cutoff of 2.4 or more or 10 or more would reduce the fraction of donors lost to 12.7 or 8.0%, respectively.

CONCLUSIONS: A screening cutoff of 10 or more predicts HLA alloimmunization in sensitized donors and is associated with higher PRAs and titers. Implementation of this cutoff may reduce TRALI risk while limiting unnecessary deferral of PLT donors.

Maker, A. V., et al. (2016). "Hepatectomy After Yttrium-90 (Y90) Radioembolization-Induced Liver Fibrosis." Journal of Gastrointestinal Surgery **20**(4): 869-870.

An obese 55-year-old woman with nonalcoholic fatty liver disease presented 7 years after resection of a T3N1 ileal carcinoid tumor with an elevated chromogranin A, multifocal metastatic disease to the liver, and carcinoid syndrome. She underwent right hepatic artery yttrium-90 (Y90) radioembolization, followed a month later by selective Y90 treatment to segment IV. She then presented to our clinic 10 months later, remaining symptomatic with flushing, diarrhea, anxiety, myalgia, pain, and persistent night sweats despite Sandostatin administration. At least 11 tumors were identified in the right lobe of the liver and three in segment IV on liver-specific imaging. These lesions were stable over a year with no new lesions. At exploration, there was marked hypertrophy of the left lateral segment due to the yttrium-90 treatment of segments IV-VIII, corresponding with preoperative volumetrics predicting a functional liver remnant (FLR) of 40% after extended right hepatectomy. The right lobe and segment IV were fibrotic, hard, and visibly damaged. The gland had a thick, fibrotic capsule, and the parenchyma was dense, inflexible, and difficult to dissect, consistent with the previously reported morbidity of these operations. Extended right hepatectomy was performed. Final pathology demonstrated 15 foci of metastatic well-differentiated neuroendocrine carcinoma that were negative for necrosis, as was expected given her continued symptoms despite radioembolization. Numerous amorphous spheres, frequently in clusters, were present in segments IV-VIII in vessels and approximating tumors consistent with prior Y90 radioembolization. The patient had an uneventful post-operative recovery and remains symptom free on follow-up. Treatment options for metastatic tumors to the liver have increased in recent years and currently include radioembolization in selected patients. Surgical cytoreduction and complete metastasectomy continue to offer improvement in symptoms, quality of life, and survival in patients with neuroendocrine liver metastases; however, hepatectomy after radioembolization is unique and carries increased morbidity/mortality, likely due to Y90-induced liver fibrosis. We demonstrate images of fibrotic yttrium-90 radiation-affected liver and histological sections of radioembolic microbeads in blood vessels and distributed around resected tumors.

Makri, C., et al. (2019). "Use and assessment of "e-plastics" as recycled aggregates in cement mortar." Journal of Hazardous Materials **379**: 120776.

In this study we investigated the physical and mechanical properties of cement mortars, partially replaced with plastic (recycled plastic aggregate, RPA) recovered from WEEE (namely, "e-plastics"). The plastic housing of 14 LCD screens was sampled and, subsequently, compositionally and elementally analysed. Acrylonitrile-butadiene-styrene (ABS), being the most commonly found polymer in WEEE, was used as aggregate in the cement mortar. The replacement percentages (RPs) used were 2.5%, 5%, 7.5%, 10% and 12.5%, while the water to cement (w/c) ratio was maintained constant at 0.5 in all tests. The basic properties (e.g. compressive strength (CS), modulus of elasticity (MoE), density (rho), porosity (PHI) and water absorption (WA)) of the created specimens were investigated. The obtained results, for all RPs, (especially those of 7.5% and 10%) exhibited an increase in the CS of the specimens by 15.4% and 7.8%, respectively, with the MoE decreased in both cases by 18.1% and 23.8%, respectively. The rest of the examined specimens' physical properties measured (rho, PHI, and WA) indicated, also, greater strength but lower ductility than the reference (standard) specimen. Concluding, the use of recovered plastics from WEEE as recycled aggregates (RAs) in cement could potentially be proved a useful downcycling alternative for waste plastics.

Maksym, G. N., et al. (2000). "Mechanical properties of cultured human airway smooth muscle cells from 0.05 to 0.4 Hz." Journal of Applied Physiology **89**(4): 1619-1632.

We investigated the rheological properties of living human airway smooth muscle cells in culture and monitored the changes in rheological properties induced by exogenous stimuli. We

oscillated small magnetic microbeads bound specifically to integrin receptors and computed the storage modulus (G') and loss modulus (G") from the applied torque and the resulting rotational motion of the beads as determined from their remanent magnetic field. Under baseline conditions, G' increased weakly with frequency, whereas G" was independent of the frequency. The cell was predominantly elastic, with the ratio of G" to G' (defined as eta) being approximately 0. 35 at all frequencies. G' and G" increased together after contractile activation and decreased together after deactivation, whereas eta remained unaltered in each case. Thus elastic and dissipative stresses were coupled during changes in contractile activation. G' and G" decreased with disruption of the actin fibers by cytochalasin D, but eta increased. These results imply that the mechanisms for frictional energy loss and elastic energy storage in the living cell are coupled and reside within the cytoskeleton.

Malafaia, G., et al. (2020). "Developmental toxicity in zebrafish exposed to polyethylene microplastics under static and semi-static aquatic systems." Science of the Total Environment **700**: 134867.

Different studies have reported the ecotoxicological effects of polyethylene microplastics (PE MPs) on aquatic organisms; however, little is known about their toxicity in the early life stages of aquatic vertebrates living in freshwater ecosystems. Thus, the aim of the current study is to evaluate the toxicity of PE MPs throughout the development of Danio rerio after their static and semi-static exposure to different concentrations of these pollutants (6.2, 12.5, 25, 50 and 100mg/L) - models were monitored at different time-periods, namely: 24, 48, 72, 96, 120 and 144h. Based on the collected data, small PE MP concentrations have harmful effects on D. rerio embryos and larvae; the magnitude and characteristics of these effects depend on the adopted exposure system, which can be static or semi-static. PE MPs had negative effect on embryos' hatching rate in both exposure systems. However, the early hatching observed during the exposure through the static system could explain the lower larval survival rate after egg hatching. Nevertheless, PE MPs induced significant changes in various morphometric parameters. The present study is the first to assess the addressed topic; therefore, it is recommended to carry out future investigations to broaden the knowledge about PE MP toxicity.

Malci, S., et al. (2005). "Selective adsorption, pre-concentration and matrix elimination for the determination of Pb(II), Cd(II), Hg(II) and Cr(III) using 1,5,9,13- tetrathiacyclohexadecane-3,11-diol anchored poly (p-chloromethylstyrene- ethyleneglycoldimethacrylate) microbeads." Analytica Chimica Acta **550**(1-2): 24-32.

Poly(p-chloromethylstyrene-ethyleneglycoldimethacrylate) polymeric microbeads, poly(p-CMS-EGDMA), were synthesized and 1,5,9,13- tetrathiacyclohexadecane-3,11-diol (S4HD) was attached chemically onto the polymeric microbeads. Characterization of all microbeads was done by Fourier transform-infrared spectrometry (FT-IR) and elemental analyzer. The amount of attached 1,5,9,13-tetrathiacyclohexadecane-3,11-diol to the polymer was found to be 2.23 mmol g⁻¹ polymers. The ligand attached microbeads, poly(p-CMS-EGDMA-S4HD), were used to examine the adsorption capacity of Pb(II), Cd(II), Hg(II) and Cr(II) ions for recovery, pre-concentration and the matrix elimination by changing the pH and the initial metal ion concentrations and also adsorption kinetics of the studied metal ions was determined. Pre-concentration factors for the studied toxic metal ions were found to be more than 500-fold and recovery was between 92 and 106%. In the drinking, lake, tap and sea-water samples from water lands, ultra-trace toxic metal ion concentrations were determined easily by using ligand modified microbeads after pre-concentration because of the high pre-concentration factor and easily matrix elimination using ligand modified microbeads. Reference sea-water material was used for the validation of the method and it was found that recovery, pre-concentration and the matrix elimination were performed perfectly. For the desorption of the toxic metal ions, 3 M HCl containing 0.8 M thiourea was used and desorption ratio was obtained more than 96%. © 2005 Elsevier B.V. All rights reserved.

Malinich, T. D., et al. (2018). "No evidence of microplastic impacts on consumption or growth of larval Pimephales promelas." Environmental Toxicology and Chemistry **37**(11): 2912-2918.

Microplastics are an abundant pollutant in aquatic systems, but little is known regarding their effects on larval fish. We conducted foraging and growth experiments to observe how increasing densities of microplastics (polyethylene microspheres) impact the foraging and growth of Pimephales promelas larvae. We found minimal impacts on larval consumption of Artemia nauplii in the consumption study, as well as little impact on total length after 30 d of the growth experiment.

Malinich, T. D., et al. (2018). "No evidence of microplastic impacts on consumption or growth of larval <i>Pimephales promelas</i>." Environmental Toxicology and Chemistry **37**(11): 2912-2918.

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Mallakpour, S. and V. Behranvand (2017). "Recycled pet/MWCNT-ZnO quantum dot nanocomposites: adsorption of Cd(II) ion, morphology, thermal and electrical conductivity properties." Chemical Engineering Journal **313**: 873-881.

This paper investigates the possibility of utilizing recycled PET bottle waste as matrix of novel composites. The effect of various MWCNT-ZnO quantum dot (QD) loadings (1, 2 and 4 by weight) on the morphology, thermal, electrical conductivity properties and water treatment of PET was studied. Results showed that the incorporation of MWCNT-ZnO QDs into the PET matrix causes that the pure polymer undergoes transition from electrically insulated to conductive at room temperature. Enhancement in thermal stability was obtained by the 4 wt% MWCNT-ZnO loading. Our results also show that rPET/MWCNT-ZnO QD composites can be used as absorbents for easy, convenient, and efficient removal of Cd(II) ions from aqueous solution. Actually, plastic waste was used and changed it to a valuable composite with potential of heavy metal adsorption as well as high electrical conductivity.

Mallappa, M. K., et al. (2015). "Calcium Alginate-Neusilin US2 Nanocomposite Microbeads for Oral Sustained Drug Delivery of Poor Water Soluble Drug Aceclofenac Sodium." Journal of Drug Delivery **2015**: 826981.

The aim of the present study was to formulate and investigate the calcium alginate- (CA-) Neusilin US2 nanocomposite microbeads containing preconcentrate of aceclofenac sodium (ACF-Na) liquid microemulsion (L-ME) for enhancement of oral bioavailability. The preconcentrate L-ME is prepared by using Labrafac PG, Labrasol, and Span 80 as oil, surfactant, and cosurfactant, respectively. The solid CA nanocomposite microbeads of L-ME prepared by microemulsification internal gelation technique using sodium alginate (SA) gelling agent, Neusilin US2 as adsorbent, and calcium chloride as crosslinking agent. L-ME has good thermodynamic stability; globule size was found to be 32.4 nm with polydispersity index 0.219

and -6.32 mV zeta potential. No significant interactions of excipients, drug in the formulations observed by FT-IR, DSC and XPRD. The concentration of SA and Neusilin US2 influences the flow properties, mean particle size, mechanical strength, drug entrapment efficiency, and percentage of drug release. All the formulations show minimum drug release in simulated gastric fluid (SGF) pH 1.2 for initial 2 h, maximum drug release in pH 6.8 phosphate buffer solution (PBS) at 6 h, followed by sustaining in simulated intestinal fluid (SIF) of pH 7.4 up to 12 h. The interaction of SA with Neusilin US2 creates a thick thixotropic gel network structure which acts as barrier to control the release of drug in the alkaline pH environment. Neusilin US2 is a novel filler used to convert L-ME into solid nanocomposite microbeads to enhance dissolution rate of poor water soluble drugs sustaining the drug release for prolonged period of time.

Mallikarjuna Rao, K., et al. (2015). "Formulation and IN-VITRO characterization of gastro retentive microbeads of terbutaline sulphate." International Journal of Advances in Pharmaceutical Research **6**(9): 264-274.

To develop and evaluate Terbutaline sulphate (TBS) floating micro beads using polymers like HPMC K15 M and Eudragit RL100. TBS is a beta2 stimulant drug which is having a very short half life of less than 4 hours hence requires frequent administration. Therefore the possible way by which this can be overcome is by formulating gastro retentive system a controlled release formulation (CRF). Floating Micro beads of TBS were prepared by iontropic gelation method by using individual polymers like HPMC K15M and Eudragit RL100. The prepared TBS floating micro beads were then subjected to FTIR, SEM, particle size & % yield, drug content, entrapment efficiency, in vitro dissolution studies, release kinetics. The FTIR Spectra's shown that, there was no interaction between polymers and TBS. The TBS floating micro beads was spherical in nature, which was confirmed by SEM. A maximum of 95.2% drug entrapment efficiency was obtained with HPMC K15M, and 83.22% with Eudragit RL100 formulations. The in-vitro performance of TBS floating micro beads showed controlled release depends on the polymer concentration. The co-efficient of determination indicated that the release data was best fitted with zero order kinetics and it follows Case II transport drug release mechanism.

Mallory, M. L., et al. (2006). "Marine Plastic Debris in Northern Fulmars from Davis Strait, Nunavut, Canada." Marine Pollution Bulletin **52**(7): 800.

Marine plastic debris in northern fulmars from Davis Strait, Nunavut, Canada is presented. Waste marine plastic debris on the ocean surface, bottom and coastlines is a worldwide, marine pollution problem that affects a wide range of wildlife species. The debris can be divided into industrial plastics, typically small pellets that are the precursors to plastic manufacturing, and user plastics, the molded, manufactured items made from industrial plastics. Wildlife ingests these plastic particles, presumably mistaking them for prey species. Once swallowed, the particles can lead to reduced digestive efficiency, blockages or ulcerations of the digestive tract, and increased contaminant loads due to plastic digestion. Ingestion of plastic is a potential problem for marine birds, and especially for procellariids, because they have the highest incidence of plastic ingestion among sea birds, and do not regurgitate indigestibles like other species.

Malsch, R., et al. (1997). "Measurement of fluorescent-labeled LMM-heparin in biological fluids using protamine-linked microbeads." Seminars in Thrombosis & Hemostasis **23**(1): 23-30.

A quantitative assay for fluorescent heparin in a purified system and in plasma was developed (Piazolo et al: Semin Thromb Hemostas 20:227-235, 1994). The protamine microbeads (1.6 microns) showed a broad size distribution and a large standard variation in low concentrations.

Our aim was to optimize these protamine microbeads for the measurement of fluorescent heparin. The following results were obtained: Paramagnetic protamine microbeads of different average diameters (0.8, 1.6, 2.8, and 4.5 microns) were synthesized by cyclocarbodiimide and tosyl activation. These microbeads bind heparin and are assayed using flow cytometry. The protamine concentration on the surface of the beads ranged between 2.0 and 61 mg/mL. The protamine microbeads bound fluorescent heparin and were analyzed by flow cytometry. The protamine microbeads bound LMM-heparin-tyramine-FITC dose dependently in saline solution, plasma, and blood. There are substantial differences between the microbeads of different origins with regard to the amount of protamine bound, the sensitivity of the detection, and the reliability for the determination of heparins in plasma and blood. The minimal sensitivity of the final method was 0.001 U/mL LMMH-tyramine-FITC in saline solution and in plasma. Human blood cells were not bound to protamine microbeads. The half-maximal binding of LMMH-tyramine-FITC of the different protamine-coated microbeads ranged from 1.7 to 8.0 micrograms/mL in saline solution, 2.3 to 8.7 micrograms/mL in plasma, and 3.1 to 6.4 micrograms/mL in blood. We conclude that all protamine microbeads can be used to quantify the concentration of LMMH-tyramine. Protamine Dynabeads M-450 (diameter 4.5 microns) have advantages over other microbeads because of their more homogeneous size distribution, a higher selectivity, and they can be measured together with leukocytes. They are currently used to develop a competitive binding assay for heparin in plasma.

Malviya, G., et al. (2013). "Assessment of the in-vivo biodistribution of NK cells induced by therapeutic antibodies in a mouse tumor model." Journal of Labelled Compounds and Radiopharmaceuticals **1)**: S386.

Objectives: Deregulation of the epidermal growth factor receptors (EGFR) signalling pathway is a recognized mechanism of carcinogenesis. Recent studies demonstrated that tumours have an effective way to suppress the immune system, that there is increasing attention for new treatment strategies that activate immune cells and tumour infiltration and that NK cell infiltration could be an early biomarker to study this process and to monitor treatment response. To gain further insight into the immune response in the tumour in vivo, and to investigate potential alterations of NK biodistribution in response to treatment, we developed a non-invasive method to assess NK cell trafficking. For this purpose, we ex-vivo radiolabeled murine NK cells with ¹¹¹In-oxine. Method(s): Transgenic SCID mice were used to isolate NK cells. These mice were generated to express human CD16 on murine NK cells. The CD16a receptor, present in human macrophages and NK cells, is responsible for recognizing the Fc domain of therapeutic IgG1 antibodies and mediate Fc related immune effectors functions. The purity and viability of the isolated NK cells was confirmed by FACS analysis. NK cells were radiolabeled with ¹¹¹In-oxine to be injected into SCID mice. Different labelling buffers and incubation times were evaluated to optimize the best labelling conditions. We also evaluated the functionality of the radiolabeled NK cell by 51Crrelease assay. Result(s): NK cells were successfully isolated from mouse spleens using anti-CD49b micro-beads and expanded in in-vitro culture. However, ex-vivo expansion of NK cells in the presence of IL-15 for 1 week resulted in the activation of NK cells and induction of cell proliferation, which also changed the expression of different cell receptors. We therefore labelled freshly purified NK cells immediately after isolation, without expansion. We optimized the conditions for NK cell labelling by titrating the amount of radioactivity and found that approximately 11 kBq of ¹¹¹In-oxine per million mouse NK cells is the maximum dose for labelling without affecting cell viability. Moreover, PBS (pH 7.4) and 20 min incubation period were selected as a method of choice that provides the highest labelling efficiency. There was no statistically

significant difference found in the functional activity of unlabelled and ¹¹¹In-oxine labelled NK cells. Biodistribution studies in SCID mice demonstrated that ¹¹¹In-oxine labelled NK cells mainly accumulate in the spleen, and to a lesser extend in the liver. Lung uptake of labelled NK cells is low, suggesting that little damage to the cells. In contrast, ¹¹¹In-oxine released from labelled NK cells, is mainly excreted from the body via the kidneys into the urine. Conclusion(s): Our results demonstrate that labelling murine NK cells is feasible with 111In without affecting their antigen expression, viability and functionality. ¹¹¹In-oxine labelled NK cells mainly target spleen, while released ¹¹¹In-oxine excreted via the kidneys into urine. Experiments are in progress to evaluate the possible alterations of NK cell biodistribution in A549 human lung tumour bearing mice before and after treatment, with different anti- EGFR antibodies.

Malviya, G., et al. (2016). "Isolation and (111)In-Oxine Labeling of Murine NK Cells for Assessment of Cell Trafficking in Orthotopic Lung Tumor Model." Molecular Pharmaceutics **13**(4): 1329-1338.

A noninvasive in vivo imaging method for NK cell trafficking is essential to gain further understanding of the pathogenesis of NK cell mediated immune response to the novel cancer treatment strategies, and to discover the homing sites and physiological distribution of NK cells. Although human NK cells can be labeled for in vivo imaging, little is known about the murine NK cell labeling and its application in animal models. This study describes the isolation and ex vivo radiolabeling of murine NK cells for the evaluation of cell trafficking in an orthotopic model of human lung cancer in mice. Scid-Tg(FCGR3A)Blt transgenic SCID mice were used to isolate NK cells from mouse splenocytes using the CD49b (DX5) MicroBeads positive selection method. The purity and viability of the isolated NK cells were confirmed by FACS analysis. Different labeling buffers and incubation times were evaluated to optimize (111)In-oxine labeling conditions. Functionality of the radiolabeled NK cell was assessed by (51)Cr-release assay. We evaluated physiological distribution of (111)In-oxine labeled murine NK cells in normal SCID mice and biodistribution in irradiated and nonirradiated SCID mice with orthotopic A549 human lung tumor lesions. Imaging findings were confirmed by histology.

Malviya, S., et al. (2013). "Formulation and evaluation of floating microbeads of ciprofloxacin HCl by emulsion gelation method." Der Pharmacia Lettre **5**(2): 63-68.

The objective of this investigation is to develop a multi-unit gastro retentive sustained release dosage form of a water soluble drug, Ciprofloxacin, from a completely aqueous environment avoiding the use of any organic solvent. A new emulsion gelation technique is used to prepare emulsion gel beads using sodium alginate as the polymer. The gel beads containing is prepare by gently mixing or homogenizing oil and water phase containing sodium alginate which is then extruded in to calcium chloride solution. The effects of factors like concentration of oil, curing time, drug: polymer ratio, alginate: pectin ratio and curing agent on drug entrapment efficiency, floating lag time, morphology and drug release are study. Minimizing the curing time of beads leaded to enhanced drug entrapment efficiency. The use of sodium alginate and combinations of sodium alginate and pectin are used to study the effect on the sustaining property of the formed beads. It is found that sodium alginate was not sufficient to sustain the drug release at gastric pH. Instead of it, appropriate combination of alginate and pectin could provide the sustain release of drug. The results show that these beads can entrap even a water soluble drug as Ciprofloxacin in sufficient amount and also can successfully deliver the drug in stomach for a prolong duration of time.

Mancuso, M., et al. (2019). "First record of microplastics ingestion by European hake MERLUCCIUS

MERLUCCIUS from the Tyrrhenian Sicilian coast (Central Mediterranean Sea)." Journal of Fish Biology **94**(3): 517-519.

A sample of 67 European hake Merluccius merluccius were examined to highlight the ingestion of microplastics in the Tyrrhenian Sea. In all samples, 31 black fibres were found in the stomach contents corresponding to 46.3% of the specimens. The data presented here could be important for the implementation of the EU Marine Strategy Framework Directive in Mediterranean waters.

Manfra, L., et al. (2017). "Comparative ecotoxicity of polystyrene nanoparticles in natural seawater and reconstituted seawater using the rotifer Brachionus plicatilis." Ecotoxicology and Environmental Safety **145**: 557-563.

The impact of nanoplastics using model polystyrene nanoparticles (PS NPs), anionic (PS-COOH) and cationic (PS-NH₂), has been investigated on the marine rotifer Brachionus plicatilis, a major component of marine zooplanktonic species. The role of different surface charges in affecting PS NP behaviour and toxicity has been considered in high ionic strength media. To this aim, the selected media were standardized reconstituted seawater (RSW) and natural sea water (NSW), the latter resembling more natural exposure scenarios. Hatched rotifer larvae were exposed for 24 h and 48 h to both PS NPs in the range of 0.5-50 micro g/ml using PS NP suspensions made in RSW and NSW. No effects on lethality upon exposure to anionic NPs were observed despite a clear gut retention was evident in all exposed rotifers. On the contrary, cationic NPs caused lethality to rotifer larvae but LC₅₀ values resulted lower in rotifers exposed in RSW (LC₅₀=2.75+or-0.67 micro g/ml) compared to those exposed in NSW (LC₅₀=6.62+or-0.87 micro g/ml). PS NPs showed similar pattern of aggregation in both high ionic strength media (RSW and NSW) but while anionic NPs resulted in large microscale aggregates (Z-average 1109+or-128 nm and 998+or-67 nm respectively), cationic NP aggregates were still in nano-size forms (93.99+or-11.22 nm and 108.3+or-12.79 nm). Both PDI and Z-potential of PS NPs slightly differed in the two media suggesting a role of their different surface charges in affecting their behaviour and stability. Our findings confirm the role of surface charges in nanoplastic behaviour in salt water media and provide a first evidence of a different toxicity in rotifers using artificial media (RSW) compared to natural one (NSW). Such evidence poses the question on how to select the best medium in standardized ecotoxicity assays in order to properly assess their hazard to marine life in natural environmental scenarios.

Manfroi, S. and P. Pagliaro (2012). "Patients and donors blood group genotyping for an efficient blood therapy." Vox Sanguinis **1)**: 220.

Background: In the Transfusion Service of our Hospital in a few months the Rare Blood Bank will be started on a molecular biology approach. This is a new project of Blood Regional Centre of Emilia-Romagna (Italy) and is based (i) on a first instance, on the identification of rare blood group donors using high throughput automated genotyping; and then (ii) by collecting and cryopreserving rare phenotype blood units. Furthermore, genotyping will be applied also to chronically transfused, alloimmunized and autoimmune hemolytic anemia patients for better red blood cell recover. Aim(s): The aim of this work is to evaluate accuracy, reliability and flexibility of BLOODchip IDCore+ (Progenika-Grifols) on patients and donor samples. Method(s): We performed genotyping on DNA samples of 39 adult and pediatric patients affected by hemoglobinopathies (five of them alloimmunized) and 42 regular blood donors. DNA was extracted from buffy coat samples. RBC genotyping was performed with BLOODchip IDCore+ (Progenika-Grifols) using XMAP Luminex technology. The products of a multiplex PCR, using biotinylated dCTP, are hybridated onto 100 sets of colored microbeads: each set exhibits a unique fluorescence signature of red and infrared dye and is conjugated with specific SNPs oligonucleotides. After a labeling phase with streptavidin-conjugated phycoerytrin, the fluorescence samples is detected by Luminex laser and results analyzed by BIDS software. The software interprets phycoerytrin and beads fluorescence, produces genotype results and converts them into predicted phenotypes for RBC tested. The IDCore+ kit can identify polymorphisms of 33 RBC antigens of RhCE, Kell (K, Kp, Js), Duffy, Kidd, MNSs, Diego, Dombrock, Colton and Cartwright systems.32/39 patient samples were also typed with HEA BeadChip (Bioarray Solutions, USA) and divergent results were solved by PCRSSP (Innotrain, Germany). Donors samples genotyping was performed with BLOODchip IDCore+ and results compared with serological typing (Sanquin). Result(s): In all samples we obtained a complete genotyping with zero 'no calls' or 'not valid' (repetition rate = 0%). For all tests internal and external control were valid. In patient group genotyped with alternative test (BeadChip) concordance was 100% in all shared antigens: RhCe (C, c, E, e), Kell (K, Kp, Js), Kidd, Duffy, MNSs, Diego, Dombrock, Colton. Compared with serological typing, we found divergent RhCE and Kell typing respectively in 9/39 and 3/39 patient samples. PCR-SSP confirmed RhCE genotyping results of both methods. BLOODchip genotyping did not find discrepancies in all donors samples between genomic and serological RhCE, Kell (K, Kp), Kidd, Duffy, MNSs antigen typing. Further we identified:- a r's variant associated to weak C expression, VS+V+ expression in five African Black patients,- Fy(a-b-)phenotype [FY*B (FYB-33)] in seven African black patients. Summary/conclusions: A reliable high throughput automated system is essential for implementing RBC genotyping in routine blood bank testing. BLOODchip IDCore+ genotyping is a robust system (wide range of DNA concentration, low contamination), ease to use, fast (<5 h for overall procedure) and flexible (up to 48 sample per run). Further, BIDS software assists during every work steps, from generating worklist to SNP genotype and predicting phenotype in final report.

Manganelli, V., et al. (2010). "Increased HMGB1 expression and release by mononuclear cells following surgical/anesthesia trauma." Critical Care (London, England) **14**(6): R197.

INTRODUCTION: High mobility group box 1 (HMGB1) is a key mediator of inflammation that is actively secreted by macrophages and/or passively released from damaged cells. The proinflammatory role of HMGB1 has been demonstrated in both animal models and humans, since the severity of inflammatory response is strictly related to serum HMGB1 levels in patients suffering from traumatic insult, including operative trauma. This study was undertaken to investigate HMGB1 production kinetics in patients undergoing major elective surgery and to address how circulating mononuclear cells are implicated in this setting. Moreover, we explored the possible relationship between HMGB1 and the proinflammatory cytokine interleukin-6 (IL-6).

METHODS: Forty-seven subjects, American Society of Anesthesiologists physical status I and II, scheduled for major abdominal procedures, were enrolled. After intravenous medication with midazolam (0.025 mg/Kg), all patients received a standard general anesthesia protocol, by thiopentone sodium (5 mg/Kg) and fentanyl (1.4 mug/Kg), plus injected Vecuronium (0.08 mg/Kg). Venous peripheral blood was drawn from patients at three different times, t(0): before surgery, t(1): immediately after surgical procedure; t(2): at 24 hours following intervention. Monocytes were purified by incubation with anti-CD14-coated microbeads, followed by sorting with a magnetic device. Cellular localization of HMGB1 was investigated by flow cytometry assay; HMGB1 release in the serum by Western blot. Serum samples were tested for IL-6 levels by ELISA. A one-way repeated-measures analysis ANOVA was performed to assess differences in HMGB1 concentration over time, in monocytes and serum.

RESULTS: We show that: a) cellular expression of HMGB1 in monocytes at t(1) was significantly higher as compared to t(0); b) at t(2), a significant increase of HMGB1 levels was found in the sera of patients. Such an increase was concomitant to a significant down-regulation of cellular HMGB1, suggesting that the release of HMGB1 might partially derive from mononuclear cells; c) treatment of monocytes with HMGB1 induced in vitro the release of IL-6; d) at t(2), high amounts of circulating IL-6 were detected as compared to t(0).

CONCLUSIONS: This study demonstrates for the first time that surgical/anesthesia trauma is able to induce an early intracellular upregulation of HMGB1 in monocytes of surgical patients, suggesting that HMGB1 derives, at least partially, from monocytes.

Mangare, C., et al. (2019). "Robust Identification of Suitable T-Cell Subsets for Personalized CMV-Specific T-Cell Immunotherapy Using CD45RA and CD62L Microbeads." International Journal of Molecular Sciences **20**(6): 20.

Viral infections and reactivations remain a serious obstacle to successful hematopoietic stem cell transplantation (HSCT). When antiviral drug treatment fails, adoptive virus-specific T-cell transfer provides an effective alternative. Assuming that naive T cells (T_N) are mainly responsible for GvHD, methods were developed to generate naive T-cell-depleted products while preserving immune memory against viral infections. We compared two major strategies to deplete potentially alloreactive T cells: CD45RA and CD62L depletion and analyzed phenotype and functionality of the resulting CD45RA⁻/CD62L⁻ naive T-cell-depleted as well as CD45RA+/CD62L+ naive T-cell-enriched fractions in the CMV pp65 and IE1 antigen model. CD45RA depletion resulted in loss of terminally differentiated effector memory T cells re-expressing CD45RA (T_{EMRA}), and CD62L depletion in loss of central memory T cells (T_{CM}). Based on these differences in target cell-dependent and target cell-independent assays, antigen-specific T-cell responses in CD62L-depleted fraction were consistently 3-5 fold higher than those in CD45RA-depleted fraction. Interestingly, we also observed high donor variability in the CD45RA-depleted fraction, resulting in a substantial loss of immune memory. Accordingly, we identified donors with expected response (DER) and unexpected response (DUR). Taken together, our results showed that a naive T-cell depletion method should be chosen individually, based on the immunophenotypic composition of the T-cell populations present.

Mani, A., et al. (2015). "Data mining strategies to improve multiplex microbead immunoassay tolerance in a mouse model of infectious diseases." PLoS ONE [Electronic Resource] **10**(1): e0116262.

Multiplex methodologies, especially those with high-throughput capabilities generate large volumes of data. Accumulation of such data (e.g., genomics, proteomics, metabolomics etc.) is fast becoming more common and thus requires the development and implementation of effective data mining strategies designed for biological and clinical applications. Multiplex microbead immunoassay (MMIA), on xMAP or MagPix platform (Luminex), which is amenable to automation, offers a major advantage over conventional methods such as Western blot or ELISA, for increasing the efficiencies in serodiagnosis of infectious diseases. MMIA allows detection of antibodies and/or antigens efficiently for a wide range of infectious agents simultaneously in host blood samples, in one reaction vessel. In the process, MMIA generates large volumes of data. In this report we demonstrate the application of data mining tools on how the inherent large volume data can improve the assay tolerance (measured in terms of sensitivity and specificity) by analysis of experimental data accumulated over a span of two years. The combination of prior knowledge with machine learning tools provides an efficient approach to improve the diagnostic power of the assay in a continuous basis. Furthermore, this study provides an in-depth knowledge base to study pathological trends of infectious agents in

mouse colonies on a multivariate scale. Data mining techniques using serodetection of infections in mice, developed in this study, can be used as a general model for more complex applications in epidemiology and clinical translational research.

Mani, M., et al. (2010). "An experimental investigation on a DI diesel engine using waste plastic oil with exhaust gas recirculation." Fuel **89**(8): 1826-1832.

Abstract: Environmental degradation and depleting oil reserves are matters of great concern around the globe. Developing countries like India depend heavily on oil import of about 125Mt per annum (7:1 diesel/gasoline). Diesel being the main transport fuel in India, finding a suitable alternative to diesel is an urgent need. In this context, waste plastic solid is currently receiving renewed interest. Waste plastic oil is suitable for compression ignition engines and more attention is focused in India because of its potential to generate large-scale employment and relatively low environmental degradation. The present investigation was to study the effect of cooled exhaust gas recirculation (EGR) on four stroke, single cylinder, direct injection (DI) diesel engine using 100% waste plastic oil. Experimental results showed higher oxides of nitrogen emissions when fueled with waste plastic oil without EGR. NO x emissions were reduced when the engine was operated with cooled EGR. The EGR level was optimized as 20% based on significant reduction in NO x emissions, minimum possible smoke, CO, HC emissions and comparable brake thermal efficiency. Smoke emissions of waste plastic oil were higher at all loads. Combustion parameters were found to be comparable with and without EGR. Compression ignition engines run on waste plastic oil are found to emit higher oxides of nitrogen. [Copyright &y& Elsevier]

Mani, T., et al. (2019). "Repeated detection of polystyrene microbeads in the Lower Rhine River." Environmental Pollution **245**: 634-641.

Microplastics are emerging pollutants in water bodies worldwide. The environmental entry areas must be studied to localise their sources and develop preventative and remedial solutions. Rivers are major contributors to the marine microplastics load. Here, we focus on a specific type of plastic microbead (diameter 286-954mum, predominantly opaque, white-beige) that was repeatedly identified in substantial numbers between kilometres 677 and 944 of the Rhine River, one of Europe's main waterways. Specifically, we aimed (i) to confirm the reported abrupt increase in microbead concentrations between the cities of Leverkusen and Duisburg and (ii) to assess the concentration gradient of these particles along this stretch at higher resolution. Furthermore, we set out (iii) to narrow down the putative entry stretch from 81.3km, as reported in an earlier study, to less than 20km according to our research design, and (iv) to identify the chemical composition of the particles and possibly reveal their original purpose. Surface water filtration (mesh: 300mum, n=9) at regular intervals along the focal river stretch indicated the concentration of these spherules increased from 0.05 to 8.3 particles m⁻³ over 20km. This spot sampling approach was supported by nine suspended solid samples taken between 2014 and 2017, encompassing the river stretch between Leverkusen and Duisburg. Ninety-five percent of microbeads analysed (202/212) were chemically identified as crosslinked polystyrene-divinylbenzene (PS-DVB, 146/212) or polystyrene (PS, 56/212) via Raman or Fourier-transform infrared spectroscopy. Based on

interpretation of polymer composition, surface structure, shape, size and colour, the PS(-DVB) microbeads are likely to be used ion-exchange resins, which are commonly applied in water softening and various industrial purification processes. The reported beads contribute considerably to the surface microplastic load of the Rhine River and their potential riverine entry area was geographically narrowed down.

Mani, T. and P. Burkhardt-Holm (2019). "Seasonal microplastics variation in nival and pluvial stretches of the Rhine River - From the Swiss catchment towards the North Sea." Science of the Total Environment: 135579.

Rivers are pivotal carriers of microplastic (MP) towards the oceans. Investigative data on MP pollution in rivers at specific timepoints is continuously compiled. However, such snapshot data can only roughly indicate the long-term extent of contamination and particle fluxes; modelling studies informed by this limited data are prone to large uncertainties. The present study sought to narrow this knowledge gap by examining the differences in MP concentrations, loads and compositions at three nival tributaries and the Rhine River in Basel, Switzerland, as well as two downstream pluvial Lower Rhine River locations in Germany over four seasons throughout 2016-2017. MP concentrations (>0.3 mm) correlated positively with average water discharge and catchment size of the evaluated stream locations and MP concentrations were significantly higher at the downstream pluvial than upstream nival sites. There was no coherent pattern in MP concentration fluctuations between seasons across the six sites investigated, and no correlation with recent precipitation. These findings suggest that temporal variations in MP fluxes towards the North Sea through the year are dominated by the different discharge regimes along the river course. This study also corroborates theoretical models that predict the highest MP loads move downstream the Rhine River during the European winter months.

Mani, T., et al. (2019). "Using castor oil to separate microplastics from four different environmental matrices." Analytical Methods **11**(13): 1788-1794.

The detection of environmental microplastics (MP) is limited by the need to rigorously separate polymers from the surrounding sample matrix. Searching for an affordable, low-risk and quick separation method, we developed a protocol to separate microplastics (size range: 0.3-1 mm; virgin polymers: PP, PS, PMMA and PET-G) from suspended surface solids (marine and fluvial) as well as soil and sediment using castor oil. We demonstrate effective separation of the four polymers in a spike-recovery experiment. The mean+or-SD MP spike-recovery rate was 99+or-4% with an average matrix reduction of 95+or-4% (dry weight, n=16). The protocol was validated by separating non-spiked environmental Rhine River suspended solids samples recovering 74+or-13% of MP. There PS comprised 76% of the non-retrieved MP and additional H₂O₂ digestion was needed to sufficiently reduce the highly abundant natural matrix. This castor oil lipophilicity-based protocol (i) achieves high MP recovery rates as a function of its environmental matrix reduction ability and (ii) provides environmentally friendly, non-hazardous and resource-efficient separation of MP from four different, typically investigated environmental compartments using one and the same method. Based on the Rhine River sample validation, the protocol is a potent replacement for traditional density separation techniques. Samples with high biogenic concentrations may require additional digestion.

Mani, T., et al. (2015). "Microplastics profile along the Rhine River." Scientific Reports **5**: 17988.

Microplastics result from fragmentation of plastic debris or are released to the environment as pre-production pellets or components of consumer and industrial products. In the oceans, they contribute to the 'great garbage patches'. They are ingested by many organisms, from protozoa

to baleen whales, and pose a threat to the aquatic fauna. Although as much as 80% of marine debris originates from land, little attention was given to the role of rivers as debris pathways to the sea. Worldwide, not a single great river has yet been studied for the surface microplastics load over its length. We report the abundance and composition of microplastics at the surface of the Rhine, one of the largest European rivers. Measurements were made at 11 locations over a stretch of 820 km. Microplastics were found in all samples, with 892,777 particles km (-2) on average. In the Rhine-Ruhr metropolitan area, a peak concentration of 3.9 million particles km (-2) was measured. Microplastics concentrations were diverse along and across the river, reflecting various sources and sinks such as waste water treatment plants, tributaries and weirs. Measures should be implemented to avoid and reduce the pollution with anthropogenic litter in aquatic ecosystems.

Mani, T., et al. (2019). "Microplastic Pollution in Benthic Midstream Sediments of the Rhine River." Environmental Science & Technology **53**(10): 6053-6062.

Rivers are major transport vectors for microplastics (MP) toward the sea. However, there is evidence that MP can temporarily or permanently be inhibited from migrating downstream by retention in sediments or ingestion by organisms. MP concentrations, compositions, and fate within the different compartments of the fluvial environment are poorly understood. Here, benthic, midstream sediments of two undammed, open-flowing stretches were investigated in the Rhine River, one of the world's busiest inland waterways. Twenty-five samples were collected at ten sites via riverbed access through a diving bell or dredging. We performed the first comprehensive analysis of riverbed sediment aliquots that avoids visual selection bias using state-of-the art automated micro-Fourier-transform infrared spectroscopy (muFTIR) imaging. MP numbers ranged between 0.26 +/- 0.01 and 11.07 +/- 0.6 x 10³ MP kg⁻¹ while MP particles <75 mum accounted for a mean numerical proportion +/- SD of 96 +/- 6%. MP concentrations decreased with sediment depth. Eighteen polymers were identified in the size range of 11-500 mum; the acrylates/polyurethane/varnish (APV) cluster was found at all sites (mean numerical proportion, 70 +/- 19%), possibly indicating particulate pollution from ship antifouling paint. Overall, polymers denser than freshwater (>1 g cm⁻³) dominated (85 +/- 18%), which contrasts the large proportions of low-density polymers previously reported in near-surface compartments of the Rhine.

Manimekalai, T. K., et al. (2015). "Kinetic, equilibrium and thermodynamic studies of synthetic dye removal using plastic waste activated carbon prepared by CO<inf>2</inf> activation." International Journal of ChemTech Research **8**(6): 225-240.

Activated carbon prepared by CO<inf>2</inf> activation of pyrolysed chars of waste plastic materials used as a high-efficiency adsorbent for the removal of a reactive dye from textile industrial effluents. Characterizations of the synthesized plastic waste activated carbon (PWAC) were analyzed using SEM, XRD and FTIR analysis. The effects of temperature, initial concentration, and contact time were systematically investigated. The equilibrium adsorption data fitted the Langmuir isotherm well and the monolayer adsorption capacity was 68.21 mg/g. Moreover, kinetics of adsorption exhibit followed the pseudo-second-order kinetic model. Thermodynamic parameters such as Gibbs free energy, enthalpy and entropy were determined. It was found that reactive dye adsorption was spontaneous, exothermic and physisorption process. Copyright © 2015, Sphinx Knowledge House. All rights reserved.

Manjann, K. M., et al. (2012). "Formulation and evaluation of dexibuprofen alginate-clay composite microbeads for oral controlled drug delivery." Asian Journal of Pharmaceutical Sciences **7**(1): 28-29.

The objective of the present research work to formulate solid microemulsion microbeads containing dexibuprofen with sodium alginate (SA)and hydrated aluminium silicate (HAS) solid matrix by micro-emulsification ionotropic gelation technique using calcium chloride as cross-linking agent. The effects of different variables such as drug-polymer ratios, concentration of cross-linking agent, clay (HAS) were evaluated on mean particle size, drug content, drug entrapment efficiency and drug release potential The shape and surface characteristics were determined by scanning electron microscopy (SEM), SA-HAS composite microbeads shows smoother surface and were found to be uniform size, spherical shape. No significant drug-polymer interactions were observed in FT-IR and DSC studies. While increasing in the concentrations of SA and HAS increased size distribution, flow properties, mean particle size, and drug entrapment efficiency. While increasing cross-linking agent significantly decreases the mean particle sizes of microbeads and found to be in the range 734 +/- 1.14 to 661 +/- 0.87. The concentration of HAS influences the mechanical strength and percentage of drug entrapment efficiency of SA microbeads and obtained in the range of 67.60 +/- 0.68 to 98.80 +/- 0.87 (w/v). In-vitro drug release profile of microbeads was examined in pH 1.2 for initial 2 h, pH 6.8 up to 6 h and pH 7.4 at end of 12 h. The mechanism of drug release from microbeads depends on swelling and erosion process resulting alginate microbeads was diffusion controlled followed by First order kinetics and whereas alginate/clay composite microbeads approaching to near Zero-order kinetics.

Manjanna, K. M., et al. (2010). "Calcium alginate cross-linked polymeric microbeads for oral sustained drug delivery in arthritis." Drug Discoveries & Therapeutics **4**(2): 109-122.

After the successful optimization and development of a drug entity, design of dosage form then plays an important role. Hence, research continuously keeps on searching for ways to deliver drugs over an extended period of time. With aceclofenac, a novel NSAID used in the treatment of rheumatoid arthritis, frequency of administration may cause certain GI-adverse effects. The objective of the present research work was to develop a microparticulate oral sustained release dosage form, to reduce dosing frequency, to eliminate the dose related adverse effects and to ultimately improve compliance in the pharmacotherapy of arthritis. The microbeads were prepared by an ionotropic external gelation technique, by using sodium alginate as the hydrophilic carrier and calcium chloride as the cross-linking agent. The shape and surface characteristics were determined by scanning electron microscopy (SEM). Particle size distribution was determined by an optical microscope. The physical state of the drug in the formulation was determined by differential scanning calorimetry (DSC). While increasing the concentration of sodium alginate dispersion increased flow properties, mean particle size, swelling ratio and drug entrapment efficiency. The mean particle sizes of drug-loaded microbeads were found to be in the range 596.45 +/- 1.04 to 880.10 +/- 0.13 mum. The drug entrapment efficiency was obtained in the range of 63.24-98.90% (w/v). The release of drug from the microbeads at pH 1.2 is negligible. Under neutral conditions, the beads will swell and the drug release depends on swelling and the erosion process resulting in an optimum level of drug released in a sustained manner which exhibits zero-order kinetics.

Manjanna, K. M., et al. (2009). "Natural polysaccharide hydrogel dexibuprofen microbeads for oral sustained drug delivery." Journal of Pharmacy Research **2**(7): 1271-1278.

The successful optimization and development of drug entity, design of dosage form then plays important role. Hence, research continuously keeps on searching for ways to deliver drugs over an extended period of time. Dexibuprofen a novel NSAID used in the treatment of rheumatoid arthritis which has a short half-life approximately 3.5 h and dosing frequency 2-3 times daily, causes certain side effects like abdominal pain, gastritis, constipation, etc. In the present study, spherical microbeads are able to prolong the release of dexibuprofen were prepared by ionotropic gelation method, using sodium alginate in combination with guar gum, chitosan and pectin natural polysaccharide hydrogels as drug release modifiers in various proportions to overcome the drug related adverse effects, improve drug bioavailability in different GI tract conditions. All investigated properties showed satisfactory results. While increase in concentration of sodium alginate and other polymer dispersion increased sphericity, size distribution, flow properties and mean diameter of microbeads No significant drugpolymer interactions were observed in FT-IR studies. Drug entrapment efficiencies were obtained in the range of 70.4% to 95.2%. Increase in concentration of calcium chloride significantly affects the mean diameter but no appreciable change in morphology and release behavior. The shape and surface characteristics were determined by scanning electron microscopy (SEM) using gold sputter technique. The mean particle size was determined by an optical microscope. The physical state of the drug in the formulation was determined by differential scanning calorimetry (DSC). In-vitro drug release profile of dexibuprofen from microbeads was examined in simulated gastric fluid (SGF pH1.2) and simulated intestinal fluid (SIF pH 7.2). Microbeads coated with chitosan and guar gum aqueous polymer dispersion shows optimum level of sustained release and exhibited zero-order kinetics followed by super case-II transport.

Manjanna, K. M., et al. (2009). "Formulation of oral sustained release aceclofenac sodium microbeads." International Journal of PharmTech Research **1**(3): 940-952.

The objective of the present study was microencapsulate the Aceclofenac sodium (NSAIDs) by ionotropic gelation technique by using sodium alginate as hydrophilic carrier in various proportions and examines the influences of various process parameters like drug: polymer ratio, concentration of calcium chloride, stirring speed and cross-linking time on physicochemical properties of drug loaded microbeads. This system was able to prolong the drug release, minimizing the drug related adverse effects and improve bioavailability in different GI-tract conditions. Formulated drug loaded microbeads were investigated for physicochemical properties and drug release potential. All investigated properties showed satisfactory results. While increasing in the concentration of sodium alginate, calcium chloride and cross-linking time increased sphericity, size distribution, flow properties, mean particle size, swelling ratio and drug entrapment efficiency. No significant effect of drug polymer interactions were observed in FT-IR studies. The drug entrapment efficiency obtained in the range of 63.24-98.90% Particle size of drug loaded formulations were measured by an optical microscope. The mean particle size of drug-loaded microbeads were found to be in the range 596.45+/-1.04 to 880.10+/-0.13. Increase in the stirring rate and cross-linking time tremendous decrease in mean particle size. The shape and surface characteristics were determined by scanning electron microscopy (SEM) using gold sputter technique. The physical state of the drug in the formulation was determined by differential scanning calorometry(DSC). In-vitro drug release profile of aceclofenac sodium from microbeads was examined in simulated gastric fluid pH1.2 for initial 2h, mixed phosphate buffer pH6.8 upto 6h and simulated intestinal pH 7.2 at end of 24h studies. The release of drug from the microbeads was pH dependent, showed negligible drug release in pH1.2. Under neutral conditions the beads will swell and the drug release depend on the swelling and erosion process resulting optimum level of drug released in a sustained manner and exhibited zero-order kinetics followed by super case-II transport.

Mann, T. (2018). "SHARING COLLECTIVE POWER." Earth Island Journal **33**(3): 11-13.

The article presents the views of women working with Earth Island Institute's (EII) network of

projects on their leadership styles and the power of women in the environmental movement. Plastic Pollution Coalition co-founder and director Dianna Cohen says women are great multi-taskers by necessity. Dana Frasz, the fonder and director of Food Shift, says women need to take the lead as they care about the planet.

Manojlovic, V., et al. (2006). "Immobilization of cells by electrostatic droplet generation: a model system for potential application in medicine." International Journal of Nanomedicine **1**(2): 163-171.

The process of electrostatic extrusion as a method for cell immobilization was investigated that could be used for potential applications in medicine. An attempt was made to assess the effects of cell addition and polymer concentration on the overall entrapment procedure, ie, on each stage of immobilization: polymer-cell suspension rheological characteristics, electrostatic extrusion process, and the process ofgelation. The findings should contribute to a better understanding of polymer-cell interactions, which could be crucial in possible medical treatments. Alginate-yeast was used as a model system for carrier-cells. The electrostatic extrusion was considered as a complex two-phase flow system and the effects of cell and alginate concentrations on the resulting microbead size and uniformity were assessed. Under investigated conditions, microbeads 50-600 microm in diameter were produced and the increase in both alginate and cell concentrations resulted in larger microbeads with higher standard deviations in size. We attempted to rationalize the findings by rheological characterization of the cell-alginate suspensions. Rheological characterization revealed non-Newtonian, pseudoplastic behavior of cell-alginate suspensions with higher viscosities at higher alginate concentrations. However, the presence of cells even at high concentrations (5x10(8) and 1x10(9) cells/mL) did not significantly affect the rheological properties of Na-alginate solution. Lastly, we investigated the kinetics of alginate gelation with respect to the quantity of Ca2+ ions and cell presence. The gelation kinetics were examined under conditions of limited supply with Ca2+ ions, which can be essential for immobilization of highly sensitive mammalian cells that require minimal exposure to CaCl2 solution. The molar ratio of G units to Ca2+ ions of 3.8:1 provided complete crosslinking, while the increase in alginate concentration resulted in prolonged gelation times but higher strength of the resulting gel. The cell presence decreased the rate of network formation as well as the strength of the obtained Ca-alginate hydrogel.

Manojlovic, V., et al. (2008). "Application of Electrostatic Extrusion - Flavour Encapsulation and Controlled Release." Sensors **8**(3): 1488-1496.

The subject of this study was the development of flavour alginate formulationsaimed for thermally processed foods. Ethyl vanilline was used as the model flavourcompound. Electrostatic extrusion was applied for the encapsulation of ethyl vanilline inalginate gel microbeads. The obtained microbeads with approx. 10 % w/w of ethylvanilline encapsulated in about 2 % w/w alginate were uniformly sized spheres of about450 mum. Chemical characterization by H-NMR spectroscopy revealed that the alginateused in this study had a high content (67 %) of guluronic residues and was rich in GG diadblocks (FGG = 55%) and thus presented a high-quality immobilisation matrix. The thermalbehaviour of alginate beads encapsulating ethyl vanilline was investigated bythermogravimetric (TG) and differential scanning calorimetry measurements (TG-DSC)under heating conditions which mimicked usual food processing to provide informationabout thermal decomposition of alginate matrix and kinetics of aroma release. Two wellresolved weight losses were observed. The first one was in the 50-150 degreeC temperaturerange with the maximum at approx. 112 degreeC, corresponding to the dehydration of thepolymer network. The second loss in the 220-325 degreeC temperature range, with a maximumat ~ 247 degreeC corresponded to the release of vanilline. The obtained results indicate that up to230 degreeC most of the vanilline remained intacta, while prolonged heating at elevatedtemperatures led to the entire loss of the aroma compound.

Manoochehrabadi, T., et al. (2016). "Effects of speed and time of centrifugation and time of freezing on the amount of produced microparticles from concentrates platelet. [Persian]." Koomesh **17**(3): 686-691.

Introduction: The main method of separating platelet microparticles (PMP) is based on the centrifugation speed and time. Due to the high cost of determining the number of PMP via micro-particles (micro bead) and also the necessity of using an expensive device such as a flow cytometer, it seems that Bradford method would be rather an inexpensive, fast and efficient way to determine the concentration of PMP. Therefore, in this study the effect of different factors, such as speed and time of centrifugation and time of freezing on the concentration of PMP in the platelet concentrates bags was studied. Material(s) and Method(s): We studied two different speeds of centrifugation for separating PRP. In the first protocol for preparation of PRP, the platelet bags were centrifuged at 1500g for 15min and in the second protocol; they were centrifuged at 5000g for the same duration. To evaluate the effect of time, microparticles were separated in 16000g for 20 and 2 min. To determine the concentration of PMP, Bradford method was used. To evaluation the effect of freezing, the PRP was prepared at 300g for 20 min, and then it was freezed in -80c for five days. Flow cytometery analysis was performed for microparticles identification. Result(s): PMP concentrates with the 1500g centrifugation speed showed higher concentration (P <0.05). There was not any significant difference in concentrations of PMPs in relation to the time of centrifugation (2 and 20 min) (P <0.05). Freezing the platelet bags led to higher PMP concentration in compare to the first day of experiment. Flow cytometry analysis showed that microparticles had platelet marker CD41, which represented their origin. Conclusion(s): The result of this study showed that the reduction of centrifugation speed could produce higher levels of the microparticles. In addition, the time of separation in the final stage had no significant effect on PMP isolation. Freezing could lead to higher PMP concentration. Copyright © 2016, Semnan University of Medical Sciences. All rights reserved.

Manoussakis, M. N., et al. (2014). "Impaired clearance of early apoptotic cells mediated by inhibitory IgG antibodies in patients with primary Sjogren's syndrome." PLoS ONE [Electronic Resource] **9**(11): e112100.

OBJECTIVES: Deficient efferocytosis (i.e. phagocytic clearance of apoptotic cells) has been frequently reported in systemic lupus erythematosus (SLE). Todate, patients with primary Sjogren's syndrome (SS) have not been assessed for phagocytosis of apoptotic cells (ApoCell-phagocytosis) and of particulate targets (microbeads, MB-phagocytosis).

DESIGN: ApoCell-phagocytosis and MB-phagocytosis were comparatively assessed by flow cytometry in peripheral blood specimens and monocyte-derived macrophage (MDM) preparations from healthy blood donors (HBD) and consecutive SS, SLE and rheumatoid arthritis (RA) patients. Cross-admixture ApoCell-phagocytosis experiments were also performed using phagocytes from HBD or patients, and apoptotic cells pretreated with whole sera or purified serum IgG derived from patients or HBD.

RESULTS: Compared to HBD, approximately half of SS and SLE patients studied (but not RA) manifested significantly reduced ApoCell-phagocytosis (p<0.001) and MB-phagocytosis (p<0.003) by blood-borne phagocytes that correlated inversely with disease activity (p<=0.004). In cross-admixture assays, healthy monocytes showed significantly reduced ApoCell-phagocytosis

when fed with apoptotic cells that were pretreated with sera or purified serum IgG preparations from SS and SLE patients (p<0.0001, compared to those from HBD or RA). Such aberrant effect of the SS and SLE sera and IgG preparations correlated linearly with their content of IgG antibodies against apoptotic cells (p<=0.0001). Phagocytic dysfunction maybe also present in certain SS and SLE patients, as supported by deficient capacity of MDM for ApoCell-phagocytosis and MB-phagocytosis under patients' serum-free conditions.
CONCLUSION: Similarly to SLE, efferocytosis is frequently impaired in SS and is primarily due to the presence of inhibitory IgG anti-ApoCell antibodies and secondarily to phagocytes' dysfunction.

Manuel, J., et al. (2015). "An educational intervention programme on hazards of plastic waste and its disposal among adults: A rural community based study." Nitte University Journal of Health Science **5**(2): 16-18.

Introduction: Plastic is everywhere in today's lifestyle. It is used for packaging, protecting, serving, and even disposing of all kinds of consumer goods. Improper plastic disposal has become a leading problem in both developed and developing countries. As plastic is non-biodegradable in nature, it remains in environment for several years and disposing plastic wastes at landfill are unsafe and has led to various health problems. So researcher felt it is vital that adults should possess knowledge on hazards of plastic wastes and its disposal. Method(s): In this study cross sectional descriptive survey was used. Adults were selected through probability simple random sampling. The data was collected using a pretested structured questionnaire. The structured-teaching programme was administered at the end of the pre-test. The post-test was carried out after 7 days, using the same tool as the pre-test. The data was analysed using SPSS version 16 and the results expressed as proportions. Result(s): A total of 100 adults were included in the study. Analysis of data revealed pre-test knowledge score was 42.52%.Considering the level of knowledge of adults, a structured teaching programme was administered. The post-test knowledge score was 80.48%. Hence comparison in pre-test knowledge score and post-test percentage of hazards of plastic waste and its disposal was approximately 37.96%. A significant association between source of information and post-test knowledge was found. Conclusion(s): A significant number of adults had inadequate knowledge. So researcher felt that awareness programmes regarding hazards of plastic waste and its disposal should be emphasized.

Mao, Y., et al. (2018). "Phytoplankton response to polystyrene microplastics: Perspective from an entire growth period." Chemosphere **208**: 59-68.

Microplastics are widely identified in aquatic environments, but their impacts on phytoplankton have not been extensively studied. Here, the responses of Chlorella pyrenoidosa under polystyrene (PS) microplastics exposure were studied across its whole growth period, with microplastic sizes of 0.1 and 1.0mum and 3 concentration gradients each, which covered (10 and 50mg/L) and exceeded (100mg/L) its environmental concentrations, respectively. PS microplastics caused dose-dependent adverse effects on Chlorella pyrenoidosa growth from the lag to the earlier logarithmic phases, but exhibited slight difference in the maximal inhibition ratio (approximately 38%) with respect to the two microplastic sizes. In addition to the reduced photosynthetic activity of Chlorella pyrenoidosa, unclear pyrenoids, distorted thylakoids and damaged cell membrane were observed, attributing to the physical damage and oxidative stress caused by microplastics. However, from the end of the logarithmic to the stationary phase, Chlorella pyrenoidosa could reduce the adverse effects of microplastics jointly through cell wall thickening, algae homo-aggregation and algae-microplastics hetero-aggregation, hence triggering an increase of algal photosynthetic activity and its growth, and cell structures turned to normal. Our study confirmed that PS microplastics can impair but then enhance algae growth, which will be helpful in understanding the ecological risks of microplastics.

Mao, Y., et al. (2019). "Nanoplastics display strong stability in aqueous environments: Insights from aggregation behaviour and theoretical calculations." Environmental Pollution **258**: 113760.

Nanoplastics are inevitably released into aquatic environments due to their extensive use and the continuous fragmentation of plastics. Therefore, it is imperative to understand the aggregation behaviours that determine the transport and fate of nanoplastics in aquatic environments. In this study, the effects of various metal cations, pH, aging and extracellular polymeric substances (EPS) on the aggregation of polystyrene nanoplastics (nano-PS) in aqueous solutions were systematically evaluated based on aggregation kinetics experiments and Derjaguin-Landau-Verwey-Overbeek (DLVO) theoretical calculation. The concentration, valence and hydration ability of metal cations jointly affected the aggregation of nano-PS. The critical coagulation concentration (CCC) of nano-PS was significantly higher than the ionic strengths in aquatic environments, indicating that the aggregation rate of nano-PS is relatively low in aquatic environments. The results of the aggregation kinetics experiments were consistent with DLVO theory, which showed that the energy barrier of nano-PS was dependent on electrostatic repulsion forces and van der Waals forces, and increased with pH. Nano-PS was artificially aged by UV-H₂O₂, which reduced the hydrophobic nature of the particle surfaces, consequently enhancing the stability of the nanoplastics. EPS (excreted from Chlorella pyrenoidosa) decreased the aggregation rates of nano-PS due to steric effects, which was confirmed by the extend DLVO model. Our results highlight the high stability of nano-PS in aquatic environments, which could help facilitate the evaluation of their environmental impact.

Maquet, L., et al. (2014). "Organization of microbeads in Leidenfrost drops." Soft Matter **10**(23): 4061-4066.

We investigated the organization of micrometric hydrophilic beads (glass or basalt) immersed in Leidenfrost drops. Starting from a large volume of water compared to the volume of the beads, while the liquid evaporates, we observed that the grains are eventually trapped at the interface of the droplet and accumulate. At a moment, the grains entirely cover the droplet. We measured the surface area at this moment as a function of the total mass of particles inserted in the droplet. We concluded that the grains form a monolayer around the droplet assuming (i) that the packing of the beads at the surface is a random close packing and (ii) that the initial surface of the drop is larger than the maximum surface that the beads can cover. Regarding the evaporation dynamics, the beads are found to reduce the evaporation rate of the drop. The slowdown of the evaporation is interpreted as being the consequence of the dewetting of the particles located at the droplet interface which makes the effective surface of evaporation smaller. As a matter of fact, contact angles of the beads with the water deduced from the evaporation rates are consistent with contact angles of beads directly measured at a flat air-water interface of water in a container.

Maragos, C. M. (2000). Novel assays and sensor platforms for the detection of aflatoxins. (Advances in Experimental Medicine and Biology Volume 504). Dordrecht, Mycotoxins and food safety Kluwer Academic Publishers**:** 85-93 40 ref.

The importance of the aflatoxins from food safety and economic standpoints has continued to drive the development of new analytical methods for these mycotoxins. Currently, the widely used methods for measurement of aflatoxins fall into two groups, the established chromatographic methods and traditional enzyme-linked immunosorbent assays (ELISAs).

Recently substantial progress has been made in the application of new technologies to the monitoring of aflatoxins. In particular, several research groups have developed biosensors for detection of the toxins as well as presumptive tests for fungal infection. Biosensors have been developed in a variety of formats including surface plasmon resonance, fibre optic probes, and microbead-based assays. The sensitivity and selectivity of the biosensors and of the presumptive tests has reached the level to where the application of these techniques to the screening of foods warrants further investigation.

Maragos, C. M. (2002). "Novel assays and sensor platforms for the detection of aflatoxins." Advances in Experimental Medicine & Biology **504**: 85-93.

The importance of the aflatoxins from food safety and economic standpoints has continued to drive the development of new analytical methods for these mycotoxins. Currently the widely used methods for measurement of aflatoxins fall into two groups, the established chromatographic methods and traditional enzyme-linked immunosorbent assays (ELISAs). Recently substantial progress has been made in the application of new technologies to the monitoring of aflatoxins. In particular, several research groups have developed biosensors for detection ofthe toxins as well as presumptive tests for fungal infection. Biosensors have been developed in a variety of formats including surface plasmon resonance, fiber optic probes, and microbead-based assays. The sensitivity and selectivity of the biosensors and of the presumptive tests has reached the level the where the application of these techniques to the screening of foods warrants further investigation. [References: 40]

Maragos, C. M. (2009). "Biosensors for mycotoxin analysis: Recent developments and future prospects." World Mycotoxin Journal **2**(2): 221-238.

The toxicity and prevalence of mycotoxins in commodities and foods has necessitated the development of rapid methods in order to ensure the protection of human food and animal feed supplies. Testing for mycotoxins can be accomplished by many techniques that range from determinative tests in which the presence of the toxin is confirmed, to presumptive tests in which the presence of the toxin is inferred from the presence of markers. This review focuses on tests that fall into a third category, namely indirect assays, where the presence of the toxin is established by it's interaction with an intermediary. Such intermediaries include biological materials that bind mycotoxins, such as antibodies, as well as synthetic materials such as polymers and man-made peptides. The diversity of assays within this category is extraordinary and includes assays based upon traditional microwell formats, microbeads, membranes, electrodes, wave-guides, and solution-phase assays. The microbead format includes platforms as diverse as flow injection immunoassays, tandem column immunoassays, and immunoaffinity columns. The membrane-based formats include flow-through as well as lateral-flow assays. The electrode-based formats incorporate miniaturised immunoassays with electrochemical endpoints. The wave-guide-based devices include formats such as surface plasmon resonance, and fluorescence array biosensors, and the solution phase formats include homogeneous assays such as fluorescence polarisation immunoassay. The breadth of technologies brought to bear upon solving the need for rapid, accurate, detection of mycotoxins is impressive and includes technologies currently available commercially and those which appear poised to enter the marketplace.

Maran, J. P., et al. (2012). "Development of model for mechanical properties of tapioca starch based edible films." Industrial Crops and Products **42**: 159-168.

Eco-efficient products are the new generation of bio-based products prepared with sustainable

materials, which agree with ecological and economic requirements including environmentally acceptable disposal of post-user waste. Increasing environmental concerns associated with handling of plastic waste has emphasized the importance of developing biodegradable edible films from starch. The objective of this study is to develop models and study the individual and interactive effects of the process variables on the mechanical properties of tapioca starch-based edible films using Box-Behnken design. Box-Behnken design with four factors at three levels was employed to evaluate the individual and interactive effects of process parameters (tapioca starch 1-3 g; glycerol 0.5-1.0 ml; agar 0.5-1.0 g; and span 80: 0.1-0.5 ml) on the tensile strength, elongation, Young's modulus, puncture force, and puncture deformation respectively. The results were analyzed using Pareto analysis of variance (ANOVA). For each response, second order polynomial regression models were developed and it showed good fit of the experimental data with high coefficient of determination (R²) and a close agreement between experimental and predicted values was found. The response surface and contour plots were constructed for representing the relationship between the process parameters and the responses.

Marayati, R., et al. (2015). "New circulating biomarker for patients with metastatic pancreatic ductal adenocarcinoma." Annals of Surgical Oncology **1)**: S21.

Introduction: Pancreatic ductal adenocarcinoma (PDAC) is a highly aggressive disease characterized by early invasion and metastasis, for which there are limited diagnostic tools and minimal effective therapies. Circulating tumor cell (CTC) burden has been shown to be prognostic in patients with metastatic disease. We aimed to identify novel biomarkers of CTCs that have potential clinical use for patients with metastatic PDAC (mPDAC). Method(s): Microarray data was analyzed from 154 primary and 30 metastatic PDAC patients. After IRB approval, CTCs and hematopoietic cells were isolated from blood samples from a prospective cohort of 20 PDAC and 4 non-PDAC patients using density gradient centrifugation followed by CD45 microbead selection. Quantitative real-time PCR was used for gene expression validation. Overall survival (OS) was assessed using the log-rank test. Result(s): We identified 67 genes differentially overexpressed in mPDAC tumors compared to primary PDAC and normal tissues. Expression of these genes was evaluated in a panel of 11 pancreatic cancer cell lines and in blood samples from 3 non-PDAC patients. We found that connexin 31 (GJB3), a gap junction protein, was undetectable in blood samples from non-PDAC patients but had high expression in all pancreatic cancer cell lines. We then validated GJB3 expression in blood samples from 20 PDAC patients including 5 patients with localized, 7 with locally advanced, and 8 with metastatic PDAC, as well as 3 non-cancer patients and 1 patient with a cancer other than PDAC. GJB3 expression was higher in samples from patients with mPDAC compared to patients with localized PDAC (p=0.016). In an analysis of 131 patients with resected PDAC tumors, patients with high tumor expression of GJB3 had a shorter median OS (15 mos vs. 24 mos, p=0.031). Conclusion(s): Our results suggest that GJB3 is associated with metastasis as patients with higher GJB3 expression have a worse outcome. GJB3 is found selectively in blood samples from patients with mPDAC and thus is a potential circulating biomarker for mPDAC Further analysis in a larger cohort of patients will be done to establish the use of GJB3 as a prognostic circulating biomarker.

Marcato, S. M. and G. J. M. M. d. Lima (2005). "Feed restriction as an alternative to reduce environmental impact of pig waste." Revista Brasileira de Zootecnia **34**(3): 855-863.

The objective of this study was to evaluate the effect of feed restriction on faecal mineral content of finishing pigs (n=48) with initial weight of 41.92+or-0.27 kg assigned to an

experimental randomized block design. Treatments were: T1=ad libitum feeding; T2=95% T1 feed intake; and T3=90% T1 feed intake and 16 replicates. The animals were kept for 21 days adaptation period in collective pens and metabolism cages. Urine and faecal collections were performed for two days using 20 g of coloured plastic particles as faecal markers. There was a reduction of 8.54% in the daily feed consumption in the diet in T3 animals, causing a decrease of 9.65% in faecal mineral content when compared with ad libitum consumption (T1). All macrominerals, except for magnesium, decreased in the faeces while feed restriction increased. Calcium and potassium in the faeces represented ~29% of the excreted mineral matter of the animals and both significantly decreased during feed restriction. For all microminerals, the relationship between the excreted amount and consumed amount were equal or >86.60%, indicating that the animals had a low retention efficiency of these nutrients. It is concluded that feed restriction in the finishing phase of pigs cause a reduction in the amount of dry matter and almost all minerals excreted. Therefore, the use of this practice can contribute to reduce pollution problems of pig manure.

Marcinkowski, U., et al. (2015). "Evaluation of polycaprolactone as a new sorbent coating for determination of polar organic compounds in water samples using membrane-SPME." Analytical and bioanalytical chemistry **407**(4): 1205-1215.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Commercially available solid-phase microextraction fibers used for isolation of polar analytes are based on the adsorption phenomenon. In consequence, typical limitations bonded with analytes displacement and matrix effects are very frequent. In the present study, alternative solution is described. Polycaprolactone (PCL) was used for the first time as sorbent to isolate polar organic compounds from water samples using the membrane-solid-phase microextraction (M-SPME) technique. In this technique, due to protective role of the mechanically and thermally stable polydimethylsiloxane (PDMS) membrane, internal polar coating might be melted during extraction and desorption of analytes. In consequence sorbents with low melting points like a PCL might be utilized. Based on chromatographic retention data, triazines were selected as a model compounds for evaluation of the sorptive properties of the polycaprolactone. Applying the screening plan and central composite design, statistically significant parameters influencing extraction efficiency were determined and optimized. The analysis of variance confirmed the significant influence of temperature, salt content, and pH of samples on the extraction efficiency. Besides the new PCL/PDMS fiber, a commercial fiber coated with divinylbenzene/polydimethylsiloxane (DVB/PDMS) was used for comparative studies. The results obtained showed that PCL is an interesting sorbent which can be successfully applied for isolation of polar organics from aqueous matrices at a broad range of analytes concentration. The determined detection limits of procedure based on the novel fiber enable its application at the concentration levels of triazines recommended by the US EPA standards. The practical applicability of the developed fiber has been confirmed by the results based on the analysis of real samples.

Mardyani, S. (2011). Nanoparticles for Cancer Detection and Therapy: Towards Diagnostic Applications of Quantum Dots and Rational Design of Drug Delivery Vehicles.

This thesis describes observations, techniques and strategies, which contribute towards the development of nanoparticle based detection and treatment of cancer. Quantum dots and biorecognition molecules were studied towards applications in detection and microgels were

used in the rational design of a targeted drug delivery vehicle. The fluorescence intensity of quantum dots was examined in buffers commonly used in molecular biology. The fluorescence intensity of ZnS-capped CdSe quantum dots (QDs) was found to vary significantly, depending on the amount of ZnS capping on the QDs or the concentration, pH and type of buffer the QDs were in. Since fluorescence cannot reliably be used to quantify QDs, an alternative quantification method was developed, which does not rely on their fluorescence. This method employs phage display to identify nanoparticle-specific bacteriophage which were then applied in an assay to quantify QDs in environments where absorbance or fluorescence spectroscopy are ineffective. Biorecognition molecules, which can direct nanoparticles to a molecular target, were also identified through phage display. Phage display on whole cells was used to identify a peptide, which was conjugated with QDs to stain HeLa (cervical cancer) cells. A high-throughput phage display screening strategy was also developed, which could enable the simultaneous identification of multiple biorecognition molecules from a single library. QD-encoded microbead barcodes were conjugated to protein targets and then used to screen a phage display library. The beads and the binding phage were then separated using flow cytometry and fluorescence assisted cell sorting. Finally, biorecognition molecules were combined with nanoparticles to create drug delivery vehicles, which were designed to protect, deliver and then release chemotherapeutic drugs through an intracellular pH trigger. PolyNIPAAm and chitosan hydrogels, under 200 nm in diameter, were loaded with chemotherapeutic drugs, conjugated to transferrin and tested in vitro on HeLa cells. These projects demonstrate the great potential in this growing field as well as some of the many challenges that have yet to be overcome.

Margiotta, S. (2007). "Technical characterization of eco-compatible plastic films for soil solarization: four years of experiments." Rivista di Ingegneria Agraria **38**(4): 1-10.

Soil solarization relies on solar radiation being converted to heat for the killing of soilborne pathogens. On one hand, this technique can be considered as an environmentally-friendly way to manage soilborne pests, as an alternative of methyl bromide phased-out in 2005, than using chemicals. On the other hand, high employment of traditional plastic sheets in agriculture causes the production of enormous quantities of waste, whose inappropriate management might have negative effects on the environment. In order to determine a reduction of the charge of plastic waste and to facilitate the waste disposal, one of the most interesting approaches, from an environmental point of view, lies in the location of innovatory plastic films such as co-extruded ultrathin films, which are able to reduce the plastic quantity to be managed, and biodegradable laminates, which after a first usage, will spontaneously start up a degradation process that avoids their collection and their consequent disposal. Beside the ecological proprieties of these innovative films, it is necessary to study their technical and agronomical behavior in order to determine their efficiency and the possibility to be used in place of the traditional plastic films. This paper represents a review of the research carrier out by the Technical Economics Department of the University of Basilicata (Italy) in the last years (1999, 2000, 2002 and 2003) on the technical performances of some innovative plastic films used for soil solarization.

Margovsky, A., et al. (1998). "Small vessel ischaemia induced by microbead embolization in the sheep hind limb." Australian and New Zealand Journal of Surgery **68**(8): 592-598.

Background: Peripheral ischaemia may be caused by small vessel disease but there has been no satisfactory experimental model for studying this condition. We have developed a model in which microbeads are embolized to the distal vascular bed of a sheep. This model induces ischaemia proportional to the volume of microbead infusion and allows the pathophysiology and therapy of small vessel occlusion to be studied. Method(s): Gradual reduction of femoral artery blood flow by 50% and 75% in unilateral hind limbs of eight sheep was achieved by slow introduction of latex microbeads (mean size = 400 mum) into the peripheral vascular bed. The other hind limb served as a control. Measurements of blood flow, subcutaneous temperature and arterial and venous blood gases were recorded in both hind limbs after each level of flow reduction. Angiography confirmed small vessel occlusion. Muscle samples were analysed for ultrastructural changes by transmission microscopy. Result(s): A linear correlation was found between the amount of microbeads infused and the reduction in the blood flow. Significant subcutaneous temperature and venous pO<inf>2</inf> changes were observed in the embolized limb at both 50% and 25% flow levels compared to baseline (P < 0.05; ANOVA). Angiography demonstrated abrupt cut-off images of the small vessels. Transmission microscopy showed graded levels of muscle cell damage from ischaemia. Conclusion(s): Latex microbead embolization induces reproducible controlled small artery occlusion. The degree of outflow obstruction and the extent of ischaemia can be varied by delivering measured quantities of microbeads. This model should be useful for studying the pathophysiology of ischaemia and for assessing the efficacy of treatment, especially the use of pharmacological agents.

Maria, M. S., et al. (2015). "Development of a microfluidic device for cell concentration and blood cell-plasma separation." Biomedical Microdevices **17**(6): 115.

This work presents design, fabrication and test of a microfluidic device which employs Fahraeus-Lindqvist and Zweifach-Fung effects for cell concentration and blood cell-plasma separation. The device design comprises a straight main channel with a series of branched channels placed symmetrically on both sides of the main channel. The design implements constrictions before each junction (branching point) in order to direct cells that would have migrated closer to the wall (naturally or after liquid extraction at a junction) towards the centre of the main channel. Theoretical and numerical analysis are performed for design of the microchannel network to ensure that a minimum flow rate ratio (of 2.5:1, main channel-to-side channels) is maintained at each junction and predict flow rate at the plasma outlet. The dimensions and location of the constrictions were determined using numerical simulations. The effect of presence of constrictions before the junctions was demonstrated by comparing the performances of the device with and without constrictions. To demonstrate the performance of the device, initial experiments were performed with polystyrene microbeads (10 and 15 mum size) and droplets. Finally, the device was used for concentration of HL60 cells and separation of plasma and cells in diluted blood samples. The cell concentration and blood-plasma purification efficiency was quantified using Haemocytometer and Fluorescence-Activated Cell Sorter (FACS). A seven-fold cell concentration was obtained with HL60 cells and a purification efficiency of 70 % and plasma recovery of 80 % was observed for diluted (1:20) blood sample. FACS was used to identify cell lysis and the cell viability was checked using Trypan Blue test which showed that more than 99 % cells are alive indicating the suitability of the device for practical use. The proposed device has potential to be used as a sample preparation module in lab on chip based diagnostic platforms.

Mariano, E. d. F. and C. H. Targino (2012). "Plastic ingestion by Masked booby, Sula dactylatra Lesson, 1831, on Biological Reserve of Rocas Atoll, RN, Brazil." Biotemas **25**(4): 285-288.

Plastic particles are one of the most common pollutants in the marine environment and it is reaching regions with low human population density. These particles are frequently ingested by many marine organisms, causing digestive problems, which may lead to the weakening and death of the animal. In a research on the feeding of 631-masked boobies, Sula dactylatra from

the Biological Reserve of Atol das Rocas, plastic particles were found in stomach contents of four adults. The artifacts found were made of transperant plastic, a piece of label of a mineral water bottle, two pieces of black plastic and a small hard and red piece. The flow of fishing and tourism boats on the Atol das Rocas Biological Reserve may be the source of origin of the plastic parts in both the stomach contents and those found on the islands of the reserve, which suggests that anthropogenic behaviour has already reached isolated areas which should have a high degree of biodiversity protection. Several measures can be taken to avoid deleterious events in the marine biota, but there is great difficulty in avoiding waste dumping from fishing and tourism ships/boats, in addition to that, there are many materials from the mainland, which requires an increase in awareness and supervision.

Marie Kampmann, E., et al. (2019). "Quality Assessment and Circularity Potential of Recovery Systems for Household Plastic Waste." Journal of Industrial Ecology **23**(1): 156-168.

Plastic recycling is promoted in the transition toward a circular economy and a closed plastic loop, typically using mass-based recycling targets. Plastic from household waste (HHW) is contaminated and heterogeneous, and recycled plastic from HHW often has a limited application range, due to reduced quality. To correctly assess the ability to close plastic loops via recycling, both plastic quantities and qualities need to be evaluated. This study defines a circularity potential representing the ability of a recovery system to close material loops assuming steady-state market conditions. Based on an average plastic waste composition including impurities, 84 recovery scenarios representing a wide range of sorting schemes, source-separation efficiencies, and material recovery facility (MRF) configurations and performances were assessed. The qualities of the recovered fractions were assessed based on contamination and the circularity potential calculated for each scenario in a European context. Across all scenarios, 17% to 100% of the generated plastic mass could be recovered, with higher source-separation and MRF efficiencies leading to higher recovery. Including quality, however, at best 55% of the generated plastic was suitable for recycling due to contamination. Source-separation, a high number of target fractions, and efficient MRF recovery were found to be critical. The circularity potential illustrated that less than 42% of the plastic loop can be closed with current technology and raw material demands. Hence, Europe is still far from able to close the plastic loop. When transitioning toward a circular economy, the focus should be on limiting impurities and losses through product design, technology improvement, and more targeted plastic waste management.

Markic, A., et al. (2019). "Plastic ingestion by marine fish in the wild." Critical Reviews in Environmental Science and Technology.

Marine plastic pollution has become a prominent environmental issue in the recent years. Plastic ingestion is of special concern, as its magnitude and consequences for marine organisms and potentially humans are still largely unknown. We reviewed 93 papers on plastic ingestion by wild marine fish published since 1972. Plastic ingestion was detected in 323 (65%) of 494 examined fish species, and in 262 (67%) of 391 examined commercial fish species. These proportions are likely greater, as a detailed analysis of the sampling effort and analytical methods used in the reviewed studies suggests an underestimation of plastic ingestion in some assessments. A significant positive relationship ($R = +0.845$, $p = 0.004$) was found between the sample size up to $N = 10$ and the detection of plastic ingestion. We also found significant differences in detection and frequency of occurrence (FO, %) of plastic ingestion among the three main types of analytical methods: naked-eye, microscopic analysis and chemical digestion. The chemical digestion method, which is also the most robust laboratory method, had the

greatest detection (86%) and the highest FO (37.6 +/- 0.6%). To avoid the underestimation of plastic ingestion in future work, we provided recommendations for sample sizes and laboratory analysis. Copyright © 2019, © 2019 Taylor & Francis Group, LLC.

Markic, A., et al. (2018). "Double trouble in the South Pacific subtropical gyre: increased plastic ingestion by fish in the oceanic accumulation zone." Marine Pollution Bulletin **136**: 547-564.

Fish are an important food source for South Pacific (SP) island countries, yet there is little information on contamination of commercial marine fish species by plastic. The aim of our study was to perform a broad-scale assessment of plastic ingestion by fish common in the diet of SP inhabitants. We examined 932 specimens from 34 commercial fish species across four SP locations, and some of the prey they ingested, for the presence of marine plastics. Plastic was found in 33 species, with an average ingestion rate (IR) of 24.3+or-1.4% and plastic load of 2.4+or-0.2 particles per fish. Rapa Nui fish exhibited the greatest IR (50.0%), significantly greater than in other three locations. Rapa Nui is located within the SP subtropical gyre, where the concentration of marine plastics is high and food is limited. Plastic was also found in prey, which confirms the trophic transfer of microplastics.

Markovetz, M. R., et al. (2019). "Establishing the mucus flake burden as a biomarker of CF disease severity." Pediatric Pulmonology **54 (Supplement 2)**: 161.

Rationale: Dehydration of the airway surface layer is a hallmark of cystic fibrosis (CF) airway disease. We have recently demonstrated that mucins (the key gel-forming polymeric component of mucus) are elevated in bronchoalveolar lavage fluid (BALF) in preschool-aged CF patients (Esther CR Jr, et al. Sci Transl Med. 2019;11:486), and that roughly half of the mucins present in BALF are present in nonswelling gels termed mucus flakes. However, the relationship between flake formation and CF disease severity has not been established. Method(s): BALF was collected from 25 children with CF (age 10.9 +/-4.6 years, % FEV<inf>1</inf> predicted 78.9 +/-13.5%) as part of routine treatment (UNC-CF). Mucin and DNA concentrations of each sample were measured by refractometry and PicoGreen assay respectively. Flake rheology was measured by microbead rheology, and the coverage area of flakes (proxy for the amount of sample that flakes occupy) was measured by tilling fluorescence microscopy. Results from this cohort group were compared to samples from healthy adults as well as previously collected data from preschool children with CF (AREST CF) undergoing bronchoscopy when clinically stable (Esther, et al). Result(s): Both mucin and DNA concentrations were increased in BALF from school-aged children with CF (UNC-CF) relative to preschool children with CF (AREST CF), with mucin and DNA concentrations higher in both groups relative to healthy adults. Although the fraction of mucins present in mucus flakes was not different between preschool and school-aged CF groups (though increased relative to healthy adults), the total flake coverage area was higher in the UNC-CF relative to both AREST CF and healthy adults. Furthermore, within the school-aged group both flake coverage area and rheology of flakes (viscosity) were inversely proportional with % FEV<inf>1</inf> predicted. Our data also shows that infection further elevates the mucin concentration, flake coverage, and rheology of flakes within the UNC-CF group. Conclusion(s): Mucus flakes are present at higher concentrations in children with CF and become more abundant and rheologically thicker with disease progression, as measured by age or worsening pulmonary function. Mucus flakes are therefore a candidate biomarker of CF disease severity and a therapeutic target. Rheologic and imaging methods can be used to assess mucus flake abundance and biophysical properties in young children.

Markovetz, M. R., et al. (2017). "Evaluating mucus-based biomarkers of CF airway disease." Pediatric

Pulmonology **52 (Supplement 47)**: 258.

The AREST CF project represents a unique opportunity to document the early onset of airway disease in cystic fibrosis. In this ongoing study, bronchoalveolar lavage (BAL) samples are collected from pediatric patients at regular intervals over the first 6 years of life. The goal of our analysis is to investigate changes in the rheological properties of mucus brought on by CF airway disease. We have previously shown that CF sputum is characterized by significantly increased mucin concentration (1) resulting in modified biophysical properties such as viscoelasticity and osmotic pressure (2, 3). Due to the dilute nature of BAL samples, determining the native concentration of mucus along the airways from BAL samples has proven impossible. While small flecks of concentrated, viscoelastic mucus are present in pediatric CF BALs, these samples also contain highly diluted mucus that is rheologically identical to saline. By combining sophisticated microbead rheological measurements of BAL samples with advanced data analytics, we are able to determine a diversity of rheological microenvironments. Specifically, we embed 1 micron diameter tracer particles into the sample volume and analyze their diffusive fluctuations. Analytically, we convert each particle's position series into a local rheological characterization (4), reflecting motilities from a range of diluted to pure mucus samples. We compare our results to young-adolescent CF patients and to normal BALs, finding that the samples collected from the pediatric AREST participants display a rheology that lies between that of healthy adults and adult CF patients. We further show that pre-school aged CF patients already have mucus that is consistent with high concentration pathology, and that mucus from CF patients has a fundamentally altered molecular structure compared to normal adults over a wide range of mucus concentrations. Finally, we evaluate the relative efficacy of mucolytic treatments with dithiothreitol (DTT) and lambda DNase in restoring pathologically altered mucus to normal.

Marques, G. A. and J. A. S. Tenorio (2000). "Use of froth flotation to separate PVC/PET mixtures." Waste Management **20**(4): 265-269.

Recycling is an important activity in the minimization of waste that results from human activities. The idea re-using this waste has increased during the last decades due to environmental, economics and social factors. In the United States, 75 billion pounds of plastic are produced every year. Unfortunately, the majority of this plastic ends up in landfills where its decomposition process can take anywhere from 10 to 30 years. The United States currently recycles about 5% of its post-consumer plastic waste; however, as much as 55% could be recycled if economically viable methods can be developed to collect and process waste streams that contain at least 50% thermoplastic materials. Froth flotation is the cheapest and most extensively used process for the separation of chemically similar minerals, and to concentrate ores for economical smelting. Flotation has a reduced cost compared to other separation operations. In this work, froth flotation was used to treat PVC and PET mixtures. The parameters studied are reagents, pH, conditioning time and particle size. The results show a yield of 99.3% pure PVC separated from PET. (C) 2000 Elsevier Science Ltd.

Marques-Santos, L. F., et al. (2018). "Cationic polystyrene nanoparticle and the sea urchin immune system: biocorona formation, cell toxicity, and multixenobiotic resistance phenotype." Nanotoxicology **12**(8): 847-867.

In order to assess the impact of nanoplastics on marine species, polystyrene nanoparticles (PS NPs) have been largely used as model particles. Here we studied the effects of 50 nm amino-modified PS-NH2 on Mediterranean sea urchin Paracentrotus lividus immune system cells (coelomocytes) in the presence of celomic fluid (CF) and at different NP concentrations (1, 5, 10, and 25 μg mL-1) and experimental conditions (absence or presence of EDTA). PS-NH2 acquired a protein corona once incubated with CF, dominated by the toposome precursor protein (TPP). In short-term cultures, a significant concentration- and time-dependent decrease in lysosomal membrane stability and apoptotic-like nuclear alterations were observed in phagocytes upon exposure to PS-NH2 (10 and 25 μg mL-1) in CF but they resulted abolished in the presence of EDTA confirming the role of TPP in triggering PS-NH2-coelomocytes interaction and toxicity. PS-NH2 did not alter MXR phenotype but the observed dose-dependent decrease in calcein accumulation suggests the ability of PS-NH2 to affect pump's efflux activity. Overall results encourage additional studies on positively charged nanoplastics, since the observed effects on sea urchin coelomocytes as well as the TPP corona formation might represent a first step for addressing their impact on sensitive marine species.

Marra, F., et al. (2017). "Virtualization of fluid-dynamics in micro-air assisted extruders for food microfluidic based encapsulation. (Special Issue: Responsible research and innovation in the food value chain.)." Journal of Food Engineering **213**: 89-98.

Microfluidic technique represents an interesting technological solution for the production of alginate microbeads in pharmaceutical, food and cosmetics industry. Given the characteristic small size of microfluidic devices and the extremely complex dynamics which are at the base of transport phenomena involved in this process, a purely experimental approach is not able to provide all significant data to design cheap but trustable devices. In this work, a virtual approach - based on computational fluid dynamics analysis - has been proposed to analyze the behavior of a micro air-assisted extruder and to provide mechanistic insight into the particle formation dynamics. The particle formation was characterized by a complex periodic dynamics, during which elongations and instabilities brought to merging of liquid droplets, of different main size, into bigger drops. Jet instabilities dominating the drops break-up dynamics were greatly influenced by geometric parameters: the fluid-dynamic analysis showed that small misalignment can dramatically change the jet breakup dynamics, introducing a completely different framework. The analysis proposed in this work represents a powerful tool for the design of simple and cheap microfluidic devices, capable of mass production of small (around 300 micro m of diameter) and regular alginate microbeads, at least for matrix encapsulation.

Marrari, M. and R. J. Duquesnoy (2010). "Detection of donor-specific HLA antibodies before and after removal of a rejected kidney transplant." Transplant Immunology **22**(3-4): 105-109.

UNLABELLED: Serum analysis of patients considered for retransplantation has a potential limitation that the rejected allograft may absorb HLA antibodies. We have determined how the highly sensitive micro bead-based Luminex antibody-binding assay with single antigens can detect donor-specific HLA antibodies (DSA) in patients before and after surgical removal of a rejected allograft. This analysis was done for 65 allograft nephrectomy (allonx) cases contributed by 16 laboratories worldwide. In the HLA-A,B and -DRB1 mismatch categories the incidence of DSA reactivity pre-allonx and post-allonx was 64% vs 87% (p=0.0033) and 57% vs 86% (p=0.001), respectively. The frequencies of individual reactive antigens were also lower before allonx: for HLA-A,B antigens: 49% vs 75% (p<0.0001) and DRB1 antigens: 48% vs 79% (p=0.0001). On the other hand, no significant differences were seen between the pre-allonx and post-allonx frequencies of DSA to DRB3/4/5 (65% vs 78%, p=0.22) and DQ mismatches (76% vs 87%, p=0.18).

CONCLUSION: although the sensitive Luminex antibody assay can detect anti-donor antibodies in the presence of a rejected transplant, it is apparent that the antibody specificity pattern is often incomplete especially against the HLA-A, -B and DR mismatches. This understanding seems relevant to the determination of acceptable mismatches for patients considered for

retransplantation.

Marsic-Lucic, J., et al. (2018). "Levels of trace metals on microplastic particles in beach sediments of the island of Vis, Adriatic Sea, Croatia." Marine Pollution Bulletin **137**: 231-236.

The aim of this study was to determine the levels of trace metals (Cd, Cr, Cu, Fe, Mn, Ni, Pb and Zn) in plastic pellets collected from two sandy beaches on the island of Vis, Croatia. A total of 92 pellets in a sediment volume of 3965mL were collected at the investigated sampling sites. Concentrations of pellets in sediment samples ranged from 6 to 36particlesdm⁻³ of wet sediment. Mean particle weight of the collected beached pellets ranged from 17mg to 31mg. Trace metal concentrations in plastic pellets were greater than the concentrations reported for seawater in the investigated area, which indicates that plastic pellets sorb metals from the marine environment. The adsorbed trace metals may enter the food chain due to incidental ingestion of microplastic particles by marine animals, which presents a potential human health risk due to consumption of seafood.

Martellini, T., et al. (2018). "A snapshot of microplastics in the coastal areas of the Mediterranean Sea." TrAC - Trends in Analytical Chemistry **109**: 173-179.

The Mediterranean Sea is affected by one of the most significant plastic pollution worldwide. This review critically evaluates the most recent literature on the presence of microplastics in sediments, suggested to be long term sinks and have a high potential to accumulate this kind of marine debris. A picture of microplastic levels in coastal environments is given, evidencing information gaps and considering also estuary, lagoons and areas influenced by the contribution of rivers. A wide range of contamination levels has been found, with the highest in lagoon and estuary environments. The lack of homogeneity in the methods of study and the need to harmonize the latter and the expression of the results in addition to the need to obtain data on the contributions of the main tributaries of the Mediterranean and on lagoons, are other important considerations taken. Copyright © 2018 Elsevier B.V.

Martin, C., et al. (2019). "Seasonality of marine plastic abundance in central Red Sea pelagic waters." Science of the Total Environment **688**: 536-541.

The Red Sea holds one of the lowest concentrations of floating plastic worldwide and no evident congregation zones were identified so far, despite peculiar oceanographic features that candidate the basin as an accumulation area for floating debris. However, the Red Sea exhibits a complex pattern of surface currents, which changes according to the monsoon season, possibly affecting the abundance of plastic throughout the year. To explore the effect of seasonality on plastic concentration in surface waters, we conducted a fortnightly time series sampling, using a neuston net, for 21months at a pelagic station in the central Red Sea, where the major seasonal overturn of the Red Sea surface circulation occurs. The estimated average abundance (+/-SE) was 58,563+/-19,272itemsKm⁻² (73.5+/-40.75gKm⁻²), highly variable according to season, lower during the summer monsoon. Indeed, the winter monsoon pushes oceanic surface waters inside the Red Sea, transporting alongside floating plastic items, whilst surface currents exit the basin during the summer monsoon, depleting central Red Sea waters from floating plastic. Composition of plastic items also changes through time. Particularly, the higher proportion of films and foams during summer months suggests that the main source of plastic at the sampling station from June to September is a short-range transport, while during winter months, the higher contribution of small fragments indicates that, from October to May, plastic is also transported to the central Red Sea through surface currents for long distances, possibly coming all the way from the Indian Ocean.

Martin, C., et al. (2019). "Adhesion to coral surface as a potential sink for marine microplastics." Environmental Pollution **Part 2. 255 (no pagination)**(113281).

Only 1% of plastic entering the ocean is found floating on its surface, with high loads in ocean accumulation zones and semi-enclosed seas, except for the Red Sea, which supports one of the lowest floating plastic loads worldwide. Given the extension of reefs in the Red Sea, we hypothesize a major role of scleractinian corals as sinks, through suspension-feeding, and assessed microplastic removal rates by three Red Sea coral species. Experimental evidence showed removal rates ranging from 0.25 x 10⁻³ to 14.8 x 10⁻³ microplastic particles polyp⁻¹ hour⁻¹, among species. However, this was only 2.2 +/- 0.6% of the total removal rate, with passive removal through adhesion to the coral surface being 40 times higher than active removal through suspension-feeding. These results point at adhesion of plastic to coral reef structures as a major sink for microplastics suspended in the water column after sinking, helping explain low concentrations in Red Sea surface waters. Corals remove microplastics from the water mainly through a passive mechanism of surface adhesion, which is a removal process 40 times more efficient than retention after ingestion. Copyright © 2019 Elsevier Ltd

Martin, C. and M. Dubois (2000). "Solarization as a practical integrated soil disinfestation system in salad crop of Roussillon (southern France)." Acta Horticulturae **532**: 243-246.

A long term demonstration project on solarization as a viable alternative for soil disinfestation is discussed. A special registered prototype of a plastic-laying machine for open fields was developed and a channel for the collection of plastic waste was tested. Cost comparisons were made for three methods for taking the plastic from the grower's field to the conditioning unit and up to a recycling unit. The results indicate an increasing potential for solarization in open fields and greenhouses, on rotations including a salad crop with cucurbits, early potatoes and artichokes in Roussillon (southern France).

Martin, E. D., et al. (1982). "Attitude in the histologic diagnosis of small-bowel disease. [French]." Acta Endoscopica **12**(4): 295-305.

Peroral biopsy is an essential diagnostic tool in diffuse mucosal small bowel disease. Enteroscopy allows a macroscopic examination, the orientation of specimens, and especially a quick retrieval of biopsies at several levels. A comparison between human and animal biopsies, obtained through aspiration-section tubes or by biopsy foreceps, reveals that the orientation of the specimens and the risks of artefacts are more important in endoscopic biopsies. For these cases, systematic serial sectioning is recommended. Rapid inclusion in plastic resin allows the use of thin sections, without retraction, which is useful in the detection of minor cytologic changes and in quantitative studies such as intraepithelial lymphocyte-counts or villous morphometry.

Martin, I. (2007). "Plastics scrap: Europe struggling with supply." Recycling International(8): 92-97.

This article focuses on issues facing the plastic scrap industry in Europe. It explains that plastic scrap consumers in Europe are finding it hard to maintain their regular supplies. This is because about 60% of the European Union's polyethylene film scrap is being exported to China. Another factor that contributed to the decline in the supply of scrap plastics is the development of efficient equipment that produce less scrap and many producers are recycling their plastic products. It explains that transportation plastic scraps via oceans is less costly than transporting them via land. For this reason, many plastic scrap collectors tend to export to China than supply

Europe's scrap plastic consumers.

Martin, I. (2010). "Market 'weaker than expected' in 2010." Recycling International(9): 33-33.
The article reports that the plastics scrap market has been weaker than expected in 2010, according to delegates at the 2010 Bureau of International Recycling (BIR) Convention. The weak market can be attributed to the wait-and-see policy adopted by buyers, according to Jacques Musa of Veolia Propreté France Recycling. It relates the amount of plastic scrap imported by China in the first five months of 2010. Some of the events in China that affect the demand for plastic scrap include tighter customs controls and stricter environmental obligations.

Martin, J., et al. (2017). "The Deposition and Accumulation of Microplastics in Marine Sediments and Bottom Water from the Irish Continental Shelf." Scientific Reports **7**(1): 10772.
Microplastics are widely dispersed throughout the marine environment. An understanding of the distribution and accumulation of this form of pollution is crucial for gauging environmental risk. Presented here is the first record of plastic contamination, in the 5 mm-250 mum size range, of Irish continental shelf sediments. Sixty-two microplastics were recovered from 10 of 11 stations using box cores. 97% of recovered microplastics were found to reside shallower than 2.5 cm sediment depth, with the area of highest microplastic concentration being the water-sediment interface and top 0.5 cm of sediments (66%). Microplastics were not found deeper than 3.5 +/- 0.5 cm. These findings demonstrate that microplastic contamination is ubiquitous within superficial sediments and bottom water along the western Irish continental shelf.

Martin, K. and A. Turner (2019). "Mobilization and bioaccessibility of cadmium in coastal sediment contaminated by microplastics." Marine Pollution Bulletin **146**: 940-944.
Cadmium has had a number of historical applications in plastics but is now highly regulated. In this study, plastics containing pigmented or recycled Cd at concentrations up to 16,300mugg⁻¹ were processed into microplastic-sized fragments and added to clean estuarine sediment. Plastic-sediment mixtures (mass ratio=1:100) were subsequently exposed to fluids simulating the digestive conditions encountered in marine deposit-feeding invertebrates prepared from a protein and a bile acid surfactant in seawater and the mobilization of Cd measured as a function of time. Kinetic profiles over a six-hour period were complex, with some fitted using a diffusion model and others exhibiting evidence of Cd interactions between the plastic and sediment surface. The maximum concentration of Cd released from plastic-sediment mixtures was about 0.8mugg⁻¹ and orders of magnitude greater than Cd mobilization from sediment alone. It is predicted that large communities of deposit-feeders could mobilize significant quantities of Cd from historical microplastics.

Martin, V. M., et al. (1998). "Immunomagnetic enrichment of disseminated epithelial tumor cells from peripheral blood by MACS." Experimental Hematology **26**(3): 252-264.
Disseminated epithelial tumor cells have been detected in the bone marrow and blood of cancer patients by means of immunocytochemical or immunofluorescent staining of cytocentrifuge slides, multiparameter flow cytometry, and reverse transcriptase-polymerase chain reaction. However, it is hardly possible using such methods to detect tumor cells at a frequency below 10(-6). To increase the sensitivity of these detection techniques we have developed a new technology for the enrichment of disseminated epithelial tumor cells from hematopoietic cell samples by high-gradient magnetic cell sorting (MACS). Cells are permeabilized and fixed and

carcinoma cells are magnetically labeled specifically with an anti-cytokeratin 8 monoclonal antibody (mAb) directly conjugated to superparamagnetic microbeads. Magnetically labeled cells are enriched on high-gradient magnetic columns. Tumor cells are detected in the enriched cell fraction by flow cytometry, fluorescence microscopy, or immunocytochemisty. In this study we demonstrated the method using a model system in which five to 5,000 cells from a breast cancer cell line were seeded into blood cell samples from a healthy donor containing 1.2 x 10(8) leukocytes. Tumor cells were 10,477+/-4242 (n=25)-fold magnetically enriched, and 57.7%+/-16.9% (n=33) of the initially seeded tumor cells were recovered. Applying the method to 20-40 mL blood samples from patients with advanced carcinomas of the breast, prostate, colon, rectum, or lung, we were able to detect between one and 6.8 x 10(4) cytokeratin-expressing tumor cells in 21 of 34 patients. This corresponds to frequencies of tumor cells between 6.8 x 10(-9) and 1.1 x 10(-3) among nucleated cells in the original sample. Enriched tumor cells were further analyzed for expression of tissue-specific and prognostic markers such as breast mucin glycoproteins, erbB2, and CD44v6 for additional characterization and to confirm their tumor origin. The technique described could become a valuable tool for the quantification and molecular characterization of metastatic carcinoma cells in hematopoietic tissue, and may ultimately prove useful in the diagnosis, prognosis, and monitoring of patients with carcinoma.

Martinelli Filho, J. E. and R. C. P. Monteiro (2019). "Widespread microplastics distribution at an Amazon macrotidal sandy beach." Marine Pollution Bulletin **145**: 219-223.

Microplastics (MPs) are widespread and cause many impacts, yet their distribution and abundance are unknown for the Amazon coast. We estimated the abundance and distribution of microplastics at a sandy beach on the northern Brazilian coast during April 2014. Sand was collected and analyzed at three depth strata (0-20, 20-40 and 40-60 cm). MPs (250-500, 501-5000 mum) from each depth were sieved and retrieved by flotation when necessary. We found 492.5 +/- 556.4 particles m⁻³, with fibers comprising up to 95%. The abundance decreased with depth (61.5, 25 and 13.5% from the surface to 40-60 cm) and the deposition zone showed higher densities compared to the erosion zone. Although present in low to moderate abundance, MPs were widespread on the beach. The Amazon coast is an important area for fisheries and traditional communities, and further studies of its potential as a source or sink of MPs are needed. Copyright © 2019 Elsevier Ltd

Martinez, H. R., et al. (2009). "Stem-cell transplantation into the frontal motor cortex in amyotrophic lateral sclerosis patients." Cytotherapy **11**(1): 26-34.

BACKGROUND AIMS: Amyotrophic lateral sclerosis (ALS) is characterized by the selective death of motor neurons. CD133(+) stem cells are known to have the capacity to differentiate into neural lineages. Stem cells may provide an alternative treatment for ALS and other neurodegenerative diseases.

METHODS: Five men and five women (aged 38-62 years) with confirmed ALS were included in this study. Our institutional ethics and research committees approved the protocol. After informed consent was obtained, patients underwent Hidrogen-Magnetic Resonance Imaging (H-MRI) spectroscopy and were given scores according to an ALS functional rating scale, Medical Research Council power muscle scale and daily living activities. Bone marrow was stimulated with 300 microg filgrastim subcutaneously daily for 3 days. Peripheral blood mononuclear cells were obtained after admission by leukapheresis. The cell suspension was conjugated with anti-human CD133 superparamagnetic microbeads, and linked cells were isolated in a magnetic field. The isolated cells (2.5-7.5x10(5)) were resuspended in 300 microL of the patient's cerebrospinal fluid, and

implanted in motor cortexes using a Hamilton syringe. Ten patients with confirmed ALS without transplantation were used as a control group. Patients were followed up for a period of 1 year.
RESULTS: The autologous transplantation of CD133(+) stem cells into the frontal motor cortex is a safe and well-tolerated procedure in ALS patients. The survival of treated patients was statistically higher (P=0.01) than untreated control patients.
CONCLUSIONS: Stem-cell transplantation in the motor cortex delays ALS progression and improves quality of life.

Martínez-Gómez, C., et al. (2017). "The adverse effects of virgin microplastics on the fertilization and larval development of sea urchins." Marine Environmental Research **130**: 69.
A study investigating the adverse effects of virgin and experimentally aged polysterene (PS) and high density polyethylene (HDPE) materials and their leachates on the pelagic fertilization and larval development of the sea urchin Paracentrotus lividus. Commercial synthetic polymers of polystyrene (PS) microspheres and HPDE fluff were used as proxies for microplastics in marine systems. About twenty mature sea urchin adults were sampled in March and April (reproductive period of the species) from the reference site Cala Reona (Murcia, SE Spain) and transported immediately to the laboratory. Physicochemical parameters were recorded in all test chambers before and after each bioassay and adjusted when necessary to maintain optimum test conditions. Sea urchin eggs were mixed (stirring gently) with PS microspheres for 10 mm in four test solutions and nominal concentrations. The sea urchin embryotoxicity test (SET) was performed following the methodology described by Duran and Beiras (2010) and Beiras et al. Statistical analyses were carried out using SPSS v.11.0 (IBM SPSS software/www.spsss.com). The study concluded that toxic effects on fertilization (ANOVA, post hoc Dunnett test; p- value <0.05) were observed after the exposure of the sea urchin eggs to virgin PS microspheres.

Martinez-Lera, S., et al. (2013). "Design and first experimental results of a bubbling fluidized bed for air gasification of plastic waste." Journal of Material Cycles and Waste Management **15**(3): 370-380.
Plastic wastes have an especially high potential for use as alternative fuels, considering their high heating value and their large and stable availability. They could be used in electricity production based on gasification technologies, wherein electricity is produced in engines by means of the conversion of plastic wastes into a valuable gas. However, there are still some technical barriers to overcome before this technology can access the commercial stage, and further scientific research is needed to gain deeper understanding of the process and to be able to control and optimize it. This research presents the design and first experimental results of a bubbling fluidized bed gasifier conceived for the gasification of actual plastic residues. The experimental tests revealed that the selection and design of the reactor were adequate and proved some of the advantages of using plastic as a fuel, related in part to the absence of ashes and char. A valuable syngas over 5 MJ/m super(3) was generated, which contained a considerable fraction of methane as well as hydrogen and carbon monoxide as main combustible gases. The highest efficiency was achieved when the equivalence ratio was increased to 0.35, reaching 61 % in terms of cold gas efficiency and 66 % carbon conversion.

Martins, A. and L. Guilhermino (2018). "Transgenerational effects and recovery of microplastics exposure in model populations of the freshwater cladoceran Daphnia magna Straus." Science of the Total Environment **631**(632): 421-428.
The environmental contamination by microplastics is a global challenge to ecosystem and human health, and the knowledge on the long-term effects of such particles is limited. Thus, the effects of microplastics and post-exposure recovery were investigated over 4 generations

(F₀, F₁, F₂, F₃) using Daphnia magna as model. Effect criteria were parental mortality, growth, several reproductive parameters, and population growth rate. Microplastics exposure (0.1 mg/l of pristine polymer microspheres 1-5 micro m diameter) caused parental mortality (10-100%), and significantly (p<=0.05) decreased growth, reproduction, and population growth rate leading to the extinction of the microplastics-exposed model population in the F₁ generation. Females descending from those exposed to microplastics in F₀ and exposed to clean medium presented some recovery but up to the F₃ generation they still had significantly (p<=0.05) reduced growth, reproduction, and population growth rate. Overall, these results indicate that D. magna recovery from chronic exposure to microplastics may take several generations, and that the continuous exposure over generations to microplastics may cause population extinction. These findings have implications to aquatic ecosystem functioning and services, and raise concern on the long-term animal and human exposure to microplastics through diverse routes.

Martins, I., et al. (2019). "MODELPlastics workshop - Modelling Ocean Plastic Litter in a Changing Climate: Gaps and future directions." Marine Pollution Bulletin **146**: 22-25.

Here we summarize the overarching issues that emerged from a workshop held to discuss scientific challenges and future directions on the use of numerical models to predict the amount, distribution and effects of plastic pollution on marine ecosystems. The need for multi-disciplinary approaches, standardized protocols for plastic quantification and analyses, using realistic contaminant concentrations in laboratorial experiments and targeting early-life stages of marine organisms were pointed out as needs to improve data accuracy.

Martins, J. and P. Sobral (2011). "Plastic marine debris on the Portuguese coastline: a matter of size?" Marine Pollution Bulletin **62**(12): 2649-2653.

Plastic debris is a worldwide threat to marine environments and Portugal is not immune to it. Though never quantified, items of all sizes can be found in the Portuguese coastline; therefore the objective of this work is the identification of main size classes in stranded plastic debris. Beaches sediment was sampled and in the laboratory plastic items were sorted in 11 classes from <1 to >10mm, counted and weighted. Plastic size ranged from 50 mum to 20 cm and microplastics (<5mm) were the majority (72%). Most plastic fits in the smaller size classes, due to expected high residence time in the sea enhancing degradation processes, which increase surface exposure and potentially persistent organic pollutants (POP) adsorption. These results point out the important contribution of microplastics to marine debris pollution, its risks, and the need to set a higher focus on this size class.

Martynenko, I. V., et al. (2019). "Magneto-Fluorescent Microbeads for Bacteria Detection Constructed from Superparamagnetic Fe₃O₄ Nanoparticles and AIS/ZnS Quantum Dots." Analytical Chemistry **91**(20): 12661-12669.

The efficient and sensitive detection of pathogenic microorganisms in aqueous environments, such as water used in medical applications, drinking water, and cooling water of industrial plants, requires simple and fast methods suitable for multiplexed detection such as flow cytometry (FCM) with optically encoded carrier beads. For this purpose, we combine fluorescent Cd-free Ag-In-S ternary quantum dots (t-QDs) with fluorescence lifetimes (LTs) of several hundred nanoseconds and superparamagnetic Fe₃O₄ nanoparticles (SPIONs) with mesoporous CaCO₃ microbeads to a magneto-fluorescent bead platform that can be surface-functionalized with bioligands, such as antibodies. This inorganic

bead platform enables immuno-magnetic separation, target enrichment, and target quantification with optical readout. The beads can be detected with steady-state and time-resolved fluorescence microscopy and flow cytometry (FCM). Moreover, they are suited for readout by time gated emission. In the following, the preparation of these magneto-fluorescent CaCO₃ beads, their spectroscopic and analytic characterization, and their conjugation with bacteria-specific antibodies are presented as well as proof-of-concept measurements with Legionella pneumophila including cell cultivation and plating experiments for bacteria quantification. Additionally, the possibility to discriminate between the long-lived emission of the LT-encoded capture and carrier CaCO₃ beads and the short-lived emission of the dye-stained bacteria with time-resolved fluorescence techniques and single wavelength excitation is demonstrated.

Maruyama, H., et al. (2008). "On-chip pH measurement using functionalized gel-microbeads positioned by optical tweezers." Lab on a Chip **8**(2): 346-351.

This paper demonstrates local pH measurement in a microchip using a pH-sensing gel-microbead. To achieve this, the gel-microbead made of a hydrophilic photo-crosslinkable resin was functionalized with the pH indicator bromothymol blue (BTB). The primary constituent of this photo-crosslinkable resin is poly(ethylene glycol). Gel-microbeads impregnated with BTB were obtained by stirring the mixture solution, which was composed of the resin, BTB, and an electrolyte solution. The gel-microbead is polymerized by UV illumination. The polymerized gel-microbead can be manipulated by optical tweezers and made to adhere to a glass surface. The local pH was measured from the color of the gel-microbead impregnated with BTB by calibrated color information in the YCrCb color space. We succeeded in measuring the local pH value using the pH-sensing gel-microbead by manipulating and positioning it at the desired point in the microchip.

Marx, G., et al. (2008). "Heat denaturation of fibrinogen to develop a biomedical matrix." Journal of Biomedical Materials Research. Part B, Applied Biomaterials **84**(1): 49-57.

Native and heat denatured fibrinogen are the basis for various matrices used to establish hemostasis as well as for constructing biomedical devices. For example, fibrin microbeads (FMB) prepared by a heated (approximately 70 degrees C) oil emulsion process were reported to be attractive to mesenchymal-type cells, such as fibroblasts, endothelial and smooth muscle cells, and useful for isolating mesenchymal stem cells from bone marrow. Here, we examined the solution properties of fibrinogen subjected to heat (47-60 degrees C). Fibrinogen exhibited maximal stability of pH(max stab) = 6.8. At physiologically relevant concentrations, Ca(II) stabilized and Zn(II) destabilized fibrinogen against heat denaturation. Scanning electron micrographs (SEM) of precipitated, heat denatured, fibrinogen showed globular structures (approximately 400 nm diameter), composed of aggregates of >3000 fibrinogen monomers. Monoclonal antibodies (MAb) to various regions of fibrinogen, as well as two polyclonal antibody (Ab) to haptotactic peptides (Haptides) equivalent to or near the C-termini of beta and gamma-chains (beta(463-483) and gamma(372-391/411)), were used to monitor epitopic changes of fibrinogen bound to and heated on plastic ELISA plates. The pattern of altered Ab binding indicated that fibrinogen heat denaturation on plastic exposed the C-terminal epitope gamma(397-411) as well as Haptide epitopes (beta(463-483) and gamma(372-391)). Immuno-staining of FMB prepared by a heated (below 75 degrees C) oil emulsion process, also presented many exposed Haptide epitopes, which probably helped to attract cells. Our results indicated that moderately heat-denatured fibrinogen, in the form of FMB, could be used for cell culturing and biomedical applications.

Masarik, M., et al. (2011). "Isolation of metallothionein from cells derived from aggressive form of high-grade prostate carcinoma using paramagnetic antibody-modified microbeads off-line coupled with electrochemical and electrophoretic analysis." Electrophoresis **32**(24): 3576-3588.

Prostate cancer with altered zinc(II) cell metabolism is the second most frequently diagnosed cancer in developed countries. The alterations of zinc(II) metabolism can influence metabolism of other metal ions and can also be associated with the expression and translation of metal-binding proteins including metallothioneins. The aim of this article was to optimize immunoseparation protocol based on paramagnetic beads conjugated with protein G for the isolation of metallothionein. Isolated metallothionein was determined by differential pulse voltammetry Brdicka reaction and SDS-PAGE. Optimal conditions: antigen-binding time - 60 min, temperature - 70degreeC, and buffer composition and pH - acetate buffer, pH 4.3, were determined. Under the optimized conditions, lysates from 22Rv1 prostate cancer cells treated with various concentrations of cadmium(II) and copper(II) ions were analyzed. We observed strong correlation in all experimental groups and all lysate types ($r>0.83$ at $p<0.041$) between metallothionein concentration related to viability and concentration of copper(II) ions and cadmium(II) ions in medium. Moreover, the results were compared with standard sample preparation as heat treatment and SDS-PAGE analysis.

Masia, P., et al. (2019). "Microplastics in special protected areas for migratory birds in the Bay of Biscay." Marine Pollution Bulletin **146**: 993-1001.

Plastic pollution is a major ecological catastrophe that endangers vulnerable species. Small plastic fragments and filaments enter the food web in the ocean threatening marine species health. Here microplastics between 0.5 and 5 mm were quantified from eight beaches of southwest Bay of Biscay (Spain) within Natura-2000 Special Protection Areas for birds. Sand samples were taken using a randomized quadrat-based protocol. Between 145 and 382 particles per kg of dry sand were found, which is relatively high in comparison with other European beaches. Microfibers were more abundant than microplastics. PERMANOVA revealed a significant effect of the beach location (inside versus outside the estuary). Open beaches contained a higher microplastic density than sheltered ones suggesting that many beached microplastics come from the ocean. Birds are at risk in the studied protected spaces as revealed from high concentrations of fibres in depositions of European shag and gulls.

Mason, S. A. (2019). "Plastics, Plastics Everywhere." American Scientist **107**(5): 284-287.

Mason highlights the ubiquity of microplastics in our rivers and drinking water. In 1967, there was a "great future in plastics." Since then plastics production has exploded, and in 2017 the world produced nearly 450 million metric tons of these lightweight materials used in everything from automobiles to food packaging to personal care products. Nearly two-thirds is discarded, whereas almost 10 percent is recycled and 12 percent is incinerated. As much as 15 percent ends up in our waterways each year.

Mason, S. A., et al. (2016). "Microplastic pollution is widely detected in US municipal wastewater treatment plant effluent." Environmental Pollution **218**: 1045-1054.

Municipal wastewater effluent has been proposed as one pathway for microplastics to enter the aquatic environment. Here we present a broad study of municipal wastewater treatment plant effluent as a pathway for microplastic pollution to enter receiving waters. A total of 90 samples were analyzed from 17 different facilities across the United States. Averaging all facilities and sampling dates, 0.05 +/- 0.024 microparticles were found per liter of effluent. Though a small

value on a per liter basis, even minor municipal wastewater treatment facilities process millions of liters of wastewater each day, yielding daily discharges that ranged from ~50,000 up to nearly 15 million particles. Averaging across the 17 facilities tested, our results indicate that wastewater treatment facilities are releasing over 4 million microparticles per facility per day. Fibers and fragments were found to be the most common type of particle within the effluent; however, some fibers may be derived from non-plastic sources. Considerable inter- and intra-facility variation in discharge concentrations, as well as the relative proportions of particle types, was observed. Statistical analysis suggested facilities serving larger populations discharged more particles.

Mason, S. A., et al. (2016). "Pelagic plastic pollution within the surface waters of Lake Michigan, USA." Journal of Great Lakes Research **42**(4): 753-759.

During the summer of 2013, a total of 59 surface water samples were collected across Lake Michigan making it the best surveyed for pelagic plastics of all the Laurentian Great Lakes. Consistent with other studies within the Great Lakes, Mantra-trawl samples were dominated by particles less than 1 mm in size. Enumeration of collected plastics under a microscope found fragments to be the most common anthropogenic particle type, followed by fibers, with more minor contributions from pellets, films and foams. The majority of these pelagic plastic particles were found to be polyethylene, with polypropylene being the second most common polymeric type, which is consistent with manufacturing trends and beach survey results. The pelagic plastic was found to be fairly evenly distributed across the entire Lake Michigan surface, despite the formation of a seasonal gyre at the southern end of the lake. We found that an average plastic abundance of ~17,000 particles/km², which when multiplied by the total surface area, gives on the order of 1 billion plastic particles floating on the surface of Lake Michigan. As the majority of these particles are extremely small, less than 1 mm in size, which allows for easy ingestion, these results highlight the need for additional studies with regard to the possible impacts upon aquatic organisms.

Mason, S. A., et al. (2018). "Synthetic Polymer Contamination in Bottled Water." Frontiers of Chemistry **6**: 407.

Eleven globally sourced brands of bottled water, purchased in 19 locations in nine different countries, were tested for microplastic contamination using Nile Red tagging. Of the 259 total bottles processed, 93% showed some sign of microplastic contamination. After accounting for possible background (lab) contamination, an average of 10.4 microplastic particles >100 um in size per liter of bottled water processed were found. Fragments were the most common morphology (66%) followed by fibers. Half of these particles were confirmed to be polymeric in nature using FTIR spectroscopy with polypropylene being the most common polymer type (54%), which matches a common plastic used for the manufacture of bottle caps. A small fraction of particles (4%) showed the presence of industrial lubricants. While spectroscopic analysis of particles smaller than 100 um was not possible, the adsorption of the Nile Red dye indicates that these particles are most probably plastic. Including these smaller particles (6.5-100 um), an average of 325 microplastic particles per liter of bottled water was found. Microplastic contamination range of 0 to over 10,000 microplastic particles per liter with 95% of particles being between 6.5 and 100 um in size. Data suggests the contamination is at least partially coming from the packaging and/or the bottling process itself. Given the prevalence of the consumption of bottled water across the globe, the results of this study support the need for further studies on the impacts of micro- and nano- plastics on human health.

Masoudipour, N., et al. (2016). "Cyanide removal efficiency of photocatalytic nanoparticles stabilized on glass microbeads under sun irradiation." Journal of Water and Wastewater/Ab va Fazilab **27**(6): e42-Pe49.

This paper investigates cyanide photodestruction (at pH 9) using the S, N-TiO₂ photocatalyst synthesized by the sol-gel method and stabilized on glass microbeads. The main raw materials were thiourea, as a source of N and S, and tetra butyl ortho titanate. The effects of S and N doses, visible light (a 400W light), sunlight, irradiation time, and different initial cyanide concentrations (50, 100, 200, and 300 ppm) were studied on cyanide photodestruction. Cyanide concentration was measured by the titration method and the photocatalyst film was characterized by X-ray diffraction (XRD), UV-Vis diffuse reflection spectroscopy (DRS), Scanning Electron Microscopy (SEM), and Energy dispersive X-ray (EDX) analysis. XRD patterns and SEM images were used to determine the nanoparticle size of the photocatalyst on glass microbeads. EDX and DRS analyses confirmed the presence of S and N as well as the activity of the photocatalyst in the visible region, respectively. The S, N-TiO₂ film with 0.25 g Thiuourea proved to be the best cyanide photodestruction agent in the visible light. Based on the results obtained, S, N-TiO₂/glass microbead was capable of destroying cyanide (50 ppm) by up to 94% in the visible light and by approximately 100% in the sunlight. The results also indicated that S, N-Tio₂/scoria stone was capable of destroying cyanide by 85% in the visible light and by 94% in the sunlight within 4 h. The reaction kinetic for all cyanide concentrations and two photocatalyst substrates were described by a first order equation. Finally, it was concluded that the S, N-TiO₂ stabilized on glass microbeads could be effectively used as a new method for treating wastewater containing free cyanide under the sunlight.

Masoudipour, N., et al. (2018). "Photo-catalytic inactivation of E. coli using stabilized Ag/S, N-TiO₂ nanoparticles by fixed bed photo-reactor under visible light and sunlight." Desalination and Water Treatment **110**: 109-116.

Silver (Ag), sulfur (S), and nitrogen (N)-codoped titanium dioxide (TiO₂) photo-catalysts were prepared by sol-gel method. The main compounds were tetrabutyl orthotitanate, 250 mg of thiourea, and 0.7, 1.4, and 2.8 mg of silver nitrate as the suppliers of sulfur, nitrogen, and silver, respectively. These photo-catalysts were stabilized on glass microbeads. The structural properties of synthesized photo-catalysts were investigated by X-ray diffraction, scanning electron microscopy, and energy dispersive X-ray. The optical activity of the photo-catalysts was evaluated by UV/Vis diffuse reflectance spectroscopy. Finally, the feasibility of inactivation of Escherichia coli, an index of water contamination, was investigated by the stabilized photo-catalyst in a fixed bed photo-reactor under visible light and sunlight. We observed that Ag (0.14 mg)/S, N-TiO₂ caused 99.6% removal of E. coli at 1.5x10⁸ CFU/mL initial concentration under visible light, but this photo-catalyst caused approximately 97% removal of E. coli under sunlight. These findings would help to better use the fixed bed reactor filled with stabilized photo-catalysts such as Ag/S, N-TiO₂, as a multipurpose and efficient technique to disinfect waters highly contaminated with E. coli.

Massos, A. and A. Turner (2017). "Cadmium, lead and bromine in beached microplastics." Environmental Pollution **227**: 139-145.

Samples of microplastic (n = 924) from two beaches in south west England have been analysed by field-portable-x-ray fluorescence (FP-XRF) spectrometry, configured in a low-density mode and with a small-spot facility, for the heavy metals, Cd and Pb, and the halogen, Br. Primary plastics in the form of pre-production pellets were the principal type of microplastic (>70%) on

both beaches, with secondary, irregularly-shaped fragments representing the remainder of samples. Cadmium and Pb were detected in 6.9% and 7.5% of all microplastics, respectively, with concentrations of either metal that exceeded 10³ mug g⁻¹ usually encountered in red and yellow pellets or fragments. Respective correlations of Cd and Pb with Se and Cr were attributed to the presence of the coloured, inorganic pigments, cadmium sulphoselenide and lead chromate. Bromine, detected in 10.4% of microplastics and up to concentrations of about 13,000 mug g⁻¹, was mainly encountered in neutrally-coloured pellets. Its strong correlation with Sb, whose oxides are effective fire suppressant synergists, suggests the presence of a variety of brominated flame retardants arising from the recycling of plastics originally used in casings for heat-generating electrical equipment. The maximum bioaccessible concentrations of Cd and Pb, evaluated using a physiological extraction based on the chemical characteristics of the proventriculus-gizzard of the northern fulmar, were about 50 mug g⁻¹ and 8 mug g⁻¹, respectively. These concentrations exceed those estimated for the diet of local seabirds by factors of about 50 and 4, respectively.

Masuya, T., et al. (2014). "Site-specific chemical labeling of mitochondrial respiratory complex i through ligand-directed tosylate chemistry." Biochemistry **53**(14): 2307-2317.

The site-specific chemical modification of NADH-quinone oxidoreductase (complex I) by various functional probes such as fluorophores and microbeads, without affecting the enzyme activity, may allow single-molecule analyses of putative dynamic conformational changes in the enzyme. In an attempt to address this challenge, we performed site-specific alkynylation of complex I in bovine heart submitochondrial particles by means of a ligand-directed tosylate (LDT) chemistry strategy with synthetic acetogenin ligand 1, which has an alkynylated tosylate in the tail moiety, as a high-affinity ligand against the enzyme. The terminal alkyne was chosen as the tag to be incorporated into the enzyme because this functional group can serve as a "footing" for subsequent diverse chemical modifications via so-called click chemistry (i.e., azide-alkyne [3+2] cycloaddition in water). To identify the position alkynylated by ligand 1, fluorescent tetramethylrhodamine was covalently attached to the incorporated alkyne by click chemistry after the solubilization of complex I. Detailed proteomic analyses revealed that alkynylation occurred at Asp160 in the 49 kDa subunit, which may be located in the inner part of the putative quinone-binding cavity. The alkynylation was completely suppressed in the presence of an excess of other inhibitors such as bullatacin and quinazoline. While the reaction yield of the alkynylation step via LDT chemistry was estimated to be ~50%, the alkynylation unfortunately resulted in the almost complete inhibition of enzyme activity. Nevertheless, the results of this study demonstrate that complex I can be site-specifically alkynylated through LDT chemistry, providing a clue about the diverse chemical modifications of the enzyme in combination with click chemistry. © 2014 American Chemical Society.

Mata, M. F., et al. (2019). "A modified CD34+ hematopoietic stem and progenitor cell isolation strategy from cryopreserved human umbilical cord blood." Transfusion **59**(12): 3560-3569.

BACKGROUND: Umbilical cord blood (UCB) is a source of hematopoietic stem cells for transplantation, offering an alternative for patients unable to find a matched adult donor. UCB is also a versatile source of hematopoietic stem and progenitor cells (hCD34 + HSPCs) for research into hematologic diseases, in vitro expansion, ex vivo gene therapy, and adoptive immunotherapy. For these studies, there is a need to isolate hCD34 + HSPCs from cryopreserved units, and protocols developed for isolation from fresh cord blood are unsuitable.

STUDY DESIGN: This study describes a modified method for isolating hCD34 + HSPCs from cryopreserved

UCB. It uses the Plasmatherm system for thawing, followed by CD34 microbead magnetic-activated cell sorting isolation with a cell separation kit (Whole Blood Columns, Miltenyi Biotec). hCD34 + HSPC phenotypes and functionality were assessed in vitro and hematologic reconstitution determined in vivo in immunodeficient mice.

RESULTS: Total nucleated cell recovery after thawing and washing was 44.7 +/- 11.7%. Recovery of hCD34 + HSPCs after application of thawed cells to Whole Blood Columns was 77.5 +/- 22.6%. When assessed in two independent laboratories, the hCD34+ cell purities were 71.7 +/- 10.7% and 87.8 +/- 2.4%. Transplantation of the enriched hCD34 + HSPCs into NSG mice revealed the presence of repopulating hematopoietic stem cells (estimated frequency of 0.07%) and multilineage engraftment.

CONCLUSION: This provides a simplified protocol for isolating high-purity human CD34 + HSPCs from banked UCB adaptable to current Good Manufacturing Practice. This protocol reduces the number of steps and associated risks and thus total production costs. Importantly, the isolated CD34 + HSPCs possess in vivo repopulating activity in immunodeficient mice, making them a suitable starting population for ex vivo culture and gene editing.

Mataji, A., et al. (2020). "Distribution and Characterization of Microplastics in Surface Waters and the Southern Caspian Sea Coasts Sediments." Archives of Environmental Contamination & Toxicology **78**(1): 86-93.

The Caspian Sea is the largest enclosed aquatic ecosystem in the world. The combinations of the toxic pollutants with microplastics endanger the Caspian Sea ecosystem. In this work, the distribution of microplastics was studied in surface waters and southern Caspian Sea coasts sediments. The samples were collected from eight stations, including the Tonakabon, Chalos, Nowshahr, Noor, Mahmood Abad, Babolsar, Sari, and Neka coasts. The average concentrations of microplastics in the coastal waters and sediments were 34,490 particles per km2 and 210 particles per kg, respectively. Isolated microplastics were characterized using ATR-FTIR and energy dispersive X-ray (EDS) techniques. The samples exhibited a strong carbon peak in the EDS spectra, which was screened as microplastic particles. The microplastics were mainly fragments and foams and identified as polyethylene, polypropylene, and polystyrene by means of ATR-FTIR spectra. This is the first study to determine the distribution of microplastics in southern Caspian coastal regions. [ABSTRACT FROM AUTHOR]

Mateos-Cardenas, A., et al. (2019). "Polyethylene microplastics adhere to Lemna minor (L.), yet have no effects on plant growth or feeding by Gammarus duebeni (Lillj.)." Science of the Total Environment **689**: 413-421.

Microplastics (1-1000 micro m) are ubiquitous in the marine, freshwater and terrestrial environments. These microsized plastics are considered freshwater pollutants of emerging concern, although the impacts on organisms and ecosystems are not yet clear. In particular, effects of microplastics on freshwater aquatic plants and the fate of microplastics in the freshwater trophic chain remain largely unexplored. Here we demonstrate that 10-45 micro m polyethylene (PE) microplastics can strongly adsorb to all surfaces of the duckweed species Lemna minor. Despite adsorbance of up to 7 PE microplastics per mm², seven day

exposure experiments showed that photosynthetic efficiency and plant growth are not affected by microplastics. Rather, dense surface coverage suggests L. minor as a potential vector for the trophic transfer of microplastics. Here we show that the freshwater amphipod Gammarus duebeni can ingest 10-45 micro m PE microplastics by feeding on contaminated L. minor. In this study, ingestion of microplastics had no apparent impact on amphipod mortality or mobility after 24 or 48 h exposure. Yet, the feeding study showed that the fate of microplastics in the environment may be complex, involving both plant adsorbance and trophic transfer.

Materic, D., et al. (2020). "Micro- and nanoplastics in Alpine snow - a new method for chemical identification and (semi)quantification in the nanogram range." Environmental Science & Technology **17**: 17.

We present a new method for chemical characterisation of micro- and nanoplastics based on thermal desorption - proton transfer reaction - mass spectrometry. The detection limit for polystyrene (PS) obtained is <1 ng of the compound present in a sample, which results in 100 times better sensitivity than previously reported by other methods. This allows us to use small volumes of samples (1 mL) and to carry out experiments without a preconcentration step. Unique features in the high-resolution mass spectrum of different plastic polymers make this approach suitable for fingerprinting, even when the samples contain mixtures of other organic compounds. Accordingly, we got a positive fingerprint of PS when just 10 ng of the polymer was present within dissolved organic matter of snow. Multiple types of microplastics (PET, PVC, and PPC), were identified in a snow-pit from the Austrian Alps, however, only PET was detected in the nanometer range for both snow-pit and surface-snow samples. This is in accordance with other publications showing that the dominant form of airborne microplastics are PET fibres. The presence of nanoplastics in high-altitude snow indicate airborne transport of plastic pollution with environmental and health consequences yet to be understood.

Matern, D. (2008). "Newborn screening for lysosomal storage disorders." Acta Paediatrica **97**(457): 33-37.

UNLABELLED: Newborn screening is a public health programme aimed at identifying treatable conditions in pre-symptomatic newborns to avoid premature mortality, morbidity and disabilities. With the advent of successful treatment options for an increasing number of lysosomal storage disorders (LSDs), such as enzyme replacement or bone marrow transplantation, inclusion of these disorders into newborn screening programmes seems reasonable. However, the success of these programmes depends on the availability of testing methods that are suitable for population screening, have high sensitivity and a low false-positive rate. In recent years, two methods have been proposed for newborn screening of LSDs, which enable assessment of more than one LSD from a single blood spot sample. One applies tandem mass spectrometry, the other microbead array technology. Now, prospective studies are needed to determine the most effective approach to newborn screening that will identify those patients who require treatment.

CONCLUSION: With the advent of high-throughput assays for the detection of LSDs, newborn screening for these disorders may soon become a reality. However, careful prospective studies are required to optimize this process before it is used on a larger scale. [References: 32]

Mathalon, A. and P. Hill (2014). "Microplastic fibers in the intertidal ecosystem surrounding Halifax Harbor, Nova Scotia." Marine Pollution Bulletin **81**(1): 69-79.

Humans continue to increase the use and disposal of plastics by producing over 240 million tonnes per year, polluting the oceans with persistent waste. The majority of plastic in the oceans are microplastics (<5 mm). In this study, the contamination of microplastic fibers was quantified in sediments from the intertidal zones of one exposed beach and two protected beaches along Nova Scotia's Eastern Shore. From the two protected beaches, polychaete worm fecal casts and live blue mussels (Mytilus edulis) were analyzed for microplastic content. Store-bought mussels from an aquaculture site were also analyzed. The average microplastic abundance observed from 10 g sediment subsamples was between 20 and 80 fibers, with higher concentrations at the high tide line from the exposed beach and at the low tide line from the protected beaches. Microplastic concentrations from polychaete fecal casts resembled concentrations quantified from low tide sediments. In two separate mussel analyses, significantly more microplastics were enumerated in farmed mussels compared to wild ones.

Mathiasson, A., et al. (1988). "Hydrolytic treatment of plastics waste contaminated with paper." Resources, Conservation and Recycling **2**(1): 57-67.

This paper summarizes the results of an experimental study of the effect of a hydrolytic treatment of the plastics fraction of municipal solid waste or industrial waste of similar composition prior to conventional processing (injection moulding). During such treatment the contaminating paper component can be expected to undergo significant embrittlement resulting in disintegration of the cellulose fibres when subjected to the shear forces acting in normal plastics processing machinery. This leads to improved flow properties of the melt and also improves the homogeneity and processibility of the waste material. The results obtained show that the method can be applied to plastics waste containing as much as 40% paper. The hydrolytic treatment can be carried out with organic or inorganic acids of reasonable strength at concentrations of well below 1%. While the modulus and strength of the final products are largely unaffected by the hydrolytic treatment, the impact strength and breaking elongation increase significantly. The stiffness of the final product increases with paper content. Thus, plastics waste containing paper can be used in several applications such as artificial wood. © 1988.

Mathies, H. (1975). "Sources of error in measurement and interpretation of rheumatic factor reactions. [German]." Allergie und Immunologie **21**(1): 77-79.

The results of determination of the rheumatic factor may be influenced by all the media involved in the demonstration reactions. The statistical data concerning the reliability of various methods are considerably influenced by the selection of the clinical material. It is also known that very different anti gammaglobulins react with aggregated gammaglobulin. The frequently underestimated factor affecting the reliability of the test methods is the difficulty of preparing constant gammaglobulin preparations and of obtaining plastic particles of constant size. The most difficult problem is that of the inhibitors, of which the most important are the gammaglobulin aggregates which are inevitably produced during every manipulation of serum (inactivation, fractionation, etc.).

Mathuriya, A. S. and J. V. Yakhmi (2019). Polyhydroxyalkanoates: Biodegradable plastics and their applications. Handbook of Ecomaterials. **4:** 2873-2900.

Human civilization has experienced several ages such as stone, bronze, iron, and steel, and now it is a plastic age. Due to multifaceted properties of plastic, it is one of the most widely available and overused item in the world today and became a necessary evil. When disposed, it does not decompose and pollutes the land or air nearby when burned in the open air. Plastic pollution is affecting the global economy. Polyhydroxyalkanoates (PHAs) have been drawing much attention as biodegradable substitutes for conventional nondegradable plastics. PHAs are synthesized by numerous bacteria as carbon and energy storage capsules and are good candidates as biodegradable plastic material. Because of their versatility and wide range of properties, biodegradable PHAs are being used in various areas of modern benefits.With the currently increased interest level and the extensive research being carried out in this area, PHAs are potentially emerging as environmentally friendly materials of the next generation with a wide range of applicability. This chapter deals with the recent advances in applicability of PHAs. © Springer Nature Switzerland AG 2019. All Rights Reserved.

Mato, Y., et al. (2001). "Plastic resin pellets as a transport medium for toxic chemicals in the marine environment." Environmental Science & Technology **35**(2): 318-324.

Plastic resin pellets (small granules 0.1-0.5 centimeters in diameter) are widely distributed in the ocean all over the world. They are an industrial raw material for the plastic industry and are unintentionally released to the environment both during manufacturing and transport. They are sometimes ingested by seabirds and other marine organisms, and their adverse effects on organisms are a concern. In the present study, PCBs, DDE, and nonylphenols (NP) were detected in polypropylene (PP) resin pellets collected from four Japanese coasts. Concentrations of PCBs (4-117 ng/g), DDE (0.16-3.1 ng/g), and NP (0.13-16 microg/g) varied among the sampling sites. These concentrations were comparable to those for suspended particles and bottom sediments collected from the same area as the pellets. Field adsorption experiments using PP virgin pellets demonstrated significant and steady increase in PCBs and DDE concentrations throughout the six-day experiment, indicating that the source of PCBs and DDE is ambient seawater and that adsorption to pellet surfaces is the mechanism of enrichment. The major source of NP in the marine PP resin pellets was thought to be plastic additives and/or their degradation products. Comparison of PCBs and DDE concentrations in mari

Matsuguma, Y., et al. (2017). "Microplastics in Sediment Cores from Asia and Africa as Indicators of Temporal Trends in Plastic Pollution." Archives of Environmental Contamination & Toxicology **73**(2): 230-239.

Microplastics (<5 mm) were extracted from sediment cores collected in Japan, Thailand, Malaysia, and South Africa by density separation after hydrogen peroxide treatment to remove biofilms were and identified using FTIR. Carbonyl and vinyl indices were used to avoid counting biopolymers as plastics. Microplastics composed of variety of polymers, including polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethyleneterphthalates (PET), polyethylene-polypropylene copolymer (PEP), and polyacrylates (PAK), were identified in the sediment. We measured microplastics between 315 µm and 5 mm, most of which were in the range 315 µm-1 mm. The abundance of microplastics in surface sediment varied from 100 pieces/kg-dry sediment in a core collected in the Gulf of Thailand to 1900 pieces/kg-dry sediment in a core collected in a canal in Tokyo Bay. A far higher stock of PE and PP composed microplastics in sediment compared with surface water samples collected in a canal in Tokyo Bay suggests that sediment is an important sink for microplastics. In dated sediment cores from Japan, microplastic pollution started in 1950s, and their abundance increased markedly toward the surface layer (i.e., 2000s). In all sediment cores from Japan, Thailand, Malaysia, and South Africa, the abundance of microplastics increased toward the surface, suggesting the global occurrence of and an increase in microplastic pollution over time. [ABSTRACT FROM AUTHOR]

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Matsuhashi, M. (2013). "Advances in granulocyte test methodologies." Vox Sanguinis **2)**: 36.

Antibodies against human neutrophil antigens (HNA) are involved in the pathogenesis of immune neutropenia, such as neonatal alloimmune neutropenia (NAN), refractoriness to granulocyte transfusions, and transfusion reactions, such as febrile non-hemolytic transfusion reactions, and transfusion-related acute lung injury (TRALI). The HNA systems are assigned to five antigen groups, namely HNA-1 to 5. HNA-1, -2, and -3a alloantibodies have been implicated in the pathogenesis of TRALI, and especially HNA-3a alloantibody has been found in the severe cases requiring artificial ventilation or with fatal reactions. Besides alloantibodies to HNA-1, -2 and -3, those against HNA- 4a and HNA-5a have been implicated in NAN. The identification of the causative antibodies is essential for the diagnosis as well as for the prevention of these disorders. The detection of HNA antibodies has been mainly dependent on cell-based assays so far. Among them, the granulocyte agglutination test (GAT), the granulocyte immunofluorescence test (GIFT) and the monoclonal antibody immobilization of granulocyte antigens (MAIGA) are the most commonly applied. According to the ISBT Working Party on Granulocyte Immunobiology, the combination of GAT and GIFT is presently the best means of HNA antibody detection. GIFT is usually more sensitive than GAT, however, HNA-3a antibodies associated with severe cases of TRALI are better detectable by GAT. In GAT and GIFT, the presence of HLA antibodies with broad specificities may affect the detection of HNA antibodies. On the other hand, the MAIGA assay allows the differentiation between HNA and HLA antibodies. These classical methods, however, require fresh neutrophils from HNA-typed donors. Also, these assays are time-consuming, which makes them not appropriate for the large-scale antibody screening. In our lab, we modified the mixed-passive hemagglutination (MPHA) assay, the method largely applied in Japan for platelet antigen/antibody detection, for the detection of HNA antibodies. Recently, alternative assays have been developed, including ELISA with recombinant HNA (rHNA), and immunofluorescence tests with transfectant cells of HNA (HNA-1, -2, -4, and -5). More recently, the molecular basis of HNA-3 antigen has been elucidated, and stable cell lines expressing HNA-3 antigens became available. These cell lines seem to have low background, and do not express detectable levels of HLA antigens, which make the identification of HNA antibodies easier. Additionally, kits that use Luminex microbeads coated with HNA antigen are being developed. These kits, however, do not include HNA-3 antigens. These new technologies significantly help improving the detection and identification of HNA antibodies, and allow the large scale screening of HNA antibodies, contributing for the reduction of the risk of the pathological conditions associated with HNA antibodies, especially TRALI. However, these new technologies significantly increase the cost of the tests. Presently, although many assays have been developed, the standard HNA antisera are not necessarily available in every lab, which makes their validation difficult to be conducted. Thus, the collaborative study among the various labs, by exchanging the available antisera, and comparing the test results, is essential for the improvement of this field.

Matsukami, H., et al. (2020). "Liquid chromatography-electrospray ionization-tandem mass spectrometry for the determination of short-chain chlorinated paraffins in mixed plastic wastes." Chemosphere **244 (no pagination)**(125531).

Wastes containing short-chain chlorinated paraffins (SCCPs) at concentrations above the Basel Convention low persistent organic pollutant content (LPC) values must be destroyed or irreversibly transformed in an environmentally-sound manner. Here, we developed a novel

liquid chromatography-electrospray ionization-tandem mass spectrometry (LC-ESI-MSMS) method for determining the concentrations of SCCPs in mixed plastic wastes. Major SCCP homologues were identified with good separation and peak width by using a low-hydrophobicity cyano-propyl column and a mobile phase consisting of water and methanol containing ammonium acetate. Precursor ion peaks corresponding to the formation of stable SCCP homologue-adducts were observed, followed by two intense product ion peaks corresponding to separation of the adduct into acetate and the homologue. The formulation of a novel calibration standard with known SCCP homologue percentage composition supported the development of our novel mass spectrometric technique. The results obtained with the LC-ESI-MSMS system were quantitatively and qualitatively comparable with those obtained with a high-resolution mass spectrometry (HRMS) coupled to gas chromatography (GC) system. Homologue concentrations determined by LC-ESI-MSMS were significantly correlated with those determined by GC-HRMS in samples of commercial chlorinated paraffin mixture and mixed plastic waste, respectively. As a complementary technique to the highly accurate, but less versatile GC-HRMS approaches, the SCCP analysis by LC-ESI-MSMS is a practical way to identify mixed plastic wastes containing SCCPs at concentrations higher than the Basel Convention's LPC value. Copyright © 2019 Elsevier Ltd

Matta, R., et al. (2019). "Minimally Invasive Delivery of Microbeads with Encapsulated, Viable and Quiescent Neural Stem Cells to the Adult Subventricular Zone." Scientific Reports **9**(1): 17798.

Stem cell therapies demonstrate promising results as treatment for neurological disease and injury, owing to their innate ability to enhance endogenous neural tissue repair and promote functional recovery. However, delivery of undifferentiated and viable neuronal stem cells requires an engineered delivery system that promotes integration of transplanted cells into the inflamed and cytotoxic region of damaged tissue. Within the brain, endothelial cells (EC) of the subventricular zone play a critical role in neural stem cell (NSC) maintenance, quiescence and survival. Therefore, here, we describe the use of polyethylene glycol microbeads for the coincident delivery of EC and NSC as a means of enhancing appropriate NSC quiescence and survival during transplantation into the mouse brain. We demonstrate that EC and NSC co-encapsulation maintained NSC quiescence, enhanced NSC viability, and facilitated NSC extravasation in vitro, as compared to NSC encapsulated alone. In addition, co-encapsulated cells delivered to an in vivo non-injury model reduced inflammatory response compared to freely injected NSC. These results suggest the strong potential of a biomimetic engineered niche for NSC delivery into the brain following neurological injury.

Mattam, J. and A. Krishna Sailaja (2016). "Preparation and evaluation of sulfasalazine loaded sodium alginate microbeads for sustained delivery." Asian Journal of Pharmaceutical and Clinical Research **9**(Supplement 2): 72-76.

Objective: The main objective of the work was to prepare and evaluate sulfasalazine loaded sodium alginate microbeads for sustained delivery for the treatment of inflammatory bowel disease and rheumatoid arthritis. Sulfasalazine has crystalluria, thrombocytopenia, and megaloblastic anemia as side effects, so to reduce side effect microbeads were prepared. Method(s): The sulfasalazine microbeads were prepared by inotropic gelation method by optimizing process parameters such as concentration of calcium chloride, agitation speed, and time of agitation. The concentration of polymer sodium alginate was varied. Result(s): Among the five formulations, the best formulation was considered by comparing process parameters such as the entrapment efficiency, drug content, in vitro drug release studies, scanning electron microscope analysis, and zeta potential. Conclusion(s): On comparison, B3 formulation was

considered as best formulation with a mean particle size ranging from 40.9 to 244 micro m, drug content of 94.7%, entrapment efficiency of 87.7%, and the drug release was found to be 97.1% for 12 hrs and followed zero order kinetics and non-Fickian diffusional pathway, with a zeta potential value of -56.8 mV indicating higher stability. Copyright © 2016, Innovare Academics Sciences Pvt. Ltd. All rights reserved.

Mattie, P. A., et al. (1994). "Development of a radiopaque, autopolymerizing dental acrylic resin." Journal of Prosthodontics **3**(4): 213-218.

PURPOSE: Current prosthetic acrylic resins are radiolucent and cannot be imaged using standard radiographic techniques. If accidentally impacted or ingested, delays in localizing or removing the foreign body may be life-threatening. The purpose of this study was to evaluate the influence of an experimental radiopaque additive, triphenyl bismuth (TPB), on polymethyl methacrylate resins formulated for dental use. We also investigated methods to improve TPB-containing resin microbeads and optimize processing variables for specimen fabrication in autopolymerizing resin systems.

MATERIALS AND METHODS: Selfcured samples of experimental resins were prepared containing 0% to 27% TPB and were tested according to American National Standards Institute/American Dental Association and International Organization for Standardization performance standards. A control group and two commercial provisional crown and bridge resins were used for comparison.

RESULTS: The standard of radiopacity (> or = aluminum radiopacity) is met at TPB levels of > or = 14.5%. The control resin had a greater transverse deflection compared with the TPB-resin groups, but deflection was within standard limits for all resins. Polishability, color stability, and solubility were unaffected by TPB, whereas sorption decreased, although not significantly, at higher TPB levels. Translucency decreased at 27% TPB, and specimens containing 0% to 20% TPB were transparent. A tendency to entrain air bubbles, because of the hydrophobicity of TPB, resulted in increased susceptibility to brittle failure at the higher TPB levels. Solubility slightly exceeded American Dental Association standards for all TPB-resins and the control. All other performance standards were acceptable for resins containing 0% to 20% TPB.

CONCLUSIONS: At concentrations that provide a diagnostic level of radiopacity, TPB does not significantly alter required performance and processing properties. Thus, TPB is capable of commercially acceptable performance as a radiopacifying additive for dental acrylics.

Mattsson, K., et al. (2015). "Altered behavior, physiology, and metabolism in fish exposed to polystyrene nanoparticles." Environmental Science & Technology **49**(1): 553-561.

The use of nanoparticles in consumer products, for example, cosmetics, sunscreens, and electrical devices, has increased tremendously over the past decade despite insufficient knowledge about their effects on human health and ecosystem function. Moreover, the amount of plastic waste products that enter natural ecosystems, such as oceans and lakes, is increasing, and degradation of the disposed plastics produces smaller particles toward the nano scale. Therefore, it is of utmost importance to gain knowledge about how plastic nanoparticles enter and affect living organisms. Here we have administered 24 and 27 nm polystyrene nanoparticles to fish through an aquatic food chain, from algae through Daphnia, and studied the effects on behavior and metabolism. We found severe effects on feeding and shoaling behavior as well as metabolism of the fish; hence, we conclude that polystyrene nanoparticles have severe effects on both behavior and metabolism in fish and that commonly used nanosized particles may have considerable effects on natural systems and ecosystem services derived from them.

Mattsson, K., et al. (2015). "Nano-plastics in the aquatic environment." Environmental Sciences: Processes and Impacts **17**(10): 1712-1721.

The amount of plastics released to the environment in modern days has increased substantially since the development of modern plastics in the early 1900s. As a result, concerns have been raised by the public about the impact of plastics on nature and on, specifically, aquatic wildlife. Lately, much attention has been paid to macro- and micro-sized plastics and their impact on aquatic organisms. However, micro-sized plastics degrade subsequently into nano-sizes whereas nano-sized particles may be released directly into nature. Such particles have a different impact on aquatic organisms than larger pieces of plastic due to their small size, high surface curvature, and large surface area. This review describes the possible sources of nano-sized plastic, its distribution and behavior in nature, the impact of nano-sized plastic on the well-being of aquatic organisms, and the difference of impact between nano- and micro-sized particles. We also identify research areas which urgently need more attention and suggest experimental methods to obtain useful data. Copyright © 2015 The Royal Society of Chemistry.

Mattsson, K., et al. (2017). "Brain damage and behavioural disorders in fish induced by plastic nanoparticles delivered through the food chain." Scientific Reports **7**(1).

The tremendous increases in production of plastic materials has led to an accumulation of plastic pollution worldwide. Many studies have addressed the physical effects of large-sized plastics on organisms, whereas few have focused on plastic nanoparticles, despite their distinct chemical, physical and mechanical properties. Hence our understanding of their effects on ecosystem function, behaviour and metabolism of organisms remains elusive. Here we demonstrate that plastic nanoparticles reduce survival of aquatic zooplankton and penetrate the blood-to-brain barrier in fish and cause behavioural disorders. Hence, for the first time, we uncover direct interactions between plastic nanoparticles and brain tissue, which is the likely mechanism behind the observed behavioural disorders in the top consumer. In a broader perspective, our findings demonstrate that plastic nanoparticles are transferred up through a food chain, enter the brain of the top consumer and affect its behaviour, thereby severely disrupting the function of natural ecosystems.

Maury, S., et al. (2010). "CD4+CD25+Regulatory T-Cell Depletion Improves the Graft-Versus-Tumor Effect of Donor Lymphocytes After Allogeneic Hematopoietic Stem Cell Transplantation." Human Gene Therapy **21**(6): 767.

Donor T-cells play a pivotal role in the graft-versus-tumor (GVT) effect after allogeneic hematopoietic stem cell transplantation (HSCT). Regulatory T-cells (Treg) may reduce alloreactivity, the major component of the GVT effect. In the setting of donor lymphocyte infusion (DLI) after HSCT, We postulated that Treg depletion could improve alloreactivity and likewise the GVT effect of donor T-cells. The safety and efficacy of Treg-depleted DLI (d-DLI) were studied in 17 adult patients with malignancy relapse after HSCT. d-DLI were prepared from donor leukaphereses using anti-CD25 magnetic microbeads. Six out of the 17 patients developed graft-versus-host disease after d-DLI and experienced a partial (n = 3) or complete (n = 3) long-term remission of their malignancy. In the whole cohort, GVHD induction through Treg depletion was associated with improved survival. Compared with unmanipulated DLI, the alloreactivity and efficacy of d-DLI appear improved.

Mavropoulos, A., et al. (2010). "Phoshorylation of P38 mapk is detectable in NKT cells of patients with autoimmune hepatitis in whom it mirrors disease activity." Journal of Hepatology **1)**: S428.

Background: Recent experimental and clinical studies demonstrate the importance of the p38

mitogen activated protein kinase (MAPK) pathway in the pathogenesis of autoimmune diseases, through the induction of pro-inflammatory cytokines. Activation of p38 MAPK has been reported in a murine model of autoimmune hepatitis (AIH) but whether p38 MAPK is activated in patients with AIH is not known. Aim(s): To investigate p38 MAPK pathway activation in patients with AIH tested at diagnosis and during drug-induced remission. Method(s): Peripheral blood mononuclear cells (PBMC) from 20 AIH patients tested at diagnosis or at the time of immunosuppressive-induced remission and 20 demographically-matched healthy controls were obtained by Ficoll-Hypaque density gradient-based centrifugation. CD56⁺ cells were isolated by magnetic microbeads, and stained for CD3, CD3⁺CD56⁺ being the phenotype of natural killer T cells (NKT). p38 phosphorylation levels at 0', 30', 60', 120' and 240' after stimulation with either phorbol 12-myristate 13-acetate (PMA) (50ng/ml) and ionomycin (1muM) or with the physiological agonist combination of IL-12 (20ng/ml) and IL-18 (25 ng/ml) were determined by flow cytometric intracellular kinase detection using p38 phospho-specific conjugated antibodies. Result(s): The frequency of phospho-p38 MAPK positive NKT cells is significantly higher in undivided AIH patients than in healthy controls at baseline (18.44+/-2.97% vs 7.9+/-1%, p<0.01) and following a 30-minute PMA/ionophore stimulation (51.14+/-5.17% vs 31 +/-3.4%, p < 0.01). Stimulation with IL-12 and IL-18 led to a more pronounced and longer-lasting NKT cell p38 phosphorylation in patients with AIH than in healthy controls at 120' (28.51 +/-5% vs 12.3+/-1.7%) and 240' (29.88+/-5.5% vs 10.9+/-1.8%) (p<0.05 for all). Within the AIH patient group, baseline phospho-p38 MAPK positive NKT cells were more frequent at diagnosis (25.33+/-3.59%) than in remission (8.62+/-2.18%, p < 0.05). This pattern was also observed after exposure to PMA/ionophore (62.03+/-4.48% vs 38.6+/-6.92%, p < 0.01) or to IL-12 plus IL-18 (39.56+/-6.5% vs 14.05+/-2.75% at 120'; 43.54+/-6.4% vs 11.75+/-2.77.% at 240') (p<0.01). Conclusion(s): Our data demonstrate that the p38 MAPK pathway is activated in the NKT cells of patients with AIH and that the magnitude of this activation mirrors disease activity. It is likely that p38 MAPK activation is involved in generating the inflammatory milieu characterising AIH.

Maximenko, N., et al. (2018). "Numerical simulations of debris drift from the Great Japan Tsunami of 2011 and their verification with observational reports." Marine Pollution Bulletin **132C**: 5.

A suite of five ocean models is used to simulate the movement of floating debris generated by the Great Japan Tsunami of 2011. This debris was subject to differential wind and wave-induced motion relative to the ambient current (often termed “windage”) which is a function of the shape, size, and buoyancy of the individual debris items. Model solutions suggest that during the eastward drift across the North Pacific the debris became “stratified” by the wind so that objects with different windages took different paths: high windage items reached North America in large numbers the first year, medium windage items recirculated southwest toward Hawaii and Asia, and low windage items collected in the Subtropical Gyre, primarily in the so-called “garbage patch” area located northeast of Hawaii and known for high concentrations of microplastics. Numerous boats lost during the tsunami were later observed at sea and/or found on the west coast of North America: these observations are used to determine optimal windage values for scaling the model solutions. The initial number of boats set adrift during the tsunami is estimated at about 1000, while about 100 boats are projected to still float in year 2018 with an e-folding decay of 2 to 8 years.

Mayank, D., et al. (2017). "Clay soil stabilization using plastic (polythene) waste as admixture." International Journal for Research in Applied Science and Engineering Technology **5**(9): 352-357.

The object of the present paper is to investigate the strength characteristics of clay soil of

western Rajasthan stabilized by readily available material of plastic (polythene) waste. Standard proctor test, California bearing test, Direct shear tests were conducted for assessing the suitability of clay soil mixed with polythene strips. This is also a way to reuse of polybag waste with reinforcing the clay soil. It will help in plastic waste removal and management. These materials cannot be disposed of properly and their disposal is not economical. These wastes impose hazardous effect on environment and human health.

Mayanskiy, N. A. (2011). "Laborator y markers for differential diagnosis of bacterial and viral infections in children with fever." Clinical Chemistry and Laboratory Medicine **1)**: S122.

Discrimination between viral and bacterial infections in pediatric febrile patients is often a puzzle, and correct solution is a prerequisite to adequate patient care. Verification of diagnosis and substantiation of treatment rely on a clinical evaluation in conjunction with laboratory tests. Available panel of the laboratory markers that are used for screening in febrile diseases does not always give sufficiently clear results. This warrants a search for additional markers and their effective combinations. Febrile infections are accompanied by alteration in cytokine production. By means of a Bio-plex microbead suspension array system we measured serum concentrations of a wide cytokine panel and found that the patients with bacterial and viral infections, as well as healthy children, all have distinct cytokine profiles. Triggering acute inflammation in febrile infections, cytokines mediate changes of homeostasis that are reflected by modifications of the laboratory variables such as white blood count with differential, C-reactive protein, procalcitonin, etc. One of the inflammatory cytokines, IL-6, has been validated as a diagnostic marker for neonatal sepsis, and IL-6 immunoassay is now available in an automated analyzer format. The cytokine production alteration during acute inflammatory response, particularly elevation of IL-6 concentration, modifies iron metabolism stimulating synthesis of hepcidin. Being a key regulator of the iron metabolism, hepcidin diminishes the availability of iron for erythropoiesis. This functional lack of iron affects hemoglobin synthesis that is promptly reflected by reduction of the hemoglobin content in reticulocytes. A test for reticulocyte hemoglobin equivalent that is available on several hematological analyzers could be an early and easy marker of infection. Inflammation and cytokines influence also neutrophil granulocytes, inducing elevation of the neutrophil counts as well as modifying their function. The latter is mirrored by change of granularity and cellular biosynthesis/nucleic acid content in the neutrophils that could be measured by an automated hematological analyzer. It is worthwhile to speculate that a combination of several laboratory parameters will possess higher discriminative ability for bacterial and viral infection than a single marker alone. Elaboration of the infection "laboratory fingerprint" will promote development of more accurate diagnostic tools that will help physicians to make important clinical decisions.

Mazurais, D., et al. (2015). "Evaluation of the impact of polyethylene microbeads ingestion in European sea bass (Dicentrarchus labrax) larvae." Marine Environmental Research **112**: 78-85.

Microplastics are present in marine habitats worldwide and may be ingested by low trophic organisms such as fish larvae, with uncertain physiological consequences. The present study aims at assessing the impact of polyethylene (PE 10-45 mu M) microbeads ingestion in European sea bass (Dicentrarchus labrax) larvae. Fish were fed an inert diet including 0, 104 and 105 fluorescent microbeads per gram from 7 until 43 days post-hatching (dph). Microbeads were detected in the gastrointestinal tract in all fish fed diet incorporating PE. Our data revealed an efficient elimination of PE beads from the gut since no fluorescent was observed in the larvae after 48 h depuration. While the mortality rate increased significantly with the amount of microbeads scored per larvae at 14 and 20 dph, only ingestion of the highest concentration slightly impacted mortality rates. Larval growth and inflammatory response through Interleukine-1-beta (IL-1 beta) gene expression were not found to be affected while cytochrome-P450-1A1 (cyp1a1) expression level was significantly positively correlated with the number of microbeads scored per larva at 20 dph. Overall, these results suggest that ingestion of PE microbeads had limited impact on sea bass larvae possibly due to their high potential of egestion.

Mbedzi, R., et al. (2020). "Functional response quantifies microplastic uptake by a widespread African fish species." Science of the Total Environment **700**: 134522.

Ecological impacts of microplastic remain poorly understood, despite their ubiquity across all habitat types globally. Microplastic concentrations vary significantly across spatiotemporal gradients, however we lack quantitative methodologies to predict species-level responses to differential environmental concentrations. In the present study, we expose a key species, the banded tilapia Tilapia sparrmanii Smith, 1940, to different concentrations of microplastic particles. We apply and develop the functional response approach for quantifications of microplastic uptake by the fish across different environmental densities. Tilapia consumed microplastic even when relatively rare in their environment, and consumption rates related negatively to concentrations supplied, conducive with a saturating Type II (i.e., inversely-density-dependent) functional response. Attack rate (i.e., search efficiency), handling time and maximum feeding rate estimates towards microplastic were estimated, providing key information on feeding behaviour in relation to exposure concentrations. We propose the utility of functional response approaches for predictive quantifications of microplastic uptake rates. In turn, this can better-link laboratory exposure studies to environmental concentrations which are known to cause ecological impact, and provide a means of comparing uptakes among species and across environmental contexts.

McAloose, D. and A. L. Newton (2009). "Wildlife cancer and plastic pollution." Nature Reviews Cancer **9**(11): 842.

McCarney, K. M., et al. (2010). "Identification of common fungal pathogens in a single sample." Clinical Microbiology and Infection **2)**: S718.

Objectives: The objective was to develop a highly sensitive and specific single test for the direct detection of Aspergillus and Candida species within clinical specimens. Method(s): Surface enhanced resonance Raman scattering (SERRS) allows more analytes to be detected at lower concentration than fluorescence. Multiplex assays were developed to detect a broad range of pathogenic fungal species, present in clinical samples, in low copy number. Genus specific polymerase chain reaction (PCR) primers and species specific probes were designed to detect multiple targets from spiked serum/whole blood samples. Each probe has a unique spectrum allowing identification of multiple targets in a mixture. One primer from each set was modified with biotin to capture amplified DNA on microbeads. The specific probes were hybridised to the PCR products and captured on microbeads. The probe is released from the microbeads and analysed by SERRS for rapid detection of multiple pathogenic fungal targets. Result(s): The assay was tested successfully against blind panels and is capable of detecting most clinically relevant species of Candida and Aspergillus. It is designed to differentiate azole resistant species and can detect multiple aetiologies in one specimen. The detection limit is 2-3 copies input per reaction and can reproducibly detect 101 organisms within a simulated clinical specimen. Conclusion(s): In this preliminary study, the assay successfully identifies the most common fungal pathogens with high efficiency and demonstrates sensitivity down to 2-3 PCR input copies. This assay is ready to go into pre-clinical testing with the addition of software designed to automate the analysis and the detection range will be increased to cover additional fungal agents. This is the first clinical application developed using D3 Technologies' powerful detection platform. The flexibility of this technology will enable ready adaptation to other clinical applications.

McCarthy, B. J. (1996). "THE ECO MOVEMENT." Recycling Textile & Plastic Waste: 155-159.

The article focuses on the start of the Eco-movement in responding to the environmental damages caused by the textile industry. As the publication of environmental reports increased, so is the public's awareness about the impact of the industry on the environment. The public's awareness had increased after the publication of Rachel Carson's article on the impact of pesticides on the environment and this time marks the beginning of the Eco-movement. With the media coverage in Germany on dioxin levels found on textiles in contact with the skin and in Great Britain on cot deaths to added flame retardants, consumers are becoming environmentally aware. As a result, the textile sector will continue to face increasing pressures and costs related to environmental issues.

McCassie, J., et al. (1992). Current methods for determining biodegradation of polymerical materials, ACS, BOOKS & JOURNALS DIVISION, WASHINGTON, DC (USA).

The Maritime Pollution Treaty will prohibit the ocean dumping of plastic waste by the U.S. Navy and all other marine commerce activities by 1994. This treaty was enacted to protect marine life from the hazards of ingestion and entanglement due to jettisoned plastic materials. In the paper, the authors give and update on the development of standardized methodologies to characterize the biodegradation of polymeric films. For the accelerated marine and soil systems biodegradation is defines as weight loss per surface area. In the automated respirometry system biodegradation is defined as mineralization.

McCormick, A., et al. (2014). "Microplastic is an Abundant and Distinct Microbial Habitat in an Urban River." Environmental Science & Technology **48**(20): 11863-11871.

Recent research has documented microplastic particles (< 5 mm in diameter) in ocean habitats worldwide and in the Laurentian Great Lakes. Microplastic interacts with biota, including microorganisms, in these habitats, raising concerns about its ecological effects. Rivers may transport microplastic to marine habitats and the Great Lakes, but data on microplastic in rivers is limited. In a highly urbanized river in Chicago, Illinois, USA, we measured concentrations of microplastic that met or exceeded those measured in oceans and the Great Lakes, and we demonstrated that wastewater treatment plant effluent was a point source of microplastic. Results from high-throughput sequencing showed that bacterial assemblages colonizing microplastic within the river were less diverse and were significantly different in taxonomic composition compared to those from the water column and suspended organic matter. Several taxa that include plastic decomposing organisms and pathogens were more abundant on microplastic. These results demonstrate that microplastic in rivers are a distinct microbial habitat and may be a novel vector for the downstream transport of unique bacterial assemblages. In addition, this study suggests that urban rivers are an overlooked and potentially significant component of the global microplastic life cycle. [ABSTRACT FROM AUTHOR]

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McCormick, A. R., et al. (2016). "Microplastic in surface waters of urban rivers: concentration, sources, and associated bacterial assemblages." Ecosphere **7**(11).

The ecological dynamics of microplastic (<5 mm) are well documented in marine ecosystems, but the sources, abundance, and ecological role of microplastic in rivers are unknown and likely to be substantial. Microplastic fibers (e.g., synthetic fabrics) and pellets (e.g., abrasives in personal care products) are abundant in wastewater treatment plant (WWTP) effluent, and can serve as a point source of microplastic in rivers. The buoyancy, hydrophobic surface, and long transport distance of microplastic make it a novel substrate for the selection and dispersal of unique microbial assemblages. We measured microplastic concentration and bacterial assemblage composition on microplastic and natural surfaces upstream and downstream of WWTP effluent sites at nine rivers in Illinois, United States. Microplastic concentration was higher downstream of WWTP effluent outfall sites in all but two rivers. Pellets, fibers, and fragments were the dominant microplastic types, and polymers were identified as polypropylene, polyethylene, and polystyrene. Mean microplastic flux was 1,338,757 pieces per day, although the flux was highly variable among nine sites (min=15,520 per day, max=4,721,709 per day). High-throughput sequencing of 16S rRNA genes showed bacterial assemblage composition was significantly different among microplastic, seston, and water column substrates. Microplastic bacterial assemblages had lower taxon richness, diversity, and evenness than those on other substrates, and microplastic selected for taxa that may degrade plastic polymers (e.g., Pseudomonas) and those representing common human intestinal pathogens (e.g., Arcobacter). Effluent from WWTPs in rivers is an important component of the global plastic "life cycle," and microplastic serves as a novel substrate that selects and transports distinct bacterial assemblages in urban rivers. Rates of microplastic deposition, consumption by stream biota, and the metabolic capacity of microplastic biofilms in rivers are unknown and merit further research.

McDevitt, J. P., et al. (2017). "Addressing the Issue of Microplastics in the Wake of the Microbead-Free Waters Act?A New Standard Can Facilitate Improved Policy." Environmental Science & Technology **51**(12): 6611-6617.

The United States Microbead-Free Waters Act was signed into law in December 2015. It is a bipartisan agreement that will eliminate one preventable source of microplastic pollution in the United States. Still, the bill is criticized for being too limited in scope, and also for discouraging the development of biodegradable alternatives that ultimately are needed to solve the bigger issue of plastics in the environment. Due to a lack of an acknowledged, appropriate standard for environmentally safe microplastics, the bill banned all plastic microbeads in selected cosmetic products. Here, we review the history of the legislation and how it relates to the issue of microplastic pollution in general, and we suggest a framework for a standard (which we call "Ecocyclable") that includes relative requirements related to toxicity, bioaccumulation, and degradation/assimilation into the natural carbon cycle. We suggest that such a standard will facilitate future regulation and legislation to reduce pollution while also encouraging innovation of sustainable technologies. [ABSTRACT FROM AUTHOR]

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full abstract. (Copyright applies to all Abstracts.)

McDonald, B. F., et al. (2015). "In-vitro characterisation of a novel celecoxib microbead formulation for the treatment and prevention of colorectal cancer." Journal of Pharmacy & Pharmacology **67**(5): 685-695.

OBJECTIVES: Colorectal cancer (CRC) is a life-threatening disease that can develop as a consequence of a sustained chronic inflammatory pathology of the colon. Although not devoid of side effects, the anti-inflammatory drug celecoxib (CLX) has been shown to exert protective effects in CRC therapy. The purpose of this study was to develop and characterise a novel CLX microbead formulation suitable for use in the treatment and prevention of CRC, which has the potential to minimise the side effects associated with CLX.

METHODS: The study involved the assessment of the effectiveness of CLX formulations in an in-vitro cell model (HT29 cells) and a comparison of these effects to that of the marketed CLX product, Celebrex. Liquid CLX formulations were developed as precursors to microbead formulations. The effect of liquid CLX formulations on HT29 cell viability (MTT and flow cytometry apoptotic assays) and motility (scratch wound assay) were assessed and compared with the effect of Celebrex. A correlation between the in-vitro dissolution performance of the formulations and the effect in the cell model was also explored. Liquid CLX formulations were translated into an optimised CLX microbead formulation, and a colonic targeted sustained release coat (Surelease) was applied to the beads with the aim of producing a formulation for a future in-vivo study to compare the effect of the coated CLX microbeads versus Celebrex in the attenuation of CRC tumours and inflammation in a CRC murine model. The production of CLX microbeads was scaled-up using vibrating-jet encapsulation technology to allow for the development of an optimised dissolution profile to enable colonic release.

KEY FINDINGS: In-vitro cell viability and motility were shown to be significantly reduced after treatment with CLX liquid formulations relative to the control, whereas the results for treatment with Celebrex were comparable with the control. Dissolution experiments and correlation analysis demonstrated that the formulations that showed a greater extent of drug release had reduced cell viability and motility. The CLX liquid formulations were translated into colon-targeted CLX microbeads suitable for use in a future in-vivo mouse study.

CONCLUSIONS: These results represent a significant step forward in the chemopreventative treatment of CRC using CLX, as the microbead formulation developed suggests the possibility of presenting CLX in a format that has the potential to minimise gastrointestinal and cardiovascular side effects.

McDonald, N. (2019). "Biological Recycling Of Biodegradable Plastics: To meet demand for organics recovery and reduced plastic waste, biodegradable plastics will be an increasing part of the future. Biological recycling infrastructure must be ready to respond." BioCycle **60**(7): 32-36.

The article offers information on importance of biological recycling of biodegradable plastics to meet demand for organics recovery and reduced plastic waste. Topics discussed include information on aerobic composting (AC) in which fungi and aerobic bacteria consume the biopolymers; combination of anaerobic digestion (AD) with existing or new AC facilities which increases percent recovery and recycling of the organics and biopolymers; and informaton on thermoplastic starch.

McDonough, K., et al. (2017). "Assessing the biodegradability of microparticles disposed down the drain." Chemosphere **175**: 452-458.

Microparticles made from naturally occurring materials or biodegradable plastics such as poly(3-hydroxy butyrate)-co-(3-hydroxy valerate), PHBV, are being evaluated as alternatives to microplastics in personal care product applications but limited data is available on their ultimate biodegradability (mineralization) in down the drain environmental compartments. An OECD 301B Ready Biodegradation Test was used to quantify ultimate biodegradability of microparticles made of PHBV foam, jojoba wax, beeswax, rice bran wax, stearyl stearate, blueberry seeds and walnut shells. PHBV polymer was ready biodegradable reaching 65.4+or-4.1% evolved CO₂ in 5 d and 90.5+or-3.1% evolved CO₂ in 80 d. PHBV foam microparticles (125-500 micro m) were mineralized extensively with >66% CO₂ evolution in 28 d and >82% CO₂ evolution in 80 d. PHBV foam microparticles were mineralized at a similar rate and extent as microparticles made of jojoba wax, beeswax, rice bran wax, and stearyl stearate which reached 84.8+or-4.8, 84.9+or-2.2, 82.7+or-4.7, and 86.4+or-3.2% CO₂ evolution respectively in 80 d. Blueberry seeds and walnut shells mineralized more slowly only reaching 39.3+or-6.9 and 5.1+or-2.8% CO₂ evolution in 80 d respectively.

McEachern, K., et al. (2019). "Microplastics in Tampa Bay, Florida: Abundance and variability in estuarine waters and sediments." Marine Pollution Bulletin **148**: 97-106.

This study provides the first measurement of microplastic abundance and distribution in surface waters and sediments in Tampa Bay, FL. Microplastic concentrations in discrete water samples ranged from 0.25 to 7.0 particles/L with an average of 0.94 (+/-0.52) particles/L. Samples taken with a 330 mum plankton net had 1.2-18.1 particles/m³ with an average of 4.5 (+/-2.3) particles/m³. Discrete samples were 200 times higher than net samples, suggesting substantial losses or undersampling with the net. For both discrete and plankton tow samples, there were no significant differences in concentrations between stations or regions. Intense rainfall events in the summer always preceded samples with substantially higher counts. Most (>75%) microplastics were fibers. Using an average value of 1 particle/L, Tampa Bay contains ~4 billion microplastic particles. Surface sediments had an average of 280 (+/-290) particles/kg, ranging from 30 to 790 particles/kg. Highest concentrations of microplastics were found in sediments close to industrial sources; lowest values in Middle and Lower Tampa Bay are consistent with shorter residence times. Copyright © 2019

McGoran, A. R., et al. (2017). "Presence of microplastic in the digestive tracts of European flounder, Platichthys flesus, and European smelt, Osmerus eperlanus, from the River Thames." Environmental Pollution **220**(Part A): 744-751.

Like many urban catchments, the River Thames in London is contaminated with plastics. This pollutant is recorded on the river banks, in the benthic environment and in the water column. The present study was conducted to assess the extent of microplastic ingestion in two River Thames fish species, the European flounder (Platichthys flesus) and European smelt (Osmerus eperlanus). Samples were collected from two sites in Kent, England; Erith and Isle of Grain/Sheppey, near Sheerness, with the latter being more estuarine. The results revealed that up to 75% of sampled European flounder had plastic fibres in the gut compared with only 20% of smelt. This difference may be related to their diverse feeding behaviours: European flounder are benthic feeders whilst European smelt are pelagic predators. The fibres were predominantly red or black polyamides and other fibres included acrylic, nylon, polyethylene and polyethylene terephthalate and there was no difference in occurrence between the sites sampled.

McGowan, B. H. (2014). The effects of applied hydrostatic pressure on osteogenic differentiation of mouse mesenchymal stem cells in an in vitro 3D culture.

Changes in the mechanical loading on the skeleton have been shown to influence bone density. In bone disorders, such as disuse osteoporosis, the reduction of loading on bone leads to reduced bone mineral density and thus increased risk of fracture. Previous studies have suggested this may be caused by a change in the mechanical environment, specifically hydrostatic pressures, of the bone cells, resulting in a change in cellular activity. However, the pressure parameters and mechanisms involved in the promotion/suppression of osteogenesis in 3D in vitro culture of bone cells are not well understood. This doctoral thesis sought to investigate the role cyclic pressure frequency has on the osteogenic differentiation of mesenchymal stem cells (MSC) in a 3D alginate microbead in vitro culture. Specifically, the objective of this research was to test the hypothesis that the osteogenic differentiation of MSCs in 3D was enhanced by cyclic pressure applied at a critical threshold frequency. To test this hypothesis an alginate scaffold and 3D culture conditions were first developed and then used to assess the effects of cyclic pressure at different frequencies on MSC differentiation. To develop a 3D culture system the effects of RGD modification on mouse MSC survival and differentiation in alginate microbeads were first examined. MSCs were encapsulated in unmodified or RGD-modified alginate and cell proliferation and the expression of several osteogenic markers were monitored over a 28 day culture. While RGD modification did facilitate cell adhesion, it did not affect MSC viability or proliferation. However, RGD did promote the development of mature osteoblasts and was therefore used in the remaining experiments. Both an increased matrix stiffness and low seeding density were found to enhance the osteogenic differentiation of MSCs in 3D, most likely through a change in integrin binding and nutrient supply, respectively. The addition of cyclic pressure (5-35 kPa for 1 h/day) also resulted in increased osteogenesis of MSCs in 3D, but only when applied at 0.5 Hz and not 0.1 Hz. In summary, we have demonstrated that RGD, a high matrix stiffness, and low seeding density can promote the early upregulation of osteogenic markers and maturation of osteoblasts. Additionally, the results of the present study provide evidence that the promotion of the osteogenesis of MSCs in 3D by cyclic pressure is affected by frequency and that a threshold likely exists around 0.5 Hz. The current findings will help progress the field of bone cell mechanobiology and can be used in the treatment of bone degenerative diseases.

McIntyre, A., et al. (1997). "Effect of bran, ispaghula, and inert plastic particles on gastric emptying and small bowel transit in humans: the role of physical factors." Gut **40**(2): 223-227.

BACKGROUND: Coarse bran is known to accelerate transit through the whole gut and to increase stool weight. This effect is much reduced by grinding the bran, suggesting that particle size influences gut motor patterns.

AIMS: To compare the effect of 15 g coarse bran with 15 g inert plastic particles and 7 g of ispaghula on the gastric emptying and small bowel transit of a rice pudding test meal.

SUBJECTS: 13 healthy volunteers.

METHODS: Transit of 99mTc labelled rice studied by gamma-scintigraphy measuring gastric emptying and colonic arrival over 10 hours. Small bowel transit was estimated from the difference between time to 50% gastric emptying and 50% colonic arrival.

RESULTS: Bran delayed gastric emptying by 22 (SEM 8) minutes compared with control values of 88 (SEM 6) minutes $p < 0.05$. Ispaghula and plastic particles had no significant effect. Small bowel transit was accelerated compared with control values of 322 (SEM 29) minutes, decreasing by 95 (29) minutes and 62 (22) minutes after bran and plastic particles respectively. Ispaghula again showed no significant effect.

CONCLUSION: Coarse bran delays gastric emptying and accelerates small bowel transit. The marked acceleration of small bowel transit also seen with inert plastic particles may be due to increased

upper gut secretions after stimulation of enteric nerves.

McKeage, K. and L. J. Scott (2003). "SLI-381 (Adderall XR)." CNS Drugs **17**(9): 669-675.
SLI-381 is an extended-release formulation of short-acting Adderall, a racemic mixture of dextro- and levo-isomers of amphetamine salts. Drug-containing microbeads within the SLI-381 capsule give a double-pulsed delivery, similar to that achieved by two equal doses of the short-acting formulation administered 4 hours apart. In an intent-to-treat analysis of a 3-week, double-blind study in 563 children with attention-deficit hyperactivity disorder (ADHD), SLI-381 10, 20 or 30mg once daily improved mean morning and afternoon behaviour scores compared with baseline significantly more than placebo ($p < 0.001$ for all comparisons), as assessed by the Connors Global Index Scale for teachers (CGIS-T). Following treatment, CGIS-T scores were similar to those reported in children without ADHD. In the same study, a dose-response relationship was observed, and increasing the dosage of SLI-381 by 10mg at weekly intervals, to a maximum of 30mg once daily, resulted in further improvements in the scores of the CGIS-T. After early morning administration of SLI-381 in this double-blind study, late-afternoon scores of the CGIS for parents were similar to morning scores. SLI-381 was generally well tolerated in randomised trials in children with ADHD for up to 24 months. Overall, adverse events were mild to moderate in intensity.

McKee, M. D., et al. (2011). "Osteopontin and wound healing in bone." Cells Tissues Organs **194**(2-4): 313-319.
Bone wound healing after surgical drilling/cutting initially involves a typical inflammatory response with a leukocyte-rich cell infiltrate whose professional phagocytes (neutrophils and macrophages) clear the wound site of various bacterial (if present), particulate, and insoluble components arising from the original wounding event. As part of this process, in a surgical model of bone repair in rats, osteopontin (OPN) secreted by macrophages - with its known mineral-binding properties arising from abundant calcium-binding phosphorylations and overall net negative charge - binds to the newly exposed mineralized surfaces of particulate bone debris and the osseous wound margins created by the drilling, as shown by high-resolution immunogold labeling and transmission electron microscopy. For bone debris powder, OPN serves as an opsonin for clearance by macrophage phagocytosis, as demonstrated in vitro by phagocytosis assays using cultured J774.A1 murine macrophages and OPN-coated microbeads. Macrophage-secreted OPN binding to the bone wound margins contributes to cement line (plane) formation with subsequent OPN additions to the cement line coming from osteoblast lineage cells arriving at this site to effect bone repair upon further osteoblast differentiation, and extracellular matrix deposition and mineralization. Such interfacial OPN is thought to contribute to the cell adhesion, cell signaling, and matrix mineralization events required to effectively integrate the new bone into the preexisting bone at the margins of the drill site. Copyright © 2011 S. Karger AG, Basel.

McLaughlin, A. (2018). "Branding the world's first plastic-free supermarket aisle." Design Week (Online Edition): 1-1.
The article focuses on logo and campaign for Plastic Free Aisle, an initiative launched in collaboration with environmental charity "A Plastic Planet" and Dutch's "Ekoplaza" to prevent plastic pollution. Topics discussed include inclusion of more than 700 food items and other goods with recyclable packaging in the aisle which bear the "plastic free" mark; comments of founding partner Ben Parker along with information on the second "Plastic Free Aisle".

McLaughlin, J. S. (2008). "THE KINGDOM FUNGI, FOOD CHAINS & PLASTIC POLLUTION." The American Biology Teacher **70**(4): 201.

In class, we identify plastic bags, nets, ropes, bottles, motor-oil jugs, diapers, toys, razors, toothbrushes, cigarette lighters and more, swirling endlessly in what was once pristine seascape. Even more alarming, we speculate about what it means to the food chain that microscopic pieces of plastic are drifting like fish food throughout the water, mimicking plankton, the food supply of most aquatic life.

McLaughlin, T., et al. (2018). "p58^{IPK} Is an Endogenous Neuroprotectant for Retinal Ganglion Cells." Frontiers in aging neuroscience **10**: 267.

p58^{IPK} is an endoplasmic reticulum (ER)-resident chaperone playing a critical role in facilitating protein folding and protein homeostasis. Previously, we have demonstrated that p58^{IPK} is expressed broadly in retinal neurons including retinal ganglion cells (RGCs) and loss of p58^{IPK} results in age-related RGC degeneration. In the present study, we investigate the role of p58^{IPK} in neuroprotection by in vitro and in vivo studies using primary RGC culture and two well-established disease-relevant RGC injury models: retinal ischemia/reperfusion (I/R) and microbead-induced ocular hypertension. Our results demonstrate that in both in vivo models, p58^{IPK -/-} mice exhibit significantly increased RGC loss compared to wild type (WT) mice. In vitro, p58^{IPK}-deficient RGCs show reduced viability and are more susceptible to cell death induced by the ER stress inducer tunicamycin (TM). Overexpression of p58^{IPK} by adeno-associated virus (AAV) significantly diminishes TM-induced cell death in both WT and p58^{IPK -/-} RGCs. Interestingly, we find that loss of p58^{IPK} leads to reduced mRNA expression, but not the protein level, of mesencephalic astrocyte-derived neurotrophic factor (MANF), a neurotrophic factor that resides in the ER. Treatment with recombinant MANF protein protects R28 retinal neural cells and mouse retinal explants from TM-induced cell death. Taken together, our study suggests that p58^{IPK} functions as an endogenous neuroprotectant for RGCs. The mechanisms underlying p58^{IPK}'s neuroprotective action and the potential interactions between p58^{IPK} and MANF warrant future investigation.

McMullen, C. (2017). "Why Restaurants are Going Straw-less in Seattle by 2018." Waste360: 1-1.

The article reports on steps taken by Seattle, Washington in banning plastic disposable straws for minimizing plastic disposals and their impact on ocean life, the environment and the health of human life. It mentions that the marketplace good, compostable items that are compostable straws and compostable cutlery that meet performance standards and can be composted at our local compost facilities.

McNeish, R. E., et al. (2018). "Microplastic in riverine fish is connected to species traits." Scientific Reports **8**(1): 11639.

Microplastic is a contaminant of concern worldwide. Rivers are implicated as major pathways of microplastic transport to marine and lake ecosystems, and microplastic ingestion by freshwater biota is a risk associated with microplastic contamination, but there is little research on microplastic ecology within freshwater ecosystems. Microplastic uptake by fish is likely affected by environmental microplastic abundance and aspects of fish ecology, but these relationships have rarely been addressed. We measured the abundance and composition of microplastic in fish and surface waters from 3 major tributaries of Lake Michigan, USA. Microplastic was detected in fish and surface waters from all 3 sites, but there was no correlation between microplastic concentrations in fish and surface waters. Rather, there was a significant effect of

functional feeding group on microplastic concentration in fish. Neogobius melanostomus (round goby, a zoobenthivore) had the highest concentration of gut microplastic (19 particles fish⁻¹) compared to 10 other fish taxa measured, and had a positive linear relationship between body size and number of microplastic particles. Surface water microplastic concentrations were lowest in the most northern, forested watershed, and highest in the most southern, agriculturally dominated watershed.

McNicholas, G. and M. Cotton (2019). "Stakeholder perceptions of marine plastic waste management in the United Kingdom." Ecological Economics **163**: 77-87.

Plastic pollution is a significant threat to the marine environment. The problem has become subject to increasing scientific scrutiny, media campaigning and growing public awareness. This has stimulated policy-makers to introduce changes aiming to reduce plastic consumption and production. However, in order to arrive at socially acceptable policy and behaviour change solutions, we need to better understand the diverse array of stakeholder perspectives on ocean plastic pollution, economic policy and consumption responsibilities. We employ a Q-methodological study to research key stakeholder viewpoints from ENGO, government agency, plastic manufacturer, retailer, research and citizen representatives in the UK. We find four emergent types of perspectives surrounding this topic, labelled: (a) socio-cultural visibility and responsibility, (b) dragons of inaction - disempowerment and defeatism, (c) value-action gap, (d) refuting retailer responsibility. We also identify a clear consensus that current and proposed government policy is not radical enough - the focus needs to move beyond single-product taxes and levies on disposal items (e.g. bags, coffee cups), to a deeper reflection about public awareness raising and education, defining waste responsibilities more clearly, and working to change the habits and unsustainable practices of consumers in the face of public apathy and a resistant retail environment.

McWilliam, L. J., et al. (1991). "Spinous injury caused by a sea urchin." Journal of Clinical Pathology **44**(5): 428.

A bather on holiday in Kenya injured a finger on a spiny marine creature living on the sea bed. A skin biopsy specimen from the injured finger contained several black spines about 0.5 mm in diameter and up to 1.5 cm in length. Spines removed from the specimen were embedded in plastic resin to facilitate transverse sectioning. Light microscopical examination using crossed polarisers showed an ornate symmetrical structure brightly illuminated against a dark background. These features are characteristic of sea urchin (Echinoderm) spines which are composed of ornately formed calcite crystals covered by an epithelium. The spines of sea mice, on the other hand, are chitinous in nature; they are also much finer and lack the ornate symmetry of sea urchin spines.

Md Amin, R., et al. (2020). "Microplastic ingestion by zooplankton in Terengganu coastal waters, southern South China Sea." Marine Pollution Bulletin **150**: 110616.

This study investigates the presence of microplastics in surface seawater and zooplankton at five different locations off the Terengganu coast in Malaysia, southern South China Sea. A total of 983 microplastic particles, with an average abundance of 3.3 particles L⁻¹ were found in surface seawater. An average of one plastic particle was detected in 130 individuals from 6 groups of zooplankton. These groups include fish larvae, cyclopoid, shrimps, polychaete, calanoid and chaetognath where they ingested 0.14, 0.13, 0.01, 0.007, 0.005 and 0.003 particle per individual, respectively. Microplastics in the form of fragments are the most common type of ingested microplastics that ranged between 0.02mm (cyclopoid) - 1.68mm (shrimp and zoea).

Contrastingly, fibers, which are identified as polyamide are the main type of microplastics that dominate in seawater.

Meallem, I. and Y. Garb (2008). "The Exposure of Bedouin Women to Waste Related Hazards." Women & Environments International Magazine(76/77): 44-48.

The article investigates the exposure of Bedouin women to waste related hazards in Negev, Israel. As Bedouin adopted more sedentary and westernized lifestyles, however, the nature of their consumption changed, generating volumes and kinds of waste that require organized disposal. In addition to waste burning as an informal method of disposal, cooking and heating fires often use scavenged wood and plastic waste is often used as an ignition aid.

Mederake, L. and D. Knoblauch (2019). "Shaping EU Plastic Policies: The Role of Public Health vs. Environmental Arguments." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(20): 16.

Few other environmental problems have received as much public attention and criticism in recent years as plastic pollution. Accordingly, in recent years, a number of plastic policies have been adopted at the national and supranational level in the EU and worldwide. In the U.S., health risks were repeatedly raised in the decision-making process of these policies and scholars have pointed out the crucial role of these arguments for the adoption of plastic policies. Hence, this article uses a structuring qualitative content analysis to investigate the parliamentary debates of two recently adopted plastic policies in the EU-namely the EU Plastics Strategy and the Single-Use Plastics Directive-and to assess the relevance of public health and environmental arguments for the EU debate. The analysis reveals broad support for plastics regulation among Members of the European Parliament, who most often use environmental arguments to corroborate their support for the policies in question. In contrast, health concerns do not seem to be crucial for the adoption of plastic policies in the EU.

Medinger, M., et al. (2011). "Increased Dkk3 protein expression in platelets and megakaryocytes of patients with myeloproliferative neoplasms." Thrombosis & Haemostasis **105**(1): 72-80.

Dickkopf-3 (Dkk3) has been proposed as tumour suppressor gene and a marker for tumour blood vessels. We analysed the expression and function of Dkk3 in platelets and megakaryocytes from healthy controls and patients with BCR-ABL1-negative myeloproliferative neoplasms (MPN). Dkk3 protein and gene expression in platelets was compared with endothelial and other blood cell populations by ELISA, real-time PCR, and immunofluorescence. Moreover, megakaryocytes were isolated from bone marrow aspirates by CD61 microbeads. Immunohistochemical studies of Dkk3 expression were performed in essential thrombocythemia (ET), polycythemia vera (PV), primary myelofibrosis (PMF) and control reactive bone marrow cases (each n=10). Compared to all other blood cell populations platelets showed the highest concentration of Dkk3 protein (150 +/- 19 ng/mg total protein). A strong DKK3 gene and protein expression was also observed in isolated megakaryocytes. Dkk3 co-localised with VEGF in alpha-granules of platelets and was released similar to VEGF upon stimulation. Addition of recombinant Dkk3 had no influence on blood coagulation (aPTT, INR) and platelet aggregation. Significantly more Dkk3+ megakaryocytes/mm2 could be found in bone marrow biopsies from patients with MPN (ET 40 +/- 10, PV 31 +/- 4, PMF 22 +/- 3) than in controls (15 +/- 3). The mean proportion of Dkk3+ megakaryocytes was increased in MPN as well (ET 83% +/- 15%; PV 84% +/- 12%; PMF 77% +/- 8%) compared to controls (53% +/- 11%). Dkk3+ megakaryocytes correlated with microvessel density in PV and PMF. We conclude that Dkk3 might be involved in the pathogenesis of MPN.

Medoro, G., et al. (2003). "A Lab-on-a-Chip for Cell Detection and Manipulation." IEEE Sensors Journal **3**(3): 317-325.

This paper presents a lab-on-a-chip for electronic manipulation and detection of microorganisms based on the use of closed dielectrophoretic (DEP) cages combined with impedance sensing. A printed circuit board (PCB) prototype has been used to trap, concentrate, and quantify polystyrene micro-beads in agreement with CAD simulations. The experiment was successfully repeated with S. cerevisiae. The results prove the effectiveness of the approach for particle manipulation and detection without the need for external optical components nor chemical labeling. With the proposed approach, particle concentration may be increased on-chip of more than three orders of magnitude, correspondingly boosting the detection sensitivity.

Meenu, S. and B. Rajeshwari (2011). "Market potential of developed consumer products of bonded material using plastic wastes." Asian Journal of Home Science **6**(2): 107-111.

One of the biggest challenges with plastic waste is that it is extremely hard to dispose of and persist in the environment for longer period. While the problem of plastics disposal has to be recognized and accepted globally, India's particular situation could be worsened by its poor drainage infrastructure in the cities, and fewer resources to spare for post disaster rectification. The study was carried out at Udaipur city of Rajasthan on Development of Bonded fabric using plastic waste for developing consumer products and assessment of their market potential. Finding of the study revealed that developed bonded fabrics of 200-300 GSM was suitable for the development of those consumer products requiring more thickness, stiffness and bursting strength. On the other hand, the developed bonded fabrics of 100-200 GSM was found more suitable for developing consumer products of general use on account of less stiffness and other related properties. Majority of the respondents appreciated developed value added consumer products. Thus, it can be concluded that the developed value added consumer products by the use of polythene bags for developing bonded fabrics were found highly acceptable in terms of acceptability and further this will also be helpful in reducing the environmental pollution in a fruitful manner.

Megri, A. C., et al. (1998). "Using plastic waste as thermal insulation for the slab-on-grade floor and basement of a building." Building and Environment **33**(2-3): 97-104.

Experimental and theoretical studies were performed to investigate the possibility of substituting traditional insulation materials with a rigid manufactured polyethylene packing waste. This procedure is of economic interest and contributes to the protection of the environment, since the disposal of plastic waste consumes energy and results in emissions of pollutants to air, water and soil. The first part involved the measurement of the thermal characteristics of the plastic waste using a non-isothermal procedure, based on the transient state of temperature. Two methods were employed: the heat wire method and the ring sensor method. In the second part, a comparative study was carried out for different building configurations using the traditional insulation or the rigid manufactured polyethylene packing waste. The effect of the water table on a building with a rectangular slab-on-grade foundation or with a basement was studied. An analytic method and a commercial software, which uses the finite difference method in two and three dimensions, were used for the comparison. For all configurations, the quantitative values of the heat loss through the ground from the building floor demonstrate the effective performance of the rigid polyethylene packing waste insulation and substantiate the pertinence of its use.

Mehdinia, A., et al. (2019). "Identification of microplastics in the sediments of southern coasts of the Caspian Sea, north of Iran." Environmental Pollution **258**: 113738.

Microplastic (MPs) pollution in the aquatic and terrestrial environments has caught many attentions in the scientific literatures. Currently, no information is available about MPs pollution in Caspian Sea, the largest lake in the world. This study indicates the first report on the MPs pollution in the sediments of the southern Caspian coastal zones, northern Iran. Density separation method was conducted on 17 surficial sediments. The combination of observation techniques including SEM-EDS analysis, polarized light microscopy and Raman micro-spectroscopy were used to identify MPs. The abundance and size of microplastics in the samples ranged between 25 and 330 items/kg and 250-500 mum, respectively. Fibers constituted the most common MPs shape and polystyrene (PS) and polyethylene (PE) were major polymer types in the samples. The distribution of MPs in the study area reflected a patchy and irregular spatial pattern implying that the higher MPs concentration are near mouth of permanent rivers and in the regions with higher level of the fishing and tourism activities. The results showed the wide occurrence of MPs in the sediments of the world's largest lake which extend the knowledge on MPs pollution in the marine system. We also recommend further research on microplastics in different compartments of Caspian Sea to inform policy discussions and the development of appropriate management responses.

Mehendale, S. S., et al. (1998). "Studies on impact of environmental plastic pollution hazard to the health of dairy cows (new emerging problem)." Journal of Bombay Veterinary College **6**(1): 21-23.

Severe rumen overloading with plastic material was diagnosed in 22 cows in early lactation and 2 pregnant cows in late lactation from the Mumbai region, India between January 1995 and May 1997. Rumenotomy was performed treated under field conditions in all cows. Plastic material (strings, carrier bags) weighing 19 to 68 kg was removed from the rumen of affected cows. Of 22 cows in early lactation, 17 resumed normal milk production after surgery, 3 reduced production level and 2 died. Of 2 pregnant animals, one aborted and the other had normal parturition.

Mehrjouei, M., et al. (2014). "Treatment of pyrolysis wastewater using heterogeneous advanced oxidation processes." Environmental Progress & Sustainable Energy **33**(1): 178-183.

In this study, treatment of a real wastewater sample produced in a thermal pyrolysis plant for plastic waste disposal was performed using a practical design of multiphase falling film reactor. The reduction in the level of chemical oxygen demand (COD) as well as color removal of this type of wastewater was evaluated by means of three different heterogeneous advanced oxidation processes (TiO_2/UVA/O_2, TiO_2/O_3, and TiO_2/UVA/O_3). In addition, the effect of acidification of this type of wastewater as well as the influence of the content of phosphate anions existing in the wastewater for biological treatment purposes on several treatment aspects were investigated and discussed in detail. The COD level of pyrolysis wastewater was decreased by about 32 and 38% after 1 h of treatment using the catalytic ozonation and photocatalytic ozonation approaches, respectively, while the decrease in the COD of this wastewater was negligible during the photocatalytic oxidation. The wastewater color was completely removed after 40 min of treatment using both ozone-based oxidation systems, while the photocatalytic oxidation led to a slight decrease in color extinction by about 10% after 1 h of treatment. © 2013 American Institute of Chemical Engineers Environ Prog, 33: 178-183, 2014 [ABSTRACT FROM AUTHOR]

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Meier, R. P., et al. (2017). "Microencapsulation of Hepatocytes and Mesenchymal Stem Cells for Therapeutic Applications." Methods in Molecular Biology **1506**: 259-271.

Encapsulated hepatocyte transplantation and encapsulated mesenchymal stem cell transplantation are newly developed potential treatments for acute and chronic liver diseases, respectively. Cells are microencapsulated in biocompatible semipermeable alginate-based hydrogels. Microspheres protect cells against antibodies and immune cells, while allowing nutrients, small/medium size proteins and drugs to diffuse inside and outside the polymer matrix. Microencapsulated cells are assessed in vitro and designed for experimental transplantation and for future clinical applications.Here, we describe the protocol for microencapsulation of hepatocytes and mesenchymal stem cells within hybrid poly(ethylene glycol)-alginate hydrogels.

Meimaridou, A. (2013). "Microsphere-based binding assays for organic pollutants." Microsphere based binding assays for organic pollutants **139**.

This thesis describes the application of microsphere-based multiplex platforms and extraction procedures for the detection of various persistent organic pollutants (POPs) in foods, particularly in fish products. Chapter 1 provides a general introduction to the topic. Chapter 2 describes a spectrally encoded microbead-based flow cytometric immunoassay for detection of polycyclic hydrocarbons in foods, while Chapter 3 discusses multiplex screening of POPs in fish using spectrally-encoded microspheres. Chapter 4 describes the use of multiplex immunoassay for POPs detection in tilapia and Chapter 5 present a comparison between multiplex flow cytometric and biosensor platforms for detection of thyroid hormone disruption. Chapter 6 offers concluding discussions and recommendations.

Meimaridou, A., et al. (2010). "Color encoded microbeads-based flow cytometric immunoassay for polycyclic aromatic hydrocarbons in food." Analytica Chimica Acta **672**(1/2): 9-14.

Food contamination caused by chemical hazards such as persistent organic pollutants (POPs) is a worldwide public health concern and requires continuous monitoring. The chromatography-based analysis methods for POPs are accurate and quite sensitive but they are time-consuming, laborious and expensive. Thus, there is a need for validated simplified screening tools, which are inexpensive, rapid, have automation potential and can detect multiple POPs simultaneously. In this study we developed a flow cytometry-based immunoassay (FCIA) using a color-encoded microbeads technology to detect benzo[a]pyrene (BaP) and other polycyclic aromatic hydrocarbons (PAHs) in buffer and food extracts as a starting point for the future development of rapid multiplex assays including other POPs in food, such as polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs). A highly sensitive assay for BaP was obtained with an IC₅₀ of 0.3 micro g L⁻¹ using a monoclonal antibody (Mab22F12) against BaP, similar to the IC₅₀ of a previously described enzyme-linked immunosorbent assay (ELISA) using the same Mab. Moreover, the FCIA was 8 times more sensitive for BaP compared to a surface plasmon resonance (SPR)-based biosensor immunoassay (BIA) using the same reagents. The selectivity of the FCIAs was tested, with two Mabs against BaP for 25 other PAHs, including two hydroxyl PAH metabolites. Apart from BaP, the FCIAs can detect PAHs such as indenol[1,2,3-cd]pyrene (IP), benz[a]anthracene (BaA), and chrysene (CHR) which are also appointed by the European Food Safety Authority

(EFSA) as suitable indicators of PAH contamination in food. The FCIAs results were in agreement with those obtained with gas chromatography-mass spectrometry (GC-MS) for the detection of PAHs in real food samples of smoked carp and wheat flour and has great potential for the future routine application of this assay in a simplex or multiplex format in combination with simplified extraction procedure which are under development.

Meimaridou, A., et al. (2011). "Multiplex screening of persistent organic pollutants in fish using spectrally encoded microspheres." Analytical Chemistry **83**(22): 8696-8702.

Persistent organic pollutants (POPs) are environmental and food-related contaminants of global public health concern and known to be carcinogenic and endocrine disruptors. Their monitoring is essential, and an easy-to-use, rapid, and affordable multianalyte screening method with simplified sample preparation can be a valuable tool prior to instrumental analysis. For this purpose, a flow cytometric immunoassay (FCIA), based on a spectrally encoded microbeads technology, was developed for the multiplex detection of polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and polybrominated diphenyl ethers (BDEs) in buffer and fish extracts. The sensitivities of the assays in the three-plex FCIA format were similar to the individual FCIAs for the marker compounds benzo[a]pyrene (BaP), 3,3',4,4'-tetrachlorobiphenyl (PCB77), and 2,2',4,4'-tetrabromodiphenyl ether (BDE47) in buffer with IC₅₀ values of 0.4, 20, and 2 micro g L⁻¹, respectively. Apart from the three markers, we could detect at least 14 other POPs. Extracts of fish with different fat content, prepared with a simplified extraction and cleanup procedure, had an insignificant influence on the overall three-plex FCIA performance, with the exception of some impact on the PAHs detection. The performance of the three-plex FCIA, in combination with the simple extraction procedure, is adequate for regulatory control in accordance with the required limits.

Mekhalef Benhafssa, A., et al. (2018). "Continuous operation of a fluidized-bed disk-type electrostatic separator for micronized plastic waste." Waste Management **79**: 763-769.

The objective of this work is to highlight the peculiarities of the continuous operating regime of a new tribo-aero-electrostatic separator for the recycling of plastics contained in micronized waste electrical and electronic equipment. The experiments were carried out with an ABS/PS mixture. The particles are charged by triboelectric effect in a fluidized bed in the presence of an electric field created between two disk electrodes connected to high voltage supplies of opposite polarities. The installation described in this paper has several control variables: the high voltage, the mass of the mixture initially introduced into the fluidized bed, the flow of fluidizing air and the rotation speed of the disk electrodes. The influence of each control variable of the machine on the efficiency of the separation was studied by simultaneously and continuously measuring the mass and the electrical charge of the collected products. The quality of the products obtained and the high hourly rates recommend this type of installation for industrial use.

Meldgaard, M., et al. (2012). "A novel multiplex analysis of filaggrin polymorphisms: a universally applicable method for genotyping." Clinica Chimica Acta **413**(19-20): 1488-1492.

BACKGROUND: The filaggrin protein is expressed as profilaggrin mainly in stratum granulosum cells of the epidermis. The profilaggrin gene codes for 10-12 filaggrin repeats. The filaggrin protein is important for skin barrier function. Filaggrin deficiency due to functional null-polymorphisms affects 8-10% of the people in Northern Europe and is a strong risk factor for several diseases. Here, we describe a novel method for efficient, multiplexed genotyping of variations in the profilaggrin gene.

METHODS: Five known techniques were combined: i) allele-specific PCR, ii) PCR with tagged primers, iii) asymmetric PCR, iv) multiplex PCR, and v) hybridization of single-stranded PCR products to spectrally coded microbeads carrying tag sequences as capture probes. Asymmetry of PCR was accomplished by having the tagged and allele-specific forward primers present in limiting concentrations. Asymmetry ensured that the later PCR cycles generated only single-stranded reverse-strand products. This greatly improved the assay sensitivity and allowed for simple optimization.

RESULTS: The specificity of the tags was verified with single PCR in wildtype and homozygous samples. Only the PCR products with the appropriate anti-tag hybridized to the corresponding beads, demonstrating the specificity of the signal. The hybridization signal is strongly dependent on single-stranded PCR products. After 46 PCR cycles, double-stranded products are clearly present, but only the single-stranded products generated in later cycles hybridize to the beads and elicit the strong signals that allow for unambiguous genotyping.

CONCLUSIONS: We have tested 17,000 samples for three filaggrin polymorphisms using this method, with a call rate exceeding 99% and a reagent cost of US $ 0.75 per sample. The method is universally applicable for multiplex genotyping of e.g. hereditary hemochromatosis, lactose intolerance, or cystic fibrosis.

Meldgaard, M., et al. (2012). "A novel multiplex analysis of filaggrin polymorphisms. An universally applicable method for genotyping." Clinical Chemistry **1)**: A85.

Background: Filaggrin is a protein located in the epidermis with a repetitive filaggrin gene located in the epidermal differentiation complex on chromosome 1q21 and the protein is important for skin barrier function. Deficiency due to functional null-polymorphisms affects 8-10% of the population in Northern Europe and cause ichthyosis vulgaris, and is a strong risk factor for atopic dermatitis, asthma, rhinitis, and food allergies. We describe a method for genotyping of three common variations in the filaggrin gene. The method is versatile and universally applicable for multiplexed genotyping. Method(s): Five known techniques are combined i) allele-specific PCR, ii) PCR with tagged primers, iii) asymmetric PCR, iv) multiplexed PCR, and v) hybridization of single-stranded PCR products to spectrally coded microbeads carrying tag-sequences as individual capture-probes. Asymmetric PCR is accomplished as the tagged and allele-specific forward primers of the three individual PCR's are present in limiting concentrations relative to the corresponding reverse primers. Asymmetry ensures that the later PCR cycles generate only single-stranded reverse strand products. This leads to highly improved assay sensitivity and allows for easy assay optimization Results: Specificity of the tags was verified by single PCR with wildtype and homozygote samples. Only PCR-products with the appropriate anti-tag hybridized to the corresponding beads, indicating a specific signal. The hybridization signal strongly dependent upon single-stranded PCR products resulting from the depletion of forward primers. After 40-48 PCR cycles double-stranded PCR products are clearly present, but only the single-stranded PCR products generated in later cycles hybridize and elicit the strong signals that allow for unambiguous genotyping. Conclusion(s): We have tested > 17,000 samples for three filaggrin polymorphisms using this method with a call-rate exceeding 99.0% and at reagent cost of only 0.75 US $ per sample. The method is universally applicable for multiplexed genotyping, and may be adapted for genotyping of for instance hereditary hemochromatosis, lactose intolerance, or cystic fibrosis.

Melero, M., et al. (2015). "Fluorescent microbead-based immunoassay for anti-Erysipelothrix rhusiopathiae antibody detection in cetaceans." Diseases of Aquatic Organisms **117**(3): 237-243.

A fluorescent microbead-based immunoassay (FMIA) for detection of anti-Erysipelothrix

rhusiopathiae antibodies in pigs was adapted for use in cetaceans. The FMIA was validated and adjusted using serum samples from 10 vaccinated captive bottlenose dolphins Tursiops truncatus collected between 1 and 13 mo after immunization. The technique was then used to analyze specimens from 15 free-ranging cetaceans stranded alive on the Valencian Mediterranean coast between 2006 and 2014: 11 striped dolphins Stenella coeruleoalba, 3 Risso's dolphins Grampus griseus and 1 bottlenose dolphin Tursiops truncatus. One of these wild animals was confirmed to have died from E. rhusiopathiae septicemia, but no anti-E. rhusiopathiae antibodies were detected in its serum, pericardial fluid or milk samples. Another free-ranging individual, which lacked any signs or lesions that might be indicative of E. rhusiopathiae infection, showed high fluorescence intensity similar to that measured in captive dolphins at 6-13 mo after vaccination. These results suggest that this animal underwent an E. rhusiopathiae infection several months before stranding. The findings in the present study suggest that FMIA can be useful for detecting anti-E. rhusiopathiae antibodies in cetaceans, and its application to free-ranging animals is particularly interesting because of the great value of these specimens. Furthermore, the FMIA can be multiplexed to allow the determination of up to 100 analytes per sample in a single well, thereby reducing the cost, time and sample volume needed.

Melief, J., et al. (2012). "Phenotyping primary human microglia: tight regulation of LPS responsiveness." GLIA **60**(10): 1506-1517.

Much is still unknown about mechanisms underlying the phenotypical and functional versatility of human microglia. Therefore, we developed a rapid procedure to isolate pure microglia from postmortem human brain tissue and studied their immediate ex vivo phenotype and responses to key inflammatory mediators. Microglia were isolated, along with macrophages from the choroid plexus by tissue dissociation, density gradient separation, and selection with magnetic microbeads. By flow cytometry, microglia were identified by a CD11b(+) CD45(dim) phenotype and a smaller size compared with CD11b(+) CD45(high) macrophages. Interestingly, white matter microglia from donors with peripheral inflammation displayed elevated CD45 levels and increased size and granularity, but were still distinct from macrophages. The phenotype of isolated microglia was further specified by absent surface expression of CD14, CD200 receptor, and mannose receptor (MR, CD206), all of which were markedly expressed by macrophages. Microglia stimulated immediately after isolation with LPS and IFNgamma failed to upregulate TNFalpha or CCR7. Notably, responsiveness to LPS and IFNgamma was clearly instigated in microglia after overnight preculture, which coincided with a strong upregulation of CD14. Culture of microglia with IL-4 resulted in the induction of HLA-DR and CCL18 but not MR, whereas culture with dexamethasone did induce MR, in addition to CD163 and CCL18. In conclusion, this study demonstrates phenotypic changes of microglia associated with peripheral inflammation, and reveals tight regulation of responses to LPS and IFNgamma as well as distinct microglial responses to IL-4 and glucocorticoids. These findings are of high relevance to studies on human microglia functioning in health and disease.

Meliton, A. Y., et al. (2014). "Pathologic cyclic stretch induces caspase-dependent apoptosis-independent microparticle formation by pulmonary endothelium." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **189**(MeetingAbstracts).

Introduction: Microparticles (MP) release from vascular endothelium has been implicated as an important mediators and markers of endothelial injury. Increased MP formation was also been described recently in the lungs of acute respiratory distress patients. MP also possess biological

activities and may exacerbate existing pathological conditions by promoting inflammatory processes. In this study, we investigated the role of pathologic mechanical stretch in MP release from human pulmonary arterial endothelial cells (HPAEC). We also examined combined effects of cyclic stretch (CS) and agonist stimulation on MP formation and investigated the mechanisms involved in increased MP production by pathologic magnitudes of cyclic stretch. Method(s): Monolayers of HPAEC were subjected to static culture (no CS) or 5% CS or 18% CS for 6 hr or 24 hr +/- thrombin or LPS. Conditioned media were collected, and MP isolation was done by differential centrifugation followed by FACS analysis using Annexin V and in comparison with fluorescent microbeads. TUNNEL assay was done to determine cells viability after cyclic stretched. Result(s): MP released after 24 hr of pathologic 18% CS showed significant increased of Annexin V compared to no CS and physiologic 5% CS. Pronounced activation of MP production caused by 18% CS was not further affected by HPAEC co-treatment with thrombin or LPS. Pretreatment of HPAEC with Rho kinase inhibitor Y-27632 or calpain inhibitor calpeptin did not alter CS-induced MP production. This effect was suppressed by pan-caspase inhibitor Z-VAD. Conclusion(s): This study demonstrates that 18% CS, but not 5% CS is a potent activator of MP production by pulmonary endothelium. We also showed that Rho kinase mechanism was not involved in CS-induced MP production by HPAEC. In contrast, CS-induced MP production was suppressed by pan-caspase inhibitor ZVAD. These data may suggest that caspase activation may trigger Rho-independent mechanisms of MP production, which may be dictated by cell type and cyclic stretched stimulation.

Melli, L., et al. (2010). "Development of electrochemical and optical immunobiosensors for diagnosis of chagas disease." Biocell **1)**: 58.

Access to appropriate diagnostic tools is an essential component in the evaluation and improvement of global health. Most diagnostic tools currently available have been developed to be implemented in laboratories highly or moderately equipped; so, largely inadequate for meeting health needs in remote or impoverished settings with no or limited infrastructure. To solve this problem, point-of-care (POC) diagnostic platforms based on immunobiosensors emerge as an alternative. Immunobiosensors are detection systems that transduce a biological signal based on the antibody-antigen recognition into a measurable signal through physical, chemical, optical or electronic transducers. In this work, we have developed optical and electrochemical immunobiosensors for the diagnosis of Chagas disease. Recombinant antigens Ag1, Ag13, Ag36, SAPA and TSSA were purified as GST fusion proteins by affinity chromatography and immobilized on carboxi-modified magnetic beads. Functionalized micro-beads were incubated with sera from infected and non-infected patients and the immune complexes were detected using rabbit anti-human IgM/G Cy5 or peroxidase conjugate antibodies. Our results indicate that the immunobiosensors here developed can be use for the diagnosis of Chagas disease and reveal the potential of such biosensors for the development of POC diagnostic platforms for multiple infectious diseases.

Melnikov, M., et al. (2017). "The influence of depression on Th17-immune response in multiple sclerosis." Journal of the Neurological Sciences **381 (Supplement 1)**: 653.

Background: Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease of the central nervous system with autoimmune mechanism of development. Depression can influence on MS course modulating immune cells activity and cytokine production. Objective(s): To study the relationship between clinical and neuropsychological impairment, concentration of biogenic amines (serotonin, dopamine, norepinephrine, epinephrine) in the serum, quantitative characteristics of Th17-cells, and to clarify the influence of biogenic amines on the function of

Th17-cells in vitro. Patients and Methods/Material and Methods: Data of clinical and neuropsychological status (Beck's scale) of 45 relapsing-remitting MS patients and 20 healthy controls were included. The concentration biogenic amines in the serum were measured by ELISA. Circulating Th17- cells were determined by flow cytometry (CD4CD26CD161CD196). The levels of interleukin-17 (IL-17) and interferon-gamma (IFN-gamma) were studied by ELISA in supernatants of peripheral blood mononuclear cells (PBMCs) stimulated with microbeads coated with anti-CD3 and anti-CD28 antibodies in the absence and in the presence of different concentrations of biogenic amines (10⁻⁴ M, 10⁻⁵ M,10⁻⁶ M). Result(s): The levels of biogenic amines were comparable in all groups. The percentages of Th17-cells and production of IL-17 and IFN-gamma by PBMCs were higher in patients with depression compared to patients without depression or to the control group (p<0.05). Biogenic amines reduced IL-17 and IFN-gamma production in all groups (p<0.05). Conclusion(s): Depression can increase Th17-immune response in multiple sclerosis.

Melnikov, M. V., et al. (2016). "[The influence of catecholamines on Th17-cells in multiple sclerosis]." Zhurnal Nevrologii i Psikhiatrii Imeni S.S. Korsakova **116**(10 Pt 2): 16-20.

AIM: To investigate the possible association between clinical characteristics of multiple sclerosis (MS), quantitative and qualitative characteristics of Th17, dopamine and norepinephrine concentrations in the serum in patients with multiple sclerosis (MS).

MATERIAL AND METHODS: A comprehensive neurological and immunological examination of 43 patients with relapsing-remitting-MS (RR-MS) was performed. All patients were subjected to a standard neurological examination with assessment of the EDSS score. Dopamine and norepinephrine concentrations in serum were measured by enzyme-linked immunosorbent assay (ELISA). Percentage of Th17-cells was determined by flow cytometry. The functional activity of Th17- and Th1-cells was assessed by the production of interleukin-17 (IL-17) and interferon-gamma (IFN-gamma), respectively, by peripheral blood mononuclear cells (PBMC) stimulated with microbeads coated with anti-CD3 and anti-CD28-antibodies.

RESULTS: The percent Th17-cells and cytokine production was significantly higher in MS patients with the exacerbation of disease than in the control group or remission, while the dopamine level was lower. Norepinephrine levels in MS patients in the acute stage and remission were comparable, but nevertheless, reliably lower than in the control group.

CONCLUSION: The results suggest the inhibitory effect of catecholamines on Th17 cells.

Melo, R. C. N., et al. (2007). "Histological approaches for high-quality imaging of zooplanktonic organisms." Micron (Oxford, England : 1993) **38**(7): 714-721.

The investigation of the internal organization of zooplankton communities provides important information on the plankton biology with special interest for the study of ecological processes. Zooplanktoners can play a structural function as indicators for ecosystem health or stress, but their study using histological techniques is still limited. Here we report that the internal structure of zooplanktonic organisms can be facilely observed by a histological approach that combines optimal fixation and processing with a plastic resin (glycol methacrylate) embedding, resulting in increased tissue resolution. Using copepods, organisms that can dominate zooplankton assemblages, as models, collected from a tropical ecosystem (Paraibuna river, Brazil), we showed fine histological details of their muscular, nervous and digestive systems, structure of appendages and cell features. Critical advantages of this approach are that it permits optimal preservation and adequate handling of the organisms (embedded in agar after fixation) for further histological processing and investigation. This is important because it prevents both mechanically induced artifacts and loss of these diminutive organisms during the

different steps of processing. Moreover, embedding in plastic resin showed a superior imaging of copepod internal structures compared to paraffin embedding. The use of glycol methacrylate is advantageous over paraffin/paraplast embedding by avoiding heat damage, tissue retraction and allowing faster embedding procedure and better tissue resolution. The value of histological approaches in enabling high-quality imaging of the internal structure of copepods is particularly important because these organisms can be used as indicators of environmental changes.

Mendoza, A., et al. (1999). "Energy dispersive X-ray fluorescence analysis of marine pollution indicators." Journal of Radioanalytical and Nuclear Chemistry **240**(2): 459-465.

The present work shows a methodology for the application of EDXRF with a X-ray tube, in the analysis of elements in the following matrices: microalgae, marine algae, marine sediments and corals. Various methods were applied: one using a relative external standard, a fundamental parameters method, an absolute method based on elemental sensitivity, a method which used X-ray fluorescence excitation measured in the back side of the sample for low contents heavy elements determination and a TRXRF method. The thin layer samples were prepared using a plastic resin. The analyzed samples of marine algae, marine sediments and corals belong to a marine ecosystem from the North of Havana City, the most affected area by natural metereological phenomena and human impact.

Mendoza, L. M. R. and P. R. Jones (2015). "Characterisation of microplastics and toxic chemicals extracted from microplastic samples from the North Pacific Gyre." Environmental Chemistry **12**(5): 611-617.

Initial studies of floating plastic debris in the oceans dealt with macroscopic particles. This research found microscale plastic present as well. Chemical analysis of sorbed materials revealed toxic materials associated with the microparticles. Seawater and plastic fragment samples were collected in September 2007 in the North Pacific Central Gyre. Polycyclic aromatic hydrocarbons and polychlorinated biphenyls (PCBs) were detected by mass spectrometry in extracts from the plastic fragments. Net concentrations of PCBs ranged from 1 to 223 ng g-1 plastic. The most common synthetic polymers were found to be polypropylene and polyethylene. Microscopic plastic fibres and particles were also discovered in the seawater samples and examined by scanning electron microscopy. Analysis of filtered seawater samples also revealed toxic materials in concentrations lower than found on the plastic particles.

Menezes, R., et al. (2019). "Ingestion of macroplastic debris by the common dolphinfish (Coryphaena hippurus) in the Western Equatorial Atlantic." Marine Pollution Bulletin **141**: 161-163.

We report the occurrence of macroplastic debris in the stomach of a common dolphinfish (Coryphaena hippurus) caught in the Western Equatorial Atlantic. On the deck, we noticed that the fish was remarkably undernourished and decided to remove its stomach for laboratory analysis. A large part of a plastic bowl and a tuna pectoral fin were the only items recorded in the fish stomach. The plastic measured 99.57 cm² and weighed 12.77 g, likely blocking the digestive tract and reducing food intake by the fish, as supported by signs of starvation. This is the record of the largest plastic debris ingested by a dolphinfish to date. As the source of the plastic container was probably a tuna fishing boat, we suggest strengthening environmental education programs to enhance the awareness of fishermen and mitigate the impacts of plastic pollution on the pelagic ecosystem and associated organisms, such as C. hippurus.

Meng, G., et al. (2005). "Present situation and restoration of agriculture ecological environment in

Western Mountain of China." Research of Agricultural Modernization **26**(3): 182-185.

The western mountain region is an important area of eco-environmental protection and construction in China. It is an important ecological barrier for the Yangtze River and the major water supplying area to the eastern region. However, a series of ecological environmental problems have emerged. The main problems of the agricultural eco-environment includes the denudation of virgin forests; the weakening of ecological function; desertification and soil erosion due to unreasonable resource exploitation and construction; pesticide and fertilizer residues; non-degradable plastic; pollution from municipal and industrial solid wastes; acid rain; and livestock manure. Serious ecological and environmental problems have hindered social and economic development in the region. Ecological agriculture is a means of encouraging economic development and protecting the ecological environment in the western mountain region. This paper, on the basis of latest survey data, analyses the background, current situation and features of eco-agriculture in this region.

Meng, X., et al. (2010). "Direct fluorescence detection of point mutations in human genomic DNA using microbead-based ligase chain reaction." Talanta **80**(5): 1725-1729.

This report has described a convenient genotyping method capable of detecting point mutations directly in human genomic DNA based on the combination of ligase chain reaction (LCR) and microbead-enrichment technique. LCR primers, including a biotin-labeled common primer and two fluorescence-labeled allele-specific primers, are designed for two alleles of a mutated site. When genomic DNA carries the mutated site, the common primer and allele-specific primer are ligated to form exponential amplified biotin-labeled fluorescence ligation products. These ligated products are enriched by streptavidin-coated microbeads, and genotypes are identified conveniently according to the fluorescence color of microbeads using fluorescent microscopy. Due to amplification of LCR process and enrichment of microbeads, the detection limit of the proposed method is as low as 10(-15)mol/L templates. The method provides a convenient and simple strategy to detect point mutation directly in human genome. We have confirmed the efficiency of this approach with the identification of beta-globin gene point mutation, which results in the reduced production of globin in an inherited hemoglobin disorder thalassemia disease.

Meng, Y., et al. (2020). "Advances and challenges of microplastic pollution in freshwater ecosystems: A UK perspective." Environmental Pollution **256**: 113445.

Microplastics have been increasingly documented in freshwater ecosystems in recent years, and growing concerns have been raised about their potential environmental health risks. To assess the current state of knowledge, with a focus on the UK, a literature review of existing freshwater microplastics studies was conducted. Sampling and analytical methodologies currently used to detect, characterise and quantify microplastics were assessed and microplastic types, sources, occurrence, transport and fate, and microplastic-biota interactions in the UK's freshwater environments were examined. Just 32% of published microplastics studies in the UK have focused on freshwater environments. These papers cover microplastic contamination of sediments, water and biota via a range of methods, rendering comparisons difficult. However, secondary microplastics are the most common type, and there are point (e.g. effluent) and diffuse (non-point, e.g. sludge) sources. Microplastic transport over a range of spatial scales and with different residence times will be influenced by particle characteristics, external forces (e.g. flow regimes), physical site characteristics (e.g. bottom topography), the degree of biofouling, and anthropogenic activity (e.g. dam release), however, there is a lack of data on this. It is predicted that impacts on biota will mirror that of the marine environment. There are many important gaps in current knowledge; field data on the transport of microplastics from diffuse sources are less available, especially in England. We provide recommendations for future research to further our understanding of microplastics in the environment and their impacts on freshwater biota in the UK.

Meng, Y. and H. S. Ramaswamy (2007). "Effect of system variables on heat transfer to canned particulate non-Newtonian fluids during end-over-end rotation." Food and Bioproducts Processing **85**(1): 34-41.
Apparent heat transfer coefficients h_{ap} and U_a were evaluated to quantify the heat transfer process with particulates in high viscosity non-Newtonian fluids in end-over-end thermal processing. An orthogonal array L16 experiment was used to examine the significances of system factors on h_{ap} and U_a values with plastic particles in CMC aqueous solutions. The variance analysis showed that rotation speed, liquid viscosity, retort temperature, particle material and particle concentration were significant factors (P<0.05) for h_{ap} and U_a. The effects of can size was also significant for h_{ap}. A central composite rotatable design (CCRD) experiment and two full factorial experiments were carried out to study the effects of those significant factors on h_{ap} and U_a values. Results showed that with the decrease of liquid viscosity and the increase of rotation speed, particle density and retort temperature, h_{ap} and U_a values increased. With the increase of can size h_{ap} values decreased. With the particle concentration increasing h_{ap} and U_a values firstly increased and then decreased with further increase in particle concentration.

Menges, G. and W. Hoffmanns (1974). "Possibilities and limits of recycling of plastic waste materials. [German]." Muell Abfall **6**(4): 114-118.
The methods presented indicate that economic recycling of plastic wastes is perfectly feasible. Pyrolysis and separation procedures for mixed plastic wastes are still in the developmental phase. As long as these procedures cannot be used on a large technical scale, further processing and use of plastic wastes is justified both for avoiding environmental stresses and for saving on new raw materials. Finally, investigations and the possibilities of further use of unseparated and unreduced plastic wastes are discussed.

Menke, D., et al. (2003). "Don't ban PVC: incinerate and recycle it instead!" Waste Management & Research **21**(2): 172-177.
Plastics are making a growing contribution to sustainable development. For example, over an expected lifetime of 50 years, the use of window frames and insulating materials made of plastic in buildings save many times the energy required to manufacture them. Plastics for packaging purposes provide protection against damage and dirt contamination, thereby saving considerable amounts of material and energy. Choosing appropriate disposal strategies for plastic waste also helps to protect the environment (Mark 2000).

Menon, T. V. and C. I. Sajeeth (2013). "Formulation and evaluation of sustained release sodium alginate microbeads of carvedilol." International Journal of PharmTech Research **5**(2): 746-753.
The main aim of the study is to formulate Carvedilol loaded microbeads of sodium alginate using gelatine and pectin as release modifiers by ionotropic gelation method. The microbeads were prepared by varying the concentration of sodium alginate, gelatin and pectin. The drug-polymer compatibility was studied by FTIR studies. The prepared microbeads were evaluated for swelling ratio, particle size, drug entrapment, Scanning electron microscopy (SEM), bio adhesion study

and invitro release study. Particle size distribution of both placebo and drug loaded formulations were measured by an optical microscope and particle size of optimized beads was determined by SEM. No significant drug-polymer interactions were observed in FT-IR studies. In-vitro drug release profile of Carvedilol micro beads was examined in pH 1.2 N Hydrochloric acid for first 2 hours followed by phosphate buffer pH 7.4 for remaining time. The in vitro wash-off test indicated that the sodium alginate micro beads had good mucoadhesive properties. The formulated beads had shown higher entrapment efficiency, drug loading, low particle size and moisture content. The formulation F3 released Carvedilol for longer duration (24 hours) and showed better mucoadhesion.

Meo, S. A., et al. (2018). "Men's Health in Industries: Plastic Plant Pollution and Prevalence of Pre-diabetes and Type 2 Diabetes Mellitus." American Journal of Mens Health **12**(6): 2167-2172.

Plastic production is prominently increasing and its pollution is an emerging environmental global health concern. This study aimed to investigate the occurrence of pre-diabetes and type 2 diabetes mellitus (T2DM) among nonsmoking plastic industry workers. Three hundred and forty volunteers male plastic industry workers were interviewed after medical history and examination; finally, 278 nonsmoking plastic industry workers were selected. The mean age for the participants was 38.03 +/- 10.86 years and body mass index was 25.52 +/- 3.15 (kg/m)². The plastic industry workers had been exposed to plastic plant pollution for 8 hr daily, 6 days in a week. Subjects with glycated hemoglobin (HbA1c) less than 5.7% were considered non-diabetics; HbA1c 5.7%-6.4% were pre-diabetics; and subjects with HbA1c greater than 6.4% were considered diabetics. In plastic industry workers, the prevalence of pre-diabetes was 176 (63.30%) and T2DM was 66 (23.74%); however, 36 (12.95%) plastic plant workers were normal. The prevalence of pre-diabetes and T2DM among plastic industry workers was significantly increased with duration of working exposure in plastic industry (p = .0001). Exposure to plastic plant pollution is associated with the prevalence of pre-diabetes and T2DM among plastic industry workers. The prevalence was associated with the duration of working exposure in plastic industry. The occupational and environmental health executives must take priority steps to minimize the plastic plant pollution from plastic industries to reduce the occurrence of pre-diabetes and T2DM among the plastic industrial workers and save the men's health in industries.

Merchant, M. S., et al. (2015). "Genetically engineered NY-ESO-1-specific T cells in HLA-A2+ patients with synovial sarcoma." Cancer Research. Conference: 106th Annual Meeting of the American Association for Cancer Research, AACR **75**(15 SUPPL. 1).

NY-ESO-1 is expressed in ~70% of synovial sarcomas and not expressed in vital tissues. We report interim results of NCT01343043 evaluating safety and activity of autologous T cells engineered to express an HLA-A2+ restricted, affinity-enhanced T cell receptor (TCR) targeting NY-ESO-1. HLA-A2+ patients with unresectable, metastatic, or recurrent synovial sarcoma were eligible if tumors expressed NY-ESO-1 by IHC. Lymphocytes were activated using anti-CD3/28 microbeads, genetically modified with a lentivector, then cryopreserved. Subjects received fludarabine 30mg/m²/d (D-6 to -2) and cyclophosphamide 1800mg/m²/d (D-3,-2), and infusion of engineered T cells. Systemic IL-2 was not administered. Nine subjects have received NY-ESO-1 cell infusions. Median transduced T cell dose was 3.4 x 10⁹ cells (range 0.4-14.4), 60x10⁶ cells/kg (range 5.7-165.5), and median transduction efficiency was 45.8%. Toxicity likely attributable to the T cells included fever, and grade 1-2 cytokine release syndrome. No autoimmune toxicity has been observed. Circulating engineered NY-ESO-1 cells were detected in all patients, peaking 3-21 days

post-infusion. Persistence has been evaluated beyond 3 months in 4 subjects, all of whom had detectable NY-ESO-1 cells at 4 mos, 6 mos+, 12 mos+ and 12 mos+. We identified persisting NY-ESO-1 T cells using dextamer and/or anti-vbeta13.1 mAbs, and observed that a high fraction of CD4+ and CD8+ NY-ESO-1 TCR expressing T cells were CD45RA+CCR7+CD95+, consistent with a stem cell memory phenotype. Persisting cells also demonstrate a polyfunctional (IFN-gamma and TNF-alpha) and cytotoxic (CD107a and granzyme B) signature without overexpression of exhaustion markers (PD-1, LAG-3, and TIM-3). Of 8 patients whose follow-up is sufficient to assess response, 4 experienced objective responses (1CR x 9 mos, 1PR x 9 mos, 2PR x 6 mos). Tumor shrinkage could not be attributed to chemotherapy alone as progressive decreases in tumor size were observed over several months following completion of the lymphodepleting regimen. All PR patients (2 upon signs of progression and 1 still responding to therapy) ultimately underwent resection for residual disease and two remain without evidence of disease. Adoptive immunotherapy with NY-ESO-1 engineered T cells shows promising results in synovial sarcoma with acceptable toxicity. High dose IL-2 is not required for therapeutic benefit with this regimen.

Meseck, S. L., et al. (2016). "Ocean Acidification Affects Hemocyte Physiology in the Tanner Crab (Chionoecetes bairdi)." PLoS ONE **11**(2).

We used flow cytometry to determine if there would be a difference in hematology, selected immune functions, and hemocyte pH (pHi), under two different, future ocean acidification scenarios (pH = 7.50, 7.80) compared to current conditions (pH = 8.09) for Chionoecetes bairdi, Tanner crab. Hemocytes were analyzed after adult Tanner crabs were held for two years under continuous exposure to acidified ocean water. Total counts of hemocytes did not vary among control and experimental treatments; however, there were significantly greater number of dead, circulating hemocytes in crabs held at the lowest pH treatment. Phagocytosis of fluorescent microbeads by hemocytes was greatest at the lowest pH treatment. These results suggest that hemocytes were dying, likely by apoptosis, at a rate faster than upregulated phagocytosis was able to remove moribund cells from circulation at the lowest pH. Crab hemolymph pH (pHe) averaged 8.09 and did not vary among pH treatments. There was no significant difference in internal pH (pHi) within hyalinocytes among pH treatments and the mean pHi (7.26) was lower than the mean pHe. In contrast, there were significant differences among treatments in pHi of the semi-granular+granular cells. Control crabs had the highest mean semi-granular+granular pHi compared to the lowest pH treatment. As physiological hemocyte functions changed from ambient conditions, interactions with the number of eggs in the second clutch, percentage of viable eggs, and calcium concentration in the adult crab shell was observed. This suggested that the energetic costs of responding to ocean acidification and maintaining defense mechanisms in Tanner crab may divert energy from other physiological processes, such as reproduction.

Messier, E. M., et al. (2013). "N-acetylcysteine protects murine alveolar type II cells from cigarette smoke injury in a nuclear erythroid 2-related factor-2-independent manner." American Journal of Respiratory Cell & Molecular Biology **48**(5): 559-567.

Emphysema is caused by the cigarette smoke (CS)-induced destruction of alveolar wall septa, and CS is the main risk factor for chronic obstructive pulmonary disease (COPD). To study the mechanisms of response to this insult, we focused on oxidant-induced lung injury and the potential role of nuclear erythroid 2-related factor-2 (Nrf2), which is a key regulator of the antioxidant defense system. We studied the protective role of N-acetylcysteine (NAC) against the injury of alveolar type II (ATII) cells induced by CS in vivo and in vitro. ATII cells were isolated and purified using magnetic MicroBeads (Miltenyi Biotec, Auburn, CA) from Nrf2(-/-) mice and wild-type mice. We analyzed pulmonary injury, inflammation, glutathione (GSH) concentrations, the expression of glutathione cysteine ligase catalytic subunit mRNA, glutathione cysteine ligase modifier subunit mRNA, and glutathione reductase mRNA, and Nrf2, heme oxygenase-1, and nicotinamide adenine dinucleotide phosphate-reduced:quinone oxireductase levels by Western blotting, TUNEL assay, and immunocytofluorescence for 4-hydroxynonenal as a marker of oxidative stress. We found that CS induced greater injury in ATII cells obtained from Nrf2(-/-) mice than from wild-type mice. Furthermore, NAC attenuated the injuries by CS in ATII cells obtained from wild-type mice both in vivo and in vitro. Moreover, NAC decreased the injury of ATII cells obtained from Nrf2(-/-) mice. Our results suggest that Nrf2-GSH signaling is important for the protective activity of NAC. In addition, in ATII cells deficient in Nrf2, this compound can provide partial protection through its reactive oxygen species-scavenging activities. Targeting the antioxidant system regulated by Nrf2 may provide an effective strategy against lung injury in COPD.

Messinetti, S., et al. (2018). "Effects of polystyrene microplastics on early stages of two marine invertebrates with different feeding strategies." Environmental Pollution **237**: 1080-1087.

Nowadays, microplastics represent one of the main threats to marine ecosystems, being able to affect organisms at different stages of their life cycle and at different levels of the food web. Although the presence of plastic debris has been reported in different habitats and the ability to ingest it has been confirmed for different taxa, few studies have been performed to elucidate the effects on survival and development of marine animals. Thus, we explored the effects of different environmental concentrations of polystyrene microbeads on the early stages of two invertebrate species widespread in the Mediterranean shallow waters: the pelagic planktotrophic pluteus larvae of the sea urchin Paracentrotus lividus and the filter-feeding sessile juveniles of the ascidian Ciona robusta. We evaluated the effects on larvae and juvenile development and determined the efficiency of bead ingestion. The feeding stages of both species proved to be extremely efficient in ingesting microplastics. In the presence of microbeads, the metamorphosis of ascidian juveniles was slowed down and development of plutei altered. These results prompted the necessity to monitor the populations of coastal invertebrates since microplastics affect sensitive stages of life cycle and may have consequences on generation recruitment.

Metzner, C., et al. (2007). "Simple model of cytoskeletal fluctuations." Physical Review E. Statistical, Nonlinear, & Soft Matter Physics **76**(2 Pt 1): 021925.

The spontaneous motion of microbeads bound to the cytoskeleton of living cells is not an ordinary random walk. Unlike Brownian motion, the mean-square displacement undergoes a transition from subdiffusive to superdiffusive behavior with time. This transition is associated with characteristic changes of the turning angle distribution. Recent experimental data demonstrated that force fluctuations measured in an elastic hydrogel matrix beneath the cell correlate with the bead motion [C. Raupach, Phys. Rev. E 76, 011918 (2007)]. These data indicate that the bead trajectory is driven by motor forces originating from the actomyosin network and that cytoskeletal remodeling processes with short- and long-time dynamics are mainly responsible for the non-Brownian behavior. We show that the essential statistical properties of the spontaneous bead motion can be reproduced by a particle diffusing in a potential well with a slowly drifting minimum position. Based on this simple model, which can be solved analytically, we develop a biologically plausible numerical model of a tensed and continuously remodeling actomyosin network that accounts quantitatively for the measured data.

Meyer, W. and N. H. Zschemisch (2002). "[Skin layer thickness at the ear of the domesticated pig , with special reference to the use of the ear integument for human dermatological research]." Berliner und Munchener Tierarztliche Wochenschrift **115**(11-12): 401-406.

Based on a shrinkage-free methodical approach (special plastic resin embedding, frozen section technique) and histological routine staining, the thickness of the different skin layers was measured from 15 regions of the outer and the inner side of the porcine auricle. Mean thickness values were for the str. corneum: 19 microns outside/20 microns inside, vital epidermis without ridges: 52 microns outside/56 microns inside, dermis: 1175 microns outside/1112 microns inside, hypodermis: 1024 microns outside/741 microns inside, perichondrium: 295 microns outside/220 microns inside. When both sides of the auricle were compared, it became obvious that the outer side generally had a thicker dermis (1140-1290 microns) and hypodermis (780-1150 microns), whereas the inner side had a thicker vital epidermis (50-60 microns) and deeper epidermal ridges (145-165 microns). The results are discussed with regard to corresponding findings from the human skin, and one region of the outer side of the porcine auricle is recommended as suitable for human dermatological research.

Mi, L., et al. (2019). "Occurrence and spatial distribution of phthalate esters in sediments of the Bohai and Yellow seas." Science of the Total Environment **653**: 792-800.

Phthalate esters (PEs) are a class of synthetic chemicals that have been widely used as plasticizers in industrial products and households. The occurrence of PEs in the marine environment has been a concern for many years because of their adverse impacts on marine organisms and human health. In this study, six major PEs, i.e. diethyl phthalate (DEP), di-isobutyl phthalate (DiBP), di-n-butyl phthalate (DnBP), benzylbutyl phthalate (BBP), dicyclohexyl phthalate (DCHP) and di-(2-ethylhexyl) phthalate (DEHP), were analyzed in sediment samples collected in the Bohai and Yellow seas. The sum concentrations of the six PEs ranged from 1.4 to 24.6ng/g and the average was 9.1ng/g. The highest concentrations of PEs in the sediment samples were those of DEHP with a median concentration of 3.77ng/g, followed by DiBP (median, 1.60ng/g), DnBP (0.91ng/g), DEP (0.32ng/g), BBP (0.03ng/g) and DCHP (0.01ng/g). Generally, concentrations of PEs in the Bohai Sea are higher than those in the Yellow Sea. The varying spatial distributions of the individual PEs can be the result of discharge sources, regional ocean circulation patterns, and mud areas in the Bohai and Yellow seas. Significant positive correlations were found between total organic carbon content and the concentrations of DiBP, DnBP, and DEHP. It is estimated that the inventories of the 6PEs were 20.73tons in the Bohai Sea and 65.87tons in the Yellow Sea. Both riverine discharge and atmospheric deposition are major input sources for the PE sedimentation, while massive plastic litter and microplastics sinking to the ocean floor can directly release PEs into sediment. This study provides an appropriate data set for the assessment of the risk of PEs to the marine ecosystem.

Miandad, R., et al. (2016). "Catalytic pyrolysis of plastic waste: A review." Process Safety & Environmental Protection: Transactions of the Institution of Chemical Engineers Part B **102**(Part B): 822-838.

This paper reviews the progress and challenges of the catalytic pyrolysis of plastic waste along with future perspectives in comparison to thermal pyrolysis. The factors affecting the catalytic pyrolysis process such as the temperature, retention time, feedstock composition and the use of catalyst were evaluated in detail to improve the process of catalytic pyrolysis. Pyrolysis can be carried out via thermal or catalytic routes. Thermal pyrolysis produces low quality liquid oil and

requires both a high temperature and retention time. In order to overcome these issues, catalytic pyrolysis of plastic waste has emerged with the use of a catalyst. It has the potential to convert 70-80% of plastic waste into liquid oil that has similar characteristics to conventional diesel fuel; such as the high heating value (HHV) of 38-45.86 MJ/kg, a density of 0.77-0.84g/cm3, a viscosity of 1.74-2.5 mm2/s, a kinematic viscosity of 1.1-2.27 cSt, a pour point of (-9) to (-67) ;IC, a boiling point of 68-352 °C, and a flash point of 26.1-48 °C. Thus the liquid oil from catalytic pyrolysis is of higher quality and can be used in several energy-related applications such as electricity generation, transport fuel and heating source. Moreover, process by-products such as char has the potential to be used as an adsorbent material for the removal of heavy metals, pollutants and odor from wastewater and polluted air, while the produced gases have the potential to be used as energy carriers. Despite all the potential advantages of the catalytic pyrolysis, some limitations such as high parasitic energy demand, catalyst costs and less reuse of catalyst are still remaining. The recommended solutions for these challenges include exploration of cheaper catalysts, catalyst regeneration and overall process optimization. [ABSTRACT FROM AUTHOR]

Miandad, R., et al. (2018). "Untapped conversion of plastic waste char into carbon-metal LDOs for the adsorption of Congo red." Journal of Colloid and Interface Science **511**: 402-410.

A low-cost novel carbon-metal double layered oxides (C/MnCuAl-LDOs) nano-adsorbent was synthesized by co-precipitation, for the adsorption of Congo red (CR), using modified carbon derived from pyrolysis of polystyrene (PS) plastic waste. The synthesized C/MnCuAl-LDOs has a crystalline structure with a high surface area of 60.43 m²/g and pore size of 99.85 A. Adsorption of CR using all prepared adsorbents from aqueous solution under equilibrium and kinetic conditions were evaluated against different values of the pH (4-10), initial CR concentrations (25-250 mg/g), contact time (0-310 min) and temperature (30-50 degrees C). The obtained results revealed that C/MnCuAl-LDOs showed maximum adsorption capacity for CR among all the used adsorbents. The optimum equilibrium time was 180 min, whereas acidic medium (pH 4.5) favored the maximum adsorption of CR up to 317.2 mg/g on C/MnCuAl-LDOs. The adsorption kinetics followed the pseudo-second-order model, whereas Freundlich adsorption isotherm fitted best to obtained data in comparison to Langmuir adsorption isotherm. The results suggested that C/MnCuAl-LDOs is an efficient material for the removal of organic pollutants from the wastewater.

Miao, L., et al. (2019). "Effects of Nanoplastics on Freshwater Biofilm Microbial Metabolic Functions as Determined by BIOLOG ECO Microplates." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(23): 21.

Nanoplastic (NP) contamination is becoming a pervasive issue as NPs, originating from microplastic particles, pose potentially harmful environmental impacts on aquatic ecosystems. The environmental hazards of NPs on microorganisms have been well documented in recent studies; however, little is known about their ecotoxicity effects on freshwater biofilms, which serve as important primary producers and decomposers and are highly connected with other ecosystem components. We investigated the effects of NPs on the microbial metabolic functions

of freshwater biofilms in terms of carbon source utilization ability. Biofilm samples were collected, cultivated in a hydrodynamic flume for six weeks, and then exposed in polystyrene (PS) beads (100 nm in size) with different NP concentrations (1, 5, and 10 mg/L). BIOLOG ECO microplates were used to quantify carbon source utilization characteristics. The data were analyzed using average well-color development (AWCD), functional diversity indices, and principle component analysis (PCA).

Miao, L., et al. (2019). "Acute effects of nanoplastics and microplastics on periphytic biofilms depending on particle size, concentration and surface modification." Environmental Pollution **255**(Pt 2): 113300.

Microplastics (MPs) can disintegrate into smaller sized microplastics and even nanoplastics (NPs). The toxicity of nanoplastics and microplastics on freshwater organisms have been well explored recently, however, very little is known about the potential impacts of NPs on freshwater biofilms, which are essential for primary production and nutrient cycling in aquatic ecosystems. In this study, we studied the acute effects (3h of exposure) of polystyrene beads (PS, with diameter range from 100nm to 9mum) on five biological endpoints targeting community and ecosystem-level processes in biofilms: chlorophyll a, photosynthetic yield, and three extracellular enzyme activities. The results showed that the large size PS beads (500nm, 1mum, and 9mum) exhibited negligible effects on the determined biological endpoints in biofilms within the range of concentrations (5-100mg/L) in this study. However, high concentration of PS beads (100nm, 100mg/L) significantly decreased the content of chlorophyll a, and the functional enzyme activities of beta-glucosidase and leucine aminopeptidase, suggesting negative effects on the carbon and nitrogen cycling of freshwater biofilms. Moreover, the influences of PS NPs (100nm) on biofilms strongly depended on the surface modification of PS particles, with the positively charged PS NPs (amide-modified) exhibiting the highest toxicity to biofilms. The excess generation of reactive oxygen species (ROS) in this study indicated oxidative stress induced by PS NPs, which might lead to the observed nano-toxic effects on biofilms. In response, the antioxidant activity of biofilm was enhanced as indicated by the increased total antioxidant capacity (T-AOC). Overall, our findings highlight nanoplastics have potential to disrupt the basic ecological functions of biofilms in aquatic environments.

Miceli, A., et al. (2008). "Influence of greenhouse Volume/Area ratio on soil solarization efficiency." Acta Horticulturae **801**(Vol 1): 211-218.

Soil temperature under plastic cover is a function of incoming radiation and thermal characteristics of the mulching material and the soil, but it could be also affected by greenhouse characteristics (structure, cover, volume:area ratio). The aim of this research was to evaluate the effects of different greenhouse unitary volumes and different plastic mulching on soil temperature and soil solarization efficiency. The experiment was carried out in non-heated greenhouses covered with low density transparent polyethylene (PE), located at the experimental field of AAT Department of Palermo University, Italy. Four volume:area (V/A) ratios were tested: 1.5, 2.0, 2.5 and 3.0. Individual plots were covered with transparent or black PE film from the end of July till the end of August (30 days) in 2003, 2004 and 2005. Results showed a good efficiency of soil solarization under closed greenhouse and confirmed other studies. Maximum soil temperatures were increased solarizing under greenhouse with V/A 2.5 ratio. Plots mulched with transparent PE film reached higher soil temperatures than those mulched with black PE. Nevertheless, black PE mulching under high V/A ratio greenhouses allowed to keep soil temperature over threshold values lethal for soilborne pathogens and seeds. Black PE film could be used and left on the soil even after solarization as crop mulching, saving money for mulching replacement and reducing plastic waste.

Miceli-Richard, C., et al. (2016). "Overlap between differentially methylated DNA regions in blood B lymphocytes and genetic at-risk loci in primary Sjogren's syndrome." Annals of the Rheumatic Diseases **75**(5): 933-940.

BACKGROUND: Beyond genetics, epigenetics alterations and especially those related to DNA methylation, play key roles in the pathogenesis of autoimmune diseases such as primary Sjogren's syndrome (pSS) and systemic lupus erythematosus. This study aimed to assess the role of methylation deregulation in pSS pathogeny through a genome-wide methylation approach.

PATIENTS AND METHODS: 26 female patients with pSS and 22 age-matched controls were included in this study. CD4+ T cells and CD19+ B cells were isolated from peripheral blood mononuclear cells by magnetic microbeads and their genome-wide DNA methylation profiles were analysed using Infinium Human Methylation 450 K BeadChips. Probes with a median DNA methylation difference of at least 7% and $p<0.01$ between patients and controls were considered significantly differentially methylated.

RESULTS: Methylation alterations were mainly present in B cells compared with T cells. In B cells, an enrichment of genes with differentially methylated probes in genetic at-risk loci was observed, suggesting involvement of both genetic and epigenetic abnormalities in the same genes. Methylation alterations in B cells were more frequent in some specific pathways including Interferon Regulated Genes, mainly among patients who were autoantibody positive. Moreover, genes with differentially methylated probes were over-represented in B cells from patients with active disease.

CONCLUSIONS: This study demonstrated more important deregulation of DNA methylation patterns in B cells compared with T cells, emphasising the importance of B cells in the pathogenesis of the disease. Overlap between genes with differentially methylated probes in B lymphocytes and genetic at-risk loci is a new finding highlighting their importance in pSS.

Michael, D. (2003). Biopolymers from crops: their potential to improve the environment. Horsham, Solutions for a better environment
Australian Society of Agronomy Inc , Victorian Institute for Dryland Agriculture**:** 0-4 2 ref.

Development of a bio-plastics industry in Australia has the potential to benefit the environment and Australian agriculture by creating new markets for existing and new crops and increased competition at the farm-gate. Bio-plastics might also benefit the Australian plastics industry a lot more than it currently thinks it would! The worldwide interest in renewable resources, reduced greenhouse gas emissions and more efficient and effective management of waste has created renewed interest in bio-plastics. The immediate problem for Australia is that the bio-plastics industry does not exist here. But the raw materials, plant breeding expertise, molecular scientists and biochemists are here to develop one. And there are over 2000 synthetic plastic resin converters operating here. A systematic and coordinated industry development programme, with significant investments in resin plants and strategic research is required.

Michel, J., et al. (2017). "Effect of titanium disks, micro beads and nanoparticles on the expression of metallothioneins and bactericidal activity in human monocyte-derived macrophages." European Journal of Immunology **47 (Supplement 2)**: 137.

Introduction: Titanium is widely used as implant material in a great variety of medical applications. Macrophages are crucial regulators of the foreign body response and related inflammation. Metallothioneins (MT) are responsible for the trace metal homeostasis, heavy metal detoxification, and downregulation of inflammatory response during the bacterial clearance. However the effect of titanium on the MT expression and function in human

macrophages was no addressed to date. Objective(s): Our study aimed to investigate whether titanium disks with polished or porous surfaces, micro-and nanoparticles induce the expression of MT family, and to examine how overexpression of MTs affects intracellular zinc homeostasis, bacterial killing and phagocytic capacity of macrophages. Material(s) and Method(s): Primary human CD14+ monocytes were isolated from buffy coats of healthy blood donors, cultured with titanium disks, or exposed to titanium micro-or nanoparticles. Three subtypes of macrophages were generated: M0 (no cytokines), M1 (IFNgamma stimulated) and M2 (IL-4 stimulated). RT-PCR was used to quantify mRNA levels of MTs. The level of intracellular zinc was determined with FluoZinTM-3 by flow cytometry. The intracellular bacterial killing was analysed with a gentamicin protection assay. Phagocytic activity was quantified by flow cytometry using fluorescent beads. Result(s): MT-1F, MT-1G and MT-1X were induced on mRNA level in M0, M1 and M2 propagated on the titanium disks (polished and porous), or exposed to titanium micro beads. Exposure of macrophages to titanium nanoparticles did not induce MT overexpression. Despite strong upregulation of MT expression, the intracellular zinc levels remain stable in macrophages cultured on titanium disks. Propagation of M1 on titanium disks enhanced MT related bactericidal activity. In contrast, titanium nanoparticles, that were unable to induce MT expression, impaired the bactericidal capacity in M1. Phagocytic capacity of M1 was not affected by titanium disks or particles. Bacterial infection induced secretion of IL-1beta and TNFalpha in M1 independently on titanium; in M0 and M2 the release of IL-1beta and TNFalpha was enhanced by titanium nanoparticles. Conclusion(s): Our data suggests that the upregulation of MTs by titanium disks have a compensatory effect on the intracellular zinc homeostasis and also by micro beads supports intracellular bacterial clearance under inflammatory conditions without enhancing the inflammatory response.

Michels, J., et al. (1885). "Rapid aggregation of biofilm-covered microplastics with marine biogenic particles." Proceedings of the Royal Society of London Series B: Biological Sciences **285**(1885): 29.

Ocean plastic pollution has resulted in a substantial accumulation of microplastics in the marine environment. Today, this plastic litter is ubiquitous in the oceans, including even remote habitats such as deep-sea sediments and polar sea ice, and it is believed to pose a threat to ecosystem health. However, the concentration of microplastics in the surface layer of the oceans is considerably lower than expected, given the ongoing replenishment of microplastics and the tendency of many plastic types to float. It has been hypothesized that microplastics leave the upper ocean by aggregation and subsequent sedimentation. We tested this hypothesis by investigating the interactions of microplastics with marine biogenic particles collected in the southwestern Baltic Sea. Our laboratory experiments revealed a large potential of microplastics to rapidly coagulate with biogenic particles, which substantiates this hypothesis. Together with the biogenic particles, the microplastics efficiently formed pronounced aggregates within a few days. The aggregation of microplastics and biogenic particles was significantly accelerated by microbial biofilms that had formed on the plastic surfaces. We assume that the demonstrated aggregation behaviour facilitates the export of microplastics from the surface layer of the oceans and plays an important role in the redistribution of microplastics in the oceans.

Michielssen, M. R., et al. (2016). "Fate of microplastics and other small anthropogenic litter (SAL) in wastewater treatment plants depends on unit processes employed." Environmental Science: Water Research & Technology **2**(6): 1064-1073.

The accumulation of microplastics (plastic particles less than 5 mm) and similarly sized small anthropogenic litter (SAL; e.g., cellulosic products manufactured from natural material) in aquatic ecosystems is a growing concern. These particles can serve as vectors of chemical toxins and microbial pathogens and thus, as organisms consume them, may lead to biomagnification of these contaminants. As collection points in managed water systems, wastewater treatment plants (WWTPs) provide an opportunity to develop and implement novel technologies to manage SAL pollution. Here, we assessed the efficiency of different unit processes at three WWTPs in removing SAL. Samples were collected from WWTPs that employ either secondary treatment (activated sludge) or tertiary treatment (granular sand filtration) as a final step, as well as a pilot membrane bioreactor system that finishes treatment with microfiltration. SAL from 20 micro m to 4.75 mm was quantified and categorized by shape. The WWTP with secondary treatment removed 95.6% of SAL, discharging 5.9 SAL per L in the final effluent; the plant with tertiary treatment removed 97.2% of SAL, discharging 2.6 SAL per L; the membrane bioreactor plant removed 99.4% of SAL, discharging 0.5 SAL per L. The majority of SAL in effluent from all plants was comprised of thin fibers (e.g., textile fibers). While the WWTP with tertiary granular sand filtration and the membrane bioreactor exhibited greater overall removal of SAL, fibers represented a larger percentage of SAL in effluent from these plants (79 and 83%, respectively) than the plant with activated sludge as a final step (44% fibers). This study suggests that retrofitting existing secondary WWTPs with granular sand filtration or membrane filtration would result in the highest possible removal of SAL - though treatment facilities would continue to serve as pathways of SAL pollution to the environment. Further, the fate of the 95-99% of SAL that is retained or leaves WWTPs through means other than effluent (e.g., sludge) must be resolved to effectively address this problem.

Miel, R. (2009). "Legally, recycling's road is a bumpy one." Waste & Recycling News **15**(14): 16-11NULL.
The article informs that post-consumer recycling stream of the plastics industry is facing some challenges. Elizabeth Bedard, director of the Association of Postconsumer Plastic Recyclers' rigid plastics recycling program, said that poor infrastructure for collecting and reusing plastics hampers the ability for businesses to make a real business case for recycling. The U.S. Federal Trade Commission cracks down on companies that make false environmental claims about their products

Mifune, J., et al. (2009). "Production of Functionalized Biopolyester Granules by Recombinant Lactococcus lactis." Applied and environmental microbiology **75**(14): 4668-4675.
Many bacteria are naturally capable of accumulating biopolyesters composed of 3-hydroxy fatty acids as intracellular inclusions, which serve as storage granules. Recently, these inclusions have been considered as nano-/microbeads with surface-attached proteins, which can be engineered to display various protein-based functions that are suitable for biotechnological and biomedical applications. In this study, the food-grade, generally-regarded-as-safe gram-positive organism Lactococcus lactis was engineered to recombinantly produce the biopolyester poly(3-hydroxybutyrate) and the respective intracellular inclusions. The codon-optimized polyhydroxybutyrate biosynthesis operon phaCAB from Cupriavidus necator was expressed using the nisin-controlled gene expression system. Recombinant L. lactis accumulated up to 6% (wt/wt) poly(3-hydroxybutyrate) of cellular dry weight. Poly(3-hydroxybutyrate) granules were isolated and analyzed with respect to bound proteins using biochemical methods and with respect to shape/size using transmission electron microscopy. The immunoglobulin G (IgG) binding ZZ domain of Staphylococcus aureus protein A was chosen as an exemplary functionality to be displayed at the granule surface by fusing it to the N terminus of the granule-associated poly(3-hydroxybutyrate) synthase. The presence of the fusion protein at the surface of isolated granules was confirmed by peptide fingerprinting using matrix-assisted laser desorption ionization-time of flight (mass spectrometry). The functionality of the ZZ domain-displaying

granules was demonstrated by enzyme-linked immunosorbent assay and IgG affinity purification. In both assays, the ZZ beads from recombinant L. lactis performed at least equally to ZZ beads from Escherichia coli. Overall, in this study it was shown that recombinant L. lactis can be used to manufacture endotoxin-free poly(3-hydroxybutyrate) beads with surface functionalities that are suitable for biomedical applications.

Miller, B. B., et al. (2002). "Trace Element Emissions from Co-combustion of Secondary Fuels with Coal: A Comparison of Bench-Scale Experimental Data with Predictions of a Thermodynamic Equilibrium Model." Energy & Fuels **16**(4): 956-963.

Trace element emissions from the co-combustion of coal with biomass and waste secondary fuels have been measured, under conditions relevant to commercial fluidized bed combustors, using a novel, bench-scale, suspension-firing reactor. Experiments have been conducted using two coals (one Polish, one Colombian), four biomass fuels (wood-bark, straw, pulp sludge, and paper sludge), and three waste fuels (agricultural waste, sewage sludge and plastic waste). Concentrations of eighteen trace elements have been measured in these raw fuels and a variety of combustion and co-combustion ashes, using inductively coupled plasma-mass spectrometry (ICP-MS) and inductively coupled plasma-atomic emission spectroscopy (ICP-AES), plus an atomic absorption based mercury determination devise. The influence of chlorine and sulfur on trace element release from combustion has been tested also, in the case of wood-bark, by injecting first HCl and then SO2 into the reactor during combustion. Experimental data have been compared with the predictions of a thermodynamic equilibrium model throughout this study. The Metallurgical and Thermochemical Databank (MTDATA) Gibbs free energy minimization software has been used to predict the speciation of individual trace elements. The trace elements have been ranked according to their average retention in combustion ashes, the most volatile being Hg and Se, followed by Cd, Tl, Pb, and As. Potentially problematic trace element emissions have been noted in certain cases, e.g., Cu and Zn from wood-bark, As and Pb from Polish coal, and Cd and Hg from sewage sludge. The injection of HCl served to decrease the retention by ash of the elements Cd, Cu, Zn, Mn, and Ba, while injection of SO2 increased the retention by ash of As and Hg, but decreased that of Cd.

Miller, C. (1992). "Polyethylene terephthalate." Waste Age **23**(9): 73-76.

This is the fourth in a series of profiles--brief, factual listings of the solid waste management characteristics of materials in the waste stream. These profiles highlight a product, explain how it fits into integrated waste management systems, and provide current data on recycling and markets for the product. Polyethylene terephthalate (PET) is a plastic resin used primarily to make soft drink bottles. Peanut butter, salad dressing, and other household and consumer products are also packaged in PET bottles. Other forms of PET packaging include trays, sheeting for cups and food trays, etc.

Miller, C. (2006). "Polyethylene Terephthalate." Waste Age **37**(4): 84-84.

The article provides information on polyethylene Terephthalate (PET), a plastic resin used to make bottles for soft drinks and other consumer products. The PET bottle was patented in 1973 and after four years, the first PET bottle was recycled. PET is one of the most highly valued plastic recyclables because it is expensive to produce. Because PET has replaced heavier steel and glass containers, PET use has reduced the size of the waste stream. Various PET packaging municipal solid waste facts are also presented.

Miller, C. (2007). "Polyethylene Terephthalate." Waste Age **38**(11): 51-51.

The article provides information on polyethylene terephthalate (PET) and looks at how it has helped reduce the size of the waste stream. PET is a plastic resin used to make bottles for soft drinks and other household and consumer products. PET is a relatively new packaging resin. The PET bottle was patented in 1973. Four years later, the first PET bottle was recycled. Soft drink bottles remain the biggest user of PET resin. PET use has reduced the size of the waste stream because PET has replaced heavier steel and glass containers.

Miller, C. (2009). "Polyethylene Terephthalate." Waste Age **40**(6): 102-102.
The article offers information on polyethylene terephthalate (PET). It is a plastic resin used to make bottles for soft drinks and other household and consumer products. It as patented in 1973 and after four years, the first PET bottle was recycled. The use of PET has reduced the size of waste stream since PET has replaced heavier steel and glass containers.

Miller, C. (2012). "Polyethylene Terephthalate." Waste Age **43**(11): 46-46.
The article focuses on polyethylene terephthalate (PET), a plastic resin which is used to make bottles for food, beverages, and other consumer products.

Miller, C. (2019). "My 2020 Vision." Waste360: N.PAG-N.PAG.
Markets remain daunting as we continue to deal with the fallout from China's decision to ban mixed paper and mixed plastic imports. The good news is that while China is banning imports of mixed recycled plastics, it is not banning imports of recycled plastic resin and pellets. Food waste recovery legislation aimed at restaurants, groceries and other large food waste generators will be popular at the state and local level. [Extracted from the article]

Miller, M., et al. (2018). "Marine debris trends: 30 years of change on Ventura County and Channel Island beaches." Western North American Naturalist **78**(3): 328-340.
The persistence of plastics in marine ecosystems and the physical hazards marine debris pose to wildlife have become issues of global concern. The Santa Barbara Channel is home to a number of important marine and coastal ecosystems, including the 5 islands of Channel Islands National Park, and has a variety of factors that influence marine debris accumulation. We examined the spatial variation of marine debris density and composition across the Santa Barbara Channel by quantifying marine debris on beaches of Santa Rosa and Santa Cruz Islands and the Ventura County mainland. Debris from surveyed beaches was cataloged, weighed, and measured to compare differences in island and mainland marine debris abundance, density, and composition. Derelict fishing gear accounted for a higher proportion of marine debris on island beaches compared to mainland beaches, and marine debris items on island beaches were significantly heavier compared to debris items on mainland beaches. The majority of debris on mainland beaches comprised smaller plastic fragments and single-use plastic items, and debris accumulation rates varied by season and location. Microplastics (plastic fibers and particles <5 mm) were found in the sand of all island and mainland beaches; however, density of microplastics did not appear to correlate with density of visually observable debris items (>25 mm) that were collected during marine debris cleanups. We compared our data from 2015 and

2016 with historical surveys performed from 1989 to 1994 to examine the temporal variation of marine debris on Santa Rosa Island. We found that there has been a significant increase in the amount of derelict fishing gear found on Santa Rosa Island over the past 27 years, which mirrors expansion of the California spiny lobster (Panulirus interruptus) fishery. This study highlights the importance of marine debris monitoring, as local changes in policy, fisheries, and consumer culture are reflected in accumulations of marine debris found on the California mainland and the uninhabited Channel Islands. Monitoring marine debris can provide insight into anthropogenic impacts and is a useful mechanism in monitoring the health of coastal and marine ecosystems.Alternate abstract:La presencia de plástico en los ecosistemas marinos, así como la amenaza que los desechos marinos significan para la vida silvestre se han convertido rápidamente en un problema global. El canal de Santa Barbara es hogar de un gran número de ecosistemas marinos y costeros, los cuales incluyen a las cinco islas que forman parte del parque nacional "Channel Islands," el cual consta de una gran variedad de factores que influyen en la acumulación de dichos desechos. Cuantificamos los desechos marinos de las playas en las islas Santa Rosa y Santa Cruz, así como en la costa del condado de Ventura para examinar la variación espacial en la densidad y composición de desechos marinos a lo largo del canal de Santa Barbara. Los desechos obtenidos en dichas playas fueron catalogados, pesados y medidos con el fin de comparar la diferencia en abundancia, densidad y composición de los desechos entre las playas de las islas y del condado. Notamos que los desechos en las playas de las islas tienden a ser más pesados y a contar con una mayor cantidad de equipo de pesca abandonado que las playas del condado, las cuales contaban con plásticos más pequeños y desechables, y cuya acumulación varía mucho dependiendo de la estación y la localización de la playa. Encontramos micro plásticos (fibras de plástico y partículas <5 mm) en la arena de todas las playas que fueron estudiadas, sin embargo, la densidad de plástico no parece estar correlacionada con la densidad de objetos más grandes (>25 mm) que fueron recolectados en días de recolección de desechos marinos en las playas de nuestro estudio. También comparamos nuestros resultados con encuestas científicas realizadas entre 1989 y 1994 para examinar la variación temporal de desechos en la isla de Santa Rosa y encontramos que ha habido un incremento significativ en la cantidad de equipo de pesca abandonado que ha sido encontrado en los últimos 27 años en ésta isla, lo cual refleja el rápido crecimiento de la industria pesquera enfocada en las langostas de California. Éste estudio hace hincapié en la importancia del monitoreo de desechos marinos, ya que los cambios en la industria pesquera, implementación o cambios en leyes y la cultura del consumidor son reflejadas en la acumulación de dichos desechos en la costa de California y hasta en las islas "Channel Islands," que son inhabitadas, también, dicho monitoreo puede brindar información en impactos antropogénicos, y ayudar a supervisar la salud de los ecosistemas tanto costeros como marinos.

Miller, M. E., et al. (2017). "Recovering microplastics from marine samples: A review of current practices." Marine Pollution Bulletin **123**(1-2): 6-18.

An important component of microplastic research is development of reproducible methods for microplastic recovery and characterization. Presented is a review of the literature comparing microplastic separation and identification methodologies from seawater, sediment and marine organisms. The efficiency of methods was examined, including processing time, recovery rates, and potential destruction of microplastics. Visual examination and acid digestion were the most common separation methods for seawater samples and organisms, while density flotation was the primary method for sediment. Few studies reported recovery rates, or investigated the physical or chemical impact on plastics. This knowledge gap may lead to misidentification of plastic or unreliable pollution estimates. Further investigation of the impact chemical

treatments have on plastic is warranted. Factors, i.e. biomass loading, recovery rates, and chemical compatibility, must be considered to allow for appropriate methodology. Standardizing this will contribute to efficient sample processing, and allow for direct comparison of microplastic contamination across environments. Copyright © 2017

Miller, R. Z., et al. (2017). "Mountains to the sea: River study of plastic and non-plastic microfiber pollution in the northeast USA." Marine Pollution Bulletin **124**(1): 245-251.

Aquatic environments are sinks for anthropogenic contamination, whether chemical or solid pollutants. Microfibers shed from clothing and other textiles contribute to this problem. These can be plastic or non-plastic origin. Our aim was to investigate the presence and distribution of both types of anthropogenic microfibers along the length of the Hudson River, USA. Surface grab samples were collected and filtered through a 0.45mum filter paper. Abundance of fibers was determined after subtraction of potential contamination. 233 microfibers were recorded in 142 samples, averaging 0.98microfibersL⁻¹. Subsequent micro-FTIR showed half of the fibers were plastic while the other half were non-plastic, but of anthropogenic origin. There was no relationship between fiber abundance, wastewater treatment plant location or population density. Extrapolating from this data, and using available hydrographic data, 34.4% of the Hudson River's watershed drainage area contributes an average 300 million anthropogenic microfibers into the Atlantic Ocean per day.

Miller, S., et al. (2019). "Electroosmotic flow driven microfluidic device for bacteria isolation using magnetic microbeads." Scientific Reports **9**(1): 14228.

The presence of bacterial pathogens in water can lead to severe complications such as infection and food poisoning. This research proposes a point-of-care electroosmotic flow driven microfluidic device for rapid isolation and detection of E. coli in buffered solution (phosphate buffered saline solution). Fluorescent E. coli bound to magnetic microbeads were driven through the microfluidic device using both constant forward flow and periodic flow switching at concentrations ranging from 2 x 10⁵ to 4 x 10⁷ bacteria/mL. A calibration curve of fluorescent intensity as a function of bacteria concentration was created using both constant and switching flow, showing an increase in captured fluorescent pixel count as concentration increases. In addition, the use of the flow switching resulted in a significant increase in the capture efficiency of E. coli, with capture efficiencies up to 83% +/- 8% as compared to the constant flow capture efficiencies (up to 39% +/- 11%), with a sample size of 3 micro L. These results demonstrate the improved performance associated with the use of the electroosmotic flow switching system in a point-of-care bacterial detection assay.

Min, J. H., et al. (2014). "Isolation of DNA using magnetic nanoparticles coated with dimercaptosuccinic acid." Analytical Biochemistry **447**: 114-118.

Lately, the isolation of DNA using magnetic nanoparticles has received increased attention owing to their facile manipulation and low costs. Although methods involving their magnetic separation have been extensively studied, there is currently a need for an efficient technique to isolate DNA for highly sensitive diagnostic applications. We describe herein a method to isolate and purify DNA using biofunctionalized superparamagnetic nanoparticles synthesized by a modified polyol method to obtain the desired monodispersity, followed by surface modification with meso-2,3-dimercaptosuccinic acid (DMSA) containing carboxyl groups for DNA absorption. The DMSA-coated magnetic nanoparticles (DMSA-MNPs) were used for the isolation of DNA, with a maximum yield of 86.16%. In particular, we found that the isolation of DNA using small quantities of DMSA-MNPs was much more efficient than that using commercial microbeads

(NucliSENS-easyMAG, BioMerieux). Moreover, the DMSA-MNPs were successfully employed in the isolation of genomic DNA from human blood. In addition, the resulting DNA-nanoparticle complex was directly subjected to PCR amplification without prior elution, which could eventually lead to simple, rapid, sensitive and integrated diagnostic systems.

Minamoto, K., et al. (2002). "Skin problems among fiber-glass reinforced plastics factory workers in Japan." Industrial Health **40**(1): 42-50.

Two surveys, one in winter the other in summer time, examined the skin problems of the entire manual workers (N=148) from 11 small-to-medium sized fiber-glass reinforced plastics (FRP) factories located in Kyushu, Japan. The workers were exposed to unsaturated polyester resin, including styrene and auxiliary agents such as cobalt naphthenate, hardeners such as methyl ethyl ketone peroxides, glass fiber and dust including shortened glass fiber and plastic particles. Eighty-seven workers (58.8%) reported having skin problems (mainly itching or dermatitis) since they started to work in FRP manufacturing and 25 workers had consulted a physician because of their skin problems; one worker was forced to take sick leave because of his severe dermatitis. History of allergic diseases and shorter occupational period (duration of employment) in a FRP factory were associated with greater probability of having a history of work-related skin symptoms. Workers in factories where dust-generating and lamination sites were located in different buildings were significantly less likely to have a history of skin problems than those in factories where the two sites were located in the same building. Of the 67 workers examined in both seasons closed to double the prevalence of dermatitis was found in summer (23.3%) than winter (13.4%).

Minhas, N. A. (1996). "RECYCLING IN THE FAR EAST - A STUDY OF COTTON WASTE." Recycling Textile & Plastic Waste: 121-126.

The article discusses a case study on cotton waste recycling as the textile industry believes that cotton will become scarcer and more expensive due to population growth and occasional crop failures. In India and China, acute shortage of cotton supplies has occurred of which the actual shortfall was about 1.5 million bales. Using the locally-made machine, it resulted to excessive fiber damage to the material being processed. Experience tells that cotton waste recovered on local Willey and wasteopeners is good enough for subsequent processing. It was illustrated that waste processing offers great opportunities for textile processors in Asia using locally-made machinery and that the recycled fibers may be used wholly or as blends.

Miniati, A., et al. (2014). "Stimulated human melanocytes express and release interleukin-8, which is inhibited by luteolin: relevance to early vitiligo." Clinical & Experimental Dermatology **39**(1): 54-57.

Vitiligo is a disorder of depigmentation, for which the pathogenesis is as yet unclear. Interleukin (IL)-8 (CXCL8) is a key inflammatory chemokine. We investigated the regulation of IL-8 production in human melanocytes, and the IL-8 serum levels and skin gene expression in patients with vitiligo and in controls. Cultured melanocytes were stimulated for 24 h with tumour necrosis factor (TNF) 100 ng/mL and IL-1beta 10 ng/mL, with or without pretreatment with luteolin 50 mumol/L for 30 min, and IL-8 release was measured by ELISA. Serum cytokines were measured by a microbead array. Skin biopsies were taken from healthy subjects (n = 14) as well as from marginal lesional and nonlesional skin from patients with vitiligo (n = 15). IL-8 gene expression was evaluated by quantitative real time PCR. Both TNF and IL-1beta stimulated significant IL-8 release (P < 0.01) from melanocytes, whereas pretreatment with luteolin significantly inhibited this effect (P < 0.01). IL-8 gene expression was significantly increased in vitiligo compared with control skin (P < 0.05). IL-8 may be involved in vitiligo inflammation.

Inhibition by luteolin of IL-8 release could be useful for vitiligo therapy.

Mintenig, S. M., et al. (2018). "Closing the gap between small and smaller: towards a framework to analyse nano- and microplastics in aqueous environmental samples." Environmental Science: Nano **5**(7): 1640-1649.

Measuring concentrations and sizes of micro- and nanoplastics in the environment is essential to assess the risks plastic particles could pose. Microplastics have been detected globally in a variety of aquatic ecosystems. The determination of nanoplastics, however, is lagging behind due to higher methodological challenges. Here, we propose a framework that can consistently determine a broad spectrum of plastic particle sizes in aquatic environmental samples. Analytical evidence is provided as proof of principle. FTIR microscopy is applied to detect microplastics. Nanoplastics are studied using field-flow-fractionation and pyrolysis GC-MS that gives information on the particle sizes and polymer types. Pyrolysis GC-MS is shown to be promising for the detection of nanoplastics in environmental samples as a mass of approximately 100 ng is required to identify polystyrene. Pre-concentrating nanoplastics by crossflow ultrafiltration enables polystyrene to be identified when the original concentration in an aqueous sample is >20 micro g L⁻¹. Finally, we present an approach to estimate polymer masses based on the two-dimensional microplastic shapes recorded during the analysis with FTIR microscopy. Our suite of techniques demonstrates that analysis of the entire size spectrum of plastic debris is feasible.

Mintenig, S. M., et al. (2017). "Identification of microplastic in effluents of waste water treatment plants using focal plane array-based micro-Fourier-transform infrared imaging." Water Research **108**: 365-372.

The global presence of microplastic (MP) in aquatic ecosystems has been shown by various studies. However, neither MP concentrations nor their sources or sinks are completely known. Waste water treatment plants (WWTPs) are considered as significant point sources discharging MP to the environment. This study investigated MP in the effluents of 12 WWTPs in Lower Saxony, Germany. Samples were purified by a plastic-preserving enzymatic-oxidative procedure and subsequent density separation using a zinc chloride solution. For analysis, attenuated total reflection Fourier-transform infrared spectroscopy (ATR-FT-IR) and focal plane array (FPA)-based transmission micro-FT-IR imaging were applied. This allowed the identification of polymers of all MP down to a size of 20 mu m. In all effluents MP was found with quantities ranging from 0 to 5 101 m-3 MP > 500 mu m and 1 101 to 9 103 m-3 MP < 500 mu m. By far, polyethylene was the most frequent polymer type in both size classes. Quantities of synthetic fibres ranged from 9 101 to 1 103 m-3 and were predominantly made of polyester. Considering the annual effluxes of tested WWTPs, total discharges of 9 107 to 4 109 MP particles and fibres per WWTP could be expected. Interestingly, one tertiary WWTP had an additionally installed post-filtration that reduced the total MP discharge by 97%. Furthermore, the sewage sludge of six WWTPs was examined and the existence of MP, predominantly polyethylene, revealed. Our findings suggest that WWTPs could be a sink but also a source of MP and thus can be considered to play an important role for environmental MP pollution.

Mintenig, S. M., et al. (2019). "Low numbers of microplastics detected in drinking water from ground water sources." Science of the Total Environment **648**: 631-635.

Microplastic particles have been detected in various natural habitats and the digestive tracts of several species. These particles have also been reported in commercially available seafood, salt or bottled water starting discussions on potential implications for human health. To be able to assess the related risks, exposure concentrations and pathways need to be known. Here, we analysed ground water and drinking water for the presence of microplastics (>20mum) using FTIR imaging. Samples were taken at different positions within the drinking water supply chain. Determined concentrations ranged from 0 to 7microplasticsm⁻³ raw water or drinking water with an overall mean of 0.7microplasticsm⁻³. These particles were identified as polyethylene, polyamide, polyester, polyvinylchloride or epoxy resin and between 50 and 150mum in size. Plastic is a resistant and durable material, still, the abrasion of plastic equipment used during water purification or transport is a likely explanation for the plastic particles detected in water samples.

Miraj, S. S., et al. (2019). "Plastic microbeads: small yet mighty concerning." International Journal of Environmental Health Research: 1-17.

The net use of plastic has increased and this augmentation in plastic usage results in ever-growing accumulation of plastic waste in our ecosystems. Regrettably, a portion of this waste is the microplastics including microbeads, which are tiny plastic particles <5 mm in diameter. Microbeads are used in our personal care products. Although, legislative ban of microbeads in some developed countries has proven effective, but many countries do not take any legal action. Hence, microbead-containing products are openly sold in international market and entered into the food chain and disturb it. In human beings and animals, plastic when ingested causes internal bleeding, abrasion, ulcers and blockage of the digestive tract. The present review highlighted the bioaccumulation of microbeads via the food chain and its adverse effect on environment health. Moreover, different scientific views and suggestions for eradication of the problem and present scenario of the use of microbeads in some Asian countries have also been discussed.

Miranda, D. d. A. and G. F. d. Carvalho-Souza (2016). "Are we eating plastic-ingesting fish?" Marine Pollution Bulletin **103**(1/2): 109-114.

Yes, we are eating plastic-ingesting fish. A baseline assessment of plastic pellet ingestion by two species of important edible fish caught along the eastern coast of Brazil is described. The rate of plastic ingestion by king mackerel (Scomberomorus cavalla) was quite high (62.5%), followed by the Brazilian sharpnose shark (Rhizoprionodon lalandii, 33%). From 2 to 6 plastic resin pellets were encountered in the stomachs of each fish, with sizes of from 1 to 5 mm, and with colors ranging from clear to white and yellowish. Ecological and health-related implications are discussed and the potential for transferring these materials through the food-chain are addressed. Further research will be needed of other species harvested for human consumption.

Miranda, M. N., et al. (2019). "Microplastics in the environment: A DPSIR analysis with focus on the responses." Science of the Total Environment: 134968.

This review organizes key information about microplastic pollution through a DPSIR (driving forces, pressures, states, impacts and responses) analysis, namely the current knowledge on the sources of microplastics in the environment, the abundance, mobility and fate of microplastics distributed across the different environmental compartments, as well as their socio-economic and environmental impacts. The available or developing upstream and downstream responses to the microplastic pollution are also reviewed as part of the DPSIR analysis. These include the regulatory and policy instruments, environmental education campaigns, product design, the development of biodegradable plastics, environmental cleanups, waste management, drinking water and wastewater treatment plants, and other treatment technologies and processes. Whenever possible, the current trends and discerning gaps in the research conducted so far by the scientific community are identified, giving some clues to what is going to be the future

research on this topic and into new lines of research.

Miranda, T., et al. (2019). "Neurotoxicity, Behavior, and Lethal Effects of Cadmium, Microplastics, and Their Mixtures on Pomatoschistus microps Juveniles from Two Wild Populations Exposed under Laboratory Conditions-Implications to Environmental and Human Risk Assessment." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(16): 10.

Microplastics (MPs) were found to modulate the toxicity of other pollutants but the knowledge on the topic is still limited. The goals of this study were to investigate the short-term toxicity of cadmium (Cd) to wild Pomatochistus microps juveniles, the potential modulation of acute Cd toxicity by 1-5 micro m polyethylene MPs in this species, and possible differences of sensitivity to Cd and MPs-Cd mixtures between juveniles from two distinct wild populations. Juveniles were collected in the estuaries of Minho (M-est) and Lima (L-est) Rivers (NW Portugal). One 96 h bioassay with M-est juveniles and another one with L-est juveniles were carried out in laboratory conditions. Each bioassay had 12 treatments: control, 5 Cd concentrations, 1 MPs concentration, and 5 MPs-Cd mixtures. No significant differences in Cd-induced mortality between juveniles from distinct estuaries or between juveniles exposed to Cd alone and those exposed to MPs-Cd mixtures were found. The total 96h LC₁₀ and LC₅₀ of Cd alone were 2 mg/L (95% CI: 0-4 mg/L) and 8 mg/L (95% CI: 2-17 mg/L), respectively. Cd alone significantly decreased the post-exposure predatory performance (PEPP) of M-est (>=6 mg/L) and L-est juveniles (>=3 mg/L), and acetylcholinesterase (AChE) activity of M-est juveniles (13 mg/L). MPs alone (0.14 mg/L) significantly reduced the PEPP and AChE activity of L-est juveniles but not of M-est juveniles. MPs-Cd mixtures (3-13 mg/L of Cd + 0.14 mg/L of MPs) significantly inhibited the PEPP of juveniles from both estuaries and AChE of L-est estuary juveniles but not of M-est juveniles. Evidences of toxicological interactions, namely antagonism, between MPs and Cd were found. Overall, the results indicate that MPs modulated the sub-lethal toxic effects of Cd in wild P. microps juveniles, especially neurotoxicity. Moreover, the environmental conditions of the natural habitats to which juveniles were exposed during pre-developmental phases influence the sub-lethal toxicity of Cd, MPs, and their mixtures. The implications to environmental and human risk assessment are discussed and further research is needed.

Mirdamadi, E. S., et al. (2020). "Liver Tissue Engineering as an Emerging Alternative for Liver Disease Treatment." Tissue Engineering Part B Reviews **17**: 17.

Chronic liver diseases affect thousands of lives throughout the world every year. The shortage of liver donors for transplantation has been the main driving force to employ alternative methods such as liver tissue engineering (LTE) in fabricating a three-dimensional transplantable liver tissue or enhancing cell delivery techniques alleviating the need for liver donors. LTE consists of three components, cells, ECM (extracellular matrix), and signaling molecules, which we discuss the first and second. The three most common cell sources used in LTE are human and animal primary hepatocytes, and stem cells for different applications. Two major categories of ECM are used to mimic the microenvironment of these cells, named scaffolds and microbeads. Scaffolds have been made by numerous methods with a wide range of synthetic and natural biomaterials. Cell encapsulation has also been utilized by many polymeric biomaterials. To investigate their functions, many properties have been discussed in the literature, such as biochemical, geometrical, and mechanical properties, in both of these categories. Overall, LTE shows excellent potential in assisting hepatic disorders. However, some challenges exist that prevent the practical use of it clinically, making LTE an ongoing research subject in the scientific society. Impact Statement This article is a comprehensive review of almost every step of liver tissue engineering (LTE) that a researcher should consider in this field. Thus, it provides knowledge and trusted references for further investigation. The main facets of LTE, cells and extracellular matrix, are reviewed and classified with precision to direct researchers to a state of the art strategy for achieving meaningful results and improvements, and, therefore, inclination toward clinical use with the aim of efficient treatment for liver diseases.

Mishima, Y., et al. (2019). "The necessary for long-term follow-up of mutated genes and clonal evolutions in multiple myeloma combined with cfDNA assay." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Introduction)Somatic mutations in multiple myeloma (MM) are strongly related to the clinical outcome and clonal evolution over the clinical course, and are a major problem. From a clinical viewpoint, although numerous novel drugs have been utilized, achieving long-lasting and complete remission remains difficult. Recent studies have elucidated the mutated genes using next-generation sequencing, and have examined how clonal change can be acquired in myeloma. In this study, we traced the transition of the somatic mutations of bone marrow tumor cells in patients with MM over a long-term follow-up. Furthermore, we compared the somatic mutations found in serum cell-free DNA (cfDNA) and mutated genes obtained from bone marrow myeloma cells. Material and Methods)Patients diagnosed with multiple myeloma who provided written informed consent to participate in the study were enrolled. Patients were treated by immuno-chemotherapy with or without radiation between 2000 and 2017 at our institute. Bone marrow aspiration and biopsy were performed at the time of diagnosis and upon disease progression. Around the time of bone marrow aspiration, serum was obtained from a peripheral blood sample for cfDNA analysis. Myeloma cells were separated from bone marrow samples with MicroBeads of CD138 antibody and genomic DNA was extracted. The peripheral blood samples derived from myeloma patients. The cfDNA was extracted from the serum using Sa Maxwell RSC cfDNA Plasma kit. Using genomic DNA derived from cfDNA and bone marrow, multiplex polymerase chain reaction (PCR) was performed, and a sequence library was then constructed with an Ion Custom Amplicon panel. The panel for the sequence library was designed using an Ion AmpliSeq Designer^{TM}. 126 targeted genes were selected. The genomes were sequenced using the Ion Proton^{TM} System. This protocol was approved by the institutional review board and the Genomic Review Board of the Japanese Foundation for Cancer Research. Result)We followed 7 patients' long term-clinical course and the transition of mutations (8.5 year average). The expression of myeloma driver genes, such as RAS, BRAF, and MYC, were not critical. We did, however, detect a relationship between an increase in the dominant mutated gene, such as TP53, DIS3, FAM46C, KDM6B, and EGR1 and poor prognosis in patients with myeloma. Next, we calculated the cfDNA concentrations from 34 cases. The cfDNA concentrations were significantly higher than 10 control cases (average 62.0 ng/mL (0-200 ng/mL) and 8.18 ng/mL (4.3-14.1 ng/mL), P=0.0046). The 2.5 year-progression free survival (PFS) during the first treatment of MM were tend to be poorer in the group with cfDNA>50 ng/mL (72.9%) than the group with cfDNA<50 ng/mL(25.9%), however there are no statistical significance (P = 0.15).We calculated concordance rate of derived mutations from bone marrow MM cells and cfDNA in 7 cases. The somatic mutations found in serum cell-free DNA (cfDNA) and bone marrow MM cells were determined the correlation coefficients. However, there are few difference expression pattern in each source. In cfDNA assay, CREEP, EGR1, HDAC4, HDAC6, and JMJD1C were highly expressed as 57.1% (4/7) - 85.7% (6/7), and these results were almost the same as those for bone marrow MM cells. On the other hand, KDM1A (85.7%), PI3KCD (71.4%), and KDM3B (57.1%) were highly detected in cfDNA, although those were not frequently expressed in bone marrow. Discussion)Our data demonstrate the importance of the long-term follow-up of somatic mutations during the clinical course of myeloma. Serum cfDNA is a useful alternative source for detecting somatic mutations in MM patients during long-term follow-up.

Mishra, P., et al. (2019). "Distinctive impact of polystyrene nano-spherules as an emergent pollutant toward the environment." Environmental Science & Pollution Research **26**(2): 1537-1547.

The increasing load of nanoplastic pollution in the environment has become a major concern toward human and environmental safety. The current investigation mainly focused on assessing the toxic behavior of nanoplastics (polystyrene nano-spheres (PNS)) toward blood cells and marine crustacean. The study also investigated the temporal stability of PNS under different water matrices and its size-dependent sedimentation behavior in the sea water dispersion. The nano-dispersion showed mean particle size of 561.4 +/- 0.80 and 613.7 +/- 0.11 nm for PNS 1 and 781.4 +/- 0.80 and 913.7 +/- 0.11 nm for PNS 2 in lake and seawater, respectively after 48-h incubation, which is ~ 8-fold increase from its original size. The LC50 value against Artemia salina and lymphocytes were found to be 4.82 and 8.79 mug/mL, and 75 mug/mL, respectively for PNS 1 and PNS 2. The genotoxic study reveals that around 50% of lymphocytes were affected by both PNS at 50 mug/mL concentration, whereas the cytotoxic studies on RBC and lymphocytes showed 50% toxicity only at 100 mug/mL concentration. The genotoxic study displayed numerous tri- and multi-nucleated cells. The biochemical profile of A. salina exposed to lethal concentration demonstrated a significant decrease in the total protein, reduced glutathione, and catalase activity and increase in lipid peroxidation activity as a result of PNS permeation to tissues. In conclusion, the present study demonstrated that the polystyrene nano-spheres are emerging pollutant in the environment and are hazardous to humans.

Mishra, S. K., et al. (2008). "Passage-delaying microbeads for controlled delivery of loratadine." Pda Journal of Pharmaceutical Science & Technology **62**(6): 421-428.

A passage-delaying, multiple unit, controlled release system of loratadine was designed to increase residence time in the stomach involving minimum contact with the gastric mucosa. Oil-entrapped floating microbeads prepared using the emulsion gelation method were optimized by a 2(3) factorial design and a polymer ratio of 1.5:0.5 (casein:sodium alginate) by weight, and 15% w/v of oil (mineral oil/castor oil) and 1 M calcium chloride solution were selected as the optimized processing conditions for the desired buoyancy and physical stability. In vitro drug release in acid phthalate buffer, pH 3.12, demonstrated a sustained release for 8 h that best fitted the peppas model with n < 0.45. The ethylcellulose coating of the passage-delaying microbeads optimized by a 2(2) factorial design resulted in a controlled release formulation of loratadine that provided zero-order release for 8 h.

Misiewicz-Krzeminska, I., et al. (2018). "Expression of proteins in CD138+ plasma cells predicts prognosis in newly diagnosed multiple myeloma patients treated with VRD regimen." HemaSphere **2 (Supplement 2)**: 727-728.

Background: The development of precision medicine requires powerful biomarkers mainly based on the mechanism of drug action to predict and improve response to treatment. Although genomic technologies have significantly increased the numbers of potential biomarkers in MM, most of them have not been subsequently validated at protein level. The low protein concentration obtained after CD138+ selection has limited the quantification of proteins in MM so far. We have recently reported the usefulness of a new technique based on capillary nanoimmunoassay (CNIA) for protein expression quantification from purified CD138+ plasma cells (PC). Aim(s): To investigate the prognostic impact of the expression of proteins involved in

the anti-myeloma mechanism of bortezomib (V), lenalidomide (R) and dexamethasone (D), together with the expression of cyclin D1 and D2 in a large cohort of CD138+ PC samples from MM patients treated with VRD. Method(s): Bone marrow aspirates from 213 newly diagnosed MM patients treated according to the Spanish clinical trial VRD-GEM followed by ASCT conditioned with Mel-200 vs BuMel, were included in the study. Plasma cells were purified by anti-CD138 magnetic microbeads using the AutoMACs separation system (purity was above 85%) and next, were stored in RLT+ buffer at -800C. Proteins were extracted by a method previously reported by our group. Total protein quantification and protein expression were analyzed by the CNIA methodology (ProteinSimple, WESTM system). Progression free survival (PFS) and overall survival (OS) were calculated for each protein. Survival curves were plotted by means of the Kaplan-Meier method and statistical significance was tested using the log-rank test. The Cutoff Finder software was used to obtain the optimal cutoff. Result(s): After the analysis of total protein content, 194 MM samples of 213 (91%) fulfilled the quantity and quality requirements. Among the 10 proteins analyzed the expression of aiolos, cereblon, ikaros, gankyrin, proteasome activator subunit 1 (PSME1), glucocorticoid receptor (GR), exportin 1 (XPO1) and interferon regulatory factor 4 (IRF4) were detected in about 90% of MM samples. On the contrary, cyclin D1 and cyclin D2 proteins were detected in only 43% and 25% of MM samples, respectively. Regard-ing cytogenetic risk, IRF4, PSME1 GR and XPO1 proteins were significantly upregulated in low risk MM patients, while cyclin D2 was upregulated in high risk MM ($p<0.05$). At the time of study, the median follow-up for survivors was 25.5 months (range, 14.1-42.1). Kaplan-Meier survival analyses showed that high levels of ikaros and gankyrin were associated with shorter PFS ($p < 0.01$ and $p < 0.05$, respectively), while high level of cereblon was associated with longer PFS ($p < 0.05$). Regarding OS, high protein levels of aiolos, cereblon, GR and XPO1 were associated with better prognosis (see table below). Interestingly, patients with high cyclin D2 protein levels had a significantly shorter PFS and OS ($p < 0.0001$), while those with high level of cyclin D1 exhibited longer OS ($p < 0.05$). Summary/Conclusion: The expression level of proteins involved in the mechanism of action of bortezomib, lenalidomide and dexamethasone, discriminate prognosis in MM patients. High level of cyclin D2 protein identified MM patients with poor outcome. The quantification of protein expression by CNIA platform can be a useful tool for biomarker identification in the era of precision medicine. (Figure Presented).

Mistri, M., et al. (2017). "Small plastic debris in sediments from the Central Adriatic Sea: Types, occurrence and distribution." Marine Pollution Bulletin **124**(1): 435-440.

This is the first survey to investigate the occurrence and extent of microplastic contamination in sediments collected along a coast-open sea 140km-long transect in the Central Adriatic Sea. Plastic debris extracted from 64 samples of sediments were counted, weighted and identified by Fourier-transform infrared spectroscopy (FT-IR). Several types of plastic particles were observed in 100% of the stations. Plastic particles ranged from 1 to 30mm in length. The primary shape types by number were filaments (69.3%), followed by fragments (16.4%), and film (14.3%). Microplastics (1-5mm) accounted for 65.1% of debris, mesoplastics (5-20mm) made up 30.3% of total amount, while macro debris (>20mm) accounted for 4.6% of total plastics collected. Identification through FT-IR spectroscopy evidenced the presence of 6 polymer types: the majority of plastic debris were nylon, polyethylene and ethylene vinyl alcohol copolymer. Our data are a baseline for microplastic research in the Adriatic Sea.

Mitchell, G. F., et al. (1990). "Further studies on variable resistance of 129/J and C57BL/6 mice to infection with Schistosoma japonicum and Schistosoma mansoni." Parasite Immunology **12**(6): 559-567.

Two mouse strains maintained in the Walter and Eliza Hall Institute (WEHI) are variably resistant to infection with S. japonicum and S. mansoni in that worms cannot be found in the liver and portal system in a high proportion (WEHI 129/J mice) or low proportion (C57BL/6 mice) some weeks after exposure to cercariae. Resistance can be as high as 100% in WEHI 129/J mice and is usually around 20% in C57BL/6 mice. The proportion of resistant mice closely parallels the proportion of mice that demonstrate a shunting of microbeads, injected into a mesenteric vein, from liver to lungs. This applies to F₁ X WEHI 129/J backcross mice in which the data suggest oligogenic genetic effects although no evidence for a participation of MHC-linked genes in the phenomenon has emerged. 129/J mice derived from the Jackson Laboratory do not show a shunting of beads from the portal system to the lungs but their progeny bred at WEHI do. Germ-free WEHI 129/J mice resemble conventionally-maintained, SPF-derived WEHI 129/J mice in their variable resistance to schistosome infection. It is suggested that nutritional factors such as hypervitaminosis A superimposed on a genetic predisposition may contribute to the hepato-portal system peculiarities in WEHI 129/J and C57BL/6 mice.

Mitchell, K., et al. (2019). "Selenium in buoyant marine debris biofilm." Marine Pollution Bulletin **149 (no pagination)**(110562).

Marine debris is widespread in all the world's oceans. Currently little is understood about how marine debris affects the chemistry of the surface oceans, particularly trace elements that can adsorb to the surface of marine debris, especially plastic debris, or be taken up by biofilms and algae growing on the surface of marine debris. Selenium (Se) is a micronutrient that is essential to all living organisms. Average seawater Se concentrations in the modern ocean are <1 nM. Here we measure the concentration of Se in surface water and one deep water sample and the concentration of Se found in algae/biofilms growing on the surface of macro-debris collected in October of 2012. Concentrations of Se in biofilm varied more according to the type of biofilm rather than the type of plastic. However, further Se measurements are needed for more conclusive results. Copyright © 2019

Mitchell, M. S., et al. (2004). "Phase I trial of large multivalent immunogen derived from melanoma lysates in patients with disseminated melanoma." Clinical Cancer Research **10**(1 Pt 1): 76-83.

PURPOSE: The purpose of this research was to determine the toxicity and immunological activity of large multivalent immunogen (LMI), a preparation of tumor cell membranes affixed to amorphous silica microbeads, in patients with melanoma.

EXPERIMENTAL DESIGN: Nineteen patients with metastatic (stage IV) melanoma were entered into the study, of whom 15 received the full 3 months of treatment with LMI. LMI was administered without adjuvant, one-half intradermally (i.d.) and the other half s.c. Because we expected little toxicity, we first treated 2 patients at each dose level, 10-, 30-, or 100-million tumor cell equivalents on weeks 0, 4, and 8, and subsequently randomized the remaining 13 patients to receive treatment with one of those dosage schedules, for a total of 19 patients. Two patients who were registered were found to be ineligible because of brain metastases, and 2 others did not complete the course of treatment for reasons other than toxicity. Thus, 15 patients were fully evaluable. Patients with evidence of a clinical response (at least stable disease at the 12-week checkpoint) had the option of continuing treatment at 4-week intervals. Frequencies of cytolytic T cell precursors against HLA-A2 matched melanoma cells, and delayed-type hypersensitivity to a melanoma cell membrane preparation from a component melanoma cell line were performed to measure immunological efficacy, and serum chemistries and complete blood counts were performed every 2 weeks throughout the study to measure possible toxicity. Computed tomography scans were performed pretreatment and at week 12 to measure

possible beneficial effects on known lesions.
RESULTS: Eight of the 15 evaluable patients had an increase in cytolytic T-cell precursors during the course of therapy, usually by day 42. No patient had demonstrable delayed-type hypersensitivity to a melanoma membrane preparation before or after treatment. No toxicity of any kind was observed. A degree of clinical effectiveness of LMI was suggested by the elicitation of stable disease in 5 patients at 12 weeks. One patient had >50% regression of a lung nodule but progression of disease to the brain, whereas a second patient had a bona fide partial remission of a 3-cm diameter solitary lung nodule.
CONCLUSIONS: LMI was nontoxic, improved immunological reactivity to melanoma cells, and showed evidence of clinical effectiveness (shrinkage of tumor) in 1 patient. Additional studies with LMI with added adjuvant materials, in melanoma and other cancers, appear warranted.

Mitra, I. N., et al. (1998). "Improving stability of anaerobic biological reactors using composite ion exchangers." Water Science & Technology **38**(8/9): 369-376.

The problem of instability in anaerobic biological processes, arising from the inhibition of methanogenesis by accumulated volatile fatty acids and heavy metals, was addressed by introducing composite ion exchangers (CIX) to the anaerobic reactors. CIX was a polymeric ion exchanger with imino-diacetate functional groups which could prevent pH decline and immobilize heavy metals. It consisted of spherical microbeads of ion exchangers physically trapped in fibrous PTFE. Its thin sheet, cloth-like texture made CIX compatible in a biological medium with high solids concentration; it was easily introduced and withdrawn from such an environment. When excess hydrogen ion or heavy metal ions were present, CIX removed them and then slowly released them when the concentrations were lower. During 3 years, the resin did not foul and retained its original exchange capacity. Its use was particularly attractive for high-strength wastewater given to unforeseen fluctuations.

Mitra, I. N., et al. (1998). "Evaluating composite ion exchangers (CIX) for improved stability of anaerobic biological reactors." Water Research **32**(11): 3267-3280.

The ability of polymeric composite ion exchangers (CIX) to maintain the stability of anaerobic biological reactors under severe conditions of organic overloading and heavy metal contamination was studied. The CIX consisted of microbeads of chelating exchanger encapsulated in fibrous polytetrafluoroethylene or Teflon. During the stress period, the CIX dissipated any build-up of hydrogen or dissolved heavy metal ions. Once the source of instability in the feed was removed, the reactor returned to steady-state conditions, slowly releasing sorbed species from the CIX. The CIX was chemically stable and durable. It did not require intermittent cleaning or regeneration. There are 35 references.

Miura, H., et al. (2005). "[IgG heterophile antibody causes false positivity for CA19-9, which is overcome with bovine immunoglobulin]." Rinsho Byori - Japanese Journal of Clinical Pathology **53**(12): 1103-1108.

Immunoassay using antibodies is widely applied to measure various clinical parameters such as tumor markers. However, many mechanisms of interference for this method have been reported. We studied serum sample showing false positive CA19-9 values in the range of 24 to approximately 286U/ml depending on the reagent lots used. PEG-pretreated serum did not show false positivity. Using high performance liquid chromatography (HPLC), the CA19-9 false positive peak was obtained around 160kD, which is the same as IgG. Antibody-coated microbeads, labeled antibody and buffer were used in different combinations between different lots, and the buffer was found to be the cause of false positive findings. The amount of bovine IgG contaminated in bovine serum albumin(BSA) in the reagent buffer markedly differed between lots of BSA, and reagent with a low amount of bovine IgG showed false positive results. Bovine immunoglobulin was superior to mouse IgG in the attempt to avoid a false positive reaction. We concluded that the cause of false positive CA19-9 findings in this serum sample was IgG heterophile antibody, which reacts with both of mouse and bovine IgG. The heterophile antibody had greater affinity to bovine IgG than to mouse IgG. The difference between CA19-9 values obtained by different reagent lots was due to different amounts of bovine IgG contaminated in BSA used in the reagent. Bovine immunoglobulin was superior to mouse IgG in the attempt to absorb the heterophile antibody and avoid false positive reaction in this case.

Miyata, K., et al. (2000). "Sarpogrelate, a selective 5-HT(2A) serotonergic receptor antagonist, inhibits serotonin-induced coronary artery spasm in a porcine model." Journal of Cardiovascular Pharmacology **35**(2): 294-301.

Serotonin is one of the most important vasoactive substances and has been implicated in the pathogenesis of coronary artery spasm and of acute coronary syndrome. We have recently demonstrated that local and long-term treatment with interleukin-1beta (IL-1beta) causes coronary arteriosclerotic changes and hyperconstrictive responses to serotonin in pigs in vivo. However, it remains to be examined which serotonergic (5-HT) receptor subtype mediates coronary spasm and whether alterations in serotonergic receptors are involved in the abnormality. In this study, we examined the inhibitory effect of sarpogrelate, a selective 5-HT(2A) serotonergic receptor antagonist, on the serotonin-induced coronary spasm as well as the possible alterations of serotonergic receptors in our porcine model. A segment of the porcine coronary artery was carefully dissected and aseptically wrapped with cotton mesh absorbing IL-beta-bound microbeads from the adventitia. Two weeks after the procedure, angiographic study was performed, followed by binding assay for 5-HT(1B) and 5-HT(2A) serotonergic receptors and reverse transcription- polymerase chain reaction (RT-PCR) analysis for mRNA of those receptors. Angiographic study showed coronary vasospastic responses to serotonin at the IL-1beta-treated site. Sarpogrelate dose-dependently inhibited the serotonin-induced coronary spasm, but it did not affect the prostaglandin F(2alpha)- induced vasoconstriction. Radiolabeled receptor-binding assay showed that receptor affinity or receptor number of the 5-HT(1B) or 5-HT(2A) receptors did not differ significantly between the spastic and the control sites. Furthermore, RT-PCR analysis showed that the expression of neither 5-HT(2A) nor 5-HT(1B) receptor mRNA was significantly altered at the spastic site. These results indicate that serotonin-induced coronary spasm is mediated primarily by 5-HT(2A) receptor in our porcine model, although the 5-HT(2A) receptor was not upregulated, suggesting that alteration in the signal- transduction pathway for vascular smooth muscle contraction beyond the 5- HT(2A) receptor plays a primary role in the pathogenesis of coronary spasm in our porcine model.

Miyata, K., et al. (1999). "Endothelial vasodilator function is preserved at the spastic/inflammatory coronary lesions in pigs." Circulation **100**(13): 1432-1437.

Background - The question of whether or not endothelial vasodilator function in the spastic coronary artery is preserved is still controversial. We recently developed a porcine model in which long-term and local treatment with interleukin-1beta (IL-1beta) from the adventitial site causes coronary arteriosclerotic changes and vasospastic responses to autacoids. The aim of this study was to examine the endothelial vasodilator function in our new porcine model of the spasm both in vivo and in vitro. Methods and Results - A segment of the porcine coronary artery was aseptically wrapped with cotton mesh that held absorbed IL-1beta-bound microbeads. Two weeks after the procedure, intracoronary administration of serotonin caused coronary vasospasm at the IL-1beta-treated site (n = 10). Coronary vasodilatation to bradykinin, substance P, or an increase in coronary blood flow was preserved at the spastic site. Vasodilator responses to 3-morpholinosydnonimine (an NO donor) and nitroglycerin also were comparable between the 2 sites. The vasoconstricting response to N(G)-monomethyl-L-arginine and the extent of the augmentation of the serotonin-induced vasoconstriction were comparable between the 2 sites. Organ chamber experiments showed that endothelium- dependent relaxations to bradykinin, the calcium ionophore A23187, and even the vasospastic agonist serotonin were preserved at the spastic site, whereas contractions to serotonin were augmented at the spastic site regardless of the presence or absence of the endothelium (n=6). Endothelium-independent relaxations to sodium nitroprusside were also preserved at the spastic site. Conclusions - These results indicate that endothelial vasodilator function is preserved at the spastic site and that the spasm is caused primarily by smooth muscle hypercontraction in our porcine model.

Miyazaki, M., et al. (2009). "Determination of enzymatic source of alanine aminotransferase activity in serum from dogs with liver injury." Journal of Pharmacological & Toxicological Methods **60**(3): 307-315.

INTRODUCTION: Increase of serum alanine aminotransferase (ALT) activity is widely used as a surrogate marker for tissue damage. Two ALT isoforms, ALT1 and ALT2, have been cloned recently in mammals. The study investigated the source of elevated ALT activity in serum of dogs treated with a hepatotoxic compound.

METHODS: ALT activity was measured by enzyme assay. Immunoblot analysis was performed using generated specific peptide antibodies against dog ALTs. LC-MS/MS-based proteomics analysis was conducted to independently identify dog ALT peptides. Serum samples immunodepleted of major serum components by Seppro IgY-D11 microbead spin column were evaluated by the immunoblot analysis, and compared with those of the ALT activity.

RESULTS: Involvement of ALT enzyme(s) is consistent with the following observations: 1) all the substrates (L-alanine and alpha-ketoglutarate) were required for serum ALT activity as purified porcine ALT1 needed for activity, 2) serum ALT activity was inhibited by L-cycloserine, a known ALT inhibitor, and 3) apparent Km value for the ALT reaction catalyzed by the serum, liver, and skeletal muscle was roughly similar. Immunoblot analysis showed that ALT1 was detected in liver and both ALTs were detected in the skeletal muscle. The relative expression level of ALTs was -: liver ALT1>skeletal muscle ALT1>skeletal muscle ALT2. LC-MS/MS-based proteomics analysis gave similar results. Immunoblot analysis of the depleted serum samples revealed the presence of ALT1 in compound-treated dogs. Intensity of the ALT1 band detected in the sera correlated well with the ALT activity measured by the enzyme assay.

DISCUSSION: Based on these findings, we conclude that the elevation of serum ALT activity in dogs with liver injury is attributed to elevation of ALT1 protein level in serum. The methodology to directly detect ALT proteins in serum could be a tool to facilitate our understanding of biological and toxicological significance of the ALT isoenzymes.

Mizraji, R., et al. (2017). "Is the feeding type related with the content of microplastics in intertidal fish gut?" Marine Pollution Bulletin **116**(1/2): 498-500.

Microplastics pollution is a growing global concern that affects all aquatic ecosystems. Microplastics in the environment can be in the form of fibers and/or particles, being the former the most abundant in the marine environment, representing up to 95% of total plastics. The aim of this work was to compare the content of microplastics among intertidal fish with different feeding type. Our results show that omnivorous fish presented a higher amount of microplastic fibers than registered in herbivores and carnivores. Moreover, lower condition factors (K) were found in omnivorous specimens with higher microplastic content. We hypothesized that the type of feeding resulted in different microplastic ingestion, with species with wider range of food sources as omnivores with higher rates. Futures studies carried out to evaluate the biological impacts of microplastics on marine organisms, and microplastics cycling on the marine environment should consider the type of feeding of the studied species.

Mizubuti, Y. G., et al. (2016). "Effect of whey protein consumption in inflammatory response by patients waiting for liver transplantation-a pilot study." Clinical Nutrition **35 (Supplement 1)**: S194.

Rationale: Whey protein may contribute to inflammation control in patients with chronic liver disease. Method(s): Baseline characteristics related to inflammation were established in blood samples from 8 patients with chronic liver disease (CLD) on the waiting list for liver transplantation at Hospital das Clinicas, Brazil and 8 healthy individuals (HI) using a kit of Luminex microbeads. Patients received whey protein isolate (WP) to take 20g in the morning and 20g at night, as a supplement to their usual diet, during 30 days. They were monitored by regularly phone calls. Plasmatic cytokines were measured before (WP<inf>0</inf>) and after (WP<inf>f</inf>) protein supplementation by Cytometric bead array. Data were analyzed by Mann-Whitney and paired T tests. The protocol was approved by the Ethics Committee. Result(s): sICAM-1 and sVCAM-1 were higher in CLD patients, contributing to the inflammatory response. However, no differences in pro-inflammatory cytokines were observed after protein supplementation (Table 1). Conclusion(s): Adhesion molecules are increased in CLD patients, however the whey protein supplementation was not able to reduce the inflammation, maybe due to the small sample size. This study is still in progress. (Table Presented).

Mizukawa, K., et al. (2013). "Monitoring of a wide range of organic micropollutants on the Portuguese coast using plastic resin pellets." Marine Pollution Bulletin **70**(1-2): 296-302.

We analyzed polychlorinated biphenyls (PCBs), dichlorodiphenyl dichloroethane and its metabolites, hexachlorocyclohexanes (HCHs), polycyclic aromatic hydrocarbons (PAHs), and hopanes, in plastic resin pellets collected from nine locations along the Portuguese coast. Concentrations of a sum of 13 PCBs were one order of magnitude higher in two major cities (Porto: 307. ng/g-pellet; Lisboa: 273. ng/g-pellet) than in the seven rural sites. Lower chlorinated congeners were more abundant in the rural sites than in the cities, suggesting atmospheric dispersion. At most of the locations, PAH concentrations (sum of 33 PAH species) were ~100 to ~300. ng/g-pellet; however, three orders of magnitude higher concentrations of PAHs, with a petrogenic signature, were detected at a small city (Sines). Hopanes were detected in the pellets at all locations. This study demonstrated that multiple sample locations, including locations in both urban and remote areas, are necessary for country-scale pellet watch. © 2013 Elsevier Ltd.

Mizutani, H., et al. (1991). "Sensitive detection of viral antigens with a new method, "laser magnet immunoassay"." Microbiology & Immunology **35**(9): 717-727.

A new method, "laser magnet immunoassay" (LMIA), has been developed for sensitive detection of viral antigens. Target viruses captured on microbeads were made to react with antibodies labeled with magnetite particles. In a magnetic field, magnetically labeled antigens dispersed in water were attracted to and concentrated at one point on the surface, resulting in the lifting up of a small surface area. A laser beam which was incident on the point reflected, making an interference fringe. The intensity of the fringe indicates the amount of the magnetite conjugated with antigen. A very low concentration of antigens, such as 5 particles of influenza virus and 0.1 pg/ml of human immunodeficiency virus (HIV) p24 antigen in human serum, could be detected by this method. Application of this method to diagnoses of viral diseases in early stages is discussed.

Mizutani, K., et al. (2009). "Prostate cancer promotes CD11B positive cells to differentiate into osteoclasts." Journal of Urology **1)**: 513.

INTRODUCTION AND OBJECTIVES: Prostate cancer continues to be an incurable disease once it has metastasized to bone. A key step in the successful establishment of prostate cancer metastases is activation of osteoclast function to induce bone resorption. Bone resorption causes the release of growth factors from the bone matrix that stimulates prostate cancer cell proliferation, thereby enabling the "vicious cycle" of tumor growth and bone destruction. We have investigated what factors are secreted by prostate cancer cells to determine the cellular and humoral mechanisms by which osteoclast formation is induced by metastatic prostate cancer cells within the tumor microenvironment. METHOD(S): Previously, investigators have demonstrated that human bone marrow mononuclear cells (HBMCs) treated with prostate cancer conditioned medium could induce osteoclast formation but it has been unclear what cells were induced to cause bone resorption. Cells of the monocyte fraction (CD11b) were isolated from healthy men's PBMCs by MACS CD11b Micro Beads. CD11b cells were cultured with Macrophage-Colony Stimulating Factor (MCSF) and conditioned media from PC-3 cells or IL-6, IL-8 and Monocyte chemoattractant protein -1 (MCP-1, CCL2) in various conditions. Osteoclast fusion was evaluated with TRAP and vitronectin staining and osteoclast function was measured by a bone resorption assay. RESULT(S): Conditioned media from prostate cancer PC-3 cells induces human mononuclear cells to differentiate into functional osteoclasts with subsequent bone resorption. Analysis of PC-3 conditioned media revealed high amounts of IL-6 and IL-8. CD11b+ cells were cultured with MCSF and IL-6 and IL-8 and CCL2, alone or in combination. All of them induced osteoclast fusion but these cells were capable of limited bone resorption. Prostate cancer conditioned media induced osteoclast fusion and bone resorption, which was not inhibited by IL-6 and IL-8 neutralizing antibodies. Co-incubation with IL-6 and IL-8 and RANKFc failed in inhibiting osteoclast fusion and bone resorption, suggesting a potential RANKL independent mechanism of functional osteoclast formation. CONCLUSION(S): This is the first study that demonstrates that functional osteoclasts can be derived from CD11b PBMCs. These findings indicate that prostate cancer cells produce multiple factors that are capable of inducing osteoclast differentiation and bone resorption. It appears that IL-6 and IL-8 induce osteoclast fusion and limited bone resorption by a RANKL-independent mechanism.

Mobasheri, A. (2016). "Year in review: Biomarkers." Osteoarthritis and Cartilage **1)**: S6-S7.

Purpose: Biomarkers have the capacity to detect early joint degradation in degenerative diseases such as osteoarthritis (OA). They can provide useful diagnostic and prognostic information by reflecting pathophysiologically relevant biological activity in the joint and predict the course of disease progression. In addition, they can serve as surrogate endpoints in the discovery and development process for disease modifying osteoarthritis drugs (DMOADs). The 'Year in Review' Plenary Session at the end of theWorld Congress on Osteoarthritis has become a well-established tradition. It provides a unique opportunity to build on the reviews from the previous years and summarize the key published papers related to OA biomarkers. The aim of this presentation is to discuss selected 'wet' biomarker related papers published between the OARSI 2015 Congress held from 30 April to 3 May 2015 in Seattle, Washington and the OARSI 2016 Congress, which will be held from 31 March to 3 April 2016 in Amsterdam, The Netherlands. The presenter will use this opportunity to review on-going 'wet' biomarker-related progress in the OA research community and focus on new biochemical and molecular studies that have advanced knowledge in this area in the previous 12 months. The review will include the results of a PubMed bibliographic search using the terms 'biomarker' and 'osteoarthritis' and summarize findings from papers published in the most relevant musculoskeletal, orthopaedics and rheumatology journals. Method(s): The PubMed/MEDLINE bibliographic database was searched using the following keywords: 'biomarker' and 'osteoarthritis'. The PubMed/MEDLINE literature search was conducted using the Advanced Search Builder function (http://www.ncbi.nlm.nih.gov/pubmed/ advanced) and specifically focused on the period between the 2015 OARSI meeting and the December 2015 deadline for the submission of abstracts for the 2016 congress. Result(s): Approximately sixty-eight new OA biomarker papers were published at the time this abstract was written (11 December, 2015). It is estimated that another fifty or so papers will be published by the end of March 2015. A small number of these papers are likely to identify new biomarkers whereas others may explore the biological properties and clinical utility of existing markers in greater detail. The biomarkers studied included some of the usual suspects such as cartilage oligomeric matrix protein (COMP), hyaluronic acid (HA), ADAMTS-4, the aggrecan ARGS neo-epitope and the type II collagen markers CTX-II, C2C and COLL2-1NO2. There were specific references to 'inflammatory biomarkers' of OA in some papers and several adipocytokine suspects were added to the line-up of offenders including leptin and adiponectin, providing molecular and mechanistic links between obesity and OA. Interestingly, ADAMTS-4 activity in synovial fluid was reported as a biomarker of inflammation and effusion. Serum and synovial fluid resistin was implicated in knee OA. ARGS-aggrecan was also implicated in a localized repair response involving an increase in aggrecan turnover following severe knee trauma. Plasma CCL3 was reported as a potential serum biomarker for knee OA with the capacity to detect preradiographic changes. New biomarker technologies were also developed including a fluoro-microbead guiding chip (FMGC) for measuring CTX-II in serum and urine and a novel magnetic nanoparticle-based technology was described for collecting and concentrating CTX-II, termed magnetic capture. Conclusion(s): The last 12 months have witnessed solid progress in the area of OA biomarker research. Several novel biomarkers have been identified and new technologies have been developed for measuring existing biomarkers. However, identification of early OA biomarkers remains a challenging and arduous task. Combining advanced imaging techniques and biochemical markers with bioinformatics (i.e. machine learning, clustering, data visualization) should increase the predictive power of new 'combination biomarkers' in the future. The refinement of proteomic, metabolomic and immunoassay technologies is also likely to contribute to improvements in diagnostic assays for wet biomarkers in serum, synovial fluid and urine.

Moeini, A., et al. (2018). "Effect of pH and TPP concentration on chemico-physical properties, release kinetics and antifungal activity of Chitosan-TPP-Ungeremine microbeads." Carbohydrate Polymers **195**: 631-641.

In this study, chitosan based microbeads containing Ungeremine, an antimicrobial alkaloid particularly active against Penicillium roqueforti, a filamentous fungus responsible of the bakery products deterioration, were prepared by external gelation by using sodium tripolyphosphate (TPP) as crosslinking agent. The stability of the beads, as well as the loading efficiency of the bioactive molecule, were assessed at different pH and TPP concentrations resulting particularly enhanced at low pH. All the microbeads evidenced antimicrobial activity against Penicillium roqueforti. The release kinetics of Ungeremine was tailored by opportunely modulating pH and TPP concentrations. Morphological analysis evidenced the improvement of the structural crosslinking density of microbeads including Ungeremine and spectroscopic analysis emphasized the active participation of Ungeremine to the crosslinking process occurring between chitosan and TPP. Finally, thermogravimetric analysis confirmed the increasing of free volume in

three-dimensional networks and their liability to thermal degradation.

Moghtader, F., et al. (2017). "Phages in modified alginate beads." Artificial Cells, Nanomedicine, & Biotechnology **45**(2): 357-363.

In order to increase stabilities and controlled/sustained released of T4 phages were encapsulated within alginate beads which were then coated with chitosan, polyethylene imine (PEI). Quite high loading capacities (over 90%) were achieved in these pH-sensitive microbeads. Coating with those polycations increased significantly stability both in "simulated gastric fluid" and bile salts especially in the case of PEI coating. The tests conducted in "simulated intestinal fluid" demonstrated that phages were released from the beads which were active at basic pH in which the release rates were smaller in case of chitosan. PEI concluded to be a better coating then chitosan.

Mohamed, A., et al. (2019). "Single microbead-based fluorescence "turn on" detection of biothiols by flow cytometry." Talanta **195**: 197-203.

Biological thiols (biothiols), such as glutathione (GSH), cysteine (Cys) and homocysteine (Hcy), play a vital role in the process of reversible redox reactions in physiological systems. In this work, flow cytometry-based fluorescent sensor is for the first time developed for the detection of biothiols in a fluorescence "turn on" manner. The probe which we name "Polystyrene/Quantum Dots/Gold Nanoparticles" or (PS/QDs/Au) is constructed by immobilizing QDs onto the surface of PS microbeads to obtain fluorescent microbeads. The probe (PS/QDs/Au) is constructed by immobilizing QDs onto the surface of PS microbeads to obtain fluorescent microbeads, followed by gold NPs absorption through electrostatic interaction to quench their fluorescence. In the presence of biothiols, the fluorescence of our probe can be restored in less than 5min, and the detection limits for GSH, Cys and Hcy are 0.5muM, 0.1muM and 0.3muM, respectively. Most importantly, the fluorescence signal of each of our probe microbeads can be collected individually by flow cytometry, realizing single microbead-based biothiols detection for the first time. Moreover, the probe is successfully applied to imaging of intracellular biothiols in A549 cells, demonstrating its potential in biological application.

Mohamed, F., et al. (2017). "Nephrotoxicity-induced proteinuria increases biomarker diagnostic thresholds in acute kidney injury." BMC Nephrology **18**(1): 122.

BACKGROUND: Paraquat ingestion is frequently fatal. While biomarkers of kidney damage increase during paraquat-induced acute kidney injury (AKI), significant concurrent proteinuria may alter diagnostic thresholds for diagnosis and prognosis to an unknown extent. This study evaluated the effect of albuminuria on biomarker cutoffs for diagnosis and outcome prediction.

METHODS: This was a multi-centre prospective clinical study of patients following acute paraquat self-poisoning in 5 Sri Lankan hospitals. Biomarker concentrations were quantified using ELISA and microbead assays and correlated with urinary albumin. Functional-AKI was defined by the Acute Kidney Injury Network serum creatinine definition and alternatively by a >=50% increase in serum cystatin C. Albuminuria was defined as albumin-creatinine ratio >30 mg/g. The study outcomes were compared with a retrospective analysis of a pre-clinical study of paraquat-induced nephrotoxicity with appropriate controls.

RESULTS: Albuminuria was detected in 34 of 50 patients, and increased with functional-AKI severity. The concentrations of uNGAL, uCysC, uClusterin, ubeta2M, and uKIM-1 were higher in albuminuric compared to non-albuminuric patients ($p < 0.001$). Albuminuria correlated with biomarker concentration ($r > 0.6$, $p < 0.01$) and was associated with death ($p = 0.006$). Optimal biomarker cutoffs for prediction of death were higher in the albuminuric group. Similar outcomes with

more detailed analysis were obtained in experimental paraquat nephrotoxicity.
CONCLUSION: Albuminuria was associated with paraquat-induced nephrotoxicity and increased excretion of low-molecular weight protein biomarkers. AKI biomarker cutoffs for diagnosis, outcome prediction and AKI stratification increased in the presence of albuminuria. This may lead to over-diagnosis of AKI in conditions independently associated with proteinuria.

Mohamed Nor, N. H. and A. A. Koelmans (2019). "Transfer of PCBs from Microplastics under Simulated Gut Fluid Conditions Is Biphasic and Reversible." Environmental Science & Technology **53**(4): 1874-1883.

The role of plastic as a vector for bioaccumulation of toxic chemicals is central to the risk assessment of microplastic for human health and the environment. However, transfer kinetics of sorbed contaminants from ingested microplastics are poorly understood. We develop and parametrize a chemical exchange model on microplastics in a gut fluid mimic of aquatic biota, and also included food to provide a better representation of contaminant dynamics when plastic and food are ingested, as would occur in nature. The transfer kinetics of 14 polychlorinated biphenyls (PCBs) were measured in gut fluid mimic systems under three environmentally relevant exposure scenarios of plastic ingestion by organisms, for low-density polyethylene (LDPE) and polyvinyl chloride (PVC), and were evaluated with the model. Chemical transfer was demonstrated to be biphasic and fully reversible, with fast exchange within hours followed by a slow transfer lasting for weeks to months. In clean gut systems, the bioavailability of plastic-associated PCBs for lugworms and cod ranged from 14 to 42% and 45-83% respectively. However, in contaminated gut systems, clean microplastic was capable of rapidly extracting ("cleaning") PCBs from food inside the gut, thus demonstrating that the effect of microplastic is context dependent. Therefore, chemical contamination and cleaning are likely to occur simultaneously due to the ingestion of microplastic.

Mohammed, J. M., et al. (2017). "The impact of different N sources on the growth and yield of cucumber varieties under the plastic greenhouse." Lucrari Stiintifice, Universitatea de Stiinte Agricole Si Medicina Veterinara "Ion Ionescu de la Brad" Iasi, Seria Horticultura **60**(2): 99-110.

Studies were conducted to determine the effect of various nitrogen (N) fertilizer sources on the growth and yield of cucumber under greenhouse condictions. Two cucumber cultivars (Ansor F1 and Trilogy F1) were planted under 10 microplastic greenhouses. The fertilizer treatments included 300 g DIX 10 N (D), 50 and 100 g NovaTec (N1 and N2), 200 g Orgevit (O)/m² and unfertilized control. Results indicated that there were significant differences among treatments, but it was observed that for all characters studied, there was an increase with significantly difference with an increase in the N level. Generally, all N fertilizer treatments (organic and inorganic) increased the soil N-NH₄, N-NO₃, P-PO₄ and K levels in the soil. Results also showed that Ansor F1 fertilized with DIX 10 N (AD) and Ansor F1 and Trilogy F1 with NovaTec 100 g/m² (AN2) and (TN2) gave strongly positive effects on the plant length and plant and root dry matter. The highest content of pigments was found in Ansor F1 fertilized with DIX 10 N (AD), NovaTec 100 g/m² (AN2) and Trilogy with DIX 10 N (TD). A significant increase in leaf content of N-NO₃ represented by inorganic fertilizer treatments were also observed, while the highest content of P-PO₄ was represented by TN2 and TO (657.86 and 728.93 ppm, respectively). It was clearly shown the highest K content affected strongly the increase of inorganic fertilizers, which was recorded with AN2 and TN2 (4513 and 4640 ppm, respectively). Results showed that all inorganic treatments gave normal and healthy concentrations of N-NO₂ and K in fruits. All treatments had strong effects on fruit length, but the greatest diameter were recorded with TN1 and TN2. The best yield results were recorded by

Trilogy F1 fertilized with DIX 10 N (TD) and Orgevit (TO), followed by Ansor F1 with Orgevit (AO) treatment, which were 4.10, 4.04 and 4.05 kg, respectively.There were significant variations between the cultivars regarding CO₂ concentrations in response to the different commercial fertilizers. The highest values was observed in the control (1449.97 and 1516.76 ppm). All treatments showed significant increase in O₂ compared to the control variants.

Mohammed, M. I., et al. (2018). "Physiological and biochemical changes analysis to labors blood samples in plastics recycling factory in Mosul-Iraq." Journal of Global Pharma Technology **10**(6): 281-288.

In this study, the healthy impacts of environmental and emitted pollutants from the recycling plastics factories in the Right Bank district of Mosul City were investigated. Urine and blood samples were collected from workers who exposed to these pollutants. Some of physiological and biochemical tests have been achieved which including Blood Pressure, Hb (Hemoglobin), PCV, ESR, blood urea, serum total protein, serum total cholesterol, serum triglycerides, ALT (GPT) and AST (GOT). Also, General Urine Examination has been performed. All results were compared with 20 unaffected persons as a control group. The results of the current study showed significant differences in some testes compared with the control group. Hemoglobin increased to 17.00 g/dl in the workers which had >20 years-work compared with the control (14.00 g/dl). Furthermore, PCV have a significant increase ranging from 55.53% to 90.53% in workers who have <10, 11-20 and >20 years-work. Blood Urea recorded highest value 50 g/dl for workers >20 years-work, while declined to the lowest value 37 g/dl in case <10 years-work. Also, liver enzymes (Aspartate Transaminase and Alanine Transaminase) were recorded slight increase reached to 13.3 and 6.6 IU/dl respectively. In addition, General Urine Examination exhibited various kinds of cells besides highest percentages of Calcium Oxalate, pus cells, amorphous and RBC (Red Blood Cells) reached to 40.85%, 13.85%, 8.71% and 3.85% respectively. ©2009-2018, JGPT. All Rights Reserved.

Mohammed, S., et al. (2019). "Optimization of the culture conditions for production of Polyhydroxyalkanoate and its characterization from a new Bacillus cereus sp. BNPI-92 strain, isolated from plastic waste dumping yard." International Journal of Biological Macromolecules **18**: 18.

The aim of this study was to optimize the culture conditions for production, recovery and characterization of polyhydroxyalkanoate (PHA) from potential Bacillus cereus strain BNPI-92. Cost effective carbon sources such as crude oil (CO), rice bran (RB), sugar cane molasses (SCM) and wheat bran (WB) were evaluated for PHA production using the isolate. Higher cell dry weight (CDW) (g/L), PHA concentration (P conc.) (g/L) PHA contents (PC) (%) and PHA synthesis rate (PSR) were obtained from Glucose (60.67% w/v) as a carbon source at 37 degreeC and pH 7 using Taguchi DOE methods. The polymer was characterized by FTIR and its functional groups (C=O) (1719.41 cm⁻¹ wavenumber) was a characteristic feature of PHB polymer. For ¹HNMR, signals of methyne (CH) (5.28 ppm), methylene (-CH2-) (2.45 ppm) and methyl (CH3) (1.27 ppm) and copolymers were predicted. Copolymers such as P (3HB-co-3 HV) and P(3HB-co-3HHX) i.e. characteristic feature of PHB were obtained from a sample of glucose, WB, and RB, respectively. XRD pattern also confirmed the presence of PHA. The major compounds obtained from GC/MS analysis of the polymer recovered from the isolate BNP-92 were 2-butenoic acid, methyl ester (8.6%), ethyl cyclopropanecarboxylate (45.99%), 1-Undecanol (10.18%) which corresponds to and have produced from PHA after thermal degradation.

Mohammed, S., et al. (2019). "An investigation for recovery of polyhydroxyalkanoates (PHA) from

Bacillus sp. BPPI-14 and Bacillus sp. BPPI-19 isolated from plastic waste landfill." International Journal of Biological Macromolecules **134**: 1085-1096.

Bio-plastic synthesis from renewable and cheap agro-based materials is a sustainable solution for replacing conventionally produced plastic with environmental contamination. The current study was aimed at screening and characterization of Polyhydroxyalkanoates (PHA) producing bacterial isolates, evaluation of their potential and recovery of PHA using the isolates. The PHA compounds were characterized using FT-IR. Based on 16SrRNA sequence analyses the isolates were designated as Bacillus sp. BPPI-14 and Bacillus sp. BPPI-19. The isolates were gram-positive, rod-shaped, endospore former, and citrate test positive. Intracellular PHA granules were observed when these isolates were stained with Sudan black B (SBB) and Nile blue A (NBA) preliminary and specific staining dyes, respectively. Effect of pH, temperature and carbon sources on the PHA production by the isolates BPPI-14 and BPPI-19 was studied. Maximum PHA production was recorded for Glucose (49.46+/-2.79%) by Bacillus sp. BPPI-14 and followed by molasses (45.86+/-2.17%) by Bacillus sp. BPPI-19, respectively at 37degreeC and pH7. The obtained PHA polymers were confirmed by preparation of plastic films for both the isolates. Fourier transform infrared spectrum for BPPI-14 and BPPI-19 showed the peak (carboxylic acid group) at 1706-1719.39cm⁻¹ was a characteristic feature of PHA and corresponds functional group (C=O).

Mohan, N. and R. Usha (2018). "Bio-augmentation - Effective method of treating plastic waste - A field study." Journal of Pure and Applied Microbiology **12**(3): 1641-1646.

Polythene waste is a serious threat to our environment. There are many methods available for its degradation. The present study shows light for eco friendly approach for mitigating the ecological problem of the century. By using bio-augmentation, microorganisms having specific metabolic capabilities are introduced into the contaminated site for enhancing the degradation of plastic waste. The field trials for a period of 3 months shows clearly that the LDPE sheets are better degraded with augmented microorganism (1.6%,4%,5.2%,8%,8.8%) than non bio augmented soil (4%,1.6%,2.8%3.6%4%). The ecological importance of this study is that we will be able to tackle plastic waste by adding bio-augmented strains in to an area or dumpyard filled in with plastic waste. Copyright © 2018 Journal of Pure and Applied Microbiology. All rights reserved.

Mohankar, R. H., et al. (2017). "Behaviour of soil reinforced with plastic waste." International Journal for Research in Applied Science and Engineering Technology **5**(6): 1058-1063.

In this paper the study of behaviour of black cotton soil, reinforced with plastic waste is done. Various tests are performed to study the properties of soil, various percentage of plastic waste are added and results are compared with the soil without plastic waste. The results shown considerable improvement in the properties of soil.

Mohapatra, A., et al. (2018). "Magnetic stimulus responsive vancomycin drug delivery system based on chitosan microbeads embedded with magnetic nanoparticles." Journal of Biomedical Materials Research. Part B, Applied Biomaterials **106**(6): 2169-2176.

Local antibiotic delivery can overcome some of the shortcomings of systemic therapy, such as low local concentrations and delivery to avascular sites. A localized drug delivery system (DDS), ideally, could also use external stimuli to modulate the normal drug release profile from the DDS to provide efficacious drug administration and flexibility to healthcare providers. To achieve this objective, chitosan microbeads embedded with magnetic nanoparticles were loaded with the antibiotic vancomycin and stimulated by a high frequency alternating magnetic field. Three such stimulation sessions separated by 1.5 h were applied to each test sample. The chromatographic analysis of the supernatant from these stimulated samples showed more than approximately 200% higher release of vancomycin from the DDS after the stimulation periods compared to nonstimulated samples. A 16-day long term elution study was also conducted where the DDS was allowed to elute drug through normal diffusion over a period of 11 days and stimulated on day 12 and day 15, when vancomycin level had dropped below therapeutic levels. Magnetic stimulation boosted elution of test groups above minimum inhibitory concentration (MIC), as compared to control groups (with no stimulation) which remained below MIC. The drug release from test groups in the intervals where no stimulation was given showed similar elution behavior to control groups. These results indicate promising possibilities of controlled drug release using magnetic excitation from a biopolymer-based DDS. © 2017 Wiley Periodicals, Inc. J Biomed Mater Res Part B: Appl Biomater, 106B: 2169-2176, 2018.

Mohd Armi, A. S., et al. (2013). "Household solid waste composition in Balakong City, Malaysia: trend and management." Polish Journal of Environmental Studies **22**(6): 1807-1816.

Waste is an obvious by-product that comes from human activities. Urbanization, economic development, and improving living standards in cities all have an impact on the increase of the quantity and difficulty of generated waste. Fast population growth and industrialization degrades the urban environment and places serious stress on natural resources. Inefficient management and disposal of solid waste is a noticeable cause of degradation of the environment in most cities of the developing world. MSW generation depends on township size and level of economic standards. Thus, it was proven by the MSW generated in the selected area of Kluang (a small town in the southern part of Peninsular Malaysia) amounted to as little as 45 tons and as much as 3,000 tons in Kuala Lumpur (Malaysia's capital). More analysis reported that the largest sources of MSW generation come from household waste, followed by industrial and commercial wastes. In Selangor State, the highest percentage of MSW consisted of putrescible waste of approximately 46%, followed by plastic and paper at 15% and 14%, respectively. This paper focuses on the trend and management of household solid waste composition generated in Balakong City, Malaysia. A survey for household residents in eight housing areas was carried out for one month and data were collected on a daily basis. The composition of solid waste collected was segregated into different components (organic waste, plastic, paper, glass, metal, and other). For overall household solid waste composition generated in the Balakong area, organic waste recorded the highest percentage at 555.5%. Then, followed by plastic waste 82.2%, paper 74.4%, other waste 42.9%, glass 25.8%, the lowest waste generated was metal at 18.9%. There is a relation between the economic position of a country and per capita waste generation rate. While the standard of living rises, waste generation rates also are increasing. The world trend of solid waste generation nowadays (including Malaysia) is mostly dependent on the changing consumption pattern, and also related to climate and seasonal differences. Thus, the management and planning of solid waste generated must be enhanced to improve sustainable solid waste management in Malaysia. Besides, public awareness, funding, expertise, equipment, and facilities that are currently lacking must be provided.

Mohd, S., et al. (2010). "Study of knowledge, attitude and practices regarding biomedical waste among paramedical workers." Indian Journal of Community Medicine **35**(2): 369-370.

A hospital-based cross-sectional study was carried out between March and September 2009 to assess the knowledge, attitude and practices of hospital staff regarding biomedical waste management. Of 267 private nursing homes and clinics in Karimnagar, Andhra Pradesh, India, 47

were selected by systematic random sampling. A total of 500 study subjects (201 males and 299 females) were selected from these hospitals and informed consent was obtained from them. Of the 500 study subjects, 237 were nurses, 132 were lab technicians and 131 were housekeeping staff. A total of 266 study subjects knew about BMW correctly, of which 138 (51.8%) were nurses, 114 (42.85%) were technicians and 14 (5.26%) were housekeepers. Only 8 (1.6%) study subjects knew about categories of BMW of which 5 (62.5%) were technicians. A total of 353 (70.6%) study subjects were having an idea about segregation of BMW. Seventy-two (14.4%) subjects had knowledge about various methods of disposal of BMW. Majority of the study subjects had knowledge about various health problems caused by BMW, of which 234 (48.8%) were nurses. The attitude of the study subjects toward separation of infectious and non-infectious waste, proper disposal and implementation of rules was positive i.e. 496 (99.2%), 494 (98.8%), and 492 (98.4%), respectively. 278 (55.6%) study subjects committed that they will cooperate in BMW management. The nurses had a better attitude toward separation of wastes (n=236; 99.5%), proper disposal (n=234; 98.7%), implementation of rules (233; 98.3%) and cooperation in programmes (149; 62.8%). The attitude of technicians and housekeeping staff was found to be almost similar. Of the 482 (96.4%) study subjects who minimized waste, 227 (47%) were nurses, 129 (26.76%) were technicians and 126 (26.14%) were housekeepers. A total of 335 (67%) study subjects segregated BMW, of which majority were nurses, 169 (50.44%). Of the 297 (59.4%) subjects who collected waste into colour-coded bags, 150 (50.5%) were nurses. Segregation and separation of plastic waste was done better by the nurses i.e. 169 (50.4%) of 335 (67%) and 56 (11.2%) of 95 (58.9%), respectively. None of the subjects disinfected the waste before disposal. 490 (98%) subjects were sending BMW to private agency for disposal and treatment.

Mohsen, M., et al. (2019). "Heavy metals in sediment, microplastic and sea cucumber Apostichopus japonicus from farms in China." Marine Pollution Bulletin **143**: 42.

The concentrations of eight heavy metals (As, Cd, Cr, Cu, Mn, Ni, Pb and Zn) were measured in the sediment, the isolated microplastics from the sediment and the body wall of sea cucumbers from farms in China. Accordingly, the heavy metal concentrations in the sediment were below the class I upper limit of Chinese sediment quality guidelines. Among heavy metals, the median concentrations of Cd and As were higher in the body wall than in the corresponding sediment. Additionally, the median concentrations of Cd, Pb, and Zn were higher on the microplastics than in the corresponding sediment. Furthermore, there was no significant correlation among heavy metals in sediment, sea cucumber and microplastics. This study contributes to the understanding of the heavy metal accumulation in the sediment, the microplastics and the body wall of the sea cucumber.

Mohsen, M., et al. (2019). "Microplastic ingestion by the farmed sea cucumber Apostichopus japonicus in China." Environmental Pollution **245**: 1071-1078.

Microplastic ingestion by the farmed sea cucumber is undocumented. Microplastics were isolated from the sea cucumber Apostichopus japonicus that was collected from eight farms along the Bohai Sea and the Yellow Sea in China. To examine microplastic ingestion, the intestines were isolated, digested and then subjected to the floatation test. The microplastic abundance in the sediment ranged from 20 to 1040 particles kg⁻¹ of dry sediment, while the ingested microplastics ranged from 0 to 30 particles intestine⁻¹. After filtering the coelomic fluid, the extracted microplastics from the coelomic fluid ranged from 0 to 19 particles animal⁻¹. Thus, we speculated that microplastics may transfer to the coelomic fluid of sea cucumber. The ingested microplastics did not correlate with the animal

body weight but was site dependent, suggesting that sea cucumber may serve as sentinel for microplastic pollution monitoring in the sediment. The microplastics were identified by Fourier transform infrared micro spectroscopy, and the polymer types were mainly cellophane, polyester, and polyethylene terephthalate. This study revealed that, microplastics widely existed in sea cucumber farms, and that sea cucumbers ingest microplastics as suitable with their mouth open. Moreover, the microplastics might transfer to the coelomic fluid of the sea cucumber. Further investigations are needed to assess the chronic effect of the microplastics on the growth and physiological status of the sea cucumber.

Mohsen, M., et al. (2019). "Microplastic fibers transfer from the water to the internal fluid of the sea cucumber Apostichopus japonicus." Environmental Pollution: 113606.

Microplastics (MPs) are small plastic particles less than 5mm in diameter. MPs in the form of microfibers (MFs) are widely detected in aquatic habitats and are of high environmental concern. Despite many reports on the effects of MFs on marine animals, their effect on sea cucumbers is still unclear. In addition, our previous filed study has shown that MFs may transfer to the coelomic fluid of the sea cucumber Apostichopus japonicus (A. japonicus). Here, we show how MFs transfer to the coelomic fluid of the sea cucumber. We captured the MFs during their transfer from the water to the coelomic fluid through the respiratory tree. A. japonicus ingested in the MFs along with the water during respiration; the MFs got stuck in the respiratory tree or transferred to the coelomic fluid. The transferred MFs increased during 72h of exposure and persisted for 72h after the transfer to clean water. Among the immunity indices, lysozyme (LZM) levels increased in response to the transferred MFs, which confirms the defensive role of LZMs against strange substances. Additionally, non-significantly decreased levels of total antioxidant capacity (T-AOC), malondialdehyde (MDA), peroxidase (POD) and phenol oxidase (PPO) were observed at 24h and 48h post-exposure, suggesting minimal oxidative imbalance. Furthermore, there were no significant changes in the speed and the total distance moved by A. japonicus post MFs transfer. This study revealed that MFs transfer and accumulate in the coelomic fluid of A. japonicus.

Mokhtar, M., et al. (2018). The Utilisation of Shredded PET as Aggregate Replacement for Interlocking Concrete Block. Les Ulis, EDP Sciences. **34**.

The consumption of plastic has grown substantially all over the world in recent years and this has created huge quantities of plastic-based waste. Plastic waste is now a serious environmental threat to the modern way of living, although steps were taken to reduce its consumption. This creates substantial garbage every day, which is much unhealthy. Plastic bottles such as Polyethylene terephthalate (PET) was use as the partially component in this making of interlocking blocks concrete. This project investigates the strength and workability of the interlocking block concrete by replacing course aggregate with % PET. The suitability of recycled plastics (PET) as course aggregate in interlocking block concrete and its advantages are discussed here. Moreover, there were more benefits when using interlocking block than using conventional block such as it easy for construction because they are aligning, easy to place, high speed stacking and they offer more resistance to shear and buildings would be even stronger. Based on the test perform, the failure parameter were discussed .From the compressive strength test result, it shows that the strength of concrete block decreased with increased of PET used. From the results, it shows that higher compressive strength was found with 5% natural course aggregate replaced with PET compared to other percentages.

Mokhtari, S., et al. (2017). "The cell wall compound of Saccharomyces cerevisiae as a novel wall material

for encapsulation of probiotics." Food Research International **96**: 19-26.

Yeast cell wall is known as a food grade ingredient which is recently being used increasingly as a novel coating for encapsulation of different materials in the food industry. This application is limited to core materials smaller than yeast in size. In this study, we have tried to encapsulate larger particles by crushing yeast cells. Hence, probiotic bacteria of Lactobacillus acidophilus and Bifidobacterium bifidum were encapsulated firstly by calcium alginate using the emulsion method and these microbeads were coated again by Saccharomyces cerevisiae cell wall compound and another layer of calcium alginate. The average diameter of microcapsules for single layer microbeads (M), microbeads coated by two layers of alginate (MCA), and microbeads coated by a layer of yeast cell and two layers of alginate (MCYA) were 54.25+/-0.18, 77.43+/-8.24 and 103.66+/-13.33mum, respectively. In simulated gastrointestinal conditions, there was a significant (P<0.05) enhancement in resistance of L. acidophilus when applying a layer of S. cerevisiae cell wall compound. For MCA and MCYA after 2h exposure to simulated gastric juice, it was revealed a log reduction of 1.53+/-0.1 and 1.1+/-0.02 with pH1.55 and in simulated intestinal juice, 2.92+/-0.04 and 2.42+/-0.06 with 0.6% bile after previous 1h incubation in gastric conditions, respectively. It can be concluded that the cell wall compound of S. cerevisiae is a suitable protective coating for probiotics and it can improve the survival of probiotics within food products.

Mokhtari, S., et al. (2017). "Descriptive analysis of bacterial profile, physicochemical and sensory characteristics of grape juice containing Saccharomyces cerevisiae cell wall-coated probiotic microcapsules during storage." International Journal of Food Science & Technology **52**(4): 1042-1048.

In this study the feasibility of incorporation of probiotic microcapsules coated with fragmented yeast cell wall in grape juice was evaluated during 60 days at 4 degrees C. Lactobacillus acidophilus and Bifidobacterium bifidum were encapsulated in alginate microbeads and coated with fragmented Saccharomyces cerevisiae cell wall and calcium alginate and were added into grape juice. At the end of storage, the survival of probiotics was higher than recommended minimum value (10⁷ cfu mL⁻¹) and the results demonstrated that applying yeast cell wall layer for L. acidophilus microcapsules significantly enhanced its survival while did not affect the survival of B. bifidum (P>0.05). Generally, probiotic grape juice showed decrease in degrees Brix, pH and colour and increase in acidity and turbidity during storage and the presence of yeast wall layer had no significant effect on its properties expect colour and turbidity. Overall acceptance of grape juices containing yeast cell wall-coated microcapsules scored the least.

Molina-Moya, B., et al. (2018). "Mycobacterium tuberculosis complex genotypes circulating in Nigeria based on spoligotyping obtained from Ziehl-Neelsen stained slides extracted DNA." PLoS Neglected Tropical Diseases **12 (2) (no pagination)**(e0006242).

Tuberculosis (TB) remains one of the most threatening diseases and Nigeria has one of the world's largest burdens. This study performed high-throughput spoligotyping directly on sputum smears to describe the Mycobacterium tuberculosis strains circulating among new TB patients in Nigeria. Method(s): All State TB control programmes in Nigeria were requested to submit 25-50 smear-positive Ziehl-Neelsen (ZN) stained slides for screening during 2013-2014. DNA was extracted from 929 slides for spoligotyping and drug-resistance analysis using microbead-based flow-cytometry suspension arrays. Result(s): Spoligotyping results were obtained for 549 (59.1%) of 929 samples. Lineage 4 Cameroon sublineage (L4.6.2) represented half of the patterns, Mycobacterium africanum (L5 and L6) represented one fifth of the patterns, and all other lineages, including other L4 sublineages, represented one third of the patterns. Sublineage

L4.6.2 was mostly identified in the north of the country whereas L5 was mostly observed in the south and L6 was scattered. The spatial distribution of genotypes had genetic geographic gradients. We did not obtain results enabling the detection of drug-resistance mutations. Conclusion/Significance: We present the first national snapshot of the M. tuberculosis spoligotypes circulating in Nigeria based on ZN slides. Spoligotyping data can be obtained in a rapid and high-throughput manner with DNA extracted from ZN-stained slides, which may potentially improve our understanding of the genetic epidemiology of TB. Copyright © 2018 Molina-Moya et al.

Mondal, M. K., et al. (2019). "Recycling waste thermoplastic for energy efficient construction materials: An experimental investigation." Journal of Environmental Management **240**: 119-125.

A large stream of research has studied the performance of waste plastics impregnated concrete, reporting multiple benefits and advocating its use in construction works. But no study has reported the merits of bricks impregnated with waste plastics. The present paper reports the results of experiments done on bricks made up of varying percentages of waste thermoplastics (0 - 10% by weight) and sand (60 - 70% by weight), holding percentages of fly ash and ordinary Portland cement constant at 15% (by weight) each. Three types of waste thermoplastics were used, forming three separate batches of bricks. The plastics were polycarbonates, polystyrenes, and mixed plastics. The bricks were cured under water for 28 days. Some of the batches were baked at temperatures ranging from 90 degreeC to 110 degreeC for 2 hours in order to melt the plastics to form voids. The bricks made with the above-stated compositions were found to possess low thermal conductivity and adequately high compressive strength. The compressive strength of these bricks is observed to be more than 17 MPa, which lies within the upper half of the range of strengths specified for bricks in the IS 1077:1992 standard. The waste plastics impregnated bricks display high thermal resistance, a feature that can add economic value to the brick manufacturers, motivating them to establish the necessary logistics for collection and use of all types of waste thermoplastics. The paper also presents a regression model to predict the compressive strength of bricks at varying plastic contents. The study, thus, introduces a new strand of research on sustainable recycling of waste thermoplastics in the context of the circular economy. Copyright © 2019 Elsevier Ltd

Monk, J. M., et al. (2013). "n3 PUFAs reduce mouse CD4⁺ T-cell ex vivo polarization into Th17 cells." Journal of Nutrition **143**(9): 1501-1508.

Little is known about the impact of n3 (omega 3) PUFAs on polarization of CD4⁺ T cells into effector subsets other than Th1 and Th2. We assessed the effects of dietary fat [corn oil (CO) vs. fish oil (FO)] and fermentable fiber [cellulose (C) vs. pectin (P)] (2x2 design) in male C57BL/6 mice fed CO-C, CO-P, FO-C, or FO-P diets for 3 wk on the ex vivo polarization of purified splenic CD4⁺ T cells (using magnetic microbeads) into regulatory T cells [Tregs; forkhead box P3 (Foxp3⁺) cells] or Th17 cells [interleukin (IL)-17A⁺ and retinoic acid receptor-related orphan receptor (ROR) gamma tau ⁺ cells] by flow cytometry. Treg polarization was unaffected by diet; however, FO independently reduced the percentage of both CD4⁺ IL-17A⁺ (P<0.05) and CD4⁺ ROR gamma tau ⁺ cells (P<0.05). Moreover, expression of another critical Th17-cell-related transcription factor, signal transducer and activator of transcription 3, was reduced by FO. Dietary FO reduced the surface expression of both IL-6R and IL-23R on polarized Th17 cells (P<=0.05), thus interfering with the promotive effects of these critical cytokines on Th17 polarization. Additionally, C57BL/6 mice fed diets enriched in eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), or DHA+EPA similarly reduced Th17-cell polarization in comparison

to CO by reducing expression of the Th17-cell signature cytokine (IL-17A; P=0.0015) and transcription factor (ROR gamma tau P=0.02), whereas Treg polarization was unaffected. Collectively, these data show that n3 PUFAs exert a direct effect on the development of Th17 cells in healthy mice, implicating a novel n3 PUFA-dependent, anti-inflammatory mechanism of action via the suppression of the initial development of this inflammatory T-cell subset.

Monk, J. M., et al. (2015). "Fish-oil-derived n-3 PUFAs reduce inflammatory and chemotactic adipokine-mediated cross-talk between co-cultured murine splenic CD8⁺ T cells and adipocytes." Journal of Nutrition **145**(4): 829-838.

Background: Obese adipose tissue (AT) inflammation is characterized by dysregulated adipokine production and immune cell accumulation. Cluster of differentiation (CD) 8⁺ T cell AT infiltration represents a critical step that precedes macrophage infiltration. n-3 (omega -3) Polyunsaturated fatty acids (PUFAs) exert anti-inflammatory effects in obese AT, thereby disrupting AT inflammatory paracrine signaling.

Monson, C. F. and M. Majda (2007). "Ion diffusion in channels containing random arrays of microspheres: an electrochemical time-of-flight method." Analytical Chemistry **79**(24): 9315-9320.

Rates of chloride ion diffusion in narrow (ca. 3 microm thick), rectangular (ca. 0.1 x 1.0 mm(2)) channels partially filled with polystyrene microspheres are investigated by a potentiometric electrochemical time-of-flight (P-ETOF) method. Lithographically fabricated on glass slides, P-ETOF devices consist of a centrally positioned 10 microm wide, ca. 1 mm long generator microelectrode and two sensor microelectrodes of the same dimensions symmetrically positioned on both side of the generator at a distance of 50 microm. The electrodes are silver-plated and partially oxidized in a chloride electrolyte to form Ag/AgCl deposits. Constant current reduction of AgCl on the generator electrode is used to produce chloride ions at a constant rate. Ag/AgCl deposited on the sensor microelectrodes allows time-dependent potentiometric monitoring of the increasing concentration of chloride ions diffusing across the interelectrode gap. The device is enclosed with a parallel glass plate to form a narrow channel with the polystyrene microbeads serving as spacers. The packing density of the microspheres expressed in terms of the fractional void volume (rho) varied from ca. 0.6 to 1.0. Using rho, we modified a diffusion equation describing the change of chloride ion concentration at the sensor microelectrode to include the effect of the microspheres restricting the void volume. We rely on digital simulations as well as on direct P-ETOF experiments to show that the proposed equation does accurately account for the effect of rho on the diffusion processes. We thus demonstrate that P-ETOF can be used to measure the number of identical microspheres in the active region of a narrow channel device. In the latter context, a future application of P-ETOF as a signal transduction mechanism in biosensors is outlined.

Montanucci, P., et al. (2015). "Insights in Behavior of Variably Formulated Alginate-Based Microcapsules for Cell Transplantation." BioMed Research International **2015**: 1-11.

Alginate-based microencapsulation of live cells may offer the opportunity to treat chronic and degenerative disorders. So far, a thorough assessment of physical-chemical behavior of alginate-based microbeads remains cloudy. A disputed issue is which divalent cation to choose for a high performing alginate gelling process. Having selected, in our system, high mannuronic (M) enriched alginates, we studied different gelling cations and their combinations to determine their eventual influence on physical-chemical properties of the final microcapsules preparation, in vitro and in vivo. We have shown that used of ultrapure alginate allows for high biocompatibility of the formed microcapsules, regardless of gelation agents, while use of different gelling cations is associated with corresponding variable effects on the capsules' basic architecture, as originally reported in this work. However, only the final application which the capsules are destined to will ultimately guide the selection of the ideal, specific gelling divalent cations, since in principle there are no capsules that are better than others.

Monteleone, A., et al. (2019). "Development of an extraction method for microplastics from biological materials and fast prognosis of contamination based on autofluorescence." Biomedizinische Technik **64 (2)**: S207.

Since the beginning of industrial production in 1950, plastic production has continued to grow strongly worldwide and is now at 335 million tonnes in the year 2016. From these very high production volumes ever larger quantities are found in the environment. There the plastics degradate to microplasticity and spread ubiquitously in the world. The present work deals with the possible uptake of microplastic particles in human organisms. For the detection of these plastic particles, an extraction method was developed and validated. Biological materials consist of human blood (healthy volunteers, n = 5) and different tissues of pigs and cattles. Various lysis solutions were tested for degradation efficiency of biological material and for effects on the plastics. The mass loss, surfaces and structure variations as well as the physiochemical spectrum of the material were observed after treatment by electron microscopy (EM), Fluorescent microscope and Fourier transform infrared spectrometry (FTIR). The different plastic types as polyamides (PA), polycarbonate (PC), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC) could be clearly differentiated and identified by FTIR. Regarding the surface control, especially PVC showed detectable alterations: After extraction an irregular surface structure caused by protuberances or bubbles could be observed. However, instead of these alterations an equivalent count of plastic particles was found in correlation to the applied plastic amount (recovery rate overall was 99,35 0,43%).). Increasing the intensity of autofluorescence by means of temperature treatment makes the particles visible on the membranes, which can be counted automatically by the computer program ImageJ. The autofluorescence can be used for an initially and fast prognosis of microplastic contamination on the membranes. The applied method can be used for plastic extractions from human or animal tissues without remarkable effects on the plastics.

Moore, C. J. (2008). "Synthetic polymers in the marine environment: A rapidly increasing, long-term threat." Environmental Research **108**(2): 131-139.

Synthetic polymers, commonly known as plastics, have been entering the marine environment in quantities paralleling their level of production over the last half century. However, in the last two decades of the 20th Century, the deposition rate accelerated past the rate of production, and plastics are now one of the most common and persistent pollutants in ocean waters and beaches worldwide. Thirty years ago the prevailing attitude of the plastic industry was that "plastic litter is a very small proportion of all litter and causes no harm to the environment except as an eyesore" [Derraik, J.G.B., 2002. The pollution of the marine environment by plastic debris: a review. Mar. Pollut. Bull. 44(9), 842-852]. Between 1960 and 2000, the world production of plastic resins increased 25-fold, while recovery of the material remained below 5%. Between 1970 and 2003, plastics became the fastest growing segment of the US municipal waste stream, increasing nine-fold, and marine litter is now 60-80% plastic, reaching 90-95% in some areas. While undoubtedly still an eyesore, plastic debris today is having significant harmful effects on marine biota. Albatross, fulmars, shearwaters and petrels mistake floating plastics for food, and many individuals of these species are affected; in fact, 44% of all seabird species are known to ingest plastic. Sea turtles ingest plastic bags, fishing line and other plastics, as do 26

species of cetaceans. In all, 267 species of marine organisms worldwide are known to have been affected by plastic debris, a number that will increase as smaller organisms are assessed. The number of fish, birds, and mammals that succumb each year to derelict fishing nets and lines in which they become entangled cannot be reliably known; but estimates are in the millions. We divide marine plastic debris into two categories: macro, >5 mm and micro, <5 mm. While macro-debris may sometimes be traced to its origin by object identification or markings, micro-debris, consisting of particles of two main varieties, (1) fragments broken from larger objects, and (2) resin pellets and powders, the basic thermoplastic industry feedstocks, are difficult to trace. Ingestion of plastic micro-debris by filter feeders at the base of the food web is known to occur, but has not been quantified. Ingestion of degraded plastic pellets and fragments raises toxicity concerns, since plastics are known to adsorb hydrophobic pollutants. The potential bioavailability of compounds added to plastics at the time of manufacture, as well as those adsorbed from the environment are complex issues that merit more widespread investigation. The physiological effects of any bioavailable compounds desorbed from plastics by marine biota are being directly investigated, since it was found 20 years ago that the mass of ingested plastic in Great Shearwaters was positively correlated with PCBs in their fat and eggs. Colonization of plastic marine debris by sessile organisms provides a vector for transport of alien species in the ocean environment and may threaten marine biodiversity. There is also potential danger to marine ecosystems from the accumulation of plastic debris on the sea floor. The accumulation of such debris can inhibit gas exchange between the overlying waters and the pore waters of the sediments, and disrupt or smother inhabitants of the benthos. The extent of this problem and its effects have recently begun to be investigated. A little more than half of all thermoplastics will sink in seawater. © 2008 Elsevier Inc. All rights reserved.

Moore, C. J., et al. (2001). "A comparison of plastic and plankton in the North Pacific Central Gyre." Marine Pollution Bulletin **42**(12): 1297-1300.

The potential for ingestion of plastic particles by open ocean filter feeders was assessed by measuring the relative abundance and mass of neustonic plastic and zooplankton in surface waters under the central atmospheric high-pressure cells of the North Pacific Ocean. Neuston samples were collected at 11 random sites, using a manta trawl lined with 333 u mesh. The abundance and mass of neustonic plastic was the largest recorded anywhere in the Pacific Ocean at 334271 pieces km² and 5114gkm², respectively. Plankton abundance was approximately five times higher than that of plastic, but the mass of plastic was approximately six times that of plankton. The most frequently sampled types of identifiable plastic were thin films, polypropylene/monofilament line and unidentified plastic, most of which were miscellaneous fragments. Cumulatively, these three types accounted for 98% of the total number of plastic pieces. Copyright © 2001 Elsevier Science Ltd.

Moore, C. J., et al. (2002). "A comparison of neustonic plastic and zooplankton abundance in southern California's coastal waters." Marine Pollution Bulletin **44**(10): 1035-1038.

The density of neustonic plastic particles was compared to that of zooplankton in the coastal ocean near Long Beach, California. Two trawl surveys were conducted, one after an extended dry period when there was little land-based runoff, the second shortly after a storm when runoff was extensive. On each survey, neuston samples were collected at five sites along a transect parallel to shore using a manta trawl lined with 333 mu mesh. Average plastic density during the study was 8 pieces per cubic meter, though density after the storm was seven times that prior to the storm. The mass of plastics was also higher after the storm, though the storm effect on mass was less than it was for density, reflecting a smaller average size of plastic particles after the storm. The average mass of plastic was two and a half times greater than that of plankton, and even greater after the storm. The spatial pattern of the ratio also differed before and after a storm. Before the storm, greatest plastic to plankton ratios were observed at two stations closest to shore, whereas after the storm these had the lowest ratios. © 2002 Elsevier Science Ltd. All rights reserved.

Moore, D., et al. (2009). "The analysis of high density lipoprotein components in serum to identify biomarkers for cardiovascular disease." Atherosclerosis Supplements. Conference: 15th International Symposium on Atherosclerosis. Boston, MA United States. Conference Publication: **10**(2).

Objectives: Develop an array of methods for the isolation and analysis of high density lipoprotein (HDL) components that can be used to identify biomarkers for cardiovascular disease. Method(s): HDL fractions were isolated by density gradient ultracentrifugation (DGU) using a dicesium cadmium ethylenediaminetetraaceticacid gradient and immunospecific-DGU (I-DGU) using IgY Anti-Apo C-I microbeads. Matrix Assisted Laser Desorption Ionization (MALDI-MS) was used for the identification of apolipoproteins. HDL fractions were analyzed for their in vitro effects on aortic smooth muscle cells. Result(s): The distribution of lipoproteins was visualized by lipoprotein density profiling prior to and following I-DGU. MALDI results showed the reduction of Apo C-I in depleted samples following immunoaffinity chromatography and an increase in Apo C-I in recovered samples. Treatment of aortic smooth muscle cells with fractions prior to and following I-DGU showed correlations between the amount of Apo C-I and the percentage of apoptotic cells. Conclusion(s): The depletion and recovery of Apo C-I was shown by profiling, confirmed by MALDI and provided results relating to Apo C-I and its role in apoptosis. A marked increase in apoptotic cells was seen with the recovered Apo C-I sample as well as a corresponding decrease with the depleted Apo C-I samples; such results strongly support the hypothesis that Apo C-I may play a role in atherogenesis.

Moore, R. C., et al. (2020). "Microplastics in beluga whales (Delphinapterus leucas) from the Eastern Beaufort Sea." Marine Pollution Bulletin **150**: 110723.

Microplastics (MPs, particles <5mm) represent an emerging global environmental concern, having been detected in multiple aquatic species. However, very little is known about the presence of MPs in higher trophic level species, including cetaceans. We worked with community based monitors and Inuvialuit hunters from Tuktoyaktuk (Northwest Territories, Canada) to sample seven beluga whales (Delphinapterus leucas) in 2017 and 2018. Microplastics were detected in the gastrointestinal tracts in every whale. We estimate that each whale contained 18 to 147 MPs in their GI tract (average of 97+/-42 per individual). FTIR-spectroscopy revealed over eight plastic polymer types, with nearly half being polyester. Fibres made up 49% of MPs. The diversity of MP shapes and polymeric identities in beluga points to a complex source scenario, and ultimately raises questions regarding the significance and long-term exposure of this pollutant in this ecologically and culturally valuable species.

Moos, N. v., et al. (2012). "Uptake and effects of microplastics on cells and tissue of the blue mussel Mytilus edulis L. after an experimental exposure." Environmental Science & Technology **46**(20): 11327-11335.

In this study, we investigated if industrial high-density polyethylene (HDPE) particles, a model microplastic free of additives, ranging >0-80 micro m are ingested and taken up into the cells and tissue of the blue mussel Mytilus edulis L. The effects of exposure (up to 96 h) and plastic ingestion were observed at the cellular and subcellular level. Microplastic uptake into the gills and digestive gland was analyzed by a new method using polarized light microscopy. Mussel

health status was investigated incorporating histological assessment and cytochemical biomarkers of toxic effects and early warning. In addition to being drawn into the gills, HDPE particles were taken up into the stomach and transported into the digestive gland where they accumulated in the lysosomal system after 3 h of exposure. Our results show notable histological changes upon uptake and a strong inflammatory response demonstrated by the formation of granulocytomas after 6 h and lysosomal membrane destabilization, which significantly increased with longer exposure times. We provide proof of principle that microplastics are taken up into cells and cause significant effects on the tissue and cellular level, which can be assessed with standard cytochemical biomarkers and polarized light microscopy for microplastic tracking in tissue.

Morath, S. J. (2019). "Our Plastic Problem." Natural Resources & Environment **33**(4): 45-49.
The article discusses the issue of plastic pollution around the world and the efforts to resolve it. Other topics include the multimodal strategy to address the problem including educational campaigns, industrial design, and institutional pledges, the increasing cases of plastic pollution in the ocean, and the dangers it poses to aquatic ecosystems, fish, and animals.

Morawski, C. and S. Millette (2019). "THE RISE OF REUSABLES." Resource Recycling **38**(5): 32-34.
The article offers information on increment of reusable items in business enterprises in order to tackle plastic pollution. Topics discussed include information of ReCircle that uses reusable lunchboxes to restaurants; lack of standardization of reuse initiatives which impact on costs; and information of Reusable Packaging Platform which aims to building a coalition of all three reusable packaging sectors consumer packaging, transport packaging, and industrial packaging.

Moreira, F. T., et al. (2016). "Revealing accumulation zones of plastic pellets in sandy beaches." Environmental Pollution **218**: 313-321.
Microplastics such as pellets are reported worldwide on sandy beaches, and have possible direct and indirect impacts on the biota and physical characteristics of the habitats where they accumulate. Evaluations of their standing stock at different spatial scales generate data on levels of contamination. This information is needed to identify accumulation zones and the specific beach habitats and communities that are likely to be most affected. Standing stocks of plastic pellets were evaluated in 13 sandy beaches in Sao Paulo state, Brazil. The sampling strategy incorporated across-shore transects from coastal dunes and backshores, and vertical profiles of the accumulated pellets down to 1 m depth below the sediment surface. Accumulation zones were identified at regional (among beaches) and local (between compartments) scales. At the regional scale pellet density tended to increase at beaches on the central and southwestern coast, near ports and factories that produce and transport the largest amounts of pellets in the country. At the local scale coastal dunes showed larger accumulations of pellets than backshores. For both compartments pellets tended to occur deeper in areas where standing stocks were larger. Most of the pellets were concentrated from the surface down to 0.4 m depth, suggesting that organisms inhabiting this part of the sediment column are more exposed to the risks associated with the presence of pellets. Our findings shed light on the local and regional scales of spatial variability of microplastics and their consequences for assessment and monitoring schemes in coastal compartments.

Morel, N., et al. (2004). "Selective and efficient immunoprecipitation of the disease-associated form of the prion protein can be mediated by nonspecific interactions between monoclonal antibodies and scrapie-associated fibrils." Journal of Biological Chemistry **279**(29): 30143-30149.

Transmissible spongiform encephalopathies are characterized by the accumulation in brain tissues of an abnormal isoform of the prion protein named PrPsc, which is the only direct marker known for transmissible spongiform encephalopathies. Here we show that PrPsc can be specifically immunoprecipitated by using several monoclonal antibodies (mAbs) of various specificities independently of the properties of their binding site (paratope). These results strongly suggest that a significant proportion of mAbs can interact with PrPsc aggregates through nonspecific paratope-independent interactions allowing selective immunoprecipitation of PrPsc when these mAbs are immobilized on a polydisperse solid phase like microbeads.

Moreno, D. D. P. and C. Saron (2018). "Influence of compatibilizer on the properties of low-density polyethylene/polyamide 6 blends obtained by mechanical recycling of multilayer film waste." Waste Management & Research **36**(8): 729-736.

Polymeric wastes have caused increasing environmental problems, mainly in oceans that accumulate large amounts of non-degradable plastic waste. Particularly, waste of polymeric multilayer films for packaging presents low interest for mechanical recycling due to the poor properties and low commercial value of the recycled material generated as polymeric blends. Multilayer films of low-density polyethylene (LDPE) and polyamide 6 (PA6) is a typical material used for packaging applications. The aim of this study was to evaluate the action of the concentration of maleic anhydride grafted polyethylene (PE- g-MA) on the compatibilization of LDPE/PA6 blends generated from mechanical recycling of multilayer films containing both polymers. The action of the PE- g-MA on the properties of the LDPE/PA6 blends was evaluated by tensile tests, optical microscopy, melt flow rate, and scanning electron microscopy. The use of PE- g-MA at 2.5 wt% as a compatibilizer during reactive extrusion of the multilayer films waste has showed the best result for production of the respective recycled LDPE/PA6 blends.

Moreno Lampaya, J. and M. Grosso (2019). "The Courtesy of the Philosopher." Waste Management and Research **37**(10): 957-958.

Moreno Martin Retortillo, L., et al. (2011). "Isolation of neuroblastoma cells as a substrate for pharmacodynamic biomarker assays to accompany early clinical trials of Neuroblastoma." European Journal of Cancer **1)**: S285.

Background: Pharmacodynamic (PD) biomarkers provide proof-ofprinciple of target modulation and evaluate downstream biological effects of novel targeted therapeutics.Repeat tumour biopsies in children are problematic, complicating the implementation of these assays into paediatric trials.Neuroblastoma (NB) is a high-risk childhood cancer in which bone marrow (BM) metastases are frequent.Our aim is to obviate the need for biopsies by developing a methodology to obtain pure or highly enriched bone marrow-derived tumour cells as a substrate for assays.Material and Methods: Peripheral blood (PB) and BM samples were spiked with cells from the NB Kelly cell line.MACS MicroBeads Technology was used for the cell separation: Purity and recovery of positive selection for GD2+ neuroblastoma antigen and negative selection of CD45+ cells were compared using flow cytometry.To determine the suitability of the samples (1) total protein concentration (bicinchoninic acid assay), and (2) changes in total and phosphoprotein signals of the PI3K pathway (MesoScale Discovery) before and after the separation were compared. Result(s): CD45 negative selection achieved a median 3.6-fold (range 2.0 - 6.3), 2.5-fold (2.0-11.0) and 6.1-fold (2.8 - 9.3) enrichment of NB cells in spiked PB, spiked BM and clinically involved BM samples respectively.Cell recovery with CD45 negative selection was superior to GD2 positive selection (73%+/-25 vs.21%+/-20 cells recovered, p < 0.001).Cellular losses were manageable permitting the realisation of

protein-based assays.Each sample was lysed to a final volume of 100 mL.In these lysates, total protein concentration was 10.4 mg/mL+/-3.0 for samples prevs.5.7+/-3.2 post-immunomagnetic separation (p = 0.10).Median sample volume required for our PI3K protein analyses was 13.9 mL (range 8.6- 50.2).PI3K assay ranges were tested in spiked cells.There was a moderate decrease in the total protein signals (-0.24 log difference, p = 0.35) and increase in the phospho protein signals (+0.14 log difference, p = 0.51) after the separation. Conclusion(s): Immunomagnetic separation was able to obtain samples with high purity in neuroblastoma cells in spiked and clinical samples.The number of cells recovered was sufficient for protein analyses.The procedure had a moderate impact in the total and phospho-protein signals for the PI3K pathway but signals were detectable and consistent.Neuroblastoma cells isolated from BM could be a source of tissue for PD assays in future clinical trials.

Moreno Villegas, Z., et al. (2010). "Effects of ultraviolet radiation in different subpopulations of peripheral blood monocytes." Inmunologia **1)**: 31.

Background: Ultraviolet (UV) irradiation has cytotoxic effects on the skin and the immune system as a consequence of oxidative stress. Several effects have been described in different immune cellular types. However, there are no studies about its effects in recently described monocyte subpopulations. Objetive: To determine the UV irradiation effects on the different subsets of peripheral blood monocytes. Material(s) and Method(s): Peripheral blood mononuclear cells were isolated from healthy donors by standard Ficoll-Paque density gradient centrifugation. Monocytes were irradiated with an UV-emitting lamp (I=1319W/m²) over different times (7, 14 and 28 minutes). Later, cells were cultured for 3, 6, 24 and 48 hours and were adquired in a FACSCalibur flow cytometer using fluorochrome-labeled monoclonal antibodies. Monocytes were selected in a FSC-SSC dot plot, and defined as CD3 negative and CD14 positive. Monocyte subpopulations were identified as classic monocytes (CD14+ CD16-), inflammatory monocytes (CD14^{+high} CD16⁺) and resident monocytes (CD14^{+dim} CD16⁺). The absolute number of viable (7-AAD-) monocytes were calculated using microbeads as an internal reference. Results. We observed that in both CD16+ monocyte subsets UV exposure caused a rapid and dramatical decrease in the absolute number of viable cells. However, the absolute number of viable classic monocytes (CD14+ CD16-) increased progressively after 7 minutes of UV exposition. Meanwhile, 14 minutes of irradiation caused at 3 hours a slow increase of viable cell number, but after 6 h decreased strongly. For all subpopulations studied, 28 minutes of UV induced a massive cell death. We also observed a very slight and progressive increase in viable classic monocytes absolute number from 6 and 24 yours for 28 and 14 minutes of irradiation respectively. Conclusion. Classic monocytes are much more resistant to ultraviolet emissions than inflammatory and residents subsets, which disappear at 3 hours of cultured.

Moreno, Z., et al. (2011). "Photoprotective effect of a Polypodium leucotomos extract against ultraviolet radiation on human peripheral blood monocytes." Journal of Investigative Dermatology **1)**: S111.

Exposure to ultraviolet radiation (UVR) induces local and systemic damage on the skin and on the immune system, mainly due to oxidative stress. We have previously reported that a Polypodium leucotomos extract (PL) possesses antioxidant and immunoprotective properties against UVR. Our objective was to determine the effects of PL on the viability of peripheral blood classical or inflammatory and resident monocytes after UVR. Human peripheral blood mononuclear cells were isolated from 6 healthy donors, cultured in presence of several dilutions of PL (4 mg/ml to 0.0625 mg/ml) for 1 hr and then were radiated with an UVA-emitting lamp (I=1319W/m2) during 7 min. Later, cells were cultured for additional 24 hrs and analyzed by

flow cytometry using 1) fluorochromelabeled monoclonal antibodies to identify classical (CD14+CD16-) or inflammatory and resident (CD16+) monocytes, 2) 7-aminoactinomycin (viable cells) and 3) microbeads as an internal reference for absolute cell count. The % of protection conferred by PL (%P) was calculated dividing the absolute number of viable UV-irradiated monocytes by the absolute number of control non-irradiated viable monocytes. Result(s): %P granted by PL against UV-induced damage on CD14+CD16- classical monocytes was dose-dependent. %P ranged from 29.87 (0.06 mg/ml) to 123.07 (4 mg/ml). We found full UV protection at PL doses of 1 mg/ml (%P=96.13) and 2 mg/ml (%P=97.73). Surprisingly, PL had not protective effect on the CD16+ monocyte which completely disappeared after UV irradiation. in conclusion, our data indicate that PL exerts dose-dependent protection against UVR on human peripheral blood monocytes. They also show that classical monocytes are much more resistant to UVR than inflammatory and resident subsets.

Moreno-Altamirano, M. M. B., et al. (2012). "Proliferation of human T lymphocytes is down-regulated by dengue virus." Immunology **1)**: 643-644.

Purpose/Objective: To analyze some mechanisms involved in the lack of activation and proliferation of T Lymphocytes exposed to dengue virus serotype-2, in vitro. Material(s) and Method(s): Peripheral blood mononuclear cells (PBMC) were obtained from Buffy coats from healthy donors. The T lymphocyte subpopulation was purified by anti-CD3-coated magnetic microbeads. T cells were cultured under: (1) Concanavalin A, (2) dengue virus, (3) dengue virus plus Concanavalin A and (4) medium alone. After incubation for 4-16 h at 37degreeC in 5% CO2, T cell were Analyzed for (1) proliferation by using carboxy-fluorescein diacetate, succinimidyl ester (CFSE) and flow cytometry, (2) Expression of CD25, by flow cytometry, (3) Synthesis of IL-2, by ELISA and (4) activation and nuclear translocation of the transcription factors NFAT and NF-kB, by confocal microscopy in whole cells, and by flow cytometry of isolated and labeled nuclei. Result(s): The proliferation of T lymphocytes was inhibited in Concanavalin A stimulated cells when pre-incubated with dengue virus. The synthesis of IL-2 was inhibited when these cells were incubated with DENV-2 before addition ofCon A. A reduction in IL-2Ra expression was also observed, by flow cytometry. The nuclear translocation of NFAT and NF-kB was diminished when Con A-stimulated T cells were previously exposed to DENV-2. Conclusion(s): Understanding the role of the immune system in the pathogenesis related to dengue virus will help to improve patients' treatment. Some reports indicate that patients infected with dengue virus have a dysfunctional proliferation of T lymphocytes. However, studies in vitro have not been performed to analyze in more detail the DEN-2-mediated mechanism(s) of inhibition. As shown in this study, inhibition of nuclear translocation of NFAT and NFkB by DEN-2, as well as inhibition of IL-2 synthesis and IL2Ra expression could be accountable for the observed dysfunctional proliferation of T cells.

Moreno-Maroto, J. M., et al. (2017). "Development of lightweight aggregates from stone cutting sludge, plastic wastes and sepiolite rejections for agricultural and environmental purposes." Journal of Environmental Management **200**: 229-242.

Three different wastes have been assessed for lightweight aggregate (LWA) manufacturing: granite and marble sludge (COR), sepiolite rejections (SEP) and polyethylene-hexene thermoplastics (P). A preliminary study of the physical and chemical properties of the raw materials was carried out to design proper batches. It was mixed 10% SEP with 90% COR to confer plasticity, and in turn, 0, 2.5, 5 and 10% (w/w) of P was added to check its suitability as a bloating agent. The mixtures were milled, kneaded with water, extruded, shaped into pellets, oven-dried and finally fired at 1100, 1125 and 1150 °C for 4, 8 and 16 min. The main

technological properties of the aggregates related to bloating, density, porosity, loss on ignition, water absorption and compressive strength were measured. Scanning Electron Microscopy was used to study the microstructure of some LWAs. 23 out of 29 types of aggregate were lightweight, although neither bloating effect was observed, nor the typical cellular structure comprised of shell and core with relatively large pores was obtained, but a structure consisting of micropores and microchannels. The increase of temperature and time of firing involved a greater sintering, which in turn was translated into higher shrinkage, density and compressive strength values, but less porosity and water absorption. The addition of P did not involve any improvement, indeed it caused a significant decrease in compressive strength. The LWA sintered without P at the minimum time (4 min) and temperature of firing (1100 °C) was selected to assess its water suction capability. The results pointed out that this LWA could be suitable in hydroponics and/or water filtration systems, even better than the commercial LWA Arlita G3. A new and most environment-friendly perspective in LWA industry arises from here, promoting LWA production at relative low temperatures (prior to significant sintering occurs) and using non-plastic silty wastes instead of clays as major components. [ABSTRACT FROM AUTHOR]

Moreno-Sader, K., et al. (2020). "Environmental sustainability analysis of chitosan microbeads production for pharmaceutical applications via computer-aided simulation, WAR and TRACI assessments." Sustainable Chemistry and Pharmacy **15 (no pagination)**(100212).

In recent decades, pharmaceutical uses of chitosan microbeads have been identified owing to their low toxicity, biocompatibility and biodegradability. However, many contributions have limited such microbeads preparation to lab-scale and there are no works reported in the literature about the scaling-up of chitosan microbeads production. To fill the knowledge gap, this research attempts to simulate and evaluate the environmental performance of large-scale production of chitosan microbeads under sustainability concept using computer-aided process engineering (CAPE). The extended energy and mass balances were provided by process simulation using the commercial software Aspen Plus . The environmental assessment was performed through two computer-aided tools: waste reduction (WAR) algorithm and Tool for the Reduction and Assessment of Chemical and other Environmental Impacts (TRACI). Results reported negatives values for total generation rate of Potential Environmental Impacts (PEI) (-1.16 x 10⁺², -9.25 x 10⁺¹, -1.00 x 10⁺² and -7.66 x 10⁺¹ PEI/hr) and highest total output rate of PEI for cases 4 and 3 (considering energy flows contributions). For TRACI tool, potential environmental impacts were low, however, the freshwater ecotoxicity potential for freshwater emissions was higher (6.03E+02 CTUeco/hr) than for natural soil emissions (1.55E+02 CTUeco/hr). These results showed good environmental performance of the process and can be used as a benchmark in the production of more environmental-friendly chitosan microbeads at large-scale. Copyright © 2020 Elsevier B.V.

Morét-Ferguson, S. and A. N. S. Siuda (2011). "Beyond our Beaches: Ocean Trash." Green Teacher(92): 6-8.

The article focuses on studies concerning plastic marine debris. According to scientists, although disposal by ships is part of the reason for the plastic litter in oceans, the bigger proportion of the debris is likely from land-based sources. The authors report that scientists saw the first open ocean plastic trash during the early 1970s. In the middle of the 1980s, students aboard the Sea Education Association's research vessel found out that the northern Sargasso Sea has the highest concentration of plastic debris in the western North Atlantic region.

Morgana, S., et al. (2018). "Microplastics in the Arctic: a case study with sub-surface water and fish samples off Northeast Greenland." Environmental Pollution **242**(Part B): 1078-1086.

The Arctic is a unique and fragile ecosystem that needs to be preserved and protected. Despite its remoteness, plastic pollution has been documented in this region. In the coming years, it is likely to worsen since, with climate changes and the opening of new shipping routes, the human presence is going to increase in the whole area. Here, we investigated the presence of microplastics (MPs) in sub-surface water and in two mid-trophic level Arctic fishes collected off Northeast Greenland: the demersal bigeye sculpin, Triglops nybelini, and the pelagic polar cod, Boreogadus saida. Plastics debris were found in the water samples at a concentration of 2.4 items/m³ +or-0.8 SD which is higher than in most seas at lower latitudes. Both fish species had eaten MPs with different proportion among the species, 34% for T. nybelini (n=71) and 18% for B. saida (n=85). The significant difference in the occurrence of MPs between the two species is likely a consequence of their feeding behavior and habitat. Polyethylene was the main plastic polymer for water samples (41%, n=17) and polyester (34%, n=156) for fish samples as analyzed by Fourier Transformed Infrared (FT-IR) spectroscopy. Our data underscore that the Arctic regions are turning into a hotspot for plastic pollution, and this calls urgently for precautionary measures.

Morganti, P. and Y. H. Li (2015). "Innovation in cosmetic and medical science. The role of chitin nanofibrils composites." Journal of Applied Cosmetology **33**(1-2): 9-24.

The main substrate of interest in cosmetic dermatology are hair, covered with hard keratin-scales, and skin Stratum Corneum (SC), being with corneocytes the outermost cell layer of the skin. Both, directly exposed to onslaught of pro-oxidative stressors and composed of dead cells filled with specific type of lipids and cross-linked proteins in the form of alpha-helix structure, represent the barrier of our body to the environment. The barrier function of both skin and hair depends, therefore, on the physicochemical properties of corneocytes and scales, which by their lipid-keratin structures, regulate and interchange water loss, oxygen and carbon dioxide, modulating the penetration of active ingredients and preventing the entrance of pathogenic microorganisms. While the skin lipid structure consists predominantly of ceramides (~50%) connected with fatty acids and cholesterol, the hair epicuticle membrane (scale) contains highly cross linked proteins (~75%) and adsorbed fatty acids (~25%), 18-methyleicosanoic acid (18-MEA) being the most abundant. In addition, skin and hair are equipped with a network of enzymatic and non-enzymatic antioxidant system, that counteract the oxidative injury. An imbalance of this complex structure leads to modifications of DNA, lipids, and proteins, resulting in loss of functionality of the barrier key components of both hair and skin. As a consequence, skin wrinkling appears and hair lose luster and alignment, decreasing its thickness and combability. The challenge of cosmetic dermatology is to produce effective and safeness cosmetic products capable to modulate both the keratin-lipid production and the antioxidant synthesis at level of skin and hair. These innovative products should slowdown skin wrinkling formation and ameliorate structure and function of the hair, giving the body a more younger appearance. For obtaining these results it is necessary to develop topical systems capable to deliver the right concentration of the right active ingredient to the right site in the body in the right period of time (4 R's), without disrupting the respective protective structures, but having the capability to stimulate the synthesis of both skin extra cellular matrix (ECM) and hair cortex components. These results have to be produced by a low consume of water and energy and by the use of green raw materials extract, for example, from fishery's waste, as Chitin Nanofibrils, and plant biomass, as lignocellulosic compounds. Thus, natural material, and biodiversity of our planet will be preserved. In this paper innovative products realized by two EU research projects Biomimetic (www.biomimetic-EU-project.eu) and n-Chitopack (www.n-Chitopack.eu) will be presented and discussed. These products, made by the use of biopolymers such as Chitin Nanofibrils (CN), Lignin (LN) and Polylactic acid (PLA), are in accordance with the incoming Bio-green economy supported by EU and UNEP. The use of these biopolymers, is, in fact, necessary to reduce the production of the actual petrol-derived polymers and stop the plastic waste in the land and in the oceans where 5 trillion pieces afloating, have been recovered, ranging a weight of over 250,000 tons. Finally it is to underline that this plastic waste causes the death of ~1 million bird and ~100,000 seamammals every year, so that scientists, opinion leaders and politic people worldwide have to work all together to solve this important problem.

Morgenroth, A., et al. (2011). "Two-step strategy for efficient killing of multiple myeloma stem cells using Auger-electrons emitting nucleoside analogue 5-Iod-4'-thio-2'-desoxyuridin (I-125-ITdU)." Molecular Cancer Therapeutics. Conference: AACR NCI EORTC International Conference: Molecular Targets and Cancer **10**(11 SUPPL. 1).

Background: Despite advances in treatment, multiple myeloma (MM) remains an incurable disease. Tumor relapse is at least in part due to the existence of drug resistant cancer stem cells (CSCs). A new therapeutic paradigm that effectively eradicates bulk MM cells and CSC needs to be developed. Auger-electrons emitting nucleoside analogues are attractive for nano-irradiation therapy when incorporated into the DNA. For this proposal, the quiescent CSCs need to be awaked. Although dormant hematopoietic stem cells (HSC) are mostly highly resistant to therapeutic regiments, they can be activated by pro-drug 5-FU to enter active cell cycle and to generate proliferative, therapy sensitive progenitor and mature cells. In analogy to HSC, the activation of highly resistant dormant CSC may present the crucial step for achieving long-term cure of cancers. Therefore in this study we evaluated the therapeutic potential of I-125-ITdU for targeting of multiple myeloma CSCs after priming with a potent thymidylate synthase (TS) inhibitor FdUrd, an active metabolite of 5-FU. Method(s): For CSCs isolation, KMS12BM cells were incubated with CD138 and CD27 MicroBeads. The CD Marker expression was investigated by flow cytometry. For FdUrd treatment, cells were incubated with 0.1 muM FdUrd for 2 d. The expression level of aldehyde dehydrogenase (ALDH) was evaluated using Aldefluor assay by flow cytometry. Cell cycle was investigated by Nicoletti. The uptake and DNA incorporation of I-125-ITdU (50kBq/2*10 4 cells) were assessed after 4 d using gamma counter. Apoptotic cells were identified using Annexin-V by flow cytometry. Result(s): The purity of isolated CSC was more than 97% (CD27⁺CD138⁻). FdUrd treatment of CD27⁺CD138⁻ cells yielded a decreased ALDH activity (65.2% vs. 29.8%). Furthermore, FdUrd induced CSC to enter the cell cycle (48.5% vs. 18.7% and 29.2% vs. 47.7% of cells in G0/G1 and S phase, respectively) and increased the CD138 expression. The treatment with a non-toxic dose of FdUrd was essential for effective incorporation of ITdU and inducing of irreparable DNA damage. The activation with FdUrd increased the cellular uptake by a factor of 25. KMS12BM CSC incorporated 46.3% +/- 2.8% of internalized activity into DNA. Most important, I-125-ITdU showed a potent antimyeloma effect on isolated CSC. More than 95% of treated cells were detected as apoptotic. Conclusion(s): This is the first report to demonstrate that DNA is a promising target for endoradio- therapy of CSC of multiple myeloma

using two-step-strategy: FdUrd for activating and Auger-radiation emitting thymidine analogue ITdU for eliminating of malign cells.

Morin, N. A. O., et al. (2017). "The presence and partitioning behavior of flame retardants in waste, leachate, and air particles from Norwegian waste-handling facilities." Journal of Environmental Sciences (China) **62**: 115-132.

Flame retardants in commercial products eventually make their way into the waste stream. Herein the presence of flame retardants in Norwegian landfills, incineration facilities and recycling sorting/defragmenting facilities is investigated. These facilities handled waste electrical and electronic equipment (WEEE), vehicles, digestate, glass, combustibles, bottom ash and fly ash. The flame retardants considered included polybrominated diphenyl ethers (BDE-10) as well as dechlorane plus, polybrominated biphenyls, hexabromobenzene, pentabromotoluene and pentabromoethylbenzene (collectively referred to as FR-7). Plastic, WEEE and vehicles contained the largest amount of flame retardants (BDE-10: 45,000-210,000mug/kg; FR-7: 300-13,000mug/kg). It was hypothesized leachate and air concentrations from facilities that sort/defragment WEEE and vehicles would be the highest. This was supported for total air phase concentrations (BDE-10: 9000-195,000pg/m³ WEEE/vehicle facilities, 80-900pg/m³ in incineration/sorting and landfill sites), but not for water leachate concentrations (e.g., BDE-10: 15-3500ng/L in WEEE/Vehicle facilities and 1-250ng/L in landfill sites). Landfill leachate exhibited similar concentrations as WEEE/vehicle sorting and defragmenting facility leachate. To better account for concentrations in leachates at the different facilities, waste-water partitioning coefficients, K_{waste} were measured (for the first time to our knowledge for flame retardants). WEEE and plastic waste had elevated K_{waste} compared to other wastes, likely because flame retardants are directly added to these materials. The results of this study have implications for the development of strategies to reduce exposure and environmental emissions of flame retardants in waste and recycled products through improved waste management practices.

Morritt, D., et al. (2014). "Plastic in the Thames: a river runs through it." Marine Pollution Bulletin **78**(1-2): 196-200.

Although contamination of the marine ecosystems by plastics is becoming recognised as a serious pollution problem, there are few studies that demonstrate the contribution made by freshwater catchments. Over a three month period from September to December 2012, at seven localities in the upper Thames estuary, 8490 submerged plastic items were intercepted in eel fyke nets anchored to the river bed. Whilst there were significant differences in the numbers of items at these locations, the majority were some type of plastic. Additionally in excess of 20% of the litter items were components of sanitary products. The most contaminated sites were in the vicinity of sewage treatment works. While floating litter is visible, this study also demonstrates that a large unseen volume of submerged plastic is flowing into the marine environment. It is therefore important that this sub-surface component is considered when assessing plastic pollution input into the sea.

Morsbach, S., et al. (2018). "Quantification of fluorescent dyes in organ tissue samples via HPLC analysis." Journal of Chromatography B: Analytical Technologies in the Biomedical and Life Sciences **1072**: 34-39.

The determination of regional blood flow via the accumulation of fluorescent microspheres is a concept regularly used in medical research. Typically, the microbeads get extracted from the tissue of interest and are then quantified by measuring the absorption or fluorescence of the incorporated dyes without further separation from the medium. However, in that case the absorption spectra of different dyes can overlap when used simultaneously, leading to an overestimation of the concentration. Additionally, background absorption from the medium can be problematic. Therefore, a high performance liquid chromatography method for the simultaneous detection of four dyes (orange, crimson, yellow-green and red) incorporated in different microbeads in samples from biological media such as organ tissue (brain, heart and kidneys) was developed. Since for biological samples often a large sample size is required for sufficient statistics, the method was optimized to yield very short run times. With this method it was possible to detect very low concentrations of only one microsphere per gram of organ tissue. By applying this sensitive quantification technique, it was demonstrated that the application of microbeads for perfusion measurements might not be reliable due to different organ distributions in each animal. Copyright © 2017 Elsevier B.V.

Morsy, M. A., et al. (2005). "Isolation, purification and flow cytometric analysis of human intrahepatic lymphocytes using an improved technique." Laboratory Investigation **85**(2): 285-296.

Intrahepatic lymphocytes (IHL) with their diverse and distinctive subsets emphasise the importance of the liver as a site of immunological activity, but special care is required for their isolation and characterisation. Protocols for IHL isolation, purification and FACS analysis were devised and compared with published extraction protocols. We have reduced the time that IHL are exposed to potentially damaging enzymes during extraction and purified specific subsets using monoclonal antibody (mAb)-coated magnetic microbeads. This has yielded IHL populations with higher viability than previously described protocols (92-95%, compared with 39-86%). Flow cytometric characterisation of IHL subset immunophenotypes was optimised by combining CD45 staining (fluorescence gating) with traditional light scatter properties. Using a panel of mAb and liver biopsies obtained from 23 cadaveric liver transplant donors, we show that the normal liver contains a heterogeneous IHL population with distinctive phenotypes. CD8+ IHL was the predominant population with a mean CD4/CD8 ratio of 1:1.7. Up to 40% of IHL expressed gammadeltaTCR and a third expressed CD56 NK marker; indicating a site of intense immunological activity. The techniques described will allow these cell types to be isolated, fully characterised and their physiological functions to be determined. The histologically normal liver contains heterogeneous and diverse IHL with large numbers of CD8+, NK, NKT and gammadelta+ cells.

Mortensen, N. P., et al. (2019). "Biological interactions between nanomaterials and placental development and function following oral exposure." Reproductive Toxicology **90**: 150-165.

We summarize the literature involving the deposition of nanomaterials within the placenta following oral exposure and the biological interactions between nanomaterials and placental development and function. The review focuses on the oral exposure of metal and metal oxide engineered nanomaterials (ENMs), carbon-based ENMs, and nanoplastics in animal models, with a minor discussion of intravenous injections. Although the literature suggests that the placenta is an efficient barrier in preventing nanomaterials from reaching the fetus, nanomaterials that accumulate in the placenta may interfere with its development and function. Furthermore, some studies have demonstrated a decrease in placental weight and association with adverse fetal health outcomes following oral exposure to nanomaterials. Since nanomaterials are increasingly used in food, food packaging, and have been discovered in drinking water, the risk for adverse impacts on placental development and functions, with secondary effects on embryo-fetal development, following unintentional maternal ingestion of nanomaterials requires further investigation.

Moscelli, N., et al. (2011). A real-time cell proliferation and motility monitoring system. BIODEVICES 2011 - Proceedings of the International Conference on Biomedical Electronics and Devices.

In this contribution we present a compact imaging system to monitor the proliferation and the motility of cells in real-time. Our monitoring system is compatible with standard multi-well plates and operates in CO2, temperature and humidity controlled cell-culture incubators. Adherent grown epithelial cells in a multi-well plate well, positioned on top of a custom made holder, have been monitored in real-time with a fixed CCD image sensor. As light source an LED is placed above the plate holder. A field of view of 3.3 × 2.5 mm2 was achieved by using a 4.6 × 4.0 mm2 image sensor and mini lens system. The image sensor has a resolution of 640 x 480 pixels. Consequently, the obtained sensing resolution of the imaging system is about 5 µm. The cell monitoring system has first been validated by visualizing micro-beads of known dimensions. Then, our system has been successfully tested, tracking the migration paths and proliferation of respectively adherent grown MDCK (Madin-Darby canine kidney) and A549 (human lung carcinoma) epithelial cells.

Moser, M. L. and D. S. Lee (1992). "A fourteen-year survey of plastic ingestion by western North Atlantic seabirds." Colonial Waterbirds **15**(1): 83-94.

To evaluate the incidence of ocean-borne plastic particle ingestion by western North Atlantic seabirds, we analyzed the gut contents of 1033 birds collected off the coast of North Carolina from 1975-1989. Twenty-one of 38 seabird species (55%) contained plastic particles. Procellariiform birds contained the most plastic and the presence of plastic was clearly correlated with feeding mode and diet. Plastic ingestion by procellariiforms increased over the 14 year study period, probably as a result of increasing plastic particle availability. Some seabirds showed a tendency to select specific plastic shapes and colors, indicating that they may be mistaking plastics for potential prey items. We found no evidence that seabird health was affected by the presence of plastic, even in species containing the largest quantities: Northern Fulmars (Fulmarus glacialis), Red Phalaropes (Phalaropus fulicaria) and Greater Shearwaters (Puffinus gravis).

Moser, N. (2015). "Ethical Spectacles." Alternatives Journal **41**(3): 44-45.

Zeal has also partnered with not-for-profits such as Second Mile Water, 5 Gyres Institute and Protect Our Winters to address climate change, plastic pollution and access to safe drinking water. Designers like Vinylize, ROLF Spectacles and Zeal Optics are making waves in the optical industry by choosing strong environmental platforms without compromising on quality and style.

Moshaverinia, A. (2012). Encapsulated periodontal ligament and Gingival mesenchymal stem cells in 3D, injectable, and biodegradable scaffold: A unique platform for bone tissue engineering.

The need for hard tissues repair has increased in modern esthetic and reconstructive dentistry. Bone grafts are currently the major modality of treatment. Tissue engineering provides a new concept for tissue regeneration and reconstruction. Stem cell-scaffold constructs seem to be a promising approach for bone tissue engineering. Stem cells in particular have drawn interest because they are undifferentiated cells with the ability to differentiate into one or more types of cells and are capable of self-renewal. Tissue regeneration using mesenchymal stem cells might be an advantageous therapeutic option since it provides high-quality regeneration of damaged tissues without forming fibrous tissue, minimum donor-site morbidity compared to autografts, and a low risk of autoimmune rejection and disease transmission. Therefore, the objectives of this study were to: (1) develop an injectable scaffold based on oxidized alginate microbeads encapsulating PDL (PDLSCs) and Gingival mesenchymal stem cells (GMSCs); and (2) investigate microsphere degradation profile, cell viability, and osteogenic differentiation of the stem cells (in vitro and in vivo) for the first time. Alginate microspheres with sizes of about 2 plus or minus 0.1 mm were fabricated with 1 x10 super(6) stem cell/ mL of alginate. Microspheres containing PDLSCs, GMSCs and hBMMSCs were further implanted subcutaneously and ectopic bone formation was analyzed by mu CT and histological analysis at 8 weeks post-implantation. The encapsulated stem cells remained viable in vitro and both osteo-differentiated and adipo-differentiated after 4 weeks of culturing in the respective induction media. Scanning electron microscopy and X-ray diffraction results confirmed that apatitic mineral was deposited by the stem cells. It was found that the degradation profile of alginate hydrogel strongly depends on the degree of oxidation demonstrating its tunable chemistry and degradation rate. In the animal study ectopic mineralization was observed inside and around the implanted microspheres containing the immobilized stem cells. These findings demonstrate for the first time that immobilization of PDLSCs and GMSCs in the alginate microspheres provides a promising strategy for bone tissue engineering.

Mosko, S. (2013). "Toxic Debris Delivers Triple Whammy." E THIS WEEK: 6-6.

The article reports that according to a new study, ocean plastic debris is a threat to human beings. The study, which is published in the December 2013 issue of the journal "Environmental Science & Technology," found that plastics introduce toxic chemicals into the ocean food web. It compared how mass-produced plastics accumulate hazardous chemicals from local seawater.

Mosko, S. S. (2014). "Youthful Skin Versus Ocean Food Web." Natural Life: 8-10.

The article talks about the products containing plastic micro-beads profess to speed up skin rejuvenation, acts like a chemical pollutant when released in lakes, rivers, & oceans. It also focuses on the plastic debris ingested by sea creatures causing a threat to the ocean food chain. In addition United Nations Environment Program estimated around forty-six thousand pieces of plastic per square mile of ocean distributed throughout the water column.

Moslemy, P., et al. (2002). "Production of size-controlled gellan gum microbeads encapsulating gasoline-degrading bacteria." Enzyme and Microbial Technology **30**(1): 10-18.

Controlling the mean diameter of polymeric carriers is crucial to the successful application of encapsulated cells for in situ bioaugmentation of contaminated aquifers. The cell carriers should be small enough to be transported through a granular soil matrix, thus an emulsification-internal gelation technique for production of cell-encapsulating gellan gum microbeads is proposed. Mean diameter and size distribution of microbeads were investigated as a function of the water-in-oil emulsion parameters. The mean diameter of the microbeads ranged from 12 to 135 mum, varying as a descending function of the stirring rate (1000-5500 rpm) and emulsifier concentration (0-0.20% w/w), and as an ascending function of the disperse phase volume fraction (0.08-0.25). A bacterial consortium encapsulated within the microbeads (23 mum mean diameter) showed improved biodegradation activity in the removal of gasoline (400 mg L⁻¹), as compared to free cells. A high degree of repeatability in the microbead formation process and particle size measurements was demonstrated. The results of this study suggest that the emulsification process can potentially be used for the large-scale production of controlled-diameter gellan gum-encapsulated cell microbeads for subsurface bioremediation applications. © 2002 Elsevier Science Inc. All rights reserved.

Moslemy, P., et al. (2004). "Activated sludge encapsulation in gellan gum microbeads for gasoline biodegradation." Bioprocess & Biosystems Engineering **26**(4): 197-204.

A two-phase dispersion technique, termed emulsification-internal gelation, is proposed for encapsulation of activated sludge in gellan gum microbeads. The influence of emulsion parameters on size distribution of microbeads was investigated. Mean diameter of microbeads varied within a range of 34-265 microm as a descending function of emulsion stirring rate (1,000-5,000 rpm), emulsification time (10-40 min), and emulsifier concentration (0-0.1% w/w), and as an ascending function of disperse phase volume fraction (0.08-0.25). Encapsulated sludge expressed a high biodegradation activity compared with non-encapsulated sludge cultures even at 4.4 times lower level of overall biomass loading. Over 90% of gasoline at an initial concentration of 35 and 70 mg l(-1) was removed by both encapsulated and non-encapsulated sludge cultures in sealed serum bottles within 7 days. Encapsulation of activated sludge in gellan gum microbeads enhanced the biological activity of microbial populations in the removal of gasoline hydrocarbons. The results of this study demonstrated the feasibility of the production of size-controlled gellan gum-encapsulated sludge microbeads and their use in the biodegradation of gasoline.

Moslemy, P., et al. (2002). "Biodegradation of gasoline by gellan gum-encapsulated bacterial cells." Biotechnology & Bioengineering **80**(2): 175-184.

Encapsulated cell bioaugmentation is a novel alternative solution to in situ bioremediation of contaminated aquifers. This study was conducted to evaluate the feasibility of such a remediation strategy based on the performance of encapsulated cells in the biodegradation of gasoline, a major groundwater contaminant. An enriched bacterial consortium, isolated from a gasoline-polluted site, was encapsulated in gellan gum microbeads (16-53 microm diameter). The capacity of the encapsulated cells to degrade gasoline under aerobic conditions was evaluated in comparison with free (non-encapsulated) cells. Encapsulated cells (2.6 mg(cells) x g(-1) bead) degraded over 90% gasoline hydrocarbons (initial concentration 50-600 mg x L(-1)) within 5-10 days at 10 degrees C. Equivalent levels of free cells removed comparable amounts of gasoline (initial concentration 50-400 mg x L(-1)) within the same period but required up to 30 days to degrade the highest level of gasoline tested (600 mg x L(-1)). Free cells exhibited a lag phase in biodegradation, which increased from 1 to 5 days with an increase in gasoline concentration (200-600 x mg L(-1)). Encapsulation provided cells with a protective barrier against toxic hydrocarbons, eliminating the adaptation period required by free cells. The reduction of encapsulated cell mass loading from 2.6 to 1.0 mg(cells) x g(-1) bead caused a substantial decrease in the extent of biodegradation within a 30-day incubation period. Encapsulated cells dispersed within the porous soil matrix of saturated soil microcosms demonstrated a reduced performance in the removal of gasoline (initial concentrations of 400 and 600 mg x L(-1)), removing 30-50% gasoline hydrocarbons compared to 40-60% by free cells within 21 days of incubation. The results of this study suggest that gellan gum-encapsulated bacterial cells have the potential to be used for biodegradation of gasoline hydrocarbons in aqueous systems.

Moslemy, P., et al. (2003). "Transport of gellan gum microbeads through sand: an experimental evaluation for encapsulated cell bioaugmentation." Journal of Environmental Management **69**(3): 249-259.

Transport of 10-40 microm gellan gum microbeads was studied in horizontal sand columns to evaluate the feasibility of using gel-encapsulated bacteria for bioaugmentation of contaminated aquifers. Three 5.2 x 110 cm columns were packed with sand (column A: 0.5-2 mm, column B:

0.25-2 mm, and column C: 0.125-2 mm). Microbeads in artificial groundwater were injected at 0.5 l h(-1) during intermittent 12-h periods. Breakthrough of microbeads increased with injection time, varying as a descending function of travel distance. After 72 h of injection, about 75% of injected microbeads were dispersed across a 5-110 cm distance from the inlet in column A, compared to 78% across a 5-50 cm in column B, and 76% across a 5-20 cm in column C. The wider dispersion of microbeads across the length of column A, compared to those observed in columns B and C, suggests a higher potential for the formation of a uniform bioactive zone of encapsulated cells across a sandy aquifer with such grain size distribution and hydrodynamic properties.

Mostafa, H. M., et al. (2010). "Mechanical properties of some bioplastics under different soil types used as biodegradable drip tubes." Agricultural Engineering International: CIGR Journal **12**(1): 12-21.

A lack of degradability and the closing of landfill sites, as well as growing water and land pollution problems, have led to concern about plastics. With the excessive use of plastics and increasing pressure being placed on capacities available for plastic waste disposal, the need for biodegradable plastics and biodegradation of plastic wastes has assumed increasing importance in the last few years. Awareness of the waste problem and its impact on the environment has awakened new interest in the area of degradable polymers. The biodegradation of five different types of commercial bioplastics available on the market as agricultural mulch film (Bioflex, Ecoflex, Mater Bi, Chitosan and Bi-OPL foil) was evaluated under different soil types (Sandy, Sandy Loam and Loamy soil) to study the material stability and life expectancy, and to establish which was better to be used in the production of biodegradable drip tubes for drip irrigation system. Weight loss, tensile strength (TS) loss and loss of percentage elongation (%E) were measured in 0, 1, 2, 3, 4, and 5 months. Bi-OPL appeared to possess a high resistance to soil types, as indicated by lower changes in tensile strength, weight losses and with maximum 26% decreased in elongation at break. At the end of the experiments, Chitosan films were completely degraded in all soil types and both surface and subsurface positions. The starch contained in Mater Bi samples was degraded after 60 days with 4% weight losses and leads to 3% observed losses in tensile strength. Weight losses of Ecoflex and Bioflex were greater after three months (more than 30%) than that previously (5% to 10%). The tensile strength of both Ecoflex and Bioflex films decreased about 4% and 3% respectively in loamy soil and loamy sand soil by Week 12, More than 40% of the elongation capacity of the films were lost by Month 3 in both soil types. The decrease of %E in both films was slightly faster in loamy and loamy sand soil than in sandy soil.

Mouchi, V., et al. (2019). "Long-term aquaria study suggests species-specific responses of two cold-water corals to macro-and microplastics exposure." Environmental Pollution **253**: 322-329.

Plastic pollution has been identified as a major threat for coastal marine life and ecosystems. Here, we test if the feeding behaviour and growth rate of the two most common cold-water coral species, Lophelia pertusa and Madrepora oculata, are affected by micro- or macroplastic exposures. Low-density polyethylene microplastics impair prey capture and growth rates of L. pertusa after five months of exposure. Macroplastic films, mimicking plastic bags trapped on deep-sea reefs, had however a limited impact on L. pertusa growth. This was due to an avoidance behaviour illustrated by the formation of skeletal 'caps' that changed the polyp orientation and allowed its access to food supply. On the contrary, M. oculata growth and feeding were not affected by plastic exposure. Such a species-specific response has the potential to induce a severe change in coral community composition and the associated biodiversity in deep-sea environments.

Moulin, T. C. and L. T. van Egmond (2019). "A possible role for pollutants in mental disorders via gut microbiota." Science of the Total Environment **693**: 133639.

Mourgkogiannis, N., et al. (2018). "Questionnaire-based survey to managers of 101 wastewater treatment plants in Greece confirms their potential as plastic marine litter sources." Marine Pollution Bulletin **133**: 822-827.

Marine pollution by plastics and microplastics (plastic particles 1nm to 5mm) is a recognized environmental issue. There are a few studies measuring the concentration of microplastics in the wastewater treatment plants (WWTP) effluent to the sea. Although microplastic concentrations are low in the WWTP effluent, the actual amount of microplastic ending up in the marine environment through WWTPs is quite significant. The present study is an extensive questionnaire-based survey to untrained managers of 101 WWTPs located all over Greece reporting visually-observed plastic items. 94 of the WWTPs have screens with gaps larger than 5mm. This suggests that microplastics are passing through pretreatment to the main WWTP. In addition, 89 of the WWTP managers observed plastics in different tanks of the WWTPs. Cotton swab sticks are identified as the most common plastic found in WWTPs and the surrounding marine and coastal areas of the effluent pipes.

Mourshed, M., et al. (2017). "Towards the effective plastic waste management in Bangladesh: a review." Environmental Science & Pollution Research **24**(35): 27021-27046.

The plastic-derived product, nowadays, becomes an indispensable commodity for different purposes. A huge amount of used plastic causes environmental hazards that turn in danger for marine life, reduces the fertility of soil, and contamination of ground water. Management of this enormous plastic waste is challenging in particular for developing countries like Bangladesh. Lack of facilities, infrastructure development, and insufficient budget for waste management are some of the prime causes of improper plastic management in Bangladesh. In this study, the route of plastic waste production and current plastic waste management system in Bangladesh have been reviewed extensively. It emerges that no technical and improved methods are adapted in the plastic management system. A set of the sustainable plastic management system has been proposed along with the challenges that would emerge during the implementation these strategies. Successful execution of the proposed systems would enhance the quality of plastic waste management in Bangladesh and offers enormous energy from waste.

Movilla-Quesada, D., et al. (2019). "Use of plastic scrap in asphalt mixtures added by dry method as a partial substitute for bitumen." Waste Management **87**: 751-760.

In recent decades, the generation of plastic waste has increased substantially worldwide, with the result that more of such waste is introduced into the environment. Currently, most polymers (polyethylene terephthalate, polyethylene, polyvinyl chloride, and others) are recycled. However, some are rejected for recycling in the primary separation processes due to their physical condition, contamination, or size. These materials are called plastic scrap. In this research, the use of plastic scrap added by dry method was evaluated as a replacement for bitumen in asphalt mixtures. Two sizes of plastic scrap, coarse and fine, were considered. An AC16S semi-dense mixture was designed for this purpose, with a 10% reduction in binder, and 10% and 20% of plastic scrap binder was added in coarse and fine sizes. The results obtained in the Marshall stability and flow test showed reduced moisture damage, greater indirect tensile strength, higher air void content, and a 2% decrease in the conserved tensile strength ratio while the same usage field as the conventional mixture was maintained. Meanwhile, significant decreases in plastic deformations, as compared to traditional values, were obtained from resilient modulus and rutting tests.

Moya, M. L., et al. (2010). "The effect of FGF-1 loaded alginate microbeads on neovascularization and adipogenesis in a vascular pedicle model of adipose tissue engineering." Biomaterials **31**(10): 2816-2826.

Engineered vascularized adipose tissue could serve as an alternative to traditional tissue reconstruction procedures. Adipose formation occurs in a coordinated fashion with neovascularization. Previous studies have shown that extracellular matrix-based materials supplemented with factors that stimulate neovascularization promote adipogenesis in a number of animal models. The present study examines the ability of fibroblast growth factor (FGF-1) delivered from alginate microbeads to induce neovascularization and adipogenesis in type I collagen gels in a vascular pedicle model of adipose tissue engineering. FGF-1 loaded microbeads stimulated greater vascular network formation in an in vitro 3D co-culture model than a single bolus of FGF-1. In in vivo studies, FGF-1 loaded beads suspended in collagen and implanted in a chamber surrounding the exposed femoral pedicle of a rat resulted in a significant increase in vascular density at 1 and 6 weeks in comparison to bolus administration of FGF-1. Staining for smooth muscle actin showed that over 48% of vessels had associated mural cells. While an increase in neovascularization was achieved, there was less than 3% adipose under any condition. These results show that delivery of FGF-1 from alginate beads stimulated a more persistent neovascularization response than bolus FGF-1 both in vitro and in vivo. However, unlike previous studies, this increased neovascularization did not result in adipogenesis. Future studies need to provide a better understanding of the relationship between neovascularization and adipogenesis in order to design advanced tissue engineering therapies.

Moya, M. L., et al. (2011). "A novel in vitro platform of perfused human microtissues for the study of neovascularization." Circulation. Conference: American Heart Association's Scientific Sessions **124**(21 SUPPL. 1).

Understanding the process of vascular network formation and remodeling is key to designing effective strategies for the treatment of ischemic vascular diseases. Much of our current understanding of the neovascularization process is limited to in vivo studies, which require extrapolation of results to human, or in vitro models that lack the dynamic feature of perfusion. In this work we report the development of an in vitro model system of metabolically active microtissues that exchange nutrients and waste through perfused capillaries. For such design, a device consisting of 2 fluidic channels on either side of a central tissue channel, containing fibroblasts seeded in a fibrin matrix (Fig 1A), was microfabricated in polydimethylsiloxane. To study vasculogenic-like processes, ECs were co-seeded with the fibroblasts in the tissue channel. The devices were grown at 5% oxygen tension and formation of perfused vessel networks was encouraged by mechanical (pressure gradients, interstitial flow) and chemical stimuli (hypoxia and nutrient deprivation). Vessel network formation was observed within a week of culture and as early as day 1. Perfusion of the network was confirmed at day 18. Fluorescent dextran (70kDa) introduced on one end of one of the fluidic channel (Fig 1B-C) was shown to reach the other side of the device by traveling through the capillaries of the microtissues as evidence by the presence of dextran in the tissue channel and the absence of dextran in the fluidic channel. (Fig 1D) Anastomosis of vessels in the tissue channel with the fluidic channels was verified by tracking movement of fluorescent 1mum beads introduced into the fluidic channel and through patent capillaries (20-105 mum/s) in the tissue channel. Confocal microscopy of devices stained for CD31 (EC marker) and DAPI (nuclear marker) showed the extensive vessel network (Fig 1E)

and further demonstrated the presence of capillary lumens containing microbeads (Fig 1F).

Moya, M. L., et al. (2012). "Stability of alginate microbead properties in vitro." Journal of Materials Science-Materials in Medicine **23**(4): 903-912.

Alginate microbeads have been investigated clinically for a number of therapeutic interventions, including drug delivery for treatment of ischemic tissues, cell delivery for tissue regeneration, and islet encapsulation as a therapy for type I diabetes. The physical properties of the microbeads play an important role in regulating cell behavior, protein release, and biological response following implantation. In this research alginate microbeads were synthesized, varying composition (mannuronic acid to guluronic acid ratio), concentration of alginate and needle gauge size. Following synthesis, the size, volume fraction, and morphometry of the beads were quantified. In addition, these properties were monitored over time in vitro in the presence of varying calcium levels in the microenvironment. The initial volume available for solute diffusion increased with alginate concentration and mannuronic (M) acid content, and bead diameter decreased with M content but increased with needle diameter. Interestingly, microbeads eroded completely in saline in less than 3 weeks regardless of synthesis conditions much faster than what has been observed in vivo. However, microbead stability was increased by the addition of calcium in the culture medium. Beads synthesized with low alginate concentration and high G content exhibited a more rapid change in physical properties even in the presence of calcium. These data suggest that temporal variations in the physical characteristics of alginate microbeads can occur in vitro depending on synthesis conditions and microbead environment. The results presented here will assist in optimizing the design of the materials for clinical application in drug delivery and cell therapy.

Moyer, H. R., et al. (2010). "Alginate microencapsulation technology for the percutaneous delivery of adipose-derived stem cells." Annals of Plastic Surgery **65**(5): 497-503.

BACKGROUND: Autologous fat is the ideal soft-tissue filler; however, its widespread application is limited because of variable clinical results and poor survival. Engineered fillers have the potential to maximize survival. Alginate is a hydrogel copolymer that can be engineered into spheres of <200 mum, thus facilitating mass transfer, allowing for subcutaneous injection, and protecting cells from shearing forces.

METHODS: Alginate powder was dissolved in saline, and adipose-derived stem cells (ADSCs) were encapsulated (1 million cells/mL) in alginate using an electrostatic bead generator. To assess effects of injection on cell viability, microspheres containing ADSCs were separated into 2 groups: the control group was decanted into culture wells and the injection group was mixed with basal media and injected through a 21-gauge needle into culture wells. Microbeads were cultured for 3 weeks, and cell number and viability were measured weekly using electron and confocal microscopy. To assess effects of percutaneous injection in vivo, twenty-four male nude mice were randomly separated into 2 groups and injected with either empty microcapsules or ADSC-laden microcapsules. Mice were harvested at 1 and 3 months, and the implants were examined microscopically to assess bead and cell viability.

RESULTS: A flow rate of 5 mL/h and an electrostatic potential of 7 kV produced viable ADSC-laden microbeads of <200 mum. There were no differences in bead morphology and ADSC viability between microcapsules placed versus injected into tissue culture plates for up to 3 weeks. Microspheres implanted in a nude mouse model show durability up to 3 months with a host response around each individual sphere. ADSCs remained viable and showed signs of mitosis.

CONCLUSIONS: ADSCs can be readily cultured, encapsulated, and injected in alginate microspheres. Stem cells suspended in alginate microspheres survive in vivo and are seen to replicate in vitro.

Mrkun, J., et al. (2014). "Elimination of apoptotic boar spermatozoa using magnetic activated cell sorting." Acta Veterinaria Brno **83**(1): 13-18.

One of the features of apoptosis is the externalization of phosphatidylserine which could be used to remove apoptotic cells from semen preparations. Magnetic-activated cell sorting using annexin V-conjugated microbeads which bind to phosphatidylserine could be used to enhance semen quality. Twelve boar semen samples after 3 days of liquid storage at 16-17 degrees C were subjected to magnetic-activated cell sorting. Bound and unbound fractions and control samples were subjected to flow cytometry following the staining of spermatozoa with Annexin V conjugated with Alexa Fluor 488 and propidium iodide. Four subpopulations were obtained: live, early apoptotic live, late apoptotic, early necrotic dead and late necrotic dead. The frequency of early apoptotic and late necrotic spermatozoa was significantly higher (P<0.05) in bound (14.1+or-10.6% and 24.1+or-10.2%, respectively) than in unbound fractions (3.4+or-2.1% and 12.7+or-3.1%) and control (3.5+or-1.6% and 12.0+or-5.0%). The lowest concentration of live spermatozoa was found in the bound fraction (10.6+or-8.0%), which differed significantly (P<0.05) from the control. In unbound fractions there was a significantly higher concentration (P<0.05) of morphologically normal spermatozoa (31.8+or-12.6%) compared to bound ones (5.9+or-7.3%). A significantly (P<0.05) lower proportion of morphologically normal spermatozoa was observed in both fractions compared to control (67.2+or-17.0%). Boar spermatozoa were separated by the above method for the first time, however, the results showed this method to be inappropriate for boar semen separation under the tested conditions.

Mrokowska, M. M. and A. Krzton-Maziopa (2019). "Viscoelastic and shear-thinning effects of aqueous exopolymer solution on disk and sphere settling." Scientific Reports **9**(1): 7897.

In this study, xanthan gum is used as a model exopolymer to demonstrate potential effects of non-Newtonian properties of natural aquatic systems on settling dynamics of particles. Rheological measurements combined with settling experiments using visualization methods revealed that instantaneous velocity fluctuations and a flow pattern formed around a particle are the effects of solution viscoelasticity and shear-thinning properties and that the average settling velocity depends on the exopolymer concentration and particle size. Our study showed that in the considered conditions a disk-shaped particle settles preferably in vertical position with a negative wake behind. The understanding of these processes is essential in technology and engineering and is necessary to improve prediction accuracy of large-scale sedimentation processes and biogeochemical cycles in the ocean involving settling of minerals, marine snow, microplastics, and locomotion of microorganisms.

Mu, C., et al. (2015). "Development of a highly effective multi-stage surface acoustic wave SU-8 microfluidic concentrator." Sensors and Actuators B: Chemical **215**: 77-85.

As an important step in sample preparation, sample concentration step helps to improve sampling techniques that are often necessary to detect low levels of pathogenic bacteria in food safety inspections, reducing or completely eliminating the need for time-consuming cell enrichment process for detection. In this study, we investigated strategies to significantly enhance performances of a surface acoustic wave (SAW) microfluidic device to concentrate various particles, including microbeads, bacterial and mammalian cells in suspensions. A low acoustic energy loss material, SU-8, was used to fabricate the microfluidic concentrator, and SAW reflectors were designed to efficiently use the SAW generated acoustic energy for particle concentration. The concentration performance was further improved by using a two-stage concentration design. We demonstrated that the SU-8 microfluidic concentrator with a two-stage concentration configuration was able to concentrate 2.00 mu m bead samples at an overall concentration factor of 65-fold with a particle recovery efficiency of 81.9 plus or minus 5.9% at a inflow rate of 300 mu l/h. Similarly, when the concentrator was used to concentrate E. coli DH5 alpha and NIH/3T3 cells, overall concentration factors of 59 and 75-fold with particle recovery efficiencies of 81.0 plus or minus 17.2% and 90.8 plus or minus 5.0% were obtained, respectively. These results show significant improvements upon those previously reported for either bacterial or mammalian cell concentration applications. In addition, the device fabrication process developed in this work is fully compatible with regular microfabrication processes, making this microfluidic concentrator readily integrable with other on-chip functionalities for cell manipulation and detection applications.

Mu, J., et al. (2019). "Abundance and distribution of microplastics in the surface sediments from the northern Bering and Chukchi Seas." Environmental Pollution **245**: 122-130.

Worldwide the seafloor has been recognized as a major sink for microplastics. However, currently nothing is known about the sediment microplastic pollution in the North Pacific sector of the Arctic Ocean. Here, we present the first record of microplastic contamination in the surface sediment from the northern Bering and Chukchi Seas. The microplastics were extracted by the density separation method from collected samples. Each particle was identified using the microscopic Fourier transform infrared spectroscopy (muFTIR). The abundances of microplastics in sediments from all sites ranged from not detected (ND) to 68.78 items/kg dry weight (DW) of sediment. The highest level of microplastic contamination in the sediment was detected from the Chukchi Sea. A negative correlation between microplastic abundance and water depth was observed. Polypropylene (PP) accounted for the largest proportion (51.5%) of the identified microplastic particles, followed by polyethylene terephthalate (PET) (35.2%) and rayon (13.3%). Fibers constituted the most common shape of plastic particles. The range of polymer types, physical shapes and spatial distribution characteristics of the microplastics suggest that water masses from the Pacific and local coastal inputs are possible sources for the microplastics found in the study area. In overall, our results highlight the global distribution of these anthropogenic pollutants and the importance of management action to reduce marine debris worldwide.

Mueller, M.-T., et al. (2020). "Surface-Related Toxicity of Polystyrene Beads to Nematodes and the Role of Food Availability." Environmental Science & Technology.

Microplastics released into freshwaters from anthropogenic sources settle in the sediments, where they may pose an environmental threat to benthic organisms. However, few studies have considered the ecotoxicological hazard of microplastic particles for nematodes, one of the most abundant taxa of the benthic meiofauna. This study investigated the toxic effects of polystyrene (PS) beads (0.1-10.0 µm) and the underlying mechanisms thereof on the reproduction of the nematode Caenorhabditis elegans. The observed effect of the PS beads on the nematodes correlated well with the total surface area of the beads per volume, with a 50% inhibition of reproduction at 55.4 ± 12.9 cm2/mL, independent of the bead size. The adverse effects were not explained by styrene monomers leaching from the beads because chemical activities of styrene in PS suspensions were well below the toxic levels. However, the observed effects could be related to the bead material because the same-sized silica (SiO2) beads had considerably less impact, probably due to their higher specific density. PS and SiO2 beads affected the food availability of C. elegans, with greater effects by the PS beads. Our results demonstrate the importance of including indirect food web effects in studies of the ecological risks posed by microplastics.

Mugnozza, G. S., et al. (1994). "A proposal for the management of agricultural plastic wastes in a region of southern Italy." 13th International congress on plastics in agriculture [Congresso internazionale del C.I.P.A.]. Proceedings of a conference held in Verona, Italy **2**(13).

In the Metapuntin area, Italy, approx. 5000 tons/year of plastic wastes, derived from agricultural applications such as mulching, small tunnels, greenhouse and pergola coverings, and pesticide containers, requires disposal. A functional model of simple application, based on a system of withdrawal from growers and a network of centres for gathering, storage, and initial treatment of plastic waste, was studied. A suitable distribution between plastic consumer farms and gathering centres was investigated, and the technical characteristics gathering centres require to obtain plastic wastes suitable for the selected final treatment (i.e. landfills, recycling or energetic use) were analysed. The results are easily transferable to other situations and areas by means of appropriate adjustments in gathering centre dimensions and land disposition.

Mugo, S. M., et al. (2019). "Integrated microcentrifuge carbon entrapped glucose oxidase poly (N-isopropylacrylamide) (pNIPAm) microgels for glucose amperometric detection." Analytical Letters **52**(5): 825-838.

This study demonstrates a miniaturized integrated glucose biosensor based on a carbon microbeads entrapped by glucose oxidase (GOx) immobilized on poly (N-isopropylacrylamide) (pNIPAm) microgels. Determined by the Lowry protein assay, the pNIPAm microgel possesses a high enzyme loading capacity of 31 mg/g. The pNIPAm GOx loaded on the microgel was found to maintain a high activity of approximately 0.140 U determined using the 4-aminoantipyrine colorimetric method. The integrated microelectrochemical cell was constructed using a microcentrifuge vial housing packed with (1:1, w/w) carbon entrapped by pNIPAm GOx microgels, which played the dual role of the microbioreactor and the working electrode. The microcentrifuge vial cover was used as a miniaturized reference electrode and an auxiliary electrode holder. The device can work as biosensor, effectively converting glucose to H₂O₂, with subsequent amperometric detection at an applied potential of -0.4 V. The microelectrochemical biosensor was used to detect glucose in wide linear range from 30 micro M to 8.0 mM, a low detection limit of 10 micro M, a good linear regression coefficient (R²) of 0.994, and a calibration sensitivity of 0.0388 micro A/mM. The surface coverage of active GOx, electron transfer rate constant (ks), and Michaelis-Menten constant (K_M^{app}) of the immobilized GOx were 4.0x10⁻¹¹mol/cm², 5.4 s⁻¹, and 0.086 mM, respectively. To demonstrate the applicability and robustness of the biosensor for analysis of high sample matrix environment, glucose was analyzed in root beer. The microelectrochemical device was demonstrated for analysis of small sample (<50 micro L), while affording high precision and fast signal measurement (<=5 s).

Muhlbacher, J., et al. (2017). "Blockade of HLA Antibody-Triggered Classical Complement Activation in Sera from Subjects Dosed with the Anti-C1s Monoclonal Antibody TNT009-Results from a Randomized First-in-Human Phase 1 Trial." Transplantation **101**(10): 2410-2418.

Background Complement may play a key role in antibody-mediated rejection. A promising therapeutic approach may be classical pathway (CP) inhibition at the level of early component C1. Methods In this first-in-human, double-blind, randomized placebo-controlled phase 1 trial, we evaluated the safety and complement inhibitory effect of TNT009, a humanized monoclonal anti-C1s antibody. Sixty-four adult healthy volunteers received either single (n = 48; 7 consecutive cohorts, 0.3-100 mg/kg) or 4 weekly infusions (n = 16; 2 consecutive cohorts, 30 and 60 mg/kg per infusion) of TNT009 or placebo. To assess the effect of treatment on complement activity, sera from dosed subjects were analyzed in a CP activation assay evaluating C3d deposition on HLA-coated microbeads spiked with alloantibodies. Results Single doses of TNT009 at 3 to 100 mg/kg uniformly and profoundly inhibited HLA antibody-mediated C3d deposition (>=86% after 60 minutes), whereby the duration of CP inhibition (2-14 days) was dose-dependent. Four weekly doses persistently blocked complement for 5 to 6 weeks. Ex vivo serum CP activity was profoundly inhibited when TNT009 concentrations exceeded 20 mug/mL. Infusions were well tolerated without serious or severe adverse events. Conclusions Treatment with TNT009 was safe and potently inhibited CP activity. Future studies in patients are required to assess the potential of TNT009 for preventing or treating antibody-mediated rejection. Copyright © 2017 Wolters Kluwer Health, Inc.

Muhlschlegel, P., et al. (2017). "Lack of evidence for microplastic contamination in honey." Food Additives and Contaminants - Part A Chemistry, Analysis, Control, Exposure and Risk Assessment **34**(11): 1982-1989.

Honey samples from Switzerland were investigated with regard to their microplastic particle burden. Five representative honey samples of different origin were processed following a standardized protocol to separate plastic-based microparticles from particles of natural origin, such as pollen, propolis, wax, and bee-related debris. The procedure was optimized to minimize post-sampling microplastic cross-contamination in the laboratory. The isolated microplastic particles were characterized and grouped by means of light microscopy as well as chemically characterized by microscopically coupled Raman and Fourier transform infrared spectroscopy. Five particle classes with an abundance significantly above blank levels were identified: black particles (particle count between 1760/kg and 8680/kg), white transparent fibres (particle count between 132/kg and 728/kg), white transparent particles (particle count between 60/kg and 172/kg), coloured fibres (particle count between 32/kg and 108/kg), and coloured particles (particle count between 8/kg and 64/kg). The black particles, which represented the majority of particles, were identified as char or soot and most probably originated from the use of smokers, a widespread practice in beekeeping. The majority of fibres were identified as cellulose or polyethylene terephthalate and were most likely of textile origin. In addition to these particle and fibre groups lower numbers of fragments were detected that were related to glass, polysaccharides or chitin, and few bluish particles contained copper phthalocyanine pigment. We found no indications that the honey samples were significantly contaminated with microplastic particles. Copyright © 2017 Informa UK Limited, trading as Taylor & Francis Group.

Mühlschlegel, P., et al. (2017). "Lack of evidence for microplastic contamination in honey: Part A. Chemistry, Analysis, Control, Exposure & Risk Assessment Part A. Chemistry, Analysis, Control, Exposure & Risk Assessment." Food Additives and Contaminants **34**(11): 1982-1989.

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Mukai, R., et al. (2019). "Mouse model of ocular hypertension with retinal ganglion cell degeneration." PLoS ONE **14**(1).

Objectives Ocular hypertension is a primary risk factor for glaucoma and results in retinal ganglion cell (RGC) degeneration. Current animal models of glaucoma lack severe RGC cell death as seen in glaucoma, making assessment of physiological mediators of cell death difficult. We developed a modified mouse model of ocular hypertension whereby long-lasting elevation of intraocular pressure (IOP) is achieved, resulting in significant reproducible damage to RGCs. Results In this model, microbeads are mixed with hyaluronic acid and injected into the anterior chamber of C57BL/6J mice. The hyaluronic acid allows for a gradual release of microbeads, resulting in sustained blockage of Schlemm's canal. IOP elevation was bimodal during the course of the model's progression. The first peak occurred 1 hours after beads injection, with an IOP value of 44.69 ± 6.00 mmHg, and the second peak occurred 6–12 days post-induction, with an IOP value of 34.91 ± 5.21 mmHg. RGC damage was most severe in the peripheral retina, with a loss of 64.1% compared to that of untreated eyes, while the midperiphery exhibited a 32.4% loss, 4 weeks following disease induction. Conclusions These results suggest that sustained IOP elevation causes more RGC damage in the periphery than in the midperiphery of the retina. This model yields significant and reproducible RGC degeneration.

Mukai-Correa, R., et al. (2004). "Controlled release of protein from hydrocolloid gel microbeads before and after drying." Current Drug Delivery **1**(3): 265-273.

Casein entrapped within gel microbeads using alginate, amidated LM pectin, gellan gum and a system containing a mixture of these polysaccharides (pectin:gellan:alginate, 1/3: 1/3: 1/3), were obtained by ionic gelation in a high-pressure capillary apparatus. Hydrogenated vegetable fat was also added to produce the gel microbeads and protein release in all the systems was measured, including from freeze-dried capsules containing protein and fat. Encapsulation efficiency, capsule size and morphology were evaluated as well as the protein release profile. Encapsulation efficiencies from 83.7 to 90.7% were obtained for the protein capsules and from 71.8 to 95.4% for those containing protein and fat. Greater release was observed from gel microbeads without fat where alginate presented the greatest diffusion (100%) and the system with a mixture of polyssacharides, the best barrier, with protein retention of 90% after 240 min in solution. The fat containing gel microbeads presented good percent retentions and both the gel microbeads and the dry microbeads showed similar percentages for release. The majority of the systems studied showed a burst effect on release. Gel microbeads size distribution was similar, both with and without fat, and independent of the matrix material, the mean size being 150microm. The morphological observations showed that the gel microbeads were spheroidal with a homogenous distribution of fat droplets in the microcapsules. Agglomeration occurred on drying but many particles maintained a partially spheroidal form, with a configuration of solid material.

Mukherjee, M. and B. H. Desai (1993). "Platelet adhesiveness in coronary heart disease." Indian Heart Journal **45**(3): 195-198.

A simple reproducible method of determination of whole blood platelet adhesiveness, on columns of unsiliconised glass microbeads, was developed and validated. Platelet adhesiveness was determined in 180 subjects who were classified into four groups. The subjects of Groups I and II had negative cardiac stress and were free from coronary heart disease (CHD). While the 42 subjects of Group I had none of the conventional coronary risk factors, the 46 subjects of Group II had one or more coronary risk factors. Group III consisted of 68 subjects who had positive cardiac stress test. They were patients with myocardial ischemia. Group IV consisted of 24 survivors of myocardial infarction. The percent of subjects with platelet retention values exceeding 50.5% were, 9.5% in Group I, 26.1% in Group II, 32.4% in Group III and 37.5% in Group IV ($p < 0.05$). Although Group II consisted of subjects free from CHD, its difference from Group I, and closeness to Groups III and IV probably indicate that asymptomatic subjects with coronary risk factors and with increased platelet adhesiveness may be on the threshold of the symptomatic phase of CHD. Increased platelet adhesiveness may thus be a predictive marker of CHD.

Mulay, S. R., et al. (2012). "Calcium-oxalate crystals induce renal inflammation and acute kidney injury by activating nlrp3 inflammasome-mediated interleukin-1 secretion in renal dendritic cells." Nephrology Dialysis Transplantation **2)**: ii338.

Introduction and Aims: Calcium oxalate (CaOx) crystal nephropathy can lead to renal failure by causing intrarenal inflammation and tissue damage but the molecular mechanisms remain elusive. The aim of the study was to investigate whether CaOx crystals have the potential to activate IL-1beta-dependent innate immunity via the NLRP3-ASC-caspase-1 axis in the kidney, and how Methods: C57BL/6, NOD/ShiLt, NOD/Casp1-/-, IL-1r1-/-, IL-18-/-, Myd88-/- male mice were procured from Jackson Laboratories (Bar Habour, MA). Nlrp3-/- and Asc-/- mice were generously provided by Dan Muruve, Calgary, Canada. All experimental procedures were approved by the local government authorities. Immunostaining, scanning electron microscope (SEM), freeze fracture (FFEM), and transmission electron microscope (TEM) were used for analysing kidney pathology. Bone marrow derived dendritic cells were generated by established protocols. Renal dendritic cells (DC) were isolated from whole kidneys by magnetic beads separation (MACS) using CD11c MicroBeads (Miltenyi Biotech, Germany). Fluorescence Activated Cell Sorter, ELISA and Immunoblot analysis was used for further data analysis. Result(s): We show that CaOx crystals activate renal DC (but not any type of renal parenchymal cell) to secrete IL-1beta. This process depended on the presence of the NLRP3 inflammasome, its adaptor molecule ASC, and caspase-1. CaOx crystal phagocytosis and potassium efflux were required for NLRP3 activation in DC. CaOx crystals dose-dependently killed tubular epithelial cells in culture, a process that lead to the release of the NLRP3 agonist ATP but ATP-degradation with apyrase did not abrogate IL-1beta release by DC upon exposure to supernatants of tubular cells killed by CaOx crystals. In experimental oxalate nephropathy, CaOx localized to tubular lumen but are also found inside tubular cells and interstitial cells as detected by Pizzolato staining, TEM, SEM, FFEM. Intrarenal crystal desposition induced severe tubular damage, cytokine expression, neutrophil recruitment, and renal dysfunction. These effects were abrogated upon DC-depletion or in mice deficient in MyD88, IL1-r1, NLRP3, ASC, or caspase-1 despite a similar extent of CaOx crystal deposition. In addition, ATP depletion with apyrase or therapeutic IL-1 antagonism with anakinra had the same effect. Conclusion(s): We conclude that CaOx crystals directly damage tubular epithelial cells. In addition, CaOx crystals are taken up by renal DC which activates the NLRP3-ASC-caspase-1 axis to trigger IL-1beta release. Subsequent

IL-1R signaling sets off MyD88-dependent renal inflammation, neutrophil recruitment and accelerates tubular damage and renal dysfunction. Therapeutic blockade of IL-1 is protective in murine CaOx nephropathy and might potentially be protective in human crystal nephropathies.

Muller, A., et al. (2018). "The effect of polymer aging on the uptake of fuel aromatics and ethers by microplastics." Environmental Pollution **240**: 639-646.

Microplastics are increasingly entering marine, limnic and terrestrial ecosystems worldwide, where they sorb hydrophobic organic contaminants. Here, the sorption behavior of the fuel-related water contaminants benzene, toluene, ethyl benzene and xylene (BTEX) and four tertiary butyl ethers to virgin and via UV radiation aged polypropylene (PP) and polystyrene (PS) pellets was investigated. Changes in material properties due to aging were recorded using appropriate polymer characterization methods, such as differential scanning calorimetry, Fourier transform infrared spectroscopy, gel permeation chromatography, X-ray photoelectron spectroscopy, and microscopy. Pellets were exposed to water containing BTEX and the ethers at 130-190mugL⁻¹ for up to two weeks. Aqueous sorbate concentrations were determined by headspace gas chromatography. Sorption to the polymers was correlated with the sorbate's K_{ow} and was significant for BTEX and marginal for the ethers. Due to substantially lower glass transition temperatures, PP showed higher sorption than PS. Aging had no effect on the sorption behavior of PP. PS sorbed less BTEX after aging due to an oxidized surface layer.

Muller, P., et al. (2017). "Intramyocardial fate and effect of iron nanoparticles co-injected with MACS purified stem cell products." Biomaterials **135**: 74-84.

BACKGROUND: Magnetic activated cell sorting (MACS) is routinely used to isolate stem cell subpopulations intended for the treatment of cardiovascular diseases. In strong contrast, studies examining the amount, effect and intramyocardial distribution of iron nanoparticles used for magnetic cell labelling are missing, although iron excess can cause functional disorders in the heart.

METHODS AND RESULTS: CD133⁺ haematopoietic and CD271⁺ mesenchymal stem cells were purified from bone marrow using automatically and manually MACS based systems. Flow cytometric measurements demonstrated a rapid loss of MACS MicroBeads from cells under culture conditions, while storage under hypothermic conditions decelerated their detachment. Moreover, an average loading of ~11 fg iron/cell caused by magnetic labelling was determined in magnetic particle spectroscopy. Importantly, hemodynamic measurements as well as histological examinations using a myocardial ischemia/reperfusion mouse model showed no influence of MACS MicroBeads on cardiac regeneration, while the transplantation of stem cells caused a significant improvement. Furthermore, immunostainings demonstrated the clearance of co-injected iron nanoparticles from stem cells and the surrounding heart tissue within 48 h post transplantation.

CONCLUSIONS: Our results indicate that iron amounts typically co-injected with MACS purified stem cells do not harm cardiac functions and are cleared from heart tissue within a few hours. Therefore, we conclude that MACS MicroBeads exhibit a good compatibility in the cardiac environment.

Muller, R. J., et al. (2001). "Biodegradation of polyesters containing aromatic constituents." Journal of Biotechnology **86**(2): 87-95.

Polymers, which undergo a controlled biological degradation by micro-organisms came to remarkable interest during the last years. Composting for instance could so be established as an

alternative waste management system for parts of the plastic waste. Within this group of innovative polymer, polyesters play a predominant role, due to their potentially hydrolyzable ester bonds. While aromatic polyesters such as poly(ethylene terephthalate) exhibit excellent material properties but proved to be almost resistant to microbial attack, many aliphatic polyesters turned out to be biodegradable but lack in properties, which are important for application. To combine good material properties with biodegradability, aliphatic-aromatic copolyesters have been developed as biodegradable polymers for many years. This article reviews the attempts to combine aromatic and aliphatic structures in biodegradable plastics and work, which has been done to evaluate the degradation behaviour and environmental safety of biodegradable polyesters, containing aromatic constituents. © 2001 Elsevier Science B.V.

Muller-Karanassos, C., et al. (2019). "Antifouling paint particles in intertidal estuarine sediments from southwest England and their ingestion by the harbour ragworm, Hediste diversicolor." Environmental Pollution **249**: 163-170.

Antifouling paint particles (APPs) of between 500 mum and >2 mm in diameter have been identified in silty, intertidal estuarine sediments through a combination of microscopy and x-ray fluorescence spectrometry. APPs were heterogeneously distributed, with maximal concentrations of 430 particles L⁻¹ (0.2 g L⁻¹) near to a facility where boats are regularly maintained and 400 particles L⁻¹ (4.2 g L⁻¹) at a location where old boats had been abandoned, with the majority of particles encountered in the finest size fraction retrieved. APPs contained variable concentrations of Cu, Zn, Sn and Pb, with respective maxima of 562,000, 269,000, 9,970 and 126,000 mg kg⁻¹. These characteristics are attributed to a multitude of contemporary and historic sources of an assortment of formulations and result in significant but heterogeneous metal contamination of local sediments. APPs were also identified in the guts of the deposit-feeding ragworm, Hediste diversicolor, that inhabited sediments impacted by abandoned boats or boating activities. The tissue of H. diversicolor was particularly enriched in Cu where ingested APPs were observed, with a significant correlation between dry weight Cu concentrations in the two media (r = 0.734) presumably reflecting the inability of the animal to regulate this metal. While the toxicity of APPs requires further investigation, there is clearly a need for stricter regulations on antifouling wastes in boatyards and marinas and a requirement to better manage abandoned boats. Antifouling paint particles in contaminated estuarine sediments can be ingested by Hediste diversicolor and result in the bioaccumulation of copper. Copyright © 2019

Muller-Marschhausen, K., et al. (2008). "Physiological hydrostatic pressure protects endothelial monolayer integrity." American Journal of Physiology - Cell Physiology **294**(1): C324-C332.

Endothelial monolayer integrity is required to maintain endothelial barrier functions and has found to be impaired in several disorders like inflammatory edema, allergic shock, or artherosclerosis. Under physiologic conditions in vivo, endothelial cells are exposed to mechanical forces such as hydrostatic pressure, shear stress, and cyclic stretch. However, insight into the effects of hydrostatic pressure on endothelial cell biology is very limited at present. Therefore, in this study, we tested the hypothesis that physiological hydrostatic pressure protects endothelial monolayer integrity in vitro. We investigated the protective efficacy of hydrostatic pressure in microvascular myocardial endothelial (MyEnd) cells and macrovascular pulmonary artery endothelial cells (PAECs) by the application of selected pharmacological agents known to alter monolayer integrity in the absence or presence of hydrostatic pressure. In both endothelial cell lines, extracellular Ca²⁺ depletion by EGTA was followed by a loss of vascular-endothelial cadherin (VE-caherin) immunostaining at cell junctions. However, hydrostatic pressure (15 cmH<inf>2</inf>O) blocked this effect of EGTA. Similarly, cytochalasin D-induced actin depolymerization and intercellular gap formation and cell detachment in response to the Ca²⁺/calmodulin antagonist trifluperazine (TFP) as well as thrombin-induced cell dissociation were also reduced by hydrostatic pressure. Moreover, hydrostatic pressure significantly reduced the loss of VE-cadherin-mediated adhesion in response to EGTA, cytochalasin D, and TFP in MyEnd cells as determined by laser tweezer trapping using VE-cadherin-coated microbeads. In caveolin-1-deficient MyEnd cells, which lack caveolae, hydrostatic pressure did not protect monolayer integrity compromised by EGTA, indicating that caveolae-dependent mechanisms are involved in hydrostatic pressure sensing and signaling. Copyright © 2008 the American Physiological Society.

Muller-Schulte, D. and H. Brunner (1995). "Novel magnetic microspheres on the basis of poly(vinyl alcohol) as affinity medium for quantitative detection of glycated haemoglobin." Journal of Chromatography. A **711**(1): 53-60.

A water-in-oil suspension cross-linking technique using poly(vinyl alcohol) as polymer phase to prepare novel magnetic microbeads is described. By dispersing a conventional Fe3O4 pigment in the polymer phase and subsequently suspending the mixture in a vegetable oil phase with a defined viscosity, spherical magnetic microspheres are obtained. Bead sizes ranging from 1 to 50 microns and above can be obtained by exploiting well defined preparation parameters such as polymer concentration and oil and polymer viscosity. The performance of the magnetic matrices for the separation and quantification of glycated haemoglobin was tested using a m-aminophenylboronic acid matrix. The feasibility of this detection method for blood sugar diagnosis is discussed using a commercial column test kit for comparison.

Mulligan, J. K., et al. (2008). "Tumors skew endothelial cells to disrupt NK cell, T-cell and macrophage functions." Cancer Immunology, Immunotherapy **57**(7): 951-961.

Introduction: Patients and mice with solid tumors, such as Lewis lung carcinoma (LLC), have defects in functions of immune effector cells. Endothelial cells, a component of the tumor vasculature, are potential regulators of immune cell functions. Therefore, these studies examined the impact of exposure to LLC tumor on the ability of endothelial cells to modulate immune cell functions. Materials and methods: Endothelial cells were pre-treated with LLC tumor-conditioned medium (Endo super(T-sup)) for 24 h. Control endothelial cells that were exposed to medium (Endo super(Media)) or epithelial cell-conditioned medium (Endo super(Epi-sup)). After the initial 24 h incubation, endothelial cells were washed and fresh media was added. Cells were allowed to incubate for an additional 24 h. Supernatants from Endo super(Media), Endo super(Epi-sup) or Endo super(T-sup) were collected and assayed for immune modulatory products and for immune modulatory activity. Results: Supernatant from Endo super(T-sup) contained increased levels of PGE sub(2), IL-6 and VEGF as compared to Endo super(Media) and Endo super(Epi-sup) controls. NK cell activity, as measured by TNF- alpha and IFN- gamma secretion, was increased following exposure to media conditioned by Endo super(Media) and Endo super(Epi-sup). Exposure of NK cells to supernatants of Endo super(T-sup), also increases TNF- alpha and IFN- gamma secretion, but to a lesser extent than by Endo super(Media) and Endo super(Epi-sup). Examination of macrophage functions demonstrated that supernatant from Endo super(T-sup) decreased microbead phagocytosis and increased production of the immune suppressive mediators, IL-10 and PGE sub(2). Lastly, T-cell responses to stimulation with anti-CD3 in the presence of supernatants from Endo super(T-sup) were examined. IFN- gamma production by CD8 super(+) T-cells was reduced after exposure to Endo super(T-sup)-conditioned medium, as compared to cells treatments with medium or

control conditioned medium. Production of IFN- gamma by CD4 super(+) T-cells exposed to Endo super(T-sup) was not altered. Conclusions: Taken together, these studies demonstrate that tumors skew endothelial cells to disrupt NK cell, T-cell and macrophages functions, and represents a novel mechanism of tumor-induced immune suppression.

Mulvaney, S. P., et al. (2007). "Rapid, femtomolar bioassays in complex matrices combining microfluidics and magnetoelectronics." Biosensors & Bioelectronics **23**(2): 191-200.

A significant challenge for all biosensor systems is to achieve high assay sensitivity and specificity while minimizing sample preparation requirements, operational complexity, and sample-to-answer time. We have achieved multiplexed, unamplified, femtomolar detection of both DNA and proteins in complex matrices (including whole blood, serum, plasma, and milk) in minutes using as few as two reagents by labeling conventional assay schemes with micrometer-scale magnetic beads, and applying fluidic force discrimination (FFD). In FFD assays, analytes captured onto a microarray surface are labeled with microbeads, and a controlled laminar flow is then used to apply microfluidic forces sufficient to preferentially remove only nonspecifically bound bead labels. The density of beads that remain bound is proportional to the analyte concentration and can be determined with either optical counting or magnetoelectronic detection of the magnetic labels. Combining FFD assays with chip-based magnetoelectronic detection enables a simple, potentially handheld, platform capable of both nucleic acid hybridization assays and immunoassays, including orthogonal detection and identification of bacterial and viral pathogens, and therefore suitable for a wide range of biosensing applications.

Mulvaney, S. P., et al. (2004). "Incorporating fluorescent dyes and quantum dots into magnetic microbeads for immunoassays." Biotechniques **36**(4): 602-606, 608-609.

Microbeads that are both paramagnetic and fluorescently labeled are commercially available in colors spanning the visible spectrum. Although these commercial beads can be bright, polydispersity in both size and fluorescent intensity limit their use in quantitative assays. Very recently, more monodisperse beads have become available, but their large size and surface properties make them less than ideal for some bioassay applications. Here we describe methods to customize commercial nonfluorescent magnetic microparticles with fluorescent dyes and quantum dots (QDs) without affecting their magnetic or surface chemical properties. Fluorescent dyes and 3.3-nm diameter CdSe/ZnS QDs were sequestered within 0.8-micron diameter magnetic beads by swelling the polystyrene matrix of the bead in organic solvent, letting the chromophores partition, and then collapsing the matrix in polar solvents. Chromophore incorporation has been characterized using both UV-visible absorption spectroscopy and fluorescence microscopy, with an average of 3 x 10(8) rhodamine 6G molecules/bead and 6 x 10(4) QDs/bead. The modified beads are uniform in size and intensity, with optical properties comparable to currently available commercial beads. Immunoassay results obtained with our custom fluorescent magnetic microbeads are consistent with those obtained using conventional magnetic microbeads.

Mulvaney, S. P., et al. (2009). "Attomolar protein detection in complex sample matrices with semi-homogeneous fluidic force discrimination assays." Biosensors and Bioelectronics **24**(5): 1109-1115.

We describe a semi-homogenous (SH) implementation of a fluidic force discriminationTM (FFD) assay using only two reagent mixtures and three assay steps that can be performed in as little as 10 min. Previously microbead labels and FFD have been combined to achieve multiplexed, femtomolar nucleic acid hybridization and immunoassays in a microarray format [Mulvaney, S.P., Cole, C.L., Kniller, M.D., Malito, M., Tamanaha, C.R., Rife, J.C., Stanton, M.W., Whitman, L.J., 2007. Biosen. Bioelectron. 23, 191-200.]. In SH FFD assays, the microbeads and any required intermediate receptors (e.g., secondary antibodies) are first mixed directly with a sample, allowing target analytes to be efficiently captured onto the beads. The target-loaded beads are then specifically captured onto a microarray surface, with nonspecifically bound beads removed by controlled, laminar fluidic forces. The remaining beads on each microarray capture spot are counted to determine the targets' identities and concentrations. SH target collection provides a 1000-fold improvement in the assay sensitivity, down to attomolar concentrations, as demonstrated by our detection of staphylococcal enterotoxin B (SEB) at 35 aM (1 fg/ml). We also show that SH assays are adaptable for extraction, preconcentration, and identification of analytes in complex sample matrices, including assays for SEB and ricin toxoid in serum and whole blood. Finally, we present a detailed model of the reaction kinetics that reveals how capturing the targets onto the beads in solution provides a significant kinetic advantage at low target concentrations where mass transport to a microarray surface is most limited. © 2008 Elsevier B.V.

Mumbach, G. D., et al. (2019). "Dissolution of adhesive resins present in plastic waste to recover polyolefin by sink-float separation processes." Journal of Environmental Management **243**: 453-462.

This study investigated the dissolution of adhesive resins present in polyolefin films that cause plastic materials to adhere to each other. The process of dissolution was made by the use of ethyl acetate and followed by separation through the sink-float process. The objective was to separate and characterize polyolefin films from plastic solid waste derived from recycled post-consumer paper. Through these procedures, 6% polyethylene of high-density (HDPE), 14% polyethylene of low-density (LDPE) and 39% polypropylene (PP) were separated and recovered from plastic waste. Fourier transform infrared spectroscopy (FTIR), thermal gravimetric analyzes (TGA), differential scanning calorimetry (DSC), and dynamic mechanical analysis (DMA) were conducted to determine the chemical, thermal and mechanical properties of the recovered polymers and to establish a comparison with standard commercial polymers. It demonstrated that recovered material kept their chemical, thermal, and mechanical properties. This process indicates possible economic viability considering the demand, the market value of the PP, and the required investment to be implemented in the recycling process that could be amortized in a short period of time. Moreover, the organic solvent used in the dissolution process can be easily recovered by distillation.

Munari, C., et al. (2017). "Microplastics in the sediments of Terra Nova Bay (Ross Sea, Antarctica)." Marine Pollution Bulletin **122**(1-2): 161-165.

This is the first survey to investigate the occurrence and extent of plastic contamination in sediments collected in Terra Nova Bay (Ross Sea, Antarctica). Plastic debris extracted from 31 samples of sediments were counted, weighted and identified by Fourier-transform infrared spectroscopy (FT-IR). All sediment samples contained plastics: a total of 1661 items of debris (3.14g) were recorded from the 31 samples of sediment. Plastic particles in the samples ranged from 0.3 to 22mm in length. Fibres were the most frequent type of small plastics debris detected. In terms of abundance, microplastics (<5mm) accounted for 78.4% of debris. 9 polymer types were found: the most common material (94.13% by weight) was styrene-butadiene-styrene copolymer (SBS), widely used in pneumatic tires, etc. A decreasing concentration of plastic debris at increasing distances from the Mario Zucchelli Base was evidenced.

Munier, B. and L. I. Bendell (2018). "Macro and micro plastics sorb and desorb metals and act as a point source of trace metals to coastal ecosystems." PLoS ONE [Electronic Resource] **13**(2): e0191759.

Nine urban intertidal regions in Burrard Inlet, Vancouver, British Columbia, Canada, were sampled for plastic debris. Debris included macro and micro plastics and originated from a wide diversity of uses ranging from personal hygiene to solar cells. Debris was characterized for its polymer through standard physiochemical characteristics, then subject to a weak acid extraction to remove the metals, zinc, copper, cadmium and lead from the polymer. Recently manufactured low density polyethylene (LDPE), nylon, polyethylene terephthalate (PET), polypropylene (PP), polystyrene (PS) and polyvinyl chloride (PVC) were subject to the same extraction. Data was statistically analyzed by appropriate parametric and non-parametric tests when needed with significance set at $P < 0.05$. Polymers identified in field samples in order of abundance were; PVC (39), LDPE (28), PS (18), polyethylene (PE, 9), PP (8), nylon (8), high density polyethylene (HDPE, 7), polycarbonate (PC, 6), PET (6), polyurethane (PUR, 3) and polyoxymethylene (POM, 2). PVC and LDPE accounted for 46% of all samples. Field samples of PVC, HDPE and LDPE had significantly greater amounts of acid extracted copper and HDPE, LDPE and PUR significantly greater amounts of acid extracted zinc. PVC and LDPE had significantly greater amounts of acid extracted cadmium and PVC tended to have greater levels of acid extracted lead, significantly so for HDPE. Five of the collected items demonstrated extreme levels of acid extracted metal; greatest concentrations were 188, 6667, 698,000 and 930 mugg-1 of copper, zinc, lead and cadmium respectively recovered from an unidentified object comprised of PVC. Comparison of recently manufactured versus field samples indicated that recently manufactured samples had significantly greater amounts of acid extracted cadmium and zinc and field samples significantly greater amounts of acid extracted copper and lead which was primarily attributed to metal extracted from field samples of PVC. Plastic debris will affect metals within coastal ecosystems by; 1) providing a sorption site (copper and lead), notably for PVC 2) desorption from the plastic i.e., the "inherent" load (cadmium and zinc) and 3) serving as a point source of acute trace metal exposure to coastal ecosystems. All three mechanisms will put coastal ecosystems at risk to the toxic effects of these metals.

Munno, K., et al. (2018). "Impacts of temperature and selected chemical digestion methods on microplastic particles." Environmental Toxicology & Chemistry **37**(1): 91-98.

Alkaline and wet peroxide oxidation chemical digestion techniques used to extract microplastics from organic matrices were assessed for recoveries and for impacts on ability to identify polymer types. Methods using wet peroxide oxidation generated enough heat to result in the complete loss of some types of microplastic particles, and boiling tests confirmed that temperatures >70 °C were responsible for the losses. Fourier transform infrared spectroscopy (FT-IR) confirmed minimal alteration of the recovered polymers by the applied methods. Environ Toxicol Chem 2018;37:91-98. © 2017 SETAC [ABSTRACT FROM AUTHOR]

Munoz, P., et al. (2004). "Using LCA for the improvement of waste management in greenhouse tomato production." DIAS Report, Animal Husbandry **61**: 205-209.

Protected cultivation is aimed to obtain higher yields by modifying and improving natural climatic conditions. In spite of the fact that Mediterranean horticulture is mainly based on low-technology cold greenhouses, and therefore input resources are less than those used by more complex greenhouses, protected cultivation has a certain environmental impact. One of the bottlenecks associated to this system of production is the large amount of solid waste production. Waste can be biologic such as non-yield biomass and organic substrates, plastics (cover film, mulching etc...) or minerals (such as steel and mineral substrates). Life Cycle Assessment, LCA, has been used to assess different scenarios of waste treatment generated in a greenhouse tomato crop. The production of plastic waste from the different material used was estimated in 1750 kg ha⁻¹ year⁻¹. Soilless closed systems, which reduce contamination from fertilisers and use of water, generated an estimated waste of 1150 kg ha⁻¹ year⁻¹ of polyethylene used in substrate bags and soil cover. Finally there is a non-yield biomass of 20000 kg of dry matter ha⁻¹ year⁻¹. Different scenarios such as landfill, incineration and compost of the biomass have been evaluated. Results shows that for most indicators categories the waste management is important in the life cycle of greenhouse tomato production.

Muntohar, A. S. (2011). "Effect of specimen size on the tensile strength behavior of the plastic waste fiber reinforced soil - lime - rice husk ash mixtures." Civil Engineering Dimension **13**(2): 82-89.

Improvement of tensile strength in fiber reinforced soil is an important research topic. A study has been undertaken to investigate the strength of stabilized clay-soil reinforced with randomly distributed discrete plastic waste fibers by carrying out split tensile strength test. In this study, the clay soil was stabilized with lime and rice husk ash mixtures. The main purpose of this research is to investigate the effect of specimen size to the tensile strength behavior. Testing procedure was formulated using extended ASTM C496 standard. The laboratory investigation results showed that split-tensile strength of reinforced specimens increased with increase in size. The limitations of the dataset indicate that specimen size of 70 mm in diameter is the threshold to produce reasonable representative strengths.

Murakami, C. D., et al. (2014). "Where Does the Plastic Go?" Green Teacher(102): 27-30.

The article focuses on teaching strategies for exposing students to socio-scientific issues (SSI) related to plastic pollution, which could be used by teachers to promote better understanding of global climate change and genetic engineering. Topics discussed include the benefits of introducing SSI to students including greater interest in science, techniques teachers can use to discuss SSI in the classroom and strategies to assess students' understanding of SSI.

Murakawa, T., et al. (2008). "Improvement of bioactive bead-mediated transformation by concomitant application of electroporation." Plant Biotechnology **25**(4): 387.

Techniques of exogenous gene introduction in plant cells have been actively applied for producing transgenic cultured cells that produce high levels of useful biological substances and are used for the molecular breeding of plants. A novel gene transfer technique has been developed using calcium alginate micro-beads (bioactive beads) to entrap genetic material. Although this technique has several advantages such as high transformation efficiency and the ability to introduce large DNA molecules, the precise optimal application conditions remain to be determined. Here, the optimal conditions for the concomitant use of bioactive beads and electroporation, such as polyethylene glycol (PEG) concentration, alginate concentration, electric field intensity, pulse duration, and pulse numbers, were determined for improved gene transfer efficiency of bioactive bead-mediated plant transformation. Consequently, highly efficient transient transgene expression (up to 4.7%) was achieved by applying electrical pulses

(0.75 kV CM-1, 30 µs, 3×) to a protoplast suspension in 12% polyethylene glycol (PEG).

Muramatsu, K. (1975). "Recycling of rubber and plastic wastes." Int.Polymer Sci.Technol **2**(1): 93-102.
It is now several years since the need to recycle rubber and plastic waste was first advocated, and since then a good start has been made on the development of techniques. However, the present state of recycling techniques cannot be said to have been perfected. In order to accelerate practical recycling, together with the research and development of techniques, it is necessary to establish economic recycling systems. This paper presents a general view of the present state of recycling. Since many authors have already discussed this theme in various ways, in order to avoid repetition, descriptions are made only of recent techniques, particularly those connected with town refuse.

Muramatsu, T., et al. (2011). "Electrochemical flow injection immunoassay for cortisol using magnetic microbeads." International Journal of Environmental Analytical Chemistry **91**(2): 161-173.
We developed a novel flow injection assay for cortisol based on competitive immunologic reactions, magnetic separation, and electrochemical measurement. The proposed flow assay system was composed of two reaction units. An anti-cortisol antibody was immobilised on magnetic beads and injected into the reaction coil of a competitive reaction unit with a blood sample and a specific quantity of acetylcholinesterase-labelled cortisol (cort-AChE). After reacting in the reaction coil, the sample was separated magnetically using a neodymium magnet. The cort-AChE was detached from the magnetic beads and transferred into the enzyme reaction unit with acetylthiocholine (ATCh). ATCh was hydrolysed by the cort-AChE to produce thiocholine. The thiocholine was quantified downstream by electrochemical detection using a Pt-Ir electrode. The performance of the proposed flow assay system was optimised under the following conditions: pH 7.5, temperature 25 degrees C, flow rate 170 micro l min⁻¹, ATCh concentration in the substrate buffer 5 mmol L⁻¹. The output current was well correlated with the concentration of the cortisol standard solution (range: 7.8-500 pg mL⁻¹). The results obtained using the proposed flow method were compared with those obtained using conventional ELISA (correlation coefficient 0.9585 [y=-0.9797+1.173(x), n=11]). These findings suggest that the EFIIA system can be used to analyse cortisol in fish plasma samples.

Murphy, A. A., et al. (2010). "Pathogenic B cell expansion observed in HCV mixed cryoglobulinemic vasculitis patients results in activation of monocytes and innate immune activation." Hepatology **1)**: 671A.
Background: Mixed Cryoglobulinemic vasculitis (MC) is a rare extrahepatic manifestation of chronic HCV infection characterized by monoclonal expansion of B cells producing pathogenic IgM with rheumatoid factor activity. High levels of innate immune activation in PBMCs have been a hallmark of untreated MC, which are normalized with B cell depletion therapy and resolution of symptoms. AIM: To determine the phenotypic and functional characteristics of B cells and their role in inducing immune activation in MC subjects undergoing Rituximab (RTX) therapy. Method(s): Seven MC patients received 4 weekly doses of RTX (375mg/m2) and were followed for 1 year. Seven normal volunteers served as controls. DNA microarray analysis was performed using RNA from PBMCs before and after treatment. Fractionation of cell types in vitro was performed using subset-specific antibodies conjugated with magnetic MicroBeads. IFIG expression was analyzed via QuantiGene Plex 2.0 assay in these human PBMCs, monocyte depleted, monocyte enriched, B cell depleted, and B cell enriched samples from both pre and post RTX treatment. B cell phenotyping was performed with a panel of anti-human mAbs

obtained from BD Biosciences, and FACS analyses were performed on a FACSCalibur flow cytometer using FlowJo software. Result(s): HCV MC subjects had a significant increase in mean IFIG expression when compared to normal volunteers (p<0.001), which normalized after RTX therapy (p=0.5). Monocytes and no B cells accounted for the IFIG expression. Specifically, the expression of IFI6, ISG20, IRF7, IFIT1, IFI44, LY6E, IFIT3, MX1, and ISG15 were upregulated at baseline and were normalized with therapy while OAS1, MX2, and STAT1 levels were unchanged even after therapy. The following table displays the results of the B cell phenotype characterization. Conclusion(s): Expansion of tissue like exhausted memory B cells, down regulation of CD21 and a reduction in memory phenotype observed in HCV MC patients may represent the expansion of pathogenic B cells in these patients. This pathognomonic B cell expansion in HCV MC contributes to innate immune activation indirectly by activation of monocytes.(Table presented).

Murphy, F., et al. (2016). "Wastewater Treatment Works (WwTW) as a Source of Microplastics in the Aquatic Environment." Environmental Science and Technology **50**(11): 5800-5808.

Municipal effluent discharged from wastewater treatment works (WwTW) is suspected to be a significant contributor of microplastics (MP) to the environment as many personal care products contain plastic microbeads. A secondary WwTW (population equivalent 650-000) was sampled for microplastics at different stages of the treatment process to ascertain at what stage in the treatment process the MP are being removed. The influent contained on average 15.70 (+/-5.23) MP.L⁻¹. This was reduced to 0.25 (+/-0.04) MP.L⁻¹ in the final effluent, a decrease of 98.41%. Despite this large reduction we calculate that this WwTW is releasing 65 million microplastics into the receiving water every day. A significant proportion of the microplastic accumulated in and was removed during the grease removal stage (19.67 (+/-4.51) MP/2.5 g), it was only in the grease that the much publicised microbeads were found. This study shows that despite the efficient removal rates of MP achieved by this modern treatment plant when dealing with such a large volume of effluent even a modest amount of microplastics being released per liter of effluent could result in significant amounts of microplastics entering the environment. This is the first study to describe in detail the fate of microplastics during the wastewater treatment process. Copyright © 2016 American Chemical Society.

Murphy, F. and B. Quinn (2018). "The effects of microplastic on freshwater Hydra attenuata feeding, morphology & reproduction." Environmental Pollution **234**: 487-494.

Microplastic pollution has been a growing concern in the aquatic environment for several years. The abundance of microplastics in the environment has invariably led them to interact with a variety of different aquatic species. The small size of microplastics may make them bioavailable to a great range of species however, the impact this may have is not fully understood. Much of the research on microplastic pollution has focused on the marine environment and species with little research undertaken in freshwater. Here we examine the effect of microplastics on the freshwater cnidarian, Hydra attenuata. This study also describes the development and use of a bioassay to investigate the impact of microplastic on freshwater organisms. Hydra attenuata play a vital role in the planktonic make up of slow moving freshwater bodies which they inhabit and are sensitive environmental indicators. Hydra attenuata were exposed to polyethylene flakes (<400 im) extracted from facewash at different concentrations (Control, 0.01, 0.02, 0.04, 0.08 g mL⁻¹). The ecologically relevant endpoint of feeding was measured by determining the amount of prey consumed (Artemia salina) after 30 and 60 min. The amount of microplastics ingested was also recorded at 30 min and 60 min. After which Hydra attenuata

were transferred to clean media and observed after 3, 24, 48 & 96 h with changes in their morphology and reproduction (Hydranth numbers) recorded. The results of this study show that Hydra attenuata are capable of ingesting microplastics, with several individuals completely filling their gastric cavities. Significant reductions in feeding rates were observed after 30 min in 0.02 & 0.08 g mL⁻¹ and after 60 min in 0.04 & 0.08 g mL⁻¹ exposures. Exposure to the microplastics caused significant changes to the morphology of Hydra attenuata, however these changes were non-lethal. This study demonstrates that freshwater Hydra attenuata is capable of ingesting microplastics and that microplastic can significantly impact the feeding of freshwater organisms.

Murphy, F., et al. (2017). "The uptake of macroplastic & microplastic by demersal & pelagic fish in the Northeast Atlantic around Scotland." Marine Pollution Bulletin **122**(1/2): 353-359.

This study reports plastic ingestion in various fish found from coastal and offshore sites in Scottish marine waters. Coastal samples consisted of three demersal flatfish species (n=128) collected from the East and West coasts of Scotland. Offshore samples consisted of 5 pelagic species and 4 demersal species (n=84) collected from the Northeast Atlantic. From the coastal fish sampled, 47.7% of the gastrointestinal tracts contained macroplastic and microplastic. Of the 84 pelagic and demersal offshore fish, only 2 (2.4%) individuals from different species had ingested plastic identified as a clear polystyrene fibre and a black polyamide fibre. The average number of plastic items found per fish from all locations that had ingested plastic was 1.8 (+or-1.7) with polyamide (65.3%), polyethylene terephthalate (14.4%) and acrylic (14.4%) being the three most commonly found plastics. This study adds to the existing data on macroplastic and microplastic ingestion in fish species.

Murphy, M. R., et al. (1989). "Passage and rumination of inert particles varying in size and specific gravity as determined from analysis of faecal appearance using multicompartment models." British Journal of Nutrition **62**(2): 481-492.

Plastic particles of defined length (2, 5 mm) and specific gravity (sp.gr. 1.10, 1.34, 1.77) were administered just before feeding into the reticulo-rumen of four cattle and four swamp buffaloes given a diet predominantly of rice straw ad lib. Simultaneously, doses of ground rice straw marked with Cr and Yb were likewise given. Plastic particles were recovered from faeces for 12 d after dosing, and divided into non-ruminated (NR) and ruminated (R) particles. Excretion data of plastic particles were interpreted using a four-pool model incorporating passage of NR (k(p)) and R from the reticulo-rumen, post-ruminal passage, rate of chewing (k(r)) and two lag times. An inverse relationship was found between k(r) and sp.gr. The k(r) was higher for 5 mm than that for 2 mm particles. In contrast, k(p) was greatest for particles of sp.gr. 1.34, with higher k(p) for 2 mm than for 5 mm particles. Rates of passage and rumination (k(p), k(r)) were higher for buffaloes than for cattle. Rumination time was related to k(r), most highly (r² 0.96) with k(r) of 2 mm, 1.10 sp.gr. particles. Fragmentation of 5 mm particles by rumination tended to increase the rate of passage from the rumen. Ruminal passage rates of Yb and Cr markers were poorly correlated with each other and with k(p) of any of the plastic markers. Reanalysis of published data from plastic particle studies supported the relationships between sp.gr., size, k(p) and k(r). In view of the additional information (k(r) obtained using plastic particles, we suggest their use may be appropriate in studies which investigate specific differences in digestive function, while being less suitable for investigating differences between diets.

Musil, J., et al. (2014). "Antitumor activity and immunogenicity of recombinant vaccinia virus expressing

HPV 16 E7 protein SigE7LAMP is enhanced by high-level coexpression of IGFBP-3." Cancer Gene Therapy **21**(3): 115-125.

We constructed recombinant vaccinia viruses (VACVs) coexpressing the insulin-like growth factor-binding protein-3 (IGFBP-3) gene and the fusion gene encoding the SigE7Lamp antigen. The expression of the IGFBP-3 transgene was regulated either by the early H5 promoter or by the synthetic early/late (E/L) promoter. We have shown that IGFBP-3 expression regulated by the H5 promoter yielded higher amount of IGFBP-3 protein when compared with the E/L promoter. The immunization with P13-SigE7Lamp-H5-IGFBP-3 virus was more effective in inhibiting the growth of TC-1 tumors in mice and elicited higher T-cell response against VACV-encoded antigen than the P13-SigE7Lamp-TK super(-) control virus. We found that high-level production of IGFBP-3 enhanced virus replication both in vitro and in vivo, resulting in more profound antigen stimulation. Production of IGFBP-3 was associated with a higher adsorption rate of P13-SigE7Lamp-H5-IGFBP-3 to CV-1 cells when compared with P13-SigE7Lamp-TK super(-). Intracellular mature virions (IMVs) of the IGFBP-3-expressing virus P13-SigE7Lamp-H5-IGFBP-3 have two structural differences: they incorporate the IGFBP-3 protein and they have elevated phosphatidylserine (PS) exposure on outer membrane that could result in increased uptake of IMVs by macropinocytosis. The IMV PS content was measured by flow cytometry using microbeads covered with immobilized purified VACV virions.

Musunuri, S., et al. (2015). "Micellar extraction possesses a new advantage for the analysis of Alzheimer's disease brain proteome." Analytical and bioanalytical chemistry **407**(4): 1041-1057.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Integral membrane proteins (MPs), such as transporters, receptors, and ion channels, are of great interest because of their participation in various vital cellular functions including cell-cell interactions, ion transport, and signal transduction. However, studies of MPs are complicated because of their hydrophobic nature, heterogeneity, and low abundance. Cloud-point extraction (CPE) with the non-ionic surfactant Triton X-114 was performed to simultaneously extract and phase separate hydrophobic and hydrophilic proteins from Alzheimer's disease (AD) and unaffected control brain tissue. Quantitative proteomics analysis of temporal neocortex samples of AD patients and controls was performed using a shotgun approach based on stable isotope dimethyl labeling (DML) quantification technique followed by nanoLC-MS/MS analysis. A total of 1096 unique proteins were identified and quantified, with 40.3 % (211/524) predicted as integral MPs with at least one transmembrane domain (TMD) found in the detergent phase, and 10 % (80/798) in the detergent-depleted phase. Among these, 62 proteins were shown to be significantly altered (p-value <0.05), in AD versus control samples. In the detergent fraction, we found 10 hydrophobic transmembrane proteins containing up to 14 putative TMDs that were significantly up- or down-regulated in AD compared with control brains. Changes in four of these proteins, alpha-enolase (ENOA), lysosome-associated membrane glycoprotein 1 (LAMP1), 14-3-3 protein gamma (1433G), and sarcoplasmic/endoplasmic reticulum calcium ATPase2 (AT2A2) were validated by immunoblotting. Our results emphasize that separating hydrophobic MPs in CPE contributes to an increased understanding of the underlying molecular mechanisms in AD. Such knowledge can become useful for the development of novel disease biomarkers.

Mutha, N. H., et al. (2006). "Plastics materials flow analysis for India." Resources, Conservation and Recycling **47**(3): 222-244.

Forecasting material flows is essential for sound policy making on issues relating to waste management. This paper presents the results of the plastics materials flow analysis (MFA) for India. In the recent past, India has witnessed a substantial growth in the consumption of plastics and an increased production of plastic waste. Polyolefins account for the major share of 60% in the total plastics consumption in India. Packaging is the major plastics consuming sector, with 42% of the total consumption, followed by consumer products and the construction industry. The relationship observed between plastic consumption and the gross domestic product for several countries was used to estimate future plastics consumption (master curve). Elasticities of the individual material growth with respect to GDP were established for the past and for the next three decades estimated for India thereby assuming a development comparable with that of Western Europe. On this basis, the total plastics consumption is projected to grow by a factor of 6 between 2000 and 2030. The consumption of various end products is combined with their corresponding lifetimes to calculate the total waste quantities. The weighted average lifetime of plastics products was calculated as 8 years. Forty-seven percent of the total plastics waste generated is currently recycled in India; this is much higher than the share of recycling in most of the other countries. The recycling sector alone employs as many people as the plastics processing sector, which employs about eight times more people than the plastics manufacturing sector. Due to the increasing share of long-life products in the economy, and consequently in the volume of waste generated, the share of recycling will decrease to 35% over the next three decades. The total waste available for disposal (excluding recycling) will increase at least 10-fold up to the year 2030 from its current level of 1.3 million tonnes. © 2005 Elsevier B.V. All rights reserved.

Muthuraj, R. and T. Mekonnen (2018). "Recent progress in carbon dioxide (CO^sub 2^) as feedstock for sustainable materials development: Co-polymers and polymer blends." Polymer **145**: 348.

Combustion of fossil fuels and many other industrial activities inevitably produces carbon dioxide (CO2) that is released into the atmosphere and is currently deemed to be among the major contributors to global warming. One of the prominent solutions proposed to mitigate global warming concerns from CO2, capture and storage (CCS), did not attract many CO2 emitting industries as expected, mainly because of economic reasons. On the contrary, environmental pollution concerns associated with plastic waste, and the demand for sustainable feedstock for their production constitute grand challenges facing our society with regard to the production and use of plastics. As a result, the materials science community is striving to generate sustainable and biodegradable plastics to substitute conventional synthetic plastics from resources that do not pose direct completion with food production. This manuscript aims to provide a general overview of the recent progress achieved in CO2 based polymers for sustainable biopolymers such as co-polymers, and polymer blends. The synthesis, material properties, processability, and performances of important CO2 based co-polymers are critically reviewed. Furthermore, a critical review of CO2 co-polymers as components of polymer blend with a focus on the most relevant CO2 based aliphatic polycarbonates, poly (propylene carbonates) (PPC), is conducted.

Mutlu, Y., et al. (2019). "Solid waste seasonal characteristics related to economic conditions: Hatay northern west as case study." The Journal of Material Cycles and Waste Management **21**(4): 743-752.

This paper studied solid waste components in six districts of Hatay (Iskenderun, Dortyol, Payas, Erzin, Belen, and Arsuz) for the period 2015 until 2018. Solid wastes were categorized, and the relationship between the population and the waste categories were determined using Pearson’s correlation test. It was mainly categorized using The Standard Method of Determination of Compositions of Unprocessed Urban Wastes by ASTM D5231-92 into 11 categories. Solid waste

in the study area consist of food waste (63%), paper (6%), plastic (9%), glass (3%), metal (1%), composite waste (1%), electric–electronic waste (0%), hazardous waste (0%), garden waste (3%), incombustible waste (5%) and combustible waste (9%). Food waste showed strong negative correlation with population ($r = -0.875$, $p < 0.05$), while plastic($r = 0.888$, $p < 0.05$), glass($r = 0.813$, $p < 0.05$) and composite waste ($r = 0.890$, $p < 0.05$) showed strong positive correlation. The other categories showed weak or moderate correlation. The socio-economic factor effects were studied in each district. Food waste showed strong negative correlation with the income level ($r = -0.72$, $p < 0.01$). Paper and plastic waste were positively correlated to the income level with the maximum correlation of ($r = 0.871$, $p < 0.01$) and ($r = 0.843$, $p < 0.01$), respectively. The seasonal variation effect also had been considered in the study. It was concluded that the food portion in the winter season was higher than summer in Belen and Payas, and this could be attributed to the internal migration. Finally, a cost analysis of the recycling aspect for the categories of paper, plastic, glass, and metal (PPGM) was assessed. The result of the cost analysis reflected the effect of inflation on the recycling market. It showed that even though the maximum PPGM generation was estimated in 2018 with value of 15994.66 kg/day, the maximum daily income was recorded in 2017 with a value of 3256.37 $/day.

Muzard, J., et al. (2012). "M13 bacteriophage-activated superparamagnetic beads for affinity separation." SMALL **8**(15): 2403-2411.

The growth of the biopharmaceutical industry has created a demand for new technologies for the purification of genetically engineered proteins.The efficiency of large-scale, high-gradient magnetic fishing could be improved if magnetic particles offering higher binding capacity and magnetization were available. This article describes several strategies for synthesizing microbeads that are composed of a M13 bacteriophage layer assembled on a superparamagnetic core. Chemical cross-linking of the pVIII proteins to a carboxyl-functionalized bead produces highly responsive superparamagnetic particles (SPM) with a side-on oriented, adherent virus monolayer. Also, the genetic manipulation of the pIII proteins with a His(6) peptide sequence allows reversible assembly of the bacteriophage on a nitrilotriacetic-acid-functionalized core in an end-on configuration. These phage-magnetic particles are successfully used to separate antibodies from high-protein concentration solutions in a single step with a >90% purity. The dense magnetic core of these particles makes them five times more responsive to magnetic fields than commercial materials composed of polymer-(iron oxide) composites and a monolayer of phage could produce a 1000 fold higher antibody binding capacity. These new bionanomaterials appear to be well-suited to large-scale high-gradient magnetic fishing separation and promise to be cost effective as a result of the self-assembling and self-replicating properties of genetically engineered M13 bacteriophage.

Myers, S. S. (2016). "Sea change." The Lancet **388**(10058): 2341-2342.

This rapid transformation of Earth's life support systems is the terrain of the emerging, multidisciplinary field of planetary health, and it is the setting for A Plastic Ocean. This documentary film is an impassioned, if occasionally meandering, exploration of the enormous mess we are making in the world's oceans as a result of the sheer volume of plastic waste that deliberately or accidentally makes its way into our seas.

Na, W., et al. (2018). "Rapid molecular diagnosis of infectious viruses in microfluidics using DNA hydrogel formation." Biosensors & Bioelectronics **108**: 9-13.

There has been an urgent need to quickly screen and isolate patients with viral infections from

patients with similar symptoms at point-of-care. In this study, we introduce a new microfluidic method for detection of various viruses using rolling circle amplification (RCA) of pathogens on the surface of thousands of microbeads packed in microchannels. When a targeted pathogen meets the corresponding particular template, the DNAs are rapidly amplified into a specific dumbbell shape through the RCA process, forming a DNA hydrogel and blocking the flow path formed between the beads. Due to the significant increase in reaction surface area, the detection time was shortened to less than 15min and the detection limit of various pathogens has been reached to 0.1pM. By injecting the stained liquid, the existence of the target pathogens in a sample fluid can be determined with the naked eye. Furthermore, by integrating multi-channel design, simultaneous phenotyping of various infective pathogens (i.e., Ebola, Middle East respiratory syndrome (MERS), and others) in biological specimens can be performed at a point-of-care.

Nabgan, B., et al. (2017). "Parametric study on the steam reforming of phenol-PET solution to hydrogen production over Ni promoted on Al^sub 2^O^sub 3^-La^sub 2^O^sub 3^ catalyst." Energy Conversion and Management **142**: 127.

Production of hydrogen from plastic waste could be a prospective key to the ecological problems resulted from waste. To further explore the process, a 32-runs parametric study on the steam reforming of Polyethylene terephthalate (PET) dissolved in phenol was conducted in a fixed bed reactor using Ni over La2O3-AI2O3 support. The five factors studied were temperature (A), feed flow rate (B), mass flow (C), phenol concentration (D), and concentration of PET solution (E), whereas the responses were phenol conversion (Y1) and hydrogen selectivity (Y2). From the result, it was observed that significant influence resulted for all the main independent variables on the dependent variable of Y1 and Y2 with the range of 47.24-97.6% and 49-70.96%, respectively. Moreover, the Y1 and Y2 responses have influenced by some interaction variables like AC, CD, CE, ACE, and BCE. As evident from the design, initial variables such as 800 °C, 0.10 ml/min feed flow rate, 10 SCCM mass flow, 10 wt.% of phenol in the feed, and 7% PET concentration were the best preliminary conditions that formed maximum Y1 (94%) and Y2 (71%) responses. However, analyses on the product composition revealed that high amount of aliphatic branched-chains along with moderate amount of cyclic compounds were produced from steam reforming of PET-phenol. Due to the short retention time of the compounds on the catalysts bed, the aromatization of PET cracking products was small.

Nabizadeh, R., et al. (2019). "Microplastic pollution on the Persian Gulf shoreline: A case study of Bandar Abbas city, Hormozgan Province, Iran." Marine Pollution Bulletin **145**: 536-546.

Microplastic particles (<5mm), which are an emerging threat, are commonly found in marine ecosystems worldwide. This study investigated the effect of different types of coastal land use on microplastic frequency and distribution on the coastline of Bandar Abbas city; this study used a large sample compared to that used in other studies conducted in this region. The average number of microplastics was determined as 3252+/-2766 microplastics/m² (+/-SD). ATR FT-IR spectroscopy showed that the dominant microplastic particles are expanded polystyrene, polyethylene terephthalate, polypropylene, and polyethylene. Statistical analysis showed a significant difference in microplastic contamination levels between the urban and nonuse beaches. This shows that heavily urbanized areas and human activities have significant effects on the dispersion and frequency of microplastics in the coastal areas of Bandar Abbas. Periodical coast-based cleanup and studies on microplastic pollution and their fluxes by comprehensive sampling are mostly recommended for the Persian Gulf coastline.

Nada, S., et al. (2015). "Isolation and initial characterization of dermal vascular smooth muscle cells in systemic sclerosis." Arthritis and Rheumatology. Conference: American College of Rheumatology/Association of Rheumatology Health Professionals Annual Scientific Meeting, ACR/ARHP **67**(SUPPL. 10).

Background/Purpose: Nearly all patients with Systemic sclerosis (SSc) suffer from vascular dysfunction as illustrated by the uniform presence of Raynaud's phenomena. The role of vascular smooth muscle cells (VSMCs) in the development of vascular dysfunction is still unknown. In this study, we isolated VSMCs from skin biopsy, and we examined their functional phenotype. Method(s): We obtained 4 mm punch-skin-biopsy from 3 patients with diffuse cutaneous SSc and 3 matched healthy controls. Skin specimens were treated with a mixture of proteases, then after digestion we plated cells in culture media and harvested the primary cell culture after 10 days. VSMCs were isolated by magnetic microbeads using cell surface markers. First, we depleted total cells from CD31+ cells, followed by positive selection for CD146 + cells. To confirm the identity of this cell population (CD31- CD146+), we performed immunoflorocytometry staining for smooth muscle myosin heavy chain 11 (MYH11), Desmin and NG2. We investigated cell proliferation by using Bromodeoxyuridine (BrdU) assay, and cell viability in normal culture conditions as well as low serum conditions using MTT assay. Result(s): Out of the total cells obtained from primary cell culture, 15% were CD31- CD146 + (VSMCs). The majority of cells in this population stained for smooth muscle MYH11 (89.1%), in addition to Desmin and NG2, while the CD31+ and the fibroblast cell populations did not. This staining pattern differentiates VSMCs from pericytes. Next, we evaluated cell proliferation using BrdU, and we demonstrated uptake of BrdU by 19% of the control-VSMCs compared to 34% of SSc-VSMCs (P= 0.0031). The MTT assay showed increase cell proliferation of SSc-VSMCs compared to control-VSMCs (0.44 and 0.25, respectively. P= 7.38E-08). Under serum starvation conditions, SSc-VSMCs exhibited more proliferation capacity than control-VSMCs (0.30 and 0.21, respectively. P= 5.73E-13). Also, we performed immunoflorocytometry staining for B-catenin and we demonstrate a cytoplasmic to nuclear translocation of B-catenin in SSc-VSMCs but not in control-VSMCs. This finding may imply potential involvement of B-catenin in the induction of VSMCs activation in SSc. Conclusion(s): This is the first report of the successful isolation and initial characterization of SSc-VSMCs. We believe that increased proliferation of SSc- VSMCs in association with resistance to apoptosis may greatly impact the vascular lesion in SSc. Further studies are warranted to fully understand the trigger and maintenance of the abnormal SSc-VSMCs phenotype.

Nadal, M. A., et al. (2016). "High levels of microplastic ingestion by the semipelagic fish bogue Boops boops (L.) around the Balearic Islands." Environmental Pollution **214**: 517-523.

For the first time this study reports on the presence of microplastics (1 nm to <5 mm) in the gastrointestinal tracts of small semipelagic fish (Boops boops) in the Balearic Islands (Mediterranean Sea) from March to May 2014. The results show microplastic ingestion in 68% of full stomach samples with an average of 3.75 items per fish. Only filament type microplastics were observed in B. boops full gastrointestinal tracts. The frequency of occurrence of microplastics was high, with values ranging from 42% to 80%, in comparison to the other ingested items. Spatial variability among locations is high, which suggests that this type of contamination is ubiquitously distributed and originates from multiple sources. The results are important and indirectly provide further evidence of the presence of microplastics, which can be ingested by biota, in the marine environment.

Nadjem, H. and E. Logemann (1998). "[A case of suicidal chloroform poisoning]." Archiv fur Kriminologie

202(1-2): 29-37.

A 33-year-old man who had suffered from phobia and depressions was found dead in his kitchen. He was entirely covered by plastic waste disposal bags stuck together. The corpse was lying flat on his stomach with his face on a towel soaked with chloroform. Within the plastic cover, on either side of the body's head, there was located a can half way filled with chloroform. Autopsy revealed cauterized lips and mucous membranes of the mouth. The morphological findings of the inner organs were unspecific. For toxicological analyses, air samples from the pleural cavities of the corpse were taken by way of charcoal tubes and a microprocessor aided pump. The solvents adsorbed on the charcoal were desorbed with benzyl alcohol and analyzed by gas chromatography according to standard procedures. The quantification of the chloroform levels of the body fluids and the tissue samples of the corpse was performed by extraction with pentane followed by addition of trichloroethylene as internal standard and consecutive gas chromatographic analysis. The results of the toxicological analyses confirmed the diagnosis of a fatal chloroform intoxication.

Nagl, S. and O. S. Wolfbeis (2007). "Optical multiple chemical sensing: status and current challenges." Analyst **132**(6): 507-511.

Multiple optical sensors for chemical species are sensitive, non-toxic and non-invasive and enable spatially and temporally resolved multianalyte detection. Recent advances are highlighted with a focus on fluorescence-based methods and the biologically and clinically important analytes oxygen, pH, carbon dioxide and temperature. Indicator chemistries such as permeation-selective microbeads and nanoparticles allow the production of microscopically homogeneous sensor layers. The use of combinations of spectral discriminations along with time-resolved monitoring schemes based on luminescence lifetime or intensity-lifetime ratios enables all-optical real-time multianalyte determination.

Nagy, E. M., et al. (2015). "Water degradation effect on some starch-based plastics." Proceedings of the 43rd International Symposium on Agricultural Engineering, Actual Tasks on Agricultural Engineering, Opatija, Croatia.

The use of starch resources in order to obtain degradable bioplastics has experienced a great development in the last years, due to environmental problem concerning the plastic waste disposal and reducing of oil resources. The starch represents a possible solution to this challenge, due to its hydrophilic nature, which plays an important role in initiating biodegradation process. Polymer hydrolytic degradation may be defined as the scission of the polymeric chain by the attack of water to form oligomers and finally monomers. Among the techniques that can be used to obtain information about the degradation mechanism of biopolymer are water uptake and rheological measurements This paper presents the results of water absorption and rheological investigations for two types of starch-based packaging materials obtained by thermoplastic extrusion of native starch, (with an amylase content of 21%), with different starch, glycerol and water ratios, subjected to natural degradation after absorption of distillate water. It was observed that the sample containing starch/glycerol/water ratio of 68/17/15 is rapidly degraded-after 8 hours forming a colloidal solution, and sample with a content of 78/19.5/2.5 starch/glycerol/water reaches the limit of swelling after 5 days, after which it begins to decompose slowly. The rheological measurements for the samples show that at low temperature (30 degrees C) there is a dependence of viscosity function of shear rate which does not comply with the Newtonian model. If the temperature increases further than 60 degrees C the dependence between viscosity and share rate tends to linearity. Switching from a non-Newtonian behavior to a Newtonian one indicates that the large conglomerates of

polymeric structures transforms in smaller elements with spherical symmetry, characteristic of simple Newtonian liquids. It is clear evidence of degradation.

Naidoo, T. and D. Glassom (2019). "Decreased growth and survival in small juvenile fish, after chronic exposure to environmentally relevant concentrations of microplastic." Marine Pollution Bulletin **145**: 254.

Glassfish, Ambassis dussumieri (Cuvier, 1828), was used as a sentinel species to investigate the effects of the ingestion of environmentally relevant microplastic concentrations on juvenile fish growth and survival. Both virgin plastic and plastic collected from an urban harbour were fed to small juvenile fish daily for 95 days. Fish standard length, body depth and mass were recorded at intervals of 20 days, while survival was continuously recorded. All fish were fed tropical flakes, measured at 1.7% of the body mass per tank. Overall, fish in in plastic treatments grew less in body length and body depth compared to those control treatments. Fish mass was also lower in the virgin plastic treatment than control fish; however, the growth in mass was not significantly lower than fish in the harbour plastic treatment. The survival probability of fish in both plastic fed treatments was also lower than fish in controls.

Naidoo, T. and D. Glassom (2019). "Sea-surface microplastic concentrations along the coastal shelf of KwaZulu-Natal, South Africa." Marine Pollution Bulletin **149**: 110514.

Ocean pollution is a global issue; yet limited quantitative data on microplastic concentrations are available for the South African coastal shelf. Estuarine outlets within industrial areas that are found along the coastline serve as conduits for plastics and other pollutants to the ocean. This study investigated coastal plastic concentrations around KwaZulu-Natal. Forty-three manta trawl samples were collected and analysed over a period of one year. An average of 4.01+/-3.28 plastic particles/100m² was found in surface trawls. Plastic concentrations in winter were significantly higher than those in summer (5.54+/-3.26 and 2.96+/-2.94 particles/100m² respectively). The highest concentrations of plastics were found south of the city of Durban, with the highest concentration at Isipingo winter with 12.2 particles/100m². Among the summer samples, the highest concentration of particles was off Amanzimtoti (9.54 particles/100m²). The main plastic forms were fragments, films and fibres that were commonly white, clear, opaque, blue and black in colour. High plastic concentrations in the Durban area and sites close-by were expected due to the high levels of urbanization in the area, however, the difference in concentrations found between winter and summer was not expected and may have been due to the prevailing wind and/or current conditions on the sampling date.

Naidoo, T., et al. (2015). "Plastic pollution in five urban estuaries of KwaZulu-Natal, South Africa." Marine Pollution Bulletin **101**(1): 473-480.

Monitoring plastic concentrations in estuaries is vital in assessing the magnitude of terrestrial inputs to oceanic environments. Data on plastics <= 5 mm in estuaries are scant. This study determined microplastic levels within five estuaries along the Durban coastline and on intervening beaches. Plastics were isolated from estuarine sediment, beach sediment and the surface water of each estuary and characterised. Sediment at the Bayhead area of Durban harbour had the highest average plastic concentrations (745.4 +/- 129.7 particles per 500 ml) and an attenuating concentration trend away from the city centre was found. Prevailing south to north longshore drift was hypothesised to result in plastic accumulation on the northern shores of beaches with estuarine effluents, however, this was not found. Fragments composed the largest percent of plastics (59%) found in Bayhead, whereas fibres dominated other

estuaries with proportions ranging from 38% of total plastics in the uMgeni estuary to 66% in the Mdloti.

Naidoo, T., et al. (2017). "Are nitric acid (HNO₃) digestions efficient in isolating microplastics from juvenile fish?" Water, Air, and Soil Pollution **228**(12).

A standard method for the detection and isolation of microplastics is required to adequately investigate plastic ingestion by juvenile fish. Dissections of juvenile fish guts require precise handling, which can affect the processing time if sample numbers are high. To investigate the efficacy of nitric acid (HNO₃) in aiding the isolation of microplastics using whole fish, we digested juvenile glassfish, Ambassis dussumieri (Cuvier, 1828), at room temperature and at 80 degrees C. For a complete digestion, overnight incubation in 10 mL of 55% analytical-reagent (AR) HNO₃ was sufficient for a whole fish of 1 g at room temperature. When coupled with elevated temperature, the digestion time is shortened to a few minutes and larger fish of 3 g can be digested in 30 min. Four of the five types of plastic survived the process, with nylon being the exception. This is a shortfall to the method; however, until a better method replaces it, we still value the use of HNO₃ for its simple, inexpensive, swift and complete digestions of whole fish. Four fish species from two feeding guilds were digested using this method to validate its use. The number of plastic particles ingested did not differ between benthic and pelagic species and microplastic fibres comprised the majority of the plastic types found.

Naidoo, T., et al. (2019). "Quantification and characterisation of microplastics ingested by selected juvenile fish species associated with mangroves in KwaZulu-Natal, South Africa." Environmental Pollution: 113635.

Though the number studies on microplastic ingestion by fish is growing, data on fish species characteristic of the South African coastline are scarce. This study quantified and characterised (physically and chemically) microplastics ingested by four species of juvenile fish (viz. Oreochromis mossambicus [Peters, 1852], Terapon jarbua [Forsskal, 1775], Ambassis dussumieri [Cuvier, 1828] and Mugil sp.), within four mangroves along the east coast of South Africa. Microplastics were isolated from whole fish using a proteinase K digestion method, and then quantified and characterised in terms of shape, chemical nature (plastic type), colour and length. Fibres (68%) and fragments (21%) were the dominant shapes found. Of the 174 fish sampled, 52% contained microplastic particles, with 0.79 +/- 1.00 particles per fish. The average number of particles per fish did not differ significantly across species within sites and across sites but was higher than in juvenile fish of other species sampled in oceanic habitats. The main plastic types collected using 10 mum filters and identified with Fourier Transform Infrared Spectroscopy (FTIR), were rayon (70.4%), polyester (10.4%), nylon (5.2%) and polyvinylchloride (3.0%). Particle length ranged from 0.1 to 4.8 mm, averaging 0.89 +/- 0.77 mm, but irrespective of length, particles were mostly blue in colour. This study provides evidence that juvenile fish inhabiting mangroves are consuming significant quantities of microplastics. Importantly, it should be noted that rayon, though the most abundant plastic type found, is a semi-synthetic fibre made from regenerated cellulose that is commonly reported in studies of this nature. The habitats studied serve as nurseries for numerous fish species; however, more detailed studies are needed to assess whether microplastic ingestion could compromise the health of these fish or whether these effects are dependent on species, feeding habit and/or plastic type.

Naidoo, T., et al. (2016). "Plastic ingestion by estuarine mullet Mugil cephalus (Mugilidae) in an urban harbour, KwaZulu-Natal, South Africa." African Journal of Marine Science **38**(1): 145-149.

Coastal urban environments have high plastic pollution levels, and hence interactions between plastic debris and marine life are frequent. We report on plastic ingestion by mullet Mugil cephalus in Durban Harbour, KwaZulu-Natal, South Africa. Of 70 mullet (13.0-19.5 cm total length), 73% had plastic particles in their guts, with a mean of 3.8 particles per fish (SD 4.7). Plastic ingestion showed no relation to digestive tract content or fish length. White and clear plastic fibres were ingested most commonly. This urban population of M. cephalus had a higher incidence of plastic ingestion than has been reported in studies on fish from other coastal areas or the oceanic environment.

Naik, A., et al. (2019). "Temperature dissociation of liquids in reusable thermoplastic containers-An eco-friendly scald risk?" Burns **45**(7): 1621-1624.

Recent global concern regarding the impact of plastic waste on the environment has resulted in efforts to utilise reusable drink containers. Research is lacking regarding temperature dissociation of drinks in reusable thermoplastic cups. This study aimed to compare the cooling time of two common hot drinks sold at a UK retailer, in the three vessels they are sold; ceramic, disposable paper (with and without lid) and reusable thermoplastic cups (with and without lid). All temperatures were collated from 250 ml volumes of black Americano coffee or cafe latte in the three different containers. The cooling time was measured every sixty seconds using a standardised digital thermocouple thermometer until a threshold liquid temperature of 43 degreeC was reached. All experiments were performed in triplicate and temperatures converted to a dimensionless logarithmic scale prior to statistical analysis. Cooling time was significantly slower for lidded cups irrespective of material. Unlidded thermoplastic cups significantly slowed cooling times for both black Americano coffee and cafe latte compared to ceramic and unlidded disposable paper cups. The growing trend in reusable cups does not in itself pose an increased risk of scald injury. However, we consider that the potentially increased ambulatory behaviour associated with using a lidded rather than unlidded cup may increase scald risk. We propose that further consumer guidance should be disseminated regarding the use of any lidded takeaway container to prevent scalds in both adults and children.

Naik, R. K., et al. (2019). "Microplastics in ballast water as an emerging source and vector for harmful chemicals, antibiotics, metals, bacterial pathogens and HAB species: A potential risk to the marine environment and human health." Marine Pollution Bulletin **149**: 110525.

Microplastic pollution in marine waters around the globe is increasing exponentially. This is the first comprehensive review which focuses on microplastics as a source and vector for metals, antibiotics, toxic chemicals, pathogenic bacteria (Vibrio cholerae), and Harmful Algal Bloom (HAB)-forming dinoflagellates across the continents through ballast water. Microplastics in ballast waters serve as 'hotspots' for the development and spread of multiple drug-resistant human pathogens through co-selection mechanisms. Microplastic inoculation at distant countries through ballast water may pose a serious threat to human health due to higher incidences of bacterial disease outbreaks and HABs. The 2017 ballast water management convention lacks a provision for on-board treatment of microplastic-contaminated ballast water. We conclude that there is a pressing need to include microplastics in the ballast water management convention as a hazardous material. Efficient on-board ballast water treatment strategies and effective limits for microplastics in ballast waters need to be developed.

Najafi, R., et al. (2014). "Development of a rapid capture-cum-detection method for Escherichia coli O157 from apple juice comprising nano-immunomagnetic separation in tandem with surface enhanced Raman scattering." International Journal of Food Microbiology **189**: 89-97.

A combined capture and detection method comprising of nano-immunomagnetic separation (NIMS) and surface enhanced Raman spectroscopy (SERS) was developed to detect Escherichia coli O157 from liquid media including apple juice. The capture antibodies (cAbs) were immobilized on magnetite-gold (Fe3O4/Au) magnetic nanoparticles (MNPs) which were used for separation and concentration of the E. coli O157 cells from model liquid food matrix. The capture efficiency (CE) for E. coli O157 using MNP was found to be approximately 84-94%. No cross reactivity was observed with background non-target organisms. There was a significant difference in the mean CE of bacteria captured by MNP and commercially sourced immunomagnetic microbeads (p<0.05). For the detection of target pathogen, SERS labels were prepared by conjugating gold nanoparticles with Raman reporter molecules and the detector antibody (dAb). Au-Raman label-dAb was interacted with gold coated MNP-cAb-E. coli O157 complex. The ability of this immunoassay to detect E. coli O157 in apple juice was investigated. We have successfully applied the synthesized Fe3O4/Au nanoclusters to E. coli O157 detection in apple juice using the SERS method. The lowest detectable bacterial cell concentration in apple juice was 10(2)CFU/mL with a total analysis time of less than an hour. This method presents a convenient way of preconcentration, separation, and detection of low levels of target pathogen from liquid food matrix.

Naji, A., et al. (2017). "Plastic debris and microplastics along the beaches of the Strait of Hormuz, Persian Gulf." Marine Pollution Bulletin **114**(2): 1057-1062.

Currently little is known about the prevalence of plastics and microplastics (MPs) in the Persian Gulf. Five sampling stations were selected along the Strait of Hormuz (Iran) that exhibited different levels of industrialization and urbanization, and included a marine protected area. Debris was observed and sediments were collected for MPs extraction via fluidization/floatation methodology. The order of MP abundance (par/kg) generally reflected the level of anthropogenic activity: Bostanu (1258+/-291)>Gorsozan (122+/-23)>Khor-e-Yekshabeh (26+/-6)>Suru (14+/-4)>Khor-e-Azini (2+/-1). Across all sites fibers dominated (83%, 11% film, 6% fragments). FT-IR analysis showed polyethylene (PE), nylon, and PET (polyethylene terephthalate) were the commonly recovered polymers. Likely sources include beach debris, discarded fishing gear, and urban and industrial outflows that contain fibers from clothes. This study provides a 'snapshot' of MP pollution and longitudinal studies are required to fully understand plastic contamination in the region.

Naji, A., et al. (2017). "The occurrence of microplastic contamination in littoral sediments of the Persian Gulf, Iran." Environmental Science & Pollution Research **24**(25): 20459-20468.

Microplastics (MPs; <5 mm) in aquatic environments are an emerging contaminant of concern due to their possible ecological and biological consequences. This study addresses that MP quantification and morphology to assess the abundance, distribution, and polymer types in littoral surface sediments of the Persian Gulf were performed. A two-step method, with precautions taken to avoid possible airborne contamination, was applied to extract MPs from sediments collected at five sites during low tide. MPs were found in 80% of the samples. Across all sites, fiber particles were the most dominate shape (88%), followed by films (11.2%) and fragments (0.8%). There were significant differences in MP particle concentration between sampling sites (p value <0.05). The sediments with the highest numbers of MPs were from sites in the vicinity of highly populated centers and municipal effluent discharges. FTIR analysis showed that polyethylene (PE), nylon, and polyethylene terephthalate (PET) were the most abundant polymer types. More than half of the observed MPs (56%) were in the size category of 1-4.7 mm length, with the remaining particles (44%) being in the size range of 10 mum to <1 mm. Compared to literature data from other regions, intertidal sediments in the Persian Gulf cannot be characterized as a hot spot for MP pollution. The present study could, however, provide useful background information for further investigations and management policies to understand the sources, transport, and potential effects on marine life in the Persian Gulf.

Naji, A., et al. (2017). "The occurrence of microplastic contamination in littoral sediments of the Persian Gulf, Iran. (Special Issue: Efficient & sustainable water systems management toward worth living development.)." Environmental Science and Pollution Research **24**(25): 20459-20468.

Microplastics (MPs; <5 mm) in aquatic environments are an emerging contaminant of concern due to their possible ecological and biological consequences. This study addresses that MP quantification and morphology to assess the abundance, distribution, and polymer types in littoral surface sediments of the Persian Gulf were performed. A two-step method, with precautions taken to avoid possible airborne contamination, was applied to extract MPs from sediments collected at five sites during low tide. MPs were found in 80% of the samples. Across all sites, fiber particles were the most dominate shape (88%), followed by films (11.2%) and fragments (0.8%). There were significant differences in MP particle concentration between sampling sites (p value <0.05). The sediments with the highest numbers of MPs were from sites in the vicinity of highly populated centers and municipal effluent discharges. FTIR analysis showed that polyethylene (PE), nylon, and polyethylene terephthalate (PET) were the most abundant polymer types. More than half of the observed MPs (56%) were in the size category of 1-4.7 mm length, with the remaining particles (44%) being in the size range of 10 micro m to <1 mm. Compared to literature data from other regions, intertidal sediments in the Persian Gulf cannot be characterized as a hot spot for MP pollution. The present study could, however, provide useful background information for further investigations and management policies to understand the sources, transport, and potential effects on marine life in the Persian Gulf.

Naji, A., et al. (2019). "Small microplastic particles (S-MPPs) in sediments of mangrove ecosystem on the northern coast of the Persian Gulf." Marine Pollution Bulletin **146**: 305-311.

We present a study of small microplastic particles (S-MPPs) in the sediments of mangrove ecosystem of Khor-e- Khoran, a Ramsar site in Iran. The spatial distribution of S-MPPs (<1mm) in mangrove surface sediments were investigated, which provided new insights into the detection and composition of S-MPPs in the study area. S-MPPs were extracted via the air-induced overflow (AIO) extraction procedure, and then they were counted and categorized according to the particle shape, color and size. The mean number of S-MPPs at the five sampling sites ranged from 19.5 to 34.5 particles per kg dry sediment in Bandar Gelkan and Bandar Lengeh, respectively. In general, microfibres followed by fragments were the most common type of S-MPPs isolated in each site (>56% and ~35%, respectively). Sewage discharge is probably the main source of extracted fibres in almost all the sites. The observed S-MPPs were classified into two size groups (10-300mum and 300-1000mum). The majority of S-MPPs fell into the smallest size group which accounted for 70-97% of the total S-MPPs. Fourier transform infrared (FTIR) analysis of some subsamples showed that polyethylene (PE) was the most common recovered polymer. Some non-plastic particles were also isolated from plastic-like particles of suspected S-MPPs in the mangrove sediments using a Scanning Electron Microscope (FE-SEM). This study provided the first evidence of S-MPPs contamination in the mangroves of the Iranian coast of the Persian Gulf. Long-term studies are required to understand, monitor and prevent further microplastics pollution in the region.

Naji, A., et al. (2018). "Microplastics contamination in molluscs from the northern part of the Persian

Gulf." Environmental Pollution **235**: 113-120.

Microplastics (MPs) are well-known emerging contaminants in the marine environment. A key route by which MPs can directly affect marine life is through ingestion. The objective of the present study was to evaluate the occurrence of MPs in marine life and seafood for human consumption in the Persian Gulf. We conducted a whole body analysis of MP (between 10 and 5000mum in diameter) abundance in five species of molluscs with different feeding strategies, including both gastropods and bivalves from the littoral zone of the Iranian coast of the Persian Gulf. The mean number of total encountered MPs in all species ranged from 0.2 to 21.0 particles per g of soft tissue (wet weight) and from 3.7 to 17.7 particles per individual. Overall, microfibres followed by fragments were the most common type of MP isolated in each species (respectively>50% and =26%). Film (=14%) and pellets (=2%) were less commonly observed. The observed MPs were classified into three size groups (ca. 10-25mum, 25-250mum and 250-5000mum), and 37-58% of MPs fell into the smallest size group. Fourier transform infrared (FT-IR) analysis confirmed the presence of polyethylene (PE), polyethylene terephthalate (PET), and nylon (PA). Our results indicated that molluscan shellfish from the Persian Gulf contain MPs, with higher concentrations in a predatory species, suggesting trophic transfer of MPs in the food web. The consumption of edible species may be a source of human microplastic intake. We compared our results with those previously reported for other regions of the world and identified the need for further studies in the Persian Gulf.

Naji, M. and Y. S. H. Najjar (2019). "Modelling of a novel infrared recycler for reclaiming waste plastics from automotive vehicles." International Journal of Sustainable Energy **38**(8): 740-751.

An infrared recycler was modelled mathematically to investigate its performance and ability to recycle waste plastics from automotive vehicles following their retirement. It uses infrared energy to heat and dry a washed stream of unsorted plastics. Because the sorting process is sensitive to many parameters, this paper discusses the effect of recycler size, temperature and emissivity on the plastic mixture. A characteristic curve was obtained for the recycler that relates the heater, drums and pellets temperatures. With this curve, if the recycler material is known, then the maximum temperatures that the heater and drum can reach are sited. Moreover, if a certain pellet temperature is required, then using this curve, the temperatures of the heater and drum are known. Results also show that lower emissivity for both the heater and pellets enhance evaporation and drying process. This increases heater and drum temperatures and consequently the pellets temperature. Minimum power consumption corresponds to (Dh/Dd) ratio of about 0.25. [ABSTRACT FROM AUTHOR]

Nakagome, K., et al. (2005). "Antigen-sensitized CD4+CD62Llow memory/effector T helper 2 cells can induce airway hyperresponsiveness in an antigen free setting." Respiratory research **6**: 46.

BACKGROUNDAirway hyperresponsiveness (AHR) is one of the most prominent features of asthma, however, precise mechanisms for its induction have not been fully elucidated. We previously reported that systemic antigen sensitization alone directly induces AHR before development of eosinophilic airway inflammation in a mouse model of allergic airway inflammation, which suggests a critical role of antigen-specific systemic immune response itself in the induction of AHR. In the present study, we examined this possibility by cell transfer experiment, and then analyzed which cell source was essential for this process.METHODSBALB/c mice were immunized with ovalbumin (OVA) twice. Spleen cells were obtained from the mice and were transferred in naive mice. Four days later, AHR was assessed. We carried out bronchoalveolar lavage (BAL) to analyze inflammation and cytokine production in the lung. Fluorescence and immunohistochemical studies were performed to identify T cells recruiting and proliferating in the lung or in the gut of the recipient. To determine the essential phenotype, spleen cells were column purified by antibody-coated microbeads with negative or positive selection, and transferred. Then, AHR was assessed.RESULTSTransfer of spleen cells obtained from OVA-sensitized mice induced a moderate, but significant, AHR without airway antigen challenge in naive mice without airway eosinophilia. Immunization with T helper (Th) 1 elicited antigen (OVA with complete Freund's adjuvant) did not induce the AHR. Transferred cells distributed among organs, and the cells proliferated in an antigen free setting for at least three days in the lung. This transfer-induced AHR persisted for one week. Interleukin-4 and 5 in the BAL fluid increased in the transferred mice. Immunoglobulin E was not involved in this transfer-induced AHR. Transfer of in vitro polarized CD4+ Th2 cells, but not Th1 cells, induced AHR. We finally clarified that CD4+CD62Llow memory/effector T cells recruited in the lung and proliferated, thus induced AHR.CONCLUSIONThese results suggest that antigen-sensitized memory/effector Th2 cells themselves play an important role for induction of basal AHR in an antigen free, eosinophil-independent setting. Therefore, regulation of CD4+ T cell-mediated immune response itself could be a critical therapeutic target for allergic asthma.

Nakajima, R., et al. (2019). "A small, stainless-steel sieve optimized for laboratory beaker-based extraction of microplastics from environmental samples." MethodsX **6**: 1677-1682.

Removing non-plastic materials is a mandatory process for studying microplastics in environmental samples, and non-plastic materials, both inorganic and organic matter, are often removed chemically through sequential processes. In the multiple chemical treatment processes, the samples need to be collected and the reagent removed at the end of each chemical treatment before the samples are again exposed to a different reagent in a separate container. This leads to a loss of microplastics to some extent. Here, we developed a new, yet simple, small sieve made of stainless-steel that can fit in a laboratory beaker (e.g. 200 ml volume), allowing it to be transferred as-is between chemical treatments of environmental samples, even being soakable in a beaker of acid solution. The collection rates of microplastics were significantly higher in the small stainless-steel sieve than the commonly used filter method for different size of microplastic particles. The use of the new sieve means the processes of rinsing off and filtering samples can be abbreviated throughout the entire process of non-plastic matter removal from environmental samples, contributing to a lower chance of microplastic loss. The time consumed in the sieve method was also significantly lower than for the filtering method due to the elimination of the collection and rinsing steps, thus the use of this sieve can reduce processing time for the samples. The new method is innovative in terms of reducing both the microplastic loss and processing time during chemical treatment processes. *The method developed allows the lower chance of microplastic loss during chemical digestion process*The method reduces the time of sequential processes during chemical digestion.

Nakajima, R., et al. (2019). "A new small device made of glass for separating microplastics from marine and freshwater sediments." PeerJ **7**: e7915.

Separating microplastics from marine and freshwater sediments is challenging, but necessary to determine their distribution, mass, and ecological impacts in benthic environments. Density separation is commonly used to extract microplastics from sediments by using heavy salt solutions, such as zinc chloride and sodium iodide. However, current devices/apparatus used for density separation, including glass beakers, funnels, upside-down funnel-shaped separators with a shut-off valve, etc., possess various shortcomings in terms of recovery rate, time consumption, and/or usability. In evaluating existing microplastic extraction methods using density separation, we identified the need for a device that allows rapid, simple, and efficient extraction of microplastics from a range of sediment types. We have developed a small glass separator, without a valve, taking a hint from an Utermohl chamber. This new device is easy to clean and portable, yet enables rapid separation of microplastics from sediments. With this simple device, we recovered 94-98% of <1,000 micro m microplastics (polyethylene, polypropylene, polyvinyl chloride, polyethylene terephthalate, and polystyrene). Overall, the device is efficient for various sizes, polymer types, and sediment types. Also, microplastics collected with this glass-made device remain chemically uncontaminated, and can, therefore, be used for further analysis of adsorbing contaminants and additives on/to microplastics.

Nakamura, J., et al. (2017). "Males without apparent alloimmunization could have HLA antibodies that recognize target HLA specificities expressed on cells." Immune Response Genetics **89**(5): 285-292.

BACKGROUND AND OBJECTIVES: Human leukocyte antigen (HLA) antibodies, which are involved in the development of transfusion-related side effects such as transfusion-related lung injury, are sometimes found in males without a history of alloimmunization (eg, transplantation and transfusion). Whether HLA antibodies in male donors can interact with their target HLA specificities expressed on cells have not been completely investigated.

MATERIALS AND METHODS: The HLA antibodies detected in 7 male donors were characterized. Flow cytometry and immunocomplex capture fluorescence analysis were performed to evaluate the ability of these antibodies to bind with target HLA specificities expressed on cells. The association of these antibodies with complement was examined using anti-C1q antibody. Sustainability of HLA antibodies over time was compared in 26 male vs 57 female donors.

RESULTS: The antibodies from all 7 donors recognized intact HLA molecules coated onto microbeads. The antibodies in 2 of 7 donors also recognized their target HLA specificities expressed on cells. Furthermore, the antibodies in one of these 2 donors showed HLA specificities that involved complement binding. Twenty-one of 26 initially positive male donors had turned negative for HLA antibody at least 1 year after their initial positive screening, whereas HLA antibody positivity was maintained for a long time in most female donors.

CONCLUSION: Males without apparent alloimmunization could have HLA antibodies that recognize their target HLA specificities on cells and that could potentially modify molecular events in affected cells.

Nakano, M., et al. (2017). "Comparison of Sensitivity and Quantitation between Microbead Dielectrophoresis-Based DNA Detection and Real-Time PCR." Biosensors **7**(4): 30.

In this study, we describe a microbead-based method using dielectrophoresis (DEP) for the fast detection of DNA amplified by polymerase chain reaction (PCR). This electrical method measures the change in impedance caused by DEP-trapped microbeads to which biotinylated target DNA molecules are chemically attached. Using this method, measurements can be obtained within 20 min. Currently, real-time PCR is among the most sensitive methods available for the detection of target DNA, and is often used in the diagnosis of infectious diseases. We therefore compared the quantitation and sensitivity achieved by our method to those achieved with real-time PCR. We found that the microbead DEP-based method exhibited the same detection limit as real-time PCR, although its quantitative detection range was slightly narrower at 10-105 copies/reaction compared with 10-107 copies/reaction for real-time PCR. Whereas real-time PCR requires expensive and complex instruments, as well as expertise in primer design and experimental principles, our novel method is simple to use, inexpensive, and rapid. This method could potentially detect viral and other DNAs efficiently in combination with conventional PCR.

Nakano, M., et al. (2018). "Fast and sensitive isothermal DNA assay using microbead dielectrophoresis for detection of anti-microbial resistance genes." Biosensors & Bioelectronics **117**: 583-589.

Antimicrobial resistant pathogens are a growing worldwide threat to human health. This study describes a novel method for rapid and sensitive detection of antimicrobial resistance (AMR) genes, specifically bla_{CTX-M-15} which encodes for the enzyme that offers resistance to extended spectrum beta-lactam antibiotics. The method combines isothermal DNA amplification by recombinase polymerase amplification (RPA), with microbead dielectrophoresis (DEP)-based DNA detection. The RPA amplicon is captured onto dielectric microbeads, and the amount of amplicon determined by dielectrophoretic impedance measurement (DEPIM) of the microbeads. Amplicon-labeled microbeads were prepared by either a two-step or one-step method. A purified recombinant plasmid containing bla_{CTX-M-15} and genomic DNA (with plasmid) extracted from an AMR bacteria (Escherichia coli NCTC 13441) were used as target samples. A one-step method in which RPA and DNA immobilization on the microbeads is carried out simultaneously, has a detection limit of 2 copies/reaction for pure plasmid and 50 copies/reaction for genomic DNA. The assays are quantitative with a dynamic range up to 10⁵ copies/reaction, with a total detection time of 26min. Both methods are easy, rapid, and unlike lateral flow detection are quantitative.

Nakao, S., et al. (2019). "Microplastics contamination in tidelands of the Osaka Bay area in western Japan." Water and Environment Journal.

Recently, researchers have been examining the actual state of microplastics contamination in the environment. However, pollution in high biodiversity environments such as tidelands has not been sufficiently investigated. Therefore, to assess the actual level of microplastics pollution therein, we conducted a survey of the tidelands of Osaka Bay in Japan to develop a model that included basins in urban and suburban areas. We quantified the levels of microplastics in the mud from four of Osaka Bay's tidelands and detected them based on three inhabitants of the main river estuary tideland, namely, bivalves (Corbicula japonica), crabs (Chiromantes dehaani) and a tufted duck (Aythya fuligula). Microplastics ranging in size from 300 mum to 5 mm were targeted, and the results indicated that the concentration of microplastics in the mud tended to increase with tideland proximity to an urban area where the density of the human population was the highest. Microplastics were detected in 10% of the bivalves and 6.7% of the crabs (n = 30 in both cases), and eight pieces of microplastics were detected in the stomach of one tufted duck. These results indicate that the mud in tidelands near urban areas had more microplastics. In addition, the results suggest that microplastics contamination levels may be higher in higher order predators in the food web. Copyright © 2019 CIWEM

Nakashima, E., et al. (2012). "Quantification of Toxic Metals Derived from Macroplastic Litter on Ookushi Beach, Japan." Environmental Science & Technology **46**(18): 10099-10105.

The potential risk of toxic metals that could leach into a beach environment from plastic litter washed ashore on Ookushi Beach, Goto Islands, Japan was estimated by balloon aerial photography, in situ beach surveys, and leaching experiments in conjunction with a Fickian diffusion model analysis. Chromium (Cr), cadmium (Cd), tin (Sn), antimony (Sb), and lead (Pb) were detected in plastic litter collected during the beach surveys. Polyvinyl chloride (PVC) fishing floats contained the highest quantity of Pb. Balloon aerial photography in conjunction with a beach survey gave an estimated mass of Pb derived from plastic litter of 313 ± 247 g. Lead leaching experiments on collected PVC floats showed that Pb in the plastic litter could leach into surrounding water on the actual beach, and that plastic litter may act as a "transport vector" of toxic metals to the beach environment. Using the experimental data, the total mass of Pb that could leach from PVC plastic litter over a year onto Ookushi Beach was estimated as 0.6 ± 0.6 g/year, suggesting that toxic metals derived from plastic beach litter are a potential "pathway" to contamination of the beach environment due to their accumulation in beach soil over time. [ABSTRACT FROM AUTHOR]

Nakashima, Y., et al. (2012). "Single bead detection with an NMR microcapillary probe." Journal of Magnetic Resonance **224**: 71-77.

We have developed a nuclear magnetic resonance (NMR) microcapillary probe for the detection of single magnetic microbeads. The geometry of the probe has been optimized so that the signal from the background water has a similar magnitude compared to the signal from the dephased water nearby a single magnetic bead within the probe detector coil. In addition, the RF field of the coil must be uniform within the effective range of the magnetic bead. Three different RF probes were tested in a 7 T (300 MHz) pulsed NMR spectrometer with sample volumes ranging from 5 nL down to 1 nL. The 1 nL probe had a single-shot signal-to-noise ratio (SNR) for pure water of 27 and a volume resolution that exhibits a 600-fold improvement over a conventional (5 mm tube) NMR probe with a sample volume of 18 muL. This allowed for the detection of a 1 mum magnetite/polystyrene bead (m=2x10(-14)Am(2)) with an estimated experimental SNR of 30. Simulations of the NMR spectra for the different coil geometries and positions of the bead within the coil were developed that include the B(0) shift near a single bead, the inhomogeneity of the coils, the local coil sensitivity, the skin effect of the coil conductor, and quantitated estimates of the proximity effect between coil windings.

Nakki, P., et al. (2017). "Bioturbation transports secondary microplastics to deeper layers in soft marine sediments of the northern Baltic Sea." Marine Pollution Bulletin **119**(1): 255-261.

Microplastics (MPs) are observed to be present on the seafloor ranging from coastal areas to deep seas. Because bioturbation alters the distribution of natural particles on inhabited soft bottoms, a mesocosm experiment with common benthic invertebrates was conducted to study their effect on the distribution of secondary MPs (different-sized pieces of fishing line < 1 mm). During the study period of three weeks, the benthic community increased MP concentration in the depth of 1.7-5.1 cm in the sediment. The experiment revealed a clear vertical gradient in MP distribution with their abundance being highest in the uppermost parts of the sediment and decreasing with depth. The Baltic clam Macoma balthica was the only study animal that ingested MPs. This study highlights the need to further examine the vertical distribution of MPs in natural sediments to reliably assess their abundance on the seafloor as well as their potential impacts on benthic communities. Copyright © 2017 Elsevier Ltd

Nakki, P., et al. (2019). "Seafloor sediments as microplastic sinks in the northern Baltic Sea - Negligible upward transport of buried microplastics by bioturbation." Environmental Pollution **249**: 74-81.

Bioturbation by the common benthic invertebrates in the northern Baltic Sea does not markedly transport buried microplastics to the sediment surface. Microplastics (MPs) are ubiquitous in the marine environment. High concentrations of MPs are found from seafloor sediments, which have been proposed to act as their final sinks. Because bioturbation is an important process affecting the burial of MPs, a mesocosm experiment was established to study whether sediment infauna may also promote MP return to the sediment surface. Thin layers of frozen sediment containing an environmentally realistic concentration (<1300 MPs per kg of dry sediment) of MP fragments in two size classes (>500 mum and 100-300 mum) were added to depths of 2 cm and 5 cm in the experimental cylinders filled with sediment. The displacement of these MPs, made of acrylonitrile butadiene styrene (ABS), by a community of common benthic invertebrates in the northern Baltic Sea (clam Limecola balthica, polychaete Marenzelleria spp., gammarid Monoporeia affinis) was studied in a 10-week experiment. After the experiment, the MPs were extracted from each sediment layer and the animals were examined for MP ingestion. The results indicated that the transportation of MPs to the sediment surface by bioturbation was negligible. Thus, in the Baltic Sea, the seafloor may act as a sink for once sedimented MPs, reducing simultaneously the MP exposure of the macrofauna feeding on the sediment surface. Copyright © 2019 The Authors

Näkki, P., et al. (2019). "Seafloor sediments as microplastic sinks in the northern Baltic Sea – Negligible upward transport of buried microplastics by bioturbation." Environmental Pollution **249**: 74-81.

Microplastics (MPs) are ubiquitous in the marine environment. High concentrations of MPs are found from seafloor sediments, which have been proposed to act as their final sinks. Because bioturbation is an important process affecting the burial of MPs, a mesocosm experiment was established to study whether sediment infauna may also promote MP return to the sediment surface. Thin layers of frozen sediment containing an environmentally realistic concentration (<1300 MPs per kg of dry sediment) of MP fragments in two size classes (>500 µm and 100–300 µm) were added to depths of 2 cm and 5 cm in the experimental cylinders filled with sediment. The displacement of these MPs, made of acrylonitrile butadiene styrene (ABS), by a community of common benthic invertebrates in the northern Baltic Sea (clam Limecola balthica , polychaete Marenzelleria spp., gammarid Monoporeia affinis) was studied in a 10-week experiment. After the experiment, the MPs were extracted from each sediment layer and the animals were examined for MP ingestion. The results indicated that the transportation of MPs to the sediment surface by bioturbation was negligible. Thus, in the Baltic Sea, the seafloor may act as a sink for once sedimented MPs, reducing simultaneously the MP exposure of the macrofauna feeding on the sediment surface. Image 1 • Bioturbation does not markedly transport buried microplastics upwards in sediments. • Burial of microplastics reduce their availability to macrofauna. • The results support the hypothesis that seafloors may form a sink for microplastics. Bioturbation by the common benthic invertebrates in the northern Baltic Sea does not markedly transport buried microplastics to the sediment surface. [ABSTRACT FROM AUTHOR]

Nam, H. C. and W. H. Park (2019). "Eco-friendly poly(lactic acid) microbeads for cosmetics via melt electrospraying." International Journal of Biological Macromolecules **02**: 02.

Microbeads (MBs) are essential materials for cosmetic and healthcare applications. However, environmental pollution has recently emerged as a concern due to the non-degradability and adsorption property of persistent organic pollutants (POPs) in environmental conditions, particularly in the marine environment. Therefore, the development of biodegradable MBs via eco-friendly methods is urgently demanded. Poly(lactic acid) (PLA) is a biodegradable and melt-processable aliphatic polyester which can be obtained from raw materials in nature. In this study, the high molecular weight PLA was pre-treated by electron beam (E-beam) irradiation in order to adjust the melt viscosity. Subsequently, the PLA MBs were prepared by varying the processing parameters via an eco-friendly melt electrospraying process. During the time, the PLA MBs showed bulk degradation which lead to decrement of the residual weight, thermal and structural stability. On the other hand, the crystallinity of PLA MBs was significantly increased due to the degradation of amorphous region. Furthermore, the PLA MBs showed poor POPs adsorption behavior compare with the commercial MBs because of low specific surface area. From these results, the PLA MBs via green method have a great potential to replace the non-degradable MBs in cosmetics.

Nam Ngoc, P., et al. (2018). "Factors influencing the microplastic contamination of bivalves from the French Atlantic coast: location, season and/or mode of life?" Marine Pollution Bulletin **129**(2): 664-674.

Monitoring the presence of microplastics (MP) in marine organisms is currently of high importance. This paper presents the qualitative and quantitative MP contamination of two bivalves from the French Atlantic coasts: the blue mussel (Mytilus edulis) and the Pacific oyster (Crassostrea gigas). Three factors potentially influencing the contamination were investigated by collecting at different sampling sites and different seasons, organisms both wild and cultivated. Inter- and intra-species comparisons were also achieved. MP quantity in organisms was evaluated at 0.61+or-0.56 and 2.1+or-1.7 MP per individual respectively for mussels and oysters. Eight different polymers were identified. Most of the MPs were fragments; about a half of MPs were grey colored and a half with a size ranging from 50 to 100 micro m for both studied species. Some inter-specific differences were found but no evidence for sampling site, season or mode of life effect was highlighted.

Nam Ngoc, P., et al. (2018). "Quantification and characterization of microplastics in blue mussels (Mytilus edulis): protocol setup and preliminary data on the contamination of the French Atlantic coast. (Special Issue: Health and environmental risks associated with emerging pollutants and novel green processes.)." Environmental Science and Pollution Research **25**(7): 6135-6144.

Microplastics (MPs) constitute a main environmental issue due to their threat to marine organisms and so far to humans. The lack of a fast standard protocol in MP isolation and identification from living organisms bring to challenge for the science. In this paper, an optimized protocol using potassium hydroxide 10% (KOH 10%; m/v) for digestion of mussel soft tissues (Mytilus edulis) and multi-steps of sedimentation has been developed. Efficiency higher than 99.9% of organic and mineral matter elimination was shown by application on mussels sampled on the French Atlantic coast. The identification of MPs was performed by FTIR microscopy straight on the filter and the whole analysis can be compatible with a routine goal. Fourteen MPs of four different chemical natures were found and identified in 5 pools of 3 sampled mussels. Their size ranged from 30 to 200 micro m. Further investigations are now needed to evaluate the potential risk of such particles within this marine bivalve species and other filter feeders.

Nam, S. E., et al. (2018). "Observation about persistence of microbeads in Echinoderms and discussion to plastic riskness of the marine ecology system." Toxicology and Environmental Health Sciences **10 (4)**: S42.

There are largely sea cucumbers, starfish and sea starfish in echinoderms, which have a specific system of water vascular system. It is responsible for osmotic phenomena in echinoderms. First, it absorbs water through the Madreporite and stimulates the Ampullae to inflate the tube feet so that it can catch the attachment or food. Recently, microbeads (or microplastics) have emerged as an environmental problem. Especially, small pellets introduced from the land are likely to remain in the body of aquatic organisms, cause toxicity, and possibly affect the end-consumer. Echinoderms living in the sea are more likely to remain in plastic because they directly absorb and use the surrounding water. However, research on microplastics in echinoderms isn't yet to be found. Therefore, this study explored the persistence period of microbeads. Fluorescent beads were treated directly on the madreporite of sea cucumber and starfish, and immediately transferred to clean seawater. After two weeks, the beads decreased but were still partially found. It was estimated that the small particles stuck to the inside and outside of the tube, resulting in a slow release. After this experiment, I will aim to examine in detail the solution of microbeads problems in the marine ecology systems.

Namba, Y., et al. (1999). "Highly Sensitive Electrochemiluminescence Immunoassay Using the Ruthenium Chelate-Labeled Antibody Bound on the Magnetic Micro Beads." Analytical Sciences **15**(11): 1087.

The newer electrochemiluminescence (ECL) immunoassay system was established by using both an antibody coated on paramagnetic micro-beads (Capt-MB) as a carrier of the immunoassay and an antibody labeled with ruthenium(II) tris-bipyridine-NHS (Ru-Ab). The ECL excitations were designed to be generated upon the surface of the working electrode which collected the reacted Capt-MB by magnetic force. As a model of the immunoassay, the reaction between alpha-fetoprotein (AFP) and anti-AFP antibodies was used in accordance with the so-called sandwich method, where the sandwich conformation of AFP-(Ru-Ab) was made on the surface of the Capt-MB. The ECL immunoassay system revealed the following results: a) the ECL signal intensity was obtained in proportion to the AFP concentration of each specimen; b) the dynamic range of this ECL immunoassay system was extended to 10000 times of magnitude in the 2-step assay; and c) the detection sensitivity reached to the level of 5 pg/ml in the AFP concentration after 15 min in the 1-step immunoassay.

Nan, B., et al. (2019). "Identification of microplastics in surface water and Australian freshwater shrimp Paratya australiensis in Victoria, Australia." Environmental Pollution **259**: 113865.

Compared to marine microplastics research, few studies have bio-monitored microplastics in inland waters. It is also important to understand the microplastics' uptake and their potential risks to freshwater species. The Australian glass shrimp Paratya australiensis (Family: Atyidae) is commonly found in fresh waterbodies in eastern Australia, and are sensitive to anthropogenic stressors but have a wide tolerance range to the natural environmental conditions. This study aimed to understand the microplastics' occurrence and types in water samples and the shrimp P. australiensis, and identify if the shrimp could be a suitable bioindicator for microplastic pollution. Surface water and P. australiensis across ten urban and rural freshwater sites in Victoria were sampled. In total, 30 water samples and 100 shrimp were analysed for microplastic content, and shrimp body weights and sizes were also recorded. Microplastics were picked, photographed and identified using FT-IR microscopy: in water samples, 57.9% of items including suspect items were selected to identify; all microplastics found in shrimp samples were identified. Microplastics were present in the surface waters of all sites, with an average abundance of 0.40 +/- 0.27 items/L. A total of 36% of shrimp contained microplastics with an average of 0.52 +/- 0.55 items/ind (24 +/- 31 items/g). Fibre was the most common shape, and blue was the most frequent colour in both water and shrimp samples. The dominant plastic types were polyester in water samples, and rayon in shrimp samples. Even though results from this study show a relatively low concentration of microplastics in water samples in comparison with global studies, it is worth noticing that microplastics were regularly detected in fresh waterbodies in Victoria, Australia. Compared with water samples, shrimp contained a wider variety of plastic types, suggesting they may potentially behave as passive samplers of microplastics pollution in freshwater environments.

Nanda, H. S., et al. (2014). "Preparation of collagen porous scaffolds with controlled and sustained release of bioactive insulin." Journal of Bioactive and Compatible Polymers **29**(2): 95-109.

Controlled and local release of bioactive growth factors from porous scaffolds can provide an efficient strategy to control the complex and dynamic regulation of cellular processes in a three-dimensional microenvironment. In this study, hybrid scaffolds of collagen and poly(lactic-co-glycolic acid) microbeads were prepared by introducing insulin-releasing poly(lactic-co- glycolic acid) microbeads into collagen porous scaffolds. Insulin-incorporated poly(lactic-co-glycolic acid) microbeads of two distinct sizes, 19.4 +/- 1.6 and 4.4 +/- 0.9 mum, were used to prepare the hybrid scaffolds. The scaffolds had controlled pore structure, and the poly(lactic-co-glycolic acid) microbeads were well distributed on the pore walls of the scaffolds. The scaffolds had a lower initial burst and a more stable insulin release than did the free microbeads. Culture of human dermal fibroblasts in the hybrid scaffolds were affected the bioactivity of released insulin. The hybrid scaffold prepared with 19.4 +/- 1.6 mum microbeads had a more linear release of insulin and a higher promotion effect on cell proliferation than did the other hybrid group and control scaffolds. The hybrid scaffold should be useful for skin tissue engineering. © The Author(s) 2014.

Nandy, B., et al. (2015). "Recovery of consumer waste in India – A mass flow analysis for paper, plastic and glass and the contribution of households and the informal sector." Resources, Conservation & Recycling **101**: 167-181.

In most municipalities in India, the collection, transportation and disposal of municipal solid waste deviates from the mass flow envisaged by the municipal agencies and planning authorities. While multiple studies have focused on the environmental problems arising due to uncontrolled waste dumping and combustion, we present a qualitative study of the efforts towards resource conservation and recycling by various actors involved, and a quantitative estimate of the amount of material recovered at various stages. Both the informal sectors (garbage collectors, waste pickers, waste dealers, small stores and itinerant merchants) and the households in India, play a vital role in recovering consumer waste. In order to have an in-depth understanding, a case study has been performed to better understand the contribution of households, garbage collectors and itinerant waste merchants towards recovering consumer waste. Our study shows that consumer waste is far more efficiently recovered in India than what has been reported in literature until now. The waste recovery takes place in multiple-stages and the final waste that reaches the municipal corporation mostly comprises of biodegradable waste, inerts and highly non-recyclable waste. Households, itinerant waste merchants and garbage collectors in India jointly recover 1.2–2.4 million tonnes of newspapers, 2.4–4.3 million tonnes of cardboard and mixed paper, 6.5–8.5 million tonnes of plastic, more than1.3 million tonnes of glass, more than 2.6 million tonnes of metal waste and 4–6.2 million tonnes of other

recyclable material per year. Overall, 30–60% of all paper and cardboard, 50–80% of all plastic and close to 100% of all glass bottles produced in India are recycled. [ABSTRACT FROM AUTHOR]

Nandy, D. K., et al. (2011). "Chemokine induced diabetic monocyte activation occurs through unique PI3 kinase pathway." Diabetes **1)**: A559-A560.

Type 2 Diabetes (T2D) is a cardiovascular risk equivalent. Chemokine induced monocyte activation is important for initiation of atherosclerosis. Plasma concentration of the chemokine platelet activating factor (PAF) is elevated in diabetes. To explore the molecular mechanism of PAF induced monocyte activation we performed adhesion, migration and transmigration assays of ex vivo monocytes isolated from the peripheral blood of non diabetic (ND; n=35), type 2 diabetic (T2D; n=25) individuals and from THP-1 cell lines by using CD 14+ micro bead technique. Euglycemic (5mM glucose) starving condition was maintained during every experiment. PAF (100etaM for 5 minutes) exposure significantly increased (p=0.03) adhesion and migration of monocytes derived from ND, T2D individuals and THP-1 cells. Both properties were completely reversed by pretreatment with PI3 Kinase inhibitor LY (10 muM). Furthermore, PAF significantly increased (p=0.03) transendothelial migration of monocytes through compact monolayer of HUVEC (human umbilical vein endothelial cell) in ND and T2D subjects and THP-1 cell lines. PAF activated monocytes (ND, T2D and THP-1 cell lines) showed significant (p=0.02) upregulation of phosphorylation of p101 and p110gamma, unique PI3Kinase class IB isoforms. Priming with PI3 Kinase inhibitor LY diminished phosphorylation of both the isoforms. Genetic knock out of p101 and p110gamma in THP-1 cells by using dominant negative retroviral transfection technique blocked PAF induced migration of THP-1 cells. These data suggest that monocytes are activated by PAF through upregulated phosphorylation of p101 and p110gamma in both T2D and ND individuals. Thus modulation of class IB PI3K activity in T2D monocytes need to be further studied to explore the possibility of targeting tissue specific PI3 Kinase modulators in prevention of accelerated atherosclerosis in type 2 Diabetes.

Nanna, M., et al. (2018). "Mapping greenhouse plastic wastes in the west region of Portugal." Acta Horticulturae.

Plastic materials are used in many applications in agriculture, as greenhouse and tunnel covering films, direct coverings, shading and protective nets, irrigation pipes, fertilizers bags, pots and others. In Mediterranean countries, plastic film is the most common greenhouse covering material. Because of direct exposure to solar radiation and wind, greenhouse plastic covers need to be replaced every 6 to 45 months, depending on the material. The huge quantities of plastic waste produced need proper management in order to avoid environmental and economic impacts. The plastic waste is usually recycled by special companies that collect and treat this waste material. The aim of this study was to apply geographical information systems (GIS) and photointerpretation techniques to evaluate the amount of plastic waste produced in one of the most important regions of greenhouse production in Portugal, the west region, specifically the Torres Vedras municipality. The methodology has integrated the characterization of the type of plastic covering material and the cartography of the greenhouse land units. It used Land Use Map 2007, Bing Map images and administrative boundaries to determine the

geographical position and the type of greenhouses. For each administrative unit, the frequency and total greenhouse area were calculated. Identification of the type of plastic material was made by photointerpretation and direct interviews at one company that sells material for greenhouses in Torres Vedras. The database created allowed us to determine the amount of plastic used as greenhouse cover materials and to identify the needs for recycling in this area. The geodatabase produced is the first step to monitor plastic waste production in time and space.

Nanninga, G. B., et al. (2019). "Microplastic ingestion rates are phenotype-dependent in juvenile anemonefish." Environmental Pollution **259**: 113855.

The potential influence of microplastic debris on marine organisms is an issue of great ecological and socioeconomic concern. Experiments exposing fishes and invertebrates to constant concentrations of microplastics often yield high variation in particle ingestion rates among individuals. Yet, despite an increasing interest in microplastic ingestion in the wild, the potential intrinsic drivers of inter-individual variation have received little attention so far. Here we assessed individual-level ingestion of Polyethylene microspheres by laboratory-reared juvenile anemonefish, Amphiprion ocellaris, in relation to (a) ambient particle concentrations and (b) repeatable behavioural traits. We show that microplastic ingestion is highly variable at all tested particle concentrations and that this variation can partially be explained by individual activity levels. Moreover, the relationship between ingestion and behavioural variation increased notably when only the most behaviourally consistent individuals (n = 40 out of 60) were considered in the analysis. Our findings indicate that microplastic ingestion rates in juvenile reef fishes may be less dependent on ambient concentrations than expected; instead they are to some degree phenotype-dependent. Care should thus be taken when reporting mean responses to microplastic exposure treatments, because some individuals may not be affected in the same way as others due to differential ingestion behaviour. We also discuss potential ramifications of non-random ingestion variability on population- and community-level responses.

Nantakomol, D. (2012). "Oral abstract: Microparticles: Affordable counting bead by flow cytometry and atomic force imaging." International Journal of Laboratory Hematology **1)**: 38-39.

Objectives: Activation of vascular endothelium and blood cells in a range of inflammatory and infectious diseases is associated with the formation of cell-derived microparticles (MPs), which are membrane vesicles with diameter <1.5 mm. Analysis of circulating MPs is becoming more refined and clinically useful. The standard single-platform flow cytometric testing that uses the known reference microbeads is expensive; more affordable alternatives are therefore needed. In this study, we validated a quantitative method called "cell bead" to measure circulating MPs in the peripheral blood of patient with Glucose-6-phosphate dehydrogenase deficiency (G6PD). In parallel, atomic force microscope (AFM) was applied to demonstrate the production of MPs during red cell vesiculation. Method(s): Citrated blood samples were collected from 34 patients with G6PD Vaingchan (871 C->T), 4 patient with G6PD Mahidol (487 G->A), 2 patient with G6PD Union (1360 C->T), and 2 patient with double mutation variant of G6PD Mahidol-Vaingchan and Vaingchan-Union. AnnexinV-FITC, a specific marker for phosphatidylserine, was used to distinguish MPs from nonspecific noise. The cellular origin of MPs was identified using an antibody to a specific surface marker of the cells, PEconjugated anti-glycophorin A was used for RBCs, PEconjugated anti-CD51 for endothelial cell, and PE-conjugated anti-CD41a for platelet and counted by FACsCalibur flow cytometer. The absolute MPs numbers were measured by CB and the results were compared with the known reference microbeads (Trucount TM). Statistical correlation and agreement were analyzed using linear regression and Bland-Altman analysis. In order to observe the morphological changes of red cell vesiculation, the vesiculating cell was examined under AFM microscope. Result(s): Linear regression analyses revealed an excellent correlation of the CB with the standard microbead method (r(2) > 0.98; absolute counts, r(2) > 0.98. Mean percent bias for the CB method was +1.35% [limits of agreement (LOA): -2.86% to +3.57%]. Using Atomic Force Microscopy, the cursor statistic was applied to measure the size of G6PDdeficient RBC and MPs. G6PD-deficient RBC was smaller than that size of normal RBC (5.9 mm versus 7.5 mm), MP's size was ranged in 0.15 to 1.8 mm. MPs were producing from discoid RBCs. Conclusion(s): The use of CB is comparable with the use of commercial microbeads. This has resulted in major cost savings to resource-limited countries where the health care system is under increasing pressure to operate cost effectively. AFM demonstrated that MPs are shed by the discoid RBCs. This might reflect the capability to remove damaged cell components for the viability of the discoid RBC.

Napper, I. E., et al. (2015). "Characterisation, quantity and sorptive properties of microplastics extracted from cosmetics." Marine Pollution Bulletin **99**(1-2): 178-185.

Cosmetic products, such as facial scrubs, have been identified as potentially important primary sources of microplastics to the marine environment. This study characterises, quantifies and then investigates the sorptive properties of plastic microbeads that are used as exfoliants in cosmetics. Polyethylene microbeads were extracted from several products, and shown to have a wide size range (mean diameters between 164 and 327 mum). We estimated that between 4594 and 94,500 microbeads could be released in a single use. To examine the potential for microbeads to accumulate and transport chemicals they were exposed to a binary mixture of (3)H-phenanthrene and (14)C-DDT in seawater. The potential for transport of sorbed chemicals by microbeads was broadly similar to that of polythene (PE) particles used in previous sorption studies. In conclusion, cosmetic exfoliants are a potentially important, yet preventable source of microplastic contamination in the marine environment.

Narancic, T. and K. E. O'Connor (2017). "Microbial biotechnology addressing the plastic waste disaster." Microbial Biotechnology **10**(5): 1232-1235.

Oceans are a major source of biodiversity, they provide livelihood, and regulate the global ecosystem by absorbing heat and CO₂ . However, they are highly polluted with plastic waste. We are discussing here microbial biotechnology advances with the view to improve the start and the end of life of biodegradable polymers, which could contribute to the sustainable use of marine and coastal ecosystems (UN Sustainability development goal 14).

Narancic, T., et al. (2018). "Biodegradable Plastic Blends Create New Possibilities for End-of-Life Management of Plastics but They Are Not a Panacea for Plastic Pollution." Environmental Science & Technology **52**(18): 10441-10452.

Plastic waste pollution is a global environmental problem which could be addressed by biodegradable plastics. The latter are blended together to achieve commercially functional properties, but the environmental fate of these blends is unknown. We have tested neat polymers, polylactic acid (PLA), polyhydroxybutyrate, polyhydroxyoctanoate, poly(butylene succinate), thermoplastic starch, polycaprolactone (PCL), and blends thereof for biodegradation across seven managed and unmanaged environments. PLA is one of the world's best-selling biodegradable plastics, but it is not home compostable. We show here that PLA when blended with PCL becomes home compostable. We also demonstrate that the majority of the tested bioplastics and their blends degrade by thermophilic anaerobic digestion with high biogas output, but degradation times are 3-6 times longer than the retention times in commercial plants. While some polymers and their blends showed good biodegradation in soil and water, the majority of polymers and their blends tested in this study failed to achieve ISO and ASTM biodegradation standards, and some failed to show any biodegradation. Thus, biodegradable plastic blends need careful postconsumer management, and further design to allow more rapid biodegradation in multiple environments is needed as their release into the environment can cause plastic pollution.

Narvaez Valderrama, J. F., et al. (2016). "Implications of observed PBDE diffusion coefficients in low density polyethylene and silicone rubber." Environmental Science. Processes & Impacts **18**(1): 87-94.

A film-stacking technique was used to estimate diffusion coefficients of polybrominated diphenyl ethers (PBDEs) in low density polyethylene (LDPE) and silicone rubber. Substantially higher PBDE diffusion coefficients were observed for silicone rubber (AlteSilTM) than for LDPE. A much steeper decrease in LDPE diffusion coefficients was found with increasing PBDE molecular weight than that for silicone rubber. From a passive sampling point-of-view, this means that for equivalent polymer-water partition coefficients for these two materials, the mass transfer resistance for these substances in the LDPE will be significantly higher than that for silicone rubber. Boundary layer control of the uptake process for silicone rubber can be expected for PBDEs. With a microplastic perspective, the low diffusion coefficients of PBDEs and in particular of decabromo diphenyl ether (BDE 209) in LDPE imply that the polymer diffusion coefficients for these plastic additives used as flame retardants need to be taken into account when considering the risk posed by microplastic particle ingestion by marine organisms.

Nasir, B., et al. (2016). "Formulation development and characterization of 5-fluorouracil based microbeads using hydroxypropyl-beta-cyclodextrin for innovative drug delivery." Latin American Journal of Pharmacy **35**(Supplement 1): 1092-1101.

The aim of the study was to formulate microbeads of hydroxypropyl-beta-cyclodextrin (HP-beta-CD) using sodium alginate (SA) containing 5-fluorouracil (5-FU) by emulsion crosslinking technique. The microbeads were prepared by varying the concentration of hydroxypropyl-beta-cyclodextrin (HP-beta-CD) and sodium alginate (SA). The prepared microbeads were evaluated for swelling degree, drug entrapment, scanning electron microscopy (SEM), Fourier transforms infrared spectroscopy (FTIR), X-ray diffraction (XRD) and differential scanning calorimetry (DSC). SEM confirms the slight rough nature of microbeads. No significant drug polymer interactions were observed in FTIR studies. XRD and DSC revealed amorphous nature of drug after being entrapped. Gas chromatography confirms the absence of glutaraldehyde residue. The drug release shows excellent sustained drug release pattern. Copyright © 2016 Latin American Journal of Pharmacy. All rights reserved.

Nasr, S. H., et al. (2007). "Thin basement membrane nephropathy cannot be diagnosed reliably in deparaffinized, formalin-fixed tissue." Nephrology Dialysis Transplantation **22**(4): 1228-1232.

In diagnostic renal pathology, electron microscopy is ideally performed on glutaraldehyde-fixed, plastic resin-embedded tissue (EM-G). When no glomeruli are present in the portion of the biopsy fixed in glutaraldehyde, formalin-fixed, paraffin-embedded tissue can be reprocessed for electron microscopy (EM-F). The usefulness of this salvage technique for the diagnosis of thin basement membrane nephropathy (TBMN) has not been studied systematically. Here we compare the glomerular basement membrane (GBM) thickness by EM-G vs EM-F in 21 renal biopsies, including TBMN (eight patients), normals (two patients), minimal change disease (MCD) (six patients) and diabetic nephropathy (DN) (five patients). There was significant reduction of the GBM thickness by EM-F compared with EM-G across all diagnostic categories in

all 21 cases. The mean percentage reduction in GBM thickness was 23% for the TBMN cases, 40% for the normal/MCD cases and 34% for the DN cases. Four patients with MCD had a mean GBM thickness by EM-F that fell below the defining threshold for diagnosis of TBMN. For the TBMN cases, the 99th percentile for GBM thickness by EM-F was 194 nm, suggesting that the diagnosis of TBMN by EM-F can be excluded with confidence if the GBM thickness is above 200 nm. No clear criteria could be established to diagnose TBMN by EM-F. Renal pathologists should be aware that reprocessing of paraffin tissue for EM causes artifactual GBM thinning that precludes accurate diagnosis of TBMN.

Nasser, F. and I. Lynch (2016). "Secreted protein eco-corona mediates uptake and impacts of polystyrene nanoparticles on Daphnia magna." Journal of Proteomics **137**: 45-51.

UNLABELLEDNanoparticles (NPs) are defined as having at least one external dimension between 1 and 100 nm. Due to their small size, NPs have a large surface area to volume ratio giving them unique characteristics that differ from bulk material of the same chemical composition. As a result these novel materials have found numerous applications in medical and industrial fields with the result that environmental exposure to NPs is increasingly likely. Similarly, increased reliance on plastic, which degrades extremely slowly in the environment, is resulting in increased accumulation of micro-/nano-plastics in fresh and marine waters, whose ecotoxicological impacts are as yet poorly understood. Although NPs are well known to adsorb macromolecules from their environment, forming a biomolecule corona which changes the NP identity and how it interacts with organisms, significantly less research has been performed on the ecological corona (eco-corona). Secretion of biomolecules is a well established predator-prey response in aquatic food chains, raising the question of whether NPs interact with secreted proteins, and the impact of such interaction on NP uptake and ecotoxicity. We report here initial studies, including optimisation of protocols using carboxylic-acid and amino modified spherical polystyrene NPs, to assess interaction of NPs with biomolecules secreted by Daphnia magna and the impact of these interactions on NP uptake, retention and toxicity towards Daphnia magna.BIOLOGICAL SIGNIFICANCEDaphnia magna are an important environmental indicator species who may be especially sensitive to nanoparticles (NPs) as a result of being filter-feeders. This paper demonstrates for the first time that proteins released by Daphnia magna create an eco-corona around polystyrene NPs which causes heightened uptake of the NPs and consequently increases toxicity. The secreted protein eco-corona also causes the NPs to be less efficiently removed from the gut of D. magna and NPs remaining in the gut of D. magna affected the rate of subsequent feeding. Thus, fate of NPs in the environment should be evaluated and monitored under more realistic exposure scenarios.

Nateghi Rostami, M., et al. (2012). "Memory rather than naive CD8+ T cell population produce IFN-g in self-healed cutaneous leishmaniasis individuals." Clinical Microbiology and Infection **3)**: 60.

Objectives: In human leishmaniasis Th1/Th2 dichotomy and the role of CD8+ T cells in protection is not clearly defined. In this study based on CCR7 expression total memory vs. naive CD8+ T cell populations were isolated from volunteers with self-healed cutaneous leishmaniasis (CL) and cytokine productions were analysed. Method(s): Leishmanin skin test (LST) was performed for all volunteers. Blood samples were collected from 13 volunteers with history of CL caused by either L. major or L. tropica and 18 healthy volunteers from non-endemic area. Using enrichment cocktail mAbs and magnetic nanoparticles CD14+CD16- monocytes and total memory CD8+ T cells were isolated from autologous peripheral blood mononuclear cells (PBMC). For naive T cells, non-naive cells depleted and CD8+ T cells positively selected using CD8 microbeads. Monocyte derived macrophages (MDM) were produced by incubation of adherent monocytes in cRPMI at 37degreeC, 5% CO2 for 6 days. Isolated T lymphocyte populations were co-cultured with 1:10 autologous MDM in the presence of PHA or soluble Leishmania antigen (SLA). Cytokine productions were titrated on culture supernatant after 72 hours incubation at 37degreeC with 5% CO2. Part of the SLA cultured cells was harvested, stimulated with PMA/Ionomycin calcium, permeabilized, stained for intracellular IFN-g, and analyzed using flow cytometer. Result(s): The mean diameters of skin indurations were significantly higher in CL volunteers (8.7 +/- 3.62 mm) compared to healthy controls (0 mm) (p < 0.005). The mean +/- SD percentage of memory T cells was 5 +/- 1.8% and of naive T cells was 9 +/- 2.2% retrieving from PBMC. Stimulation of isolated CD8+ memory T cells from CL volunteers induced a significantly higher IFN-g production compared with that of controls (p < 0.005). No significant difference was seen in the production of IFN-g from naive T cells and in the production of IL- 10 from naive or memory T cells between CL and controls. Significantly higher numbers of memory CD8+ T cells from CL volunteers were positive for intracellular IFN-g than the same cells from controls (p < 0.001). No significant difference was found in the frequency of IFN-g positive naive CD8+ T cells between CL and controls. Conclusion(s): The role of CD8+ T cells as a source of IFN-g production has been suggested before, in this study memory population is shown responsible for IFN-g production in volunteers with history of CL. Purification of different memory subsets is needed for further study.

Nattie, E. E., et al. (1998). "Brain stem lesion size determined by DEAD red or conjugation of neurotoxin to fluorescent beads." Journal of applied physiology (Bethesda, Md. : 1985) **85**(6): 2370-2375.

Neurotoxin microinjected into the retrotrapezoid nucleus of anesthetized rats decreases phrenic activity and eliminates the response to CO2. In unanesthetized rats, such treatment has no effect on awake, resting breathing and decreases CO2 sensitivity by 40% (M. Akilesh, M. Kamper, A. Li, and E. E. Nattie. J. Appl. Physiol. 82: 469-479, 1997). One important factor in explaining these disparate results is the actual size of the anatomic lesion. In the present study, we injected ibotenic acid into the retrotrapezoid nucleus of anesthetized rats and evaluated lesion size by using two new approaches: 1) DEAD red, a fluorescent probe that enters impaired cells through leaky membranes and binds to nucleic acids, and 2) conjugation of toxin to fluorescent beads. With the use of DEAD red, the region containing labeled dying cells was 313 +/- 104 nl (n = 4), six times larger than the initial injected volume, and the physiological effects on phrenic amplitude, the CO2 response, and blood pressure began within minutes and were substantial. With conjugated toxin, in theory, neuronal damage would be limited to the region of detectable fluorescence (49 +/- 10 nl; n = 4). Effects on phrenic amplitude, CO2 sensitivity, and blood pressure were absent until approximately 2 h postinjection. Control experiments, with 2 h of in vitro incubation of the neurotoxin-microbead conjugate and injection of the supernatant after centrifugation, showed similar results that suggest release of conjugated neurotoxin. We conclude that DEAD red provides a useful means to monitor neuronal impairment in acute studies in vivo. Conjugation of neurotoxin to microbeads may be less reliable in this regard.

Naveca, F. G., et al. (2018). "Analysis of the immunological biomarker profile during acute Zika virus infection reveals the overexpression of CXCL10, a chemokine linked to neuronal damage." Memorias do Instituto Oswaldo Cruz **113**(6): e170542.

BACKGROUND: Infection with Zika virus (ZIKV) manifests in a broad spectrum of disease ranging from mild illness to severe neurological complications and little is known about Zika immunopathogenesis.

OBJECTIVES: To define the immunologic biomarkers that correlate with acute ZIKV infection.

METHODS: We characterized the levels of circulating cytokines, chemokines, and growth factors in 54 infected patients of both genders at five different time points after symptom onset using microbeads multiplex immunoassay; comparison to 100 age-matched controls was performed for statistical analysis and data mining.
FINDINGS: ZIKV-infected patients present a striking systemic inflammatory response with high levels of pro-inflammatory mediators. Despite the strong inflammatory pattern, IL-1Ra and IL-4 are also induced during the acute infection. Interestingly, the inflammatory cytokines IL-1beta, IL-13, IL-17, TNF-alpha, and IFN-gamma; chemokines CXCL8, CCL2, CCL5; and the growth factor G-CSF, displayed a bimodal distribution accompanying viremia. While this is the first manuscript to document bimodal distributions of viremia in ZIKV infection, this has been documented in other viral infections, with a primary viremia peak during mild systemic disease and a secondary peak associated with distribution of the virus to organs and tissues.
MAIN CONCLUSIONS: Biomarker network analysis demonstrated distinct dynamics in concurrence with the bimodal viremia profiles at different time points during ZIKV infection. Such a robust cytokine and chemokine response has been associated with blood-brain barrier permeability and neuroinvasiveness in other flaviviral infections. High-dimensional data analysis further identified CXCL10, a chemokine involved in foetal neuron apoptosis and Guillain-Barre syndrome, as the most promising biomarker of acute ZIKV infection for potential clinical application.

Naviaux, R. K. (2019). "Perspective: Cell danger response Biology-The new science that connects environmental health with mitochondria and the rising tide of chronic illness." Mitochondrion **51**: 40-45.

This paper is written for non-specialists in mitochondrial biology to provide access to an important area of science that has broad implications for all people. The cell danger response (CDR) is a universal response to environmental threat or injury. Once triggered, healing cannot be completed until the choreographed stages of the CDR are returned to an updated state of readiness. Although the CDR is a cellular response, it has the power to change human thought and behavior, child development, physical fitness and resilience, fertility, and the susceptibility of entire populations to disease. Mitochondria regulate the CDR by monitoring and responding to the physical, chemical, and microbial conditions within and around the cell. In this way, mitochondria connect cellular health to environmental health. Over 7,000 chemicals are now made or imported to the US for industrial, agricultural, and personal care use in amounts ranging from 25,000 to over 1 million pounds each year, and plastic waste now exceeds 83 billion pounds/year. This chemical load creates a rising tide of manmade pollutants in the oceans, air, water, and food chain. Fewer than 5% of these chemicals have been tested for developmental toxicity. In the 1980s, 5-10% of children lived with a chronic illness. As of 2018, 40% of children, 50% of teens, 60% of adults under age 65, and 90% of adults over 65 live with a chronic illness. Several studies now report the presence of dozens to hundreds of manmade chemicals and pollutants in placenta, umbilical cord blood, and newborn blood spots. New methods in metabolomics and exposomics allow scientists to measure thousands of chemicals in blood, air, water, soil, and the food chain. Systematic measurements of environmental chemicals can now be correlated with annual and regional patterns of childhood illness. These data can be used to prepare a prioritized list of molecules for congressional action, ranked according to their impact on human health.

Nayak, S., et al. (2014). "Silk sericin-alginate-chitosan microcapsules: hepatocytes encapsulation for enhanced cellular functions." International Journal of Biological Macromolecules **65**: 258-266.

The encapsulation based technology permits long-term delivery of desired therapeutic products in local regions of body without the need of immunosuppressant drugs. In this study microcapsules composed of sericin and alginate micro bead as inner core and with an outer chitosan shell are prepared. This work is proposed for live cell encapsulation for potential therapeutic applications. The sericin protein is obtained from cocoons of non-mulberry silkworm Antheraea mylitta. The sericin-alginate micro beads are prepared via ionotropic gelation under high applied voltage. The beads further coated with chitosan and crosslinked with genipin. The microcapsules developed are nearly spherical in shape with smooth surface morphology. Alamar blue assay and confocal microscopy indicate high cell viability and uniform encapsulated cell distribution within the sericin-alginate-chitosan microcapsules indicating that the microcapsules maintain favourable microenvironment for the cells. The functional analysis of encapsulated cells demonstrates that the glucose consumption, urea secretion rate and intracellular albumin content increased in the microcapsules. The study suggests that the developed sericin-alginate-chitosan microcapsule contributes towards the development of cell encapsulation model. It also offers to generate enriched population of metabolically and functionally active cells for the future therapeutics especially for hepatocytes transplantation in acute liver failure.

Nazareth, M., et al. (2019). "Commercial plastics claiming biodegradable status: Is this also accurate for marine environments?" Journal of Hazardous Materials **366**: 714-722.

Concerns about plastic pollution and global public policies have encouraged consumers to acquire environmentally friendly products. Thus, products made of biodegradable plastics have been preferred by the public, despite their costs. However, greenwashing practices, promising more environmental benefits than the products actually offer, has become frequent. Nevertheless, no studies assessing the occurrence of greenwashing in commercial plastic products sold in large world economies have been performed. The present study aimed to experimentally evaluate alterations in structure and chemical composition of selected plastic products marketed in Canada, USA and Brazil. The aging experiments carried out by seawater immersion for 180 days showed no evidence of degradation in 4 out of the 6 studied samples, despite product claims of biodegradability or 100% degradability status. This finding denotes unequivocal greenwashing practices, even including bags made of polyethylene, an ordinary non-biodegradable polymer. Thus, the inadequate adoption of green marketing is deceiving to consumers and may lead to improper disposal of these materials. These practices are highly counterproductive in view of the global public policies recently adopted to control plastic pollution. Therefore, considering the technologies currently available for identification of polymers, a strict control should be exercised over products that claim biodegradable status.

Nedovic, V. A., et al. (2001). "Electrostatic generation of alginate microbeads loaded with brewing yeast." Process Biochemistry **37**(1): 17-22.

The substantial concern with the possible use of immobilized yeast cells for beer production is reduction of internal mass transfer resistance during continuous fermentation. One way to minimise this problem is to use small-diameter beads. The effects of bead diameters in the range 0.3-2.0 mm on yeast cell immobilization and growth over a short-term cultivation were investigated. Bead diameters in the range 0.5-0.6 mm were optimal and provided rapid cell growth and the highest final cell concentration (2.33 x 10 super(9) cells/ml of beads). Electrostatic droplet generation was investigated as a technique for production of alginate microbeads. The effects of applied potential, internal needle diameter and electrode position on bead diameter were assessed. The results have shown that this method can be used for controlled production of small-size microbeads loaded with yeast. Depending on applied conditions it was possible to produce the beads in the range 250 mu m-2.0 mm in diameter.

Negorev, D., et al. (2018). "Human neutrophils can mimic myeloid-derived suppressor cells (PMN-MDSC) and suppress microbead or lectin-induced T cell proliferation through artefactual mechanisms." Scientific Reports **8**(1): 3135.

We report that human conventional CD15⁺ neutrophils can be isolated in the peripheral blood mononuclear cell (PBMC) layer during Ficoll gradient separation, and that they can impair T cell proliferation in vitro without concomitant neutrophil activation and killing. This effect was observed in a total of 92 patients with organ transplants, lung cancer or anxiety/depression, and in 18 healthy donors. Although such features are typically associated in the literature with the presence of certain myeloid-derived suppressor cell (PMN-MDSC) populations, we found that commercial centrifuge tubes that contained membranes or gels for PBMC isolation led to up to 70% PBMC contamination by CD15⁺ neutrophils, with subsequent suppressive effects in certain cellular assays. In particular, the suppressive activity of human MDSC should not be evaluated using lectin or microbead stimulation, whereas assays involving soluble or plate-bound antibodies or MLR are unaffected. We conclude that CD15⁺ neutrophil contamination, and associated effects on suppressor assays, can lead to significant artefacts in studies of human PMN-MDSC.

Neha, G., et al. (2011). "Effect of polymer and cross linking agent on in vitro release of quercetin from microbeads." Asian Journal of Pharmacy and Life Science **1**(4): 401-405.

This investigation describes the effect of polymers and cross linking agent on in vitro release of quercetin from sodium alginate beads. The formulations were prepared by utilizing 2³ factorial designs. Hydrophilic polymer hydroxy propyl methyl cellulose (15-24 cps) was used for its gel forming and release controlling properties. The effect of different concentrations of cross linking agent (calcium chloride) on entrapment efficiency and drug release profile were investigated. The beads were prepared by changing the experimental variables such as concentration of polymer and cross linking agent in order to optimize independent variables. The bead formulations were prepared by Ionotropic gelation method. Quercetin was used as model drug. The prepared beads were evaluated for its particle size, drug entrapment efficiency and in vitro release. The entrapment efficiency and particle size was between the range of 16.62% to 72.47% and 0.726+or-0.0088 mm to 1.179+or-0.0547 mm respectively. Results reveal that on increasing polymer concentration and cross linking agent, entrapment efficiency of drug increases with decrease in its release rate. The result indicates the possibility of getting controlled release system by varying the concentration of polymer and cross linking agent.

Neha, S. and J. Aishwary (2018). "Design and characterization of d-limonene and liquorice loaded nanosponge based drug delivery system for complete eradication of H. pylori infection." Asian Journal of Pharmaceutical and Clinical Research **11 (11)**: 95.

H. pylori is the prominent etiologic factor responsible for peptic ulcer disease. With the major conceptual fact that H. pylori plays a dominant role in majority of peptic ulcer, prevention of relapse is focused on eradication of this organism from the stomach. H. pylori is approximately involved in 100% of chronic active antral gastritis cases, 90% of duodenal ulcer patients, and 50-60% gastric ulcer patients. Single antibiotic regimens led to the result of failure in H. pylori treatment, due to above reason various combination regimens are suggested to increase the rate of H. pylori eradication. H. pylori deals with the utmost importance for choosing the drug delivery system. One of the best approaches followed to extend the residency of medication in the stomach is of lower density floating dosage form, so that the gastric fluid should be capable of floating on the gastric juice in the stomach. Conventional dosage forms are treatable for H. pylori but complete eradication does not take place. Some novely arrived drug deliverance technologies include double liposomes, microspheres, microbeads, microballons, as well as mucoadhesive drug delivery systems. The main aim of this research work deals with the fact of better, approachable as well as optimized drug delivery concepts specified for H. pylori eradication in less time interval. The formulation with a size of less than 100 nm was said to be prone to fusion with bacterial membrane, thereby directly releasing a high dose of active drug moiety into the bacterial membrane, which can further led to absorption of active content. In the present research work, design and characterization of D-Limonene and liquorice loaded nanosponge based drug delivery system for complete eradication of H. Pylori infection. Research initiated with the full over optimistic carry over approach which will enlighten the novel concept of the drug deliverance through a in situ gel based system integrating nanosponges loaded with combined regimen therapy based drugs.

Neigh, G. and M. Shurte (2009). "Affective and cognitive consequences of small cerebral infarcts." Journal of Cerebral Blood Flow and Metabolism **1)**: S220.

Objective: Together, late-life major depression and subsyndromal depression rob more than 15% of the elderly population of personal happiness and exacerbate comorbid conditions.¹ The most serious consequence of late-life depression is premature death due to increased mortality following myocardial infarction and stroke as well as an increased rate of suicide.² Although the etiology of late-life depression is not fully understood, it is associated with vascular pathology. Silent cerebral infarcts (SCI) have been identified in over 50% of patients with late onset depression,³ and these lesions are associated with more severe symptoms,⁴ more hospital admissions for depression, and longer hospitalizations for depression.⁵ Due to the inherent limitations of human research, it is unknown whether vascular changes in the elderly are causative of depressive behaviors or an unrelated but co-occurring event. Because small cerebral infarcts have been repeatedly associated with increased occurrence and severity of symptoms of depression, the current work tests the hypothesis that small cerebral infarcts induce anxiety-like and depressive-like behaviors in a rat model. Method(s): Male rats (3 or 18 mos old) were anesthetized and microembolism or SHAM procedures were performed. Briefly, the left or right common carotid was exposed and microbeads (50 mum in diameter) were injected via a 30-G needle. After 14d of recovery from the procedure, rats were tested for both depressive-like and anxiety-like behaviors. Tests included: social interaction, elevated plus maze, open field, sucrose preference, and forced swim. Result(s): Data indicate that rats that received microembolism infarcts demonstrate an increase in depressive-like behavior, as measured by deficits in sucrose preference and forced swim activity, as compared to SHAM operated rats. Results from the full panel of behavioral tests in both age groups will be presented. Analysis of the brain tissue from these rats will determine the role of lesion laterality and location in generation of behavioral changes. Conclusion(s): The data collected to date indicate that experimental induction of small cerebral infarcts is sufficient to induce depressive-like behavior. This suggests that small cerebral infarcts may be one underlying cause of late life depression in the elderly population. A better understanding of the behavioral consequences of small cerebral infarcts will provide insight into the neurobiology of vascularly-induced behavioral changes and guide the development of novel treatment strategies.

Nel, H., et al. (2019). "Simple yet effective modifications to the operation of the Sediment Microplastic

Isolation unit to avoid polyvinyl chloride (PVC) contamination." MethodsX **6**: 2656-2661.

Effective microplastic extraction from sediment and soil samples requires a density separation step, with the ability to remove >80 % of plastic particles without introducing substantial contamination. Additional benefits such as affordability and simplicity allow microplastic campaigns on limited budgets the ability to achieve high extraction efficacies. Coppock et al. (2017) designed the Sediment Microplastic Isolation (SMI) unit with these criteria in mind, warning that long-term use may lead to polyvinyl chloride (PVC) contamination. As part of the method validation work for a large-scale international project, collecting samples from more than 100 rivers globally, a pilot study of extraction efficiency and contamination potential of an SMI unit was performed. PVC contamination occurred during the extraction of 20 samples, with indicative grey shavings found in both negative controls and field samples. The original protocol was modified and artificially spiked sediments (positive blanks) were run to test extraction efficacy. The modification, requiring the PVC ball valve to remain open throughout the extraction. This modification eliminated contamination caused by wear and tear of the ball valve, while still maintaining recovery rates >80 %. Three points describing the change not the original: *The PVC ball valve is open while sample is agitated with a magnetic stirrer.*The PVC ball valve remains open while the solution is decanted.*The upper chamber is unscrewed and rinsed; recovering particles attached to the inner walls that would be lost using other filtration approaches.

Nel, H. A., et al. (2018). "Sinks and sources: assessing microplastic abundance in river sediment and deposit feeders in an Austral temperate urban river system." Science of the Total Environment **612**: 950-956.

Microplastics are important novel pollutants in freshwaters but their behaviour in river sediments is poorly understood due to the large amounts of coloured dissolved organic matter that impede sample processing. The present study aimed to (1.) estimate the microplastic pollution dynamics in an urban river system experiencing temporal differences in river flow, and (2.) investigate the potential use of chironomids as indicators of microplastic pollution levels in degraded freshwater environments. Microplastic levels were estimated from sediment and Chironomus spp. larvae collected from various sites along the Bloukrans River system, in the Eastern Cape South Africa during the summer and winter season. River flow, water depth, channel width, substrate embeddedness and sediment organic matter were simultaneously collected from each site. The winter season was characterised by elevated microplastic abundances, likely as a result of lower energy and increased sediment deposition associated with reduced river flow. In addition, results showed that particle distribution may be governed by various other external factors, such as substrate type and sediment organic matter. The study further highlighted that deposit feeders associated with the benthic river habitats, namely Chironomus spp. ingest microplastics and that the seasonal differences in sediment microplastic dynamics were reflected in chironomid microplastic abundance. There was a positive, though weakly significant relationship between deposit feeders and sediment suggesting that deposit feeders such as Chironomus spp. larvae could serve as an important indicator of microplastic loads within freshwater ecosystems.

Nel, H. A., et al. (2019). "Colour and size influences plastic microbead underestimation, regardless of sediment grain size." Science of the Total Environment **655**: 567-570.

The quantification of microplastics in environmental samples often requires an observer to determine whether a particle is plastic or non-plastic, prior to further verification procedures. This implies that inconspicuous microplastics with a low natural detection may be underestimated. The present study aimed at assessing this underestimation, looking at how colour (white, green and blue), size (large; ~1000 µm and small; <400 µm) and grain size fraction may affect detection. Sediment treatments varying in grain size were inoculated with known quantities of low-density polyethylene microbeads extracted from commercially bought facial scrubs. These microbeads varied in colour and size. Once extracted using a density separation method microbeads were counted. An overall underestimation of 78.59% may be a result of observer error and/or technical error. More specifically, the results suggested that microbeads varying in colour and size have a different detection probability and that these microbead features are more important in underestimation likelihoods than grain sizes. Graphical abstract Unlabelled Image Highlights • Microbeads, found in cosmetics, vary in colour and size. • Detection probabilities were significantly different between microbeads. • Microbead characteristics may explain underestimation in in situ sampling. [ABSTRACT FROM AUTHOR]

Nel, H. A., et al. (2017). "Do microplastic loads reflect the population demographics along the southern African coastline?" Marine Pollution Bulletin **115**(1/2): 115-119.

Plastic pollution is a major anthropogenic contaminant effecting the marine environment and is often associated with high human population densities and industrial activities. The microplastic (63 to 5000 micro m) burden of beach sediment and surf-zone water was investigated at selected sites along the entire length of the South African coastline. It was predicted that samples collected in areas of high population density, would contain a higher microplastic burden than those along coasts that demonstrate very low population densities. With the exception of water column microplastics within Richard's Bay Harbour (413.3+or-77.53 particles.m⁻³) and Durban Harbour (1200+or-133.2 particles.m⁻³), there were no significant spatial differences in microplastic loads. This supports the theory that harbours act as a source of microplastics for the surrounding marine environment. Additionally, the absence of any spatial variation highlights the possible long range distribution of microplastic pollutants by large scale ocean currents.

Nelms, S. E., et al. (2019). "Microplastics in marine mammals stranded around the British coast: ubiquitous but transitory?" Scientific Reports **9**(1): 1075.

Plastic pollution represents a pervasive and increasing threat to marine ecosystems worldwide and there is a need to better understand the extent to which microplastics (<5 mm) are ingested by high trophic-level taxa, such as marine mammals. Here, we perform a comprehensive assessment by examining whole digestive tracts of 50 individuals from 10 species whilst operating strict contamination controls. Microplastics were ubiquitous with particles detected in every animal examined. The relatively low number per animal (mean = 5.5) suggests these particles are transitory. Stomachs, however, were found to contain a greater number than intestines, indicating a potential site of temporary retention. The majority of particles were fibres (84%) while the remaining 16% was fragments. Particles were mainly blue and black (42.5% and 26.4%) in colour and Nylon was the most prevalent (60%) polymer type. A possible relationship was found between the cause of death category and microplastic abundance, indicating that animals that died due to infectious diseases had a slightly higher number of particles than those that died of trauma and other drivers of mortality. It is not possible, however, to draw any firm conclusions on the potential biological significance of this observation and further research is required to better understand the potential chronic effects of microplastic exposure on animal health, particularly as marine mammals are widely considered important sentinels for the implications of pollution for the marine environment.

Nelms, S. E., et al. (2018). "Investigating microplastic trophic transfer in marine top predators." Environmental Pollution **238**: 999-1007.

Microplastics are highly bioavailable to marine organisms, either through direct ingestion, or indirectly by trophic transfer from contaminated prey. The latter has been observed for low-trophic level organisms in laboratory conditions, yet empirical evidence in high trophic-level taxa is lacking. In natura studies face difficulties when dealing with contamination and differentiating between directly and indirectly ingested microplastics. The ethical constraints of subjecting large organisms, such as marine mammals, to laboratory investigations hinder the resolution of these limitations. Here, these issues were resolved by analysing sub-samples of scat from captive grey seals (Halichoerus grypus) and whole digestive tracts of the wild-caught Atlantic mackerel (Scomber scombrus) they are fed upon. An enzymatic digestion protocol was employed to remove excess organic material and facilitate visual detection of synthetic particles without damaging them. Polymer type was confirmed using Fourier-Transform Infrared (FTIR) spectroscopy. Extensive contamination control measures were implemented throughout. Approximately half of scat subsamples (48%; n=15) and a third of fish (32%; n=10) contained 1-4 microplastics. Particles were mainly black, clear, red and blue in colour. Mean lengths were 1.5 mm and 2 mm in scats and fish respectively. Ethylene propylene was the most frequently detected polymer type in both. Our findings suggest trophic transfer represents an indirect, yet potentially major, pathway of microplastic ingestion for any species whose feeding ecology involves the consumption of whole prey, including humans.

Nelms, S. E., et al. (2019). "What goes in, must come out: Combining scat-based molecular diet analysis and quantification of ingested microplastics in a marine top predator." Methods in Ecology and Evolution **10**(10): 1712-1722.

Microplastics (plastic particles <5 mm in size) are highly available for ingestion by a wide range of organisms, either through direct consumption or indirectly, via trophic transfer, from prey to predator. The latter is a poorly understood, but potentially major, route of microplastic ingestion for marine top predators.We developed a novel and effective methodology pipeline to investigate dietary exposure of wild top predators (grey seals; Halichoerus grypus) to microplastics, by combining scat-based molecular techniques with a microplastic isolation method. We employed DNA metabarcoding, a rapid method of biodiversity assessment, to garner detailed information on prey composition from scats, and investigated the potential relationship between diet and microplastic burden.Outcomes of the method development process and results of both diet composition from metabarcoding analysis and detection of microplastics are presented. Importantly, the pipeline performed well and initial results suggest the frequency of microplastics detected in seal scats may be related to the type of prey consumed.Our non-invasive, data-rich approach maximizes time and resource–efficiency, while minimizing costs and sample volumes required for analysis. This pipeline could be used to underpin a much-needed increase in understanding of the relationship between diet composition and rates of microplastic ingestion in high trophic level species.

Nemer, J. (2012). "Umbilical vascular access task trainer - An inexpensive and biohazardly safe DIY (do it yourself) model." Academic Emergency Medicine **1)**: S404-S405.

Background: Umbilical vascular access is an essential skill set for providers involved in neonatal resuscitation. It is imperative to learn, practice, and perfect these important skills prior to performing these procedures on a critically ill neonate. Umbilical cord procedures are infrequently performed in most emergency departments, which may lead to a lack of comfort and expertise. Simulation provides a valuable opportunity to acquire and maintain competency in umbilical vascular access. Simulation of umbilical vascular access currently involves two types of models: commercially available task trainers, and real umbilical cord sections. Commercial trainers are expensive, easily damaged, and require costly replacements after a limited number of uses. Real umbilical cords involve those plus additional challenges in supply, storage, and biohazard exposure. Objective(s): This DIY (Do It Yourself) umbilical cord model was created to provide an inexpensive biohazardly safe umbilical cord model which includes two arteries and a vein to simulate the experience of performing umbilical vein and artery catheterization. This model has realistic anatomy with twisting umbilical vessels, and realistic texture of rubbery exterior amniotic epithelium of the cord, and the slippery Wharton's jelly supporting the "vessels". The model can be refrigerated and reused or discarded like other food and plastic waste. Equipment needed: gelatin, food coloring, syrup, glove fingers, catheters, tubing, and syringes. Method(s): This presentation will include detailed instructions, and comparisons in cost and limitations of each type of umbilical cord trainer. Conclusion(s): This DIY umbilical cord task trainer is a low cost alternative to the expensive commercially available kits, and without the biohazard risks of a real umbilical cord.

Nemit, V. and A. K. Tripathi (2016). "Municipal solid waste (MSW) composition, quantification and characterization at the three MSW dumping sites of Himachal Pradesh: a case study." Indian Journal of Forestry **39**(1): 31-36.

Methane emission from landfills due to unmanaged dumping contributes significantly to greenhouse gas emissions and ultimately to climate change. The green house gas emission from the dumping sites depends on various factors like quantity of waste generated, composition of solid waste, and characteristics of solid waste. The quantification and characterization of urban solid waste generation is fundamental for adequate decision making in the management strategy of urban solid waste in a city. The objective of this study is to quantify and characterize the waste generated in the three cities of Himachal Pradesh i.e. Shimla, Solan and Nahan. The chemical characteristics study include pH, Moisture. Nitrogen, Phosphorus, Potassium, Carbon and C/N ration and physical studies includes the composition of different waste categories. The annual waste generation in Shimla, Solan and Nahan calculated in this study 17,426.52, 7,130.70 and 1,608.37 tons (t) respectively for the year (yr) 2012-13. The main fractions were: Food and Carbon waste, paper and plastic waste. The pH of MSW was found slight to highly acidic in nature whereas moisture content was found to be in the range from 42.60+or-1.95 in Nahan to 60.12+or-1.39% in Shimla. The N, K, P and C estimated were found maximum 0.81% (Shimla), 0.65% (Nahan), 0.33% (Shimla), and 40.49% (Solan) respectively.

Nemmaoui, A., et al. (2019). "DSM and DTM generation from VHR satellite stereo imagery over plastic covered greenhouse areas." Computers and Electronics in Agriculture **164**(104903).

Agriculture under Plastic Covered Greenhouses (PCG) has represented a step forward in the evolution from traditional to industrial farming. However, PCG-based agricultural model has been also criticized for its associated environmental impact such as plastic waste, visual impact, soil pollution, biodiversity degradation and local runoff alteration. In this sense, timely and effective PCG mapping is the only way to help policy-makers in the definition of plans dealing with the trade-off between farmers' profit and environmental impact for the remaining inhabitants. This work proposes a methodological pipeline for producing high added value 3D geospatial products (Digital Surface Models (DSM) and Digital Terrain Models (DTM)) from VHR satellite imagery over PCG areas. The 3D information layer provided through the devised approach could be very valuable as a complement to the traditional 2D spectral information offered by VHR satellite imagery to improve PCG mapping over large areas. This methodological approach has been tested in Almeria (Southern Spain) from a WorldView-2 VHR satellite stereo-pair. Once grid spacing format DSM and DTM were built, their vertical accuracy was assessed by means of lidar data provided by the Spanish Government (PNOA Programme). Regarding DSM completeness results, the image matching method based on hierarchical semi-global matching yielded much better scores (98.87%) than the traditional image matching method based on area-based matching and cross-correlation threshold (86.65%) when they were tested on the study area with the highest concentration of PCG (around 85.65% of PCG land cover). However, both image matching methods yielded similar vertical accuracy results in relation to the finally interpolated DSM, with mean errors ranging from 0.01 to 0.35 m and random errors (standard deviation) between 0.56 and 0.82 m. The DTM error figures also showed no significant differences between both image matching methods, although being highly dependent on DSM-to-DTM filtering error, in turn closely related to greenhouse density and terrain complexity.

Neri, P., et al. (2009). "miRNA expression in multiple myeloma as predictive model of response to bortezomib." Blood. Conference: 51st Annual Meeting of the American Society of Hematology, ASH. New Orleans, LA United States. Conference Publication: **114**(22).

Background: Bortezomib therapeutic efficacy is well established in multiple myeloma (MM) however response to this therapy remains difficult to predict with resistant disease observed in nearly 20% of MM patients. Through DNA microarrays, predictive models of response to stem cell transplant and Bortezomib were reported correlating mRNA expression data with disease outcomes and response to therapy. MicroRNAs (miRNAs) are a key class of small, non-coding RNA molecules that modulate post-transcriptional regulation of gene expression and were recently described to be involved in deregulation of gene expression in many cancers including MM. Little evidence however is available concerning the role of miRNA expression in the prediction of response to Bortezomib in MM. We aimed to assess the expression of miRNAs in a panel of Bortezomib highly sensitive and relatively resistant MM cell lines as well as primary MM cells and identify miRNA expression patterns that are associated with response to Bortezomib. Method(s): We have used miRNA microarrays (Affymetrix miRNA GeneChip) as well as liquid phase Luminex microbead miRNA profiling (Flexmir, Luminex) to profile miRNA expression in MM cell lines (MM1S, KMS11, INA6, U266) and sorted CD138+ bone marrow PCs from MM patients prior to treatment with Bortezomib (n=5; 3 sensitive and 2 resistant) and PCs from a healthy normal donor (n=1). The MM cell lines included in this analysis were classified as sensitive (S) or resistant (R) based on their Bortezomib IC50 at 48 hours (IC50 for MM1S and KMS11 ~ 5 nM versus INA6 and U266 ~ 20nM). For the microarray studies the hybridization signal values for the multiple probes for each miRNA were obtained and normalized with the use of miRNA QC tool (Affymetrix) and analyzed using Partek Genomics Suite software. Thereafter, filters were applied to identify the miRNA probes whose normalized signal were at least 2 folds differentially expressed between sensitive (MM1S) and resistant (INA6) cell lines with a P value < 0.05 (ANOVA) and a FDR of 0.05. Bortezomib sensitive (n=3) and resistant (n=2) primary MM samples were subjected to the same miRNA array analysis and filtering. Liquid phase Luminex microbead miRNA profiling (FlexmiR) was used for the confirmation (MM1S and

INA6) and validation of the array results in other MM cell lines KMS11 (IC50 5nM) and U266 (IC50 20nM). Result(s): Using Affymetrix miRNA GeneChip we identified 22 differentially expressed miRNA with overexpression of miR-155, miR-342-3p, miR-181a and b, miR-128, miR-20b and downregulation miR-let-7b, miR-let-7i, miR-let-7d, miR-let-7c, miR-222, miR-221, miR-23a, miR-27a and miR-29a in bortezomib relatively resistant (INA6) versus sensitive (MM1S) cell line. These results were confirmed in INA6 and MM1S cells with the use of Luminex microbead miRNA profiling and validated to be similarly differentially expressed between KMS11 (sensitive) and relatively U266 (resistant) cell lines. Furthermore, TargetScan algorithms and Ingenuity Pathway Analysis software were used to identify predicted miRNAstargeted mRNAs or potentially regulated networks and included genes involved in cell cycle regulation, cell growth, apoptosis and ubiquitin-conjugation pathways. Lastly to further investigate the clinical relevance of miRNAs in MM in terms of prediction of response and outcome to Bortezomib, we correlated miRNA expression profile of sorted CD138+ bone marrow PCs from Bortezomib sensitive (n=3) and resistant (n=2) MM patients with their response to therapy. Unsupervised analysis of the data revealed that the Bortezomib sensitive MM patients clustered with MM1S cell line while resistant patients segregated into the INA6 cluster. Conclusion(s): In summary, we have described a MM miRNA signature, which includes miRNAs that modulate the expression of proteins critical to myeloma pathogenesis and is predictive of response to Bortezomib. Further validation of this miRNA signature in a larger cohort of Bortezomib-treated MM patients is ongoing.

Neto, J. A. B., et al. (2019). "The impact of sediment dumping sites on the concentrations of microplastic in the inner continental shelf of Rio de Janeiro/Brazil." Marine Pollution Bulletin **149**: 1.

The marine environment is constantly being impacted by anthropogenic activities. Nowadays, microplastics (MPs) representing one of the most deleterious material among of all substances and material from anthropogenic origin. The Microplastics (MPs) are particles smaller than 5 mm. This study presents information on abundance, distribution, type and colour of microplastics in the bottom sediments of the continental Shelf of Rio de Janeiro State. This area is strongly impacted due to its location in front of one of the most polluted coastal bays in the Brazilian Coastline. It receives untreated sewage from an Ipanema Beach submarine emissary and also a great amount of sediments dredged from Rio de Janeiro Harbour, which strongly influences the distribution of MPs in the area. The analyses detected the presence of MP in 100% of the samples, composed mainly by secondary microplastics, and almost 50% were fibers, followed by plastic films, plastic fragments and pellets. Based on the nature of the sources of the MP, a great variety of colours was shown, dominated by four main colours: blue, white, transparent, and black, this pattern could potentially increase their bioavailability due to resemblance to prey items, especially to visual raptorial species.

Neves, D., et al. (2015). "Ingestion of microplastics by commercial fish off the Portuguese coast." Marine Pollution Bulletin **101**(1): 119-126.

The digestive tract contents of 263 individuals from 26 species of commercial fish were examined for microplastics. These were found in 17 species, corresponding to 19.8% of the fish of which 32.7% had ingested more than one microplastic. Of all the fish that ingested microplastics, 63.5% was benthic and 36.5% pelagic species. A total of 73 microplastics were recorded, 48 (65.8%) being fibres and 25 (34.2%) being fragments. Polymers were polypropylene, polyethylene, alkyd resin, rayon, polyester, nylon and acrylic. The mean of ingested microplastics was 0.27+or-0.63 per fish, (n=263). Pelagic fish ingested more particles and benthic fish ingested more fibres, but no significant differences were found. Fish with the

highest number of microplastics were from the mouth of the Tagus river. Scomber japonicus registered the highest mean of ingested microplastics, suggesting its potential as indicator species to monitor and investigate trends in ingested litter, in the MSFD marine regions.

Newhook, T. E., et al. (2014). "The MEK inhibitor trametinib delays tumor outgrowth and prolongs survival in a patient-derived mouse model of occult hepatic metastatic pancreatic cancer." Cancer Research. Conference: 105th Annual Meeting of the American Association for Cancer Research, AACR **74**(19 SUPPL. 1).

Background: Survival for patients with pancreatic ductal adenocarcinoma (PDAC) remains dismal and the majority of patients succumb to metastatic disease. Even for those with localized PDAC, most will die from metastatic disease despite margin-negative resection and adjuvant therapy. Therefore, these patients must harbor occult metastatic PDAC at presentation. We have developed a PDAC model of occult liver metastases using patient-derived xenografts (PDXs) to study the growth of PDAC within the metastatic microenvironment of the liver and evaluated the role of KRAS-MEK-ERK signaling on tumor progression. Methods and Results: Extensively characterized low passage, patient-derived KRAS-mutant (Tumors 608, 366, and 654) and wild-type (Tumors 738 and 215) PDAC cells expressing luciferase were injected into the spleens of athymic, nude mice and allowed to circulate for 10 minutes, after which a splenectomy was performed. To evaluate metastatic cell growth kinetics in the liver, tumor burden was monitored by sequential bioluminescent imaging. Each of the PDX tumors exhibited a characteristic and reproducible time to proliferative outgrowth ranging from 20 days (Tumor 608) to greater than 100 days (Tumor 654). To evaluate the role of KRAS signaling in maintaining dormant cell survival and proliferative outgrowth, tumor 608 cells were injected and mice were treated with the MEK inhibitor trametinib (0.3 mg/kg, daily) or control beginning 48 hours post-injection. Trametinib significantly reduced metastatic tumor burden, delayed time to proliferative outgrowth, and greatly prolonged survival as compared to control (med. survival: 114 vs. 43 days, p<0.001). In contrast, in an orthotopic model with 250-500 mm³ tumors trametinib led to limited inhibition in tumor growth for Tumor 608. To characterize these PDAC cells, we isolated Tumor 608 cells from the liver 48 and 72 hours, 10 and 28 days after splenic injection using magnetic column separation with human EpCAM (CD326)-targeted magnetically labeled microbeads. Flow cytometric analyses of retrieved cells revealed that decreased cellular markers of proliferation and increased PARP cleavage correlated with decreased tumor burden observed at these timepoints in mice treated with trametinib. Conclusion(s): Using a model of occult liver metastatic PDAC, patient-derived tumors exhibited characteristic, albeit different growth kinetics in the liver microenvironment. Further, inhibition of KRAS-MEK-ERK signaling with the MEK inhibitor trametinib decreased metastatic cellular proliferation, increased apoptosis, prolonged metastatic tumor outgrowth, and significantly increased survival. Further investigation into factors promoting PDAC cell survival within the hepatic microenvironment will lead to development of rational therapeutic strategies for patients with occult metastatic PDAC.

Ng, E. L., et al. (2018). "An overview of microplastic and nanoplastic pollution in agroecosystems." Science of the Total Environment **627**: 1377-1388.

Microplastics and nanoplastics are emerging pollutants of global importance. They are small enough to be ingested by a wide range of organisms and at nano-scale, they may cross some biological barriers. However, our understanding of their ecological impact on the terrestrial environment is limited. Plastic particle loading in agroecosystems could be high due to inputs of some recycled organic waste and plastic film mulching, so it is vital that we develop a greater understanding of any potentially harmful or adverse impacts of these pollutants to agroecosystems. In this article, we discuss the sources of plastic particles in agroecosystems, the mechanisms, constraints and dynamic behaviour of plastic during aging on land, and explore the responses of soil organisms and plants at different levels of biological organisation to plastic particles of micro and nano-scale. Based on limited evidence at this point and understanding that the lack of evidence of ecological impact from microplastic and nanoplastic in agroecosystems does not equate to the evidence of absence, we propose considerations for addressing the gaps in knowledge so that we can adequately safeguard world food supply.

Ng, K. L. and J. P. Obbard (2006). "Prevalence of microplastics in Singapore's coastal marine environment." Marine Pollution Bulletin **52**(7): 761-767.

Microplastics have been recently identified as marine pollutants of significant concern due to their persistence, ubiquity and potential to act as vectors for the transfer and exposure of persistent organic pollutants to marine organisms. This study documents, for the first time, the presence and abundance of microplastics (>1.6 microm) in Singapore's coastal environment. An optimized sampling protocol for the collection and analysis of microplastics was developed, and beach sediments and seawater (surface microlayer and subsurface layer) samples were collected from nine different locations around the coastline. Low density microplastics were separated from sediments by flotation and polymer types were identified using Fourier transform infrared (FTIR) spectrometry. Synthetic polymer microplastics identified in beach sediments included polyethylene, polypropylene, polystyrene, nylon, polyvinyl alcohol and acrylonitrile butadiene styrene. Microplastics were detected in samples from four out of seven beach environments, with the greatest quantity found in sediments from two popular beaches in the eastern part of Singapore. Polyethylene, polypropylene and polystyrene microplastics were also found in the surface microlayer (50-60 microm) and subsurface layer (1m) of coastal waters. The presence of microplastics in sediments and seawater is likely due to on-going waste disposal practices from industries and recreational activities, and discharge from shipping.

Ng, L. F., et al. (2009). "IL-1beta, IL-6, and RANTES as biomarkers of Chikungunya severity." PLoS ONE [Electronic Resource] **4**(1): e4261.

BACKGROUND: Little is known about the immunopathogenesis of Chikungunya virus. Circulating levels of immune mediators and growth factors were analyzed from patients infected during the first Singaporean Chikungunya fever outbreak in early 2008 to establish biomarkers associated with infection and/or disease severity.

METHODS AND FINDINGS: Adult patients with laboratory-confirmed Chikungunya fever infection, who were referred to the Communicable Disease Centre/Tan Tock Seng Hospital during the period from January to February 2008, were included in this retrospective study. Plasma fractions were analyzed using a multiplex-microbead immunoassay. Among the patients, the most common clinical features were fever (100%), arthralgia (90%), rash (50%) and conjunctivitis (40%). Profiles of 30 cytokines, chemokines, and growth factors were able to discriminate the clinical forms of Chikungunya from healthy controls, with patients classified as non-severe and severe disease. Levels of 8 plasma cytokines and 4 growth factors were significantly elevated. Statistical analysis showed that an increase in IL-1beta, IL-6 and a decrease in RANTES were associated with disease severity.

CONCLUSIONS: This is the first comprehensive report on the production of cytokines, chemokines, and growth factors during acute Chikungunya virus infection. Using these biomarkers, we were able to distinguish between mild disease and more severe forms of Chikungunya fever, thus enabling the identification of patients with poor prognosis and monitoring of the disease.

Ng, L. F. P., et al. (2009). "IL-1β, IL-6, and RANTES as Biomarkers of Chikungunya Severity." PLoS ONE **4**(1).

Background Little is known about the immunopathogenesis of Chikungunya virus. Circulating levels of immune mediators and growth factors were analyzed from patients infected during the first Singaporean Chikungunya fever outbreak in early 2008 to establish biomarkers associated with infection and/or disease severity. Methods and Findings Adult patients with laboratory-confirmed Chikungunya fever infection, who were referred to the Communicable Disease Centre/Tan Tock Seng Hospital during the period from January to February 2008, were included in this retrospective study. Plasma fractions were analyzed using a multiplex-microbead immunoassay. Among the patients, the most common clinical features were fever (100%), arthralgia (90%), rash (50%) and conjunctivitis (40%). Profiles of 30 cytokines, chemokines, and growth factors were able to discriminate the clinical forms of Chikungunya from healthy controls, with patients classified as non-severe and severe disease. Levels of 8 plasma cytokines and 4 growth factors were significantly elevated. Statistical analysis showed that an increase in IL-1β, IL-6 and a decrease in RANTES were associated with disease severity. Conclusions This is the first comprehensive report on the production of cytokines, chemokines, and growth factors during acute Chikungunya virus infection. Using these biomarkers, we were able to distinguish between mild disease and more severe forms of Chikungunya fever, thus enabling the identification of patients with poor prognosis and monitoring of the disease.

Ng, W., et al. (2020). "Convolutional neural network for soil microplastic contamination screening using infrared spectroscopy." Science of the Total Environment **702**: 134723.

Microplastics are emerging pollutants that exist in our environment. Microplastics are synthetic polymers that have particles size smaller than 5mm. Rapid screening of microplastics contamination in the soil could assist in identifying anomalous concentrations of microplastics in the terrestrial environment. Because there is no rule on the maximum concentration limit on how much microplastics can exist within the soil, the concentration of microplastics collected from industrial areas around metropolitan Sydney was used as a baseline. Spectra obtained from the visible-near-infrared (vis-NIR) spectra has been shown to be feasible in predicting microplastics in the soil. Instead of creating a regression model predicting the concentration of microplastic, a classification model for screening was proposed. A convolutional neural network (CNN) model was trained to classify the soil sample into various degrees of contamination based on concentration. We also delved into the CNN model to understand how the CNN model classifies the spectral data input. The model performance was first tested on two levels of classification (contaminated vs. non-contaminated). The model was able to classify the uncontaminated samples into the appropriate class more accurately than the contaminated samples. When the number of classes were gradually increased, the classification accuracy for the higher level of contaminated samples improved. Transfer learning CNN model further improved the classification prediction only on the extremes, but not the intermediate classes.

Ngo, H. T., et al. (2018). "Direct Detection of Unamplified Pathogen RNA in Blood Lysate using an Integrated Lab-in-a-Stick Device and Ultrabright SERS Nanorattles." Scientific Reports **8**(1): 4075.

Direct detection of genetic biomarkers in body fluid lysate without target amplification will revolutionize nucleic acid-based diagnostics. However, the low concentration of target sequences makes this goal challenging. We report a method for direct detection of pathogen RNA in blood lysate using a bioassay using surface-enhanced Raman spectroscopy (SERS)-based detection integrated in a "lab-in-a-stick" portable device. Two levels of signal enhancement were employed to achieve the sensitivity required for direct detection. Each target sequence was tagged with an ultrabright SERS-encoded nanorattle with ultrahigh SERS signals, and these tagged target sequences were concentrated into a focused spot for detection using hybridization sandwiches with magnetic microbeads. Furthermore, the washing process was automated by integration into a "lab-in-a-stick" portable device. We could directly detect synthetic target with a limit of detection of 200 fM. More importantly, we detected plasmodium falciparum malaria parasite RNA directly in infected red blood cells lysate. To our knowledge, this is the first report of SERS-based direct detection of pathogen nucleic acid in blood lysate without nucleic acid extraction or target amplification. The results show the potential of our integrated bioassay for field use and point-of-care diagnostics.

Ngo, P. L., et al. (2019). "Pathway, classification and removal efficiency of microplastics in wastewater treatment plants." Environmental Pollution **255**(Pt 2): 113326.

Microplastics (MPs) contamination in water environment has recently been documented as an emerging environmental threat due to their negative impact on the ecosystem. Their sources are many, but all of them are from synthetic materials. The sources of MPs are cosmetics and personal care products, breakdown or abrasion processes of other plastic products, textile and tyre, bitumen and road marking paints. Because of their low density and small particle size, they are easily discharged into the wastewater drainage systems. Therefore, the municipal wastewater treatment plants (WWTPs) are indicated to be the main recipients of MPs before getting discharged into the natural waterbodies. Therefore, understanding the occurrence and fate of MPs in WWTPs are of great importance towards its control. The aim of this article is to provide a comprehensive review to better understand the pathways of MPs before entering the WWTPs, characteristics of MPs in wastewater, and the removal efficiency of MPs of the existing wastewater treatment technologies adopted by the WWTPs. This review also covers the development of potential microplastics treatment technologies investigated to date. Based on the review of existing literature, it is found that the existing WWTPs are inefficient to completely remove the MPs and there is a risk that they may get discharged into the ambient water sources.

Nguyen, B., et al. (2019). "Separation and Analysis of Microplastics and Nanoplastics in Complex Environmental Samples." Accounts of Chemical Research **52**(4): 858-866.

The vast amount of plastic waste emitted into the environment and the increasing concern of potential harm to wildlife has made microplastic and nanoplastic pollution a growing environmental concern. Plastic pollution has the potential to cause both physical and chemical harm to wildlife directly or via sorption, concentration, and transfer of other environmental contaminants to the wildlife that ingest plastic. Small particles of plastic pollution, termed microplastics (>100 nm and <5 mm) or nanoplastics (<100 nm), can form through fragmentation of larger pieces of plastic. These small particles are especially concerning because of their high specific surface area for sorption of contaminants as well as their potential to translocate in the bodies of organisms. These same small particles are challenging to separate and identify in environmental samples because their size makes handling and observation difficult. As a result, our understanding of the environmental prevalence of nanoplastics and microplastics is limited. Generally, the smaller the size of the plastic particle, the more difficult it is to separate from environmental samples. Currently employed passive density and size separation techniques to isolate plastics from environmental samples are not well suited to separate microplastics and nanoplastics. Passive flotation is hindered by the low buoyancy of small particles as well as the difficulty of handling small particles on the surface of flotation media. Here we suggest exploring alternative techniques borrowed from other fields of research to improve separation of the

smallest plastic particles. These techniques include adapting active density separation (centrifugation) from cell biology and taking advantage of surface-interaction-based separations from analytical chemistry. Furthermore, plastic pollution is often challenging to quantify in complex matrices such as biological tissues and wastewater. Biological and wastewater samples are important matrices that represent key points in the fate and sources of plastic pollution, respectively. In both kinds of samples, protocols need to be optimized to increase throughput, reduce contamination potential, and avoid destruction of plastics during sample processing. To this end, we recommend adapting digestion protocols to match the expected composition of the nonplastic material as well as taking measures to reduce and account for contamination. Once separated, plastics in an environmental sample should ideally be characterized both visually and chemically. With existing techniques, microplastics and nanoplastics are difficult to characterize or even detect. Their low mass and small size provide limited signal for visual, vibrational spectroscopic, and mass spectrometric analyses. Each of these techniques involves trade-offs in throughput, spatial resolution, and sensitivity. To accurately identify and completely quantify microplastics and nanoplastics in environmental samples, multiple analytical techniques applied in tandem are likely to be required.

Nguyen, D. V., et al. (2015). "HLA-B 1502 and carbamazepine-induced severe cutaneous adverse drug reactions in Vietnamese." Asia Pacific Allergy **5**(2): 68-77.

BACKGROUND: In Vietnam, we observed a high incidence of carbamazepine (CBZ)-induced severe cutaneous adverse drug reactions (SCARs)-Stevens-Johnson syndrome (SJS)/toxic epidermal necrolysis (TEN), and drug-induced hypersensitivity rash with eosinophilia and systemic symptoms (DRESS). In other Asian countries, HLA-B(*)1502 is an established risk factor for SCARs.

OBJECTIVE: The aim of our study was to determine the frequency of HLA-B(*)1502 in SCARs patients at a large University Medical Center in Hanoi, Vietnam.

METHODS: Thirty-eight cases of SCARs caused by CBZ and 25 patients with epilepsy tolerating CBZ were enrolled in a case-controlled study. Clinical manifestations and laboratory findings were recorded for each subject. Genomic DNA was isolated using the QIAamp DNA purification system. The combination of polymerase chain reaction and sequence specific oligonucleotide probes with the Luminex 100xMAP flow cytometry dual laser system was then used to quantitate fluorescently labelled oligonucleotides attached to colour-coded microbeads.

RESULTS: Cases comprised 20 SJS (52.6%), 7 TEN (18.4%), 8 overlap syndrome (21.1%), and 3 DRESS patients (7.9%). A strong association between HLA B(*)1502 and bullous skin reactions such as SJS/TEN and overlap was confirmed with an odds ratio (OR) of 33.78 (95% confidence interval [CI], 7.55-151.03), $p < 0.0001$, Sensitivity 91.4%, Specificity 76.0%, positive predictive value 84.2%, and negative predictive value 86.4%. We did not, however, observe any correlation between the presence of this allele and CBZ-induced nonbullous skin reactions (DRESS) (OR, 6.33; 95% CI, 0.48-82.74; $p = 0.1592$).

CONCLUSION: Our results indicate the presence of HLA-B(*)1502 in Vietnamese is a pharmacogenetic risk factor for developing CBZ-induced SJS/TEN.

Nguyen, V. D., et al. (2013). "The association between the presence of HLA B*1502 and carbamazepine-induced stevens-johnson syndrome (SJS), toxic epidermal necrolysis (TEN) and druginduced hypersensitivity syndrome with rash, eosinophilia and systemic symptoms (DRESS) in Vietnamese." Allergy: European Journal of Allergy and Clinical Immunology **98)**: 71.

Background: In Vietnam, we observed a high incidence of drug-induced Severe Cutaneous Adverse Reactions (SCARs)-SJS/TEN/DRESS (common culprit, carbamazepine [CBZ]). In other

Asian countries, HLA-B*1502 is an established risk factor for SCARs (Chung et al., 2004). A high prevalence of HLA B*1502 exists in Hanoi (Bach Khanh Hoa et al., 2008). We designed a study to determine the frequency of HLA B*1502 in SCARs patients at Bach mai Hospital. Method(s): Thirty-eight cases of SCARs caused by CBZ and 25 patients with epilepsy (tolerating CBZ) were enrolled in a case-control study. Clinical manifestations and laboratory findings were recorded for each subject (RegiSCAR-Group Diagnostic Score-Roujeau et al., 2009). Genomic DNA was isolated using the QIAamp DNA purification system (Quiagen). The combination of PCR and sequence specific oligonucleotide probes with the Luminex 100xMAP flow cytometry dual laser system was then used to quantitate fluorescently labelled oligonucleotides attached to colour-coded microbeads, (Sonic Clinical Institute). Result(s): Cases comprised 20 SJS (52.6%), seven TEN (18.4%), eight Overlap Syndrome (21.1%), three DRESS (7.9%) patients-mean age 40.6 +/- 18.7 years. The 25 controls had a mean age of 22.4 +/- 13.1 years. Skin lesion areas in SCARs-affected 62.1 +/- 24.1% of BSA; Skin detachment 12.3 +/- 12.9% of Body Surface Area, SCORTEN (severity-ofillness score, Sekula et al., 2011)-mean 1.1 +/- 1.0 (range 1-4) and Index-day was 14.2 +/- 8.3 days (median 12.5 days). Indications for CBZ were epilepsy (34.2%), neuropathic pain (42.1%), mental disorders (18.4%) and other conditions (5.3%). The HLA B*1502 allele was detected in 34/38 (89.5%) with CBZ-induced SJS/TEN/ DRESS, but in only 6/25 (24.0%) controls. Odds Ratio for HLAB*1502 positivity was 26.9 (6.7-107.4 with CI = 95%, P < 0.001), Sensitivity 89.5%, Specificity 76%, Positive Predictive Value 85% and Negative Predictive Value 82.6%. Conclusion(s): Our results indicate the presence of HLA B*1502 is a pharmacogenetic risk factor for developing CBZinduced SCARs in Vietnamese.

Nhamo, G. (2008). "Regulating Plastics Waste, Stakeholder Engagement and Sustainability Challenges in South Africa." Urban Forum **19**(1): 83-101.

In May 2003, the South African government enacted regulations banning the production of thin-film plastic shopping bags. The government advocated that such thin-film plastic shopping bags were indiscriminately discarded because they had no economic and recycling value. However, in as much as the regulations led to significant reductions in plastic shopping bags in the environment, the law resulted in severe unintended negative consequences, as jobs were lost with some businesses in the plastic shopping bag manufacturing sector closing down. The paper also reveals that key stakeholders, such as industry, business and labour, lobbied against the introduction of the regulations but without success. On average, business went down by about 83% with a conservative 25% reduction in employment. Drawing insights from the Irish and Australian experiences, this paper critically reviews sustainability debates and responses surrounding environmental regulation and business, with a special focus on the Plastic Bag Regulations in South Africa. Lessons learnt are presented with the intention to provide insights for future waste product or other environmental regulation initiatives in South Africa and elsewhere in the region. [ABSTRACT FROM AUTHOR]

Ni, H. G., et al. (2016). "Brominated flame retardant emissions from the open burning of five plastic wastes and implications for environmental exposure in China." Environmental Pollution **214**: 70-76.

Based on the most widely used plastics in China, five plastic wastes were selected for

investigation of brominated flame retardant (BFR) emission behaviors during open burning. Considerable variations were observed in the emission factors (EF) of polybrominated diphenyl ethers (PBDEs) and hexabromocyclododecanes (HBCDs) from the combustion of different plastic wastes. Distribution of BFR output mass showed that SIGMAPBDE was emitted mainly by the airborne particle (51%), followed by residual ash (44%) and the gas phase (5.1%); these values for SIGMAHBCD were 62%, 24%, and 14%, respectively. A lack of mass balance after the burning of the plastic wastes for some congeners (output/input mass ratios>1) suggested that formation and survival exceeded PBDE decomposition during the burns. However, that was not the case for HBCD. A comparison with literature data showed that the open burning of plastic waste is major source of PBDE compared to regulated combustion activities. Even for state-of-the-art waste incinerators equipped with sophisticated complex air pollution control technologies, BFRs are released on a small scale to the environment. According to our estimate, SIGMAPBDE release to the air and land from municipal solid waste (MSW) incineration plants in China in 2015 were 105 kg/year and 7124 kg/year. These data for SIGMAHBCD were 25.5 and 71.7 kg/year, respectively. Considering the fact that a growing number of cities in China are switching to incineration as the preferred method for MSW treatment, our estimate is especially important. This study provides the first data on the environmental exposure of BFRs emitted from MSW incineration in China.

Ni, K., et al. (2013). "Polybrominated diphenyl ethers (PBDEs) in China: Policies and recommendations for sound management of plastics from electronic wastes." Journal of Environmental Management **115**: 114-123.

Polybrominated diphenyl ethers (PBDEs), used as flame retardants (BFRs), are incorporated in plastics of most electronic equipment. Among BFR mixtures, deca-BDE is the most widely used commercial additive in the polymer industry and the use of deca-BDE is currently not subject to any restrictions in China. However, debate over environmental and health risks associated with deca-BDE still remains. Regulatory agencies in developed countries have adopted and/or established environmentally sound strategies for the management of potential threat posed by PBDEs to the environment and human health. No regulations or management policies for PBDEs currently exist in China at either central or provincial government levels. Large amounts of plastics containing PBDEs are still in use and must be disposed of after their lifetimes, creating outdoor reservoirs for the future dispersal of PBDEs into the environment. Concerted action is needed not only to regulate the production and use of PBDEs but also to find ways to effectively manage waste electrical and electronic products that contain PBDEs. This article is the first to investigate the policy issues and current problems related to the use of PBDEs in China. In addition, we estimate the mass flows of PBDEs contained in Waste Electrical and Electronic Equipment (WEEE) in China. We suggest alternatives to PBDEs and sound management of plastics used in electrical and electronic equipment (EEE) that contain PBDEs. [Copyright &y& Elsevier]

Niazi, J. H., et al. (2015). "In vitro HER2 protein-induced affinity dissociation of carbon nanotube-wrapped anti-HER2 aptamers for HER2 protein detection." Analyst **140**(1): 243-249.

A new in vitro assay was developed to detect human epidermal growth factor receptor 2 (HER2) protein, based on affinity dissociation of carbon nanotube (CNT)-wrapped anti-HER2 ssDNA aptamers. First, we selected an anti-HER2 ssDNA aptamer (H2) using an in vitro serial evolution of ligands by an exponential enrichment (SELEX) process. Then the fluorescently labelled H2 ssDNAs were tightly packed on CNTs that had previously been coupled with magnetic microbeads (MBs), forming MB-CNT-H2 hybrids. The loading capacity of these MB-CNTs heterostructures (2.8 x 10(8)) was determined to be 0.025 to 3.125 muM of H2. HER2 protein-induced H2 dissociation occurred from MB-CNT-H2 hybrids, which was specifically induced by the target HER2 protein, with a dissociation constant (Kd) of 270 nM. The stoichiometric affinity dissociation ratio with respect to H2-to-HER2 protein was shown to be approximately 1 : 1. Our results demonstrated that the developed assay can be an effective approach in detecting native forms of disease biomarkers in free solutions or in biological samples, for accurate diagnosis.

Nichols, J. L., et al. (2010). "The effects of environmental cues on hematopoietic stem cell colony fetal hemoglobin production." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

Objective.: Increased fetal hemoglobin (HbF) levels are associated with increased life span and reduced pain crises in patients with Sickle Cell disease. An increased understanding of the mechanisms controlling HbF expression would be important to develop new therapies to increase HbF. The objective of these experiments was to test the hypothesis that interactions between bone marrow (BM) erythroid progenitor cells and the stromal microenvironment influence HbF expression. Materials and Methods.: Baboon CD34+ BM cells were harvested and purified by immunomagnetic column chromatography using the 12.8 anti-CD34 mouse monoclonal antibody and immunomagnetic microbeads conjugated to rat anti-mouse IgM (Miltenyi). CD34+ BM Cells were grown in liquid cultures in Iscove's media containing 30% fetal bovine serum, 200ng/ml stem cell factor, 2u/ml erythropoietin, and 1uM dexamethasone in the presence of an AFT024 mouse fetal liver cell line and an OP9 mouse bone marrow cell line as feeder layers, in methylcellulose media, and in liquid media. Globin chain synthesis in cultures was measured on d11 and d14 by biosynthetic radiolabeling. Cells were incubated overnight in leucine-free alpha-MEM media containing 50uCi/ml [3H leucine]. Globin chains were separated by High Performance Liquid Chromatography (HPLC), and the radioactivity in each fraction was determined by liquid scintillation counting. To correlate changes in gamma-globin expression with DNA methylation of the gamma-globin gene promoter, the methylation state of 5 CpG sites within the gamma-globin promoter region was determined by bisulfite sequencing. Erythroid cells were purified from cultures on d14 by immunomagnetic column chromatography using mouse anti-baboon RBC monoclonal antibody. DNA was isolated from purified erythroid cells using Qiagen kits. Bisulfite modification was performed using Epitect bisulfite kits. Two rounds of PCR amplification were performed using nested primers flanking 5 CpG residues within the baboon gamma-globin gene promoter. Minilysate DNA was prepared from at least 10 independent clones for each sample. Sequence analysis of purified DNA samples was performed at the University of Illinois DNA Sequence facility. Results.: Elevated levels of gamma-globin chain synthesis were observed in cells cultured in methylcellulose and liquid media in the absence of a feeder layer when compared to cells grown in the presence of feeder layers. On d11, the gamma/gamma+beta chain synthetic ratio was 0.623 in cells cultured in methylcellulose and 0.324 in cells cultured in liquid media, compared to 0.092 in cells cultured in the presence of AFT024 feeder layers and 0.178 in cells cultured in the presence of OP9 feeder layers. On d14, the gamma/gamma+beta chain synthetic ratio was 0.663 in cells cultured in methylcellulose and 0.349 in cells cultured in liquid media, compared to 0.135 in cells cultured in the presence of AFT024 feeder layers and 0.252 in cells cultured in the presence of OP9 feeder layers. The level of DNA methylation (%dmC) of 5 sites in the gamma-globin gene promoter negatively correlated with levels of HbF production. On d14, the level of DNA methylation was 79% in cells cultured in methylcellulose, 72% in cells cultured in liquid media, and 97% in cells grown in the presence of AFT024 feeder layers. Conclusions.: Cells grown in the presence of AFT024 feeder layers expressed physiologic levels of gamma-globin and cells grown in the presence of OP9 feeder layers expressed midrange levels of gamma-globin. Significantly increased gamma-globin expression was observed in cells cultured in the absence of a feeder layer. The gamma-globin promoter in cells grown in the presence of the AFT024 feeder layer exhibited a significantly higher degree of methylation than in cells grown in methylcellulose and liquid media. These results show that interactions between erythroid progenitor cells and the stromal microenvironment can influence both the level of gamma-globin expression and the DNA methylation of the gamma-globin gene promoter. These results ave clinical relevance; if the bone marrow microenvironment could be effectively altered in vivo, methylation of the gamma-globin promoter could be decreased and HbF production increased. Further experiments must be performed to determine what is mediating the methylation of the gamma-globin promoter when cells are grown on these feeder layers.

Nie, H., et al. (2019). "Microplastic pollution in water and fish samples around Nanxun Reef in Nansha Islands, South China Sea." Science of the Total Environment **696**: 134022.

Nanxun Reef is one of the typical reefs in Nansha Islands, South China Sea. As the Nansha Islands are surrounded by certain developing countries, the economic and population growth have resulted in increased surface runoff of persistent organic pollutants in offshore areas. Microplastic has been found in many freshwaters and sea areas in recent years. However, the levels of microplastics contamination in Nansha Islands are still uncharted. In this study, 15 water and 35 fish samples were collected around the Nanxun Reef. The average concentration of microplastics was 1733 items/m³ for surface water samples and 3.1 items per individual for fish samples. The majority of ingested microplastics by fish were fibers, mostly transparent or blue. In surface water samples, blue microbeads were the main types of microplastics, accounting for 76.5% of all the detected particles. The main size of microplastics was <0.5mm both in water and fish samples. Our results demonstrated that fishery activities and human domestic sewage might be the dominant sources of microplastic pollution in the Nansha Island, South China Sea.

Niederer, F., et al. (2010). "Pro-inflammatory activity of SIRT1 in monocytes." Arthritis and Rheumatism **10)**: 1528.

Purpose: Sirtuins are a conserved family of NAD+ dependent histone deacetylases (HDAC) and mono-ADP-ribosyltransferases. The human sirtuins are critical regulators of many cellular processes, including cell survival and inflammation. Here we focused on the expression of SIRT1 in monocytes and tissues from patients with rheumatoid arthritis (RA) and osteoarthritis (OA) and assessed the function of SIRT1 in monocytes. Method(s): To study the expression of SIRT1 in RA and OA tissues, Western blot and immunohistochemistry were performed. Monocytes from peripheral blood were negatively isolated from healthy donors or RA patients using magnetic MicroBeads (MACS separation). Levels of SIRT1 mRNA were measured with SYBR green Real-time PCR. Healthy monocytes were stimulated (n=9) with the Toll-like receptor 4 (TLR4) ligand LPS (10 ng/ml) for 8 hours in the presence or absence of a SIRT1 inhibitor, EX-527 (9 uM). Moreover, freshly isolated monocytes (n=5) were transfected to overexpress a wild type or an

enzymatically inactive mutant form of SIRT1 for 18 hours, following LPS-stimulation (10 ng/ml) for 8 hours. The levels of TNF-alpha protein were measured in the supernatants of stimulated monocytes by ELISA (BD Bioscience). Result(s): Performing Western blot analysis of SIRT1 in RA and OA tissues, we found an upregulation of SIRT1 in whole RA tissues. Immunohistochemistry in synovial tissues showed the expression of SIRT1 in monocytes/macrophages. Consistently, levels of SIRT1 mRNA in monocytes from RA patients were expressed at dCt = 7.55 +/- 0.31 and in healthy controls at dCt = 8.69 +/- 0.72, p=0.12. Treatment of LPS-stimulated monocytes with the SIRT1 inhibitor EX-527 significantly reduced TNF-alpha production by 37 +/- 17% (p<0.01). Monocytes transfected with a vector encoding an enzymatically inactive form of SIRT1 showed a prominent downregulation of TNF-alpha by 81 +/- 21% (p=0.04) compared to wild type SIRT1 transfected cells. Conclusion(s): SIRT1 is overexpressed in RA tissues and monocytes. The inhibition of SIRT1 activity significantly reduced the production of TNF-alpha in monocytes. Thus, SIRT1 appears to contribute to the characteristic inflammatory phenotype of synovial cells in rheumatoid arthritis.

Niedoszytko, M., et al. (2013). "Serum markers which could predict the risk of anaphylaxis in mastocytosis patients." Allergy: European Journal of Allergy and Clinical Immunology **97)**: 575.

Background: Patients suffering from mastocytosis are at risk of anaphylactic reactions which occur in 50% of patients with systemic and 15% of patients with cutaneus disease. There are no in vitro methods available which could be used to predict the risk of the reaction so far. The aim of the study was to analyze the cytokines levels in the serum which could indicate patients at risk of anaphylactic reaction. Method(s): Eighty-five patients suffering from systemic mastocytosis and 20 controls were included in the study. Among the mastocytosis patients 54 (63%) declared anaphylactic reaction in the medical history, while 31 (37%) did not suffer from such reaction so far. Cytokine levels (GMCSF, IL-13, IL 1 beta, IL-3, IL-4, IL-6, IL-8, MCP-1, RANTES, TNF-alfa, VEGF, bFGF) were measured in the serum of the patients using flow cytometry and microbead flex set. Result(s): The significant difference was found in the level of IL8 (mean 23.6 +/- 16.6 ng/ml in patients with anaphylaxis) vs (mean 31.3 +/- 63.7 ng/ml in patients without anaphylaxis) P = 0.038. MCP1 (mean 156.4 +/- 165 ng/ml in patients with anaphylaxis) vs (mean 86.2 +/- 45.6 ng/ml in patients without anaphylaxis) P = 0.016. The levels of other measured cytokines did not differ in analyzed populations. Conclusion(s): IL8 and MCP1 levels might be used in the further studies to create an in vitro method assessing the risk of anaphylaxis in mastocytosis patients.

Nies, J. H., et al. (2002). "IL-4 supplemented B-cell cultures of allergic children show reduced IgA and IgG production in response to additional stimulation with IL-10." Journal of Investigational Allergology & Clinical Immunology **12**(2): 99-106.

BACKGROUND: Cytokines play an important role in mediating immunoglobulin switch, the secretion of protective mucosal immunoglobulins, and the development of allergic diseases. This study investigates whether B cells from allergic and healthy children have different capacities to secrete immunoglobulins after stimulation with IL-4, IL-6, IL-10, IL-11, and IL13.

METHODS: We analyzed the peripheral venous blood of 44 healthy probands and of 109 allergic patients with a mean age of 13 years, allergic to grass pollen, birch pollen, and house dust mites. Lymphocytes were isolated by a density gradient and B cells were enriched by using a Magnetic Activated Cell Separator (MACS) and anti-CD19 microbeads. B Cells were co-cultured with human CDw32 (Fc gammaRII) expressing mouse Ltk fibroblasts and mouse anti-human CD40 monoclonal antibodies (CD40 system). The interleukins IL-4, IL-6, IL-10, IL-11, and IL-13 were supplemented in various combinations. After 14 days, concentrations of IgE, IgG, IgA, and IgM

were measured in the supernatants with ELISA.
RESULTS: Suppression of IgA-, IgG, and IgM- synthesis was induced by stimulation of B cells with IL-4. After additional application of IL-10, IgA, IgG, and IgM synthesis was significantly increased. When cultures stimulated with IL-4 were additionally supplemented with IL-10, IgA, and IgG synthesis of B cells obtained from allergic individuals was significantly decreased compared to nonallergic individuals. IgE-secretion of B cells from allergic individuals was significantly increased compared to nonallergic individuals after stimulation with IL-4.
CONCLUSION: Our results implicate that IL-4 is essential for the regulation of immunoglobulin class switch to IgE and that IL-4 is an important cytokine for the development of allergic diseases. The capacity of B cells in allergic children to produce less IgA and IgG in response to additional stimulation with IL-10 of cultures supplemented with IL-4 could play an important role in mediating a mucosal immune system vulnerable to allergens. This phenomenon could contribute to the pathogenesis of allergic diseases.

Niitsu, K., et al. (2019). "A 65-nm CMOS Fully Integrated Analysis Platform Using an On-Chip Vector Network Analyzer and a Transmission-Line-Based Detection Window for Analyzing Circulating Tumor Cell and Exosome." IEEE Transactions on Biomedical Circuits & Systems **13**(2): 470-479.

A fully integrated CMOS circuit based on a vector network analyzer and a transmission-line-based detection window for circulating tumor cell (CTC) and exosome analysis is presented for the first time. We have introduced a fully integrated architecture, which eliminates the undesired parasitic components and enables high-sensitivity, to analyze extremely low-concentration CTC in blood. The detection window was designed on the high-sensitive coplanar waveguide line. To validate the operation of the proposed system, a test chip was fabricated using 65-nm CMOS technology. Measurements were performed after adding a tiny lump of silicone or a droplet of water on its detection window. The measured results show
S_21
degradation of -1.96 dB and -6.04 dB for the silicone and the droplet, respectively, at 1.4 GHz. In addition, in another measurement using magnetic beads, it is confirmed that the proposed circuit can analyze even low concentrations of 20 beads/muL. As well as microbeads, measurement with CTCs was successfully demonstrated.

Nilmayer, O., et al. (2014). "Intravenous administration of human mesenchymal stromal cells (HMSC) in mice results in fragmentation into microvesicles and uptake of the fragments through immune cells." Transfusion Medicine and Hemotherapy **1)**: 22.

Background: In recent years, empirical clinical studies have shown a substantial potency of i.v. injected bone marrow-derived mesenchymal stromal cells (hMSCs) to modulate treatment-resistant graft-versus -host-disease after allogeneic stem cell transplantation. Animal models have suggested a beneficial effect of hMSCs in other diseases, such as inflammatory bowel disease or bacterial sepsis. But the fate of i.v. injected hMSC and exact mechanisms of immunosuppression are not fully understood. Method(s): The behaviour of hMSC in the vasculature was studied using specifically established flow cytometry protocols containing size-calibrated microbeads. In some experiments, we used intravital microscopy in the mouse cremaster model. To track the injected cells, hMSC were previously stained by fluorescent live dye pkh26. Pkh26+MSC were injected i.v. into the C57BL/6J mice, and mice were sacrificed after five min, six hours, one and two days. The organs (lung, liver, spleen, kidney and brain) were isolated, minced and analyzed by flow cytometry. The pkh26+events were re-isolated from the organs by using of magnetic columns separation and fluorescent activated sorting. The mixed

lymphocyte reaction (MLR) was used to study the functions of hMSC derived fragments. Result(s): Five min after i.v. injection, we found about 95% of pkh26+MSC in the lung, whereas no events were detected in the other organs of interest. Six hours after injection, the majority of pkh26+events were detected in the liver and spleen. The diameter of these events was now between 1 and 6 mum. These events were defined as fragments or microvesicles. After 24 and 48 hours, the pkh26+events with diameter over 6 mum were found in the liver and spleen. The analysis of these events by flow cytometry confirmed the hypothesis, that the MSC derived particles were contained in CD11c+ and CD11b+ cells. No phk26+events were found in brain and kidney. Fragmentation of hMSC could also be visualized by using of the intravital microscopy in cremaster muscle model, and under controlled shear in vitro. The immunosuppressive potential of hMSC fragments were analyzed by mixed lymphocyte reaction (MLR). Whereas ex vivo generated hMSC- fragments which were directly added to MLR failed to inhibit T-cell proliferation, uptake of pkh26+ MSCs or parts thereof into dendritic cells was visualized, demonstrating an implicate regulation of dendritic cell function by sequestration of hMSC. Conclusion(s): After i.v. injection, hMSC accumulate in the lungs and are fragmented by the blood stream. The fragments are flushed into the liver and spleen, where they are taken up by phagocytes. The hMSC derived fragments can be classified as microvesicles expressing the same surface markers as hMSC. Our findings help to explain an immunosuppressive function of intravenously injected hMSCs through 1) fragmentation to microvesicles in the blood stream and 2) uptake into CD11b+ and CD11c+ phagocytes.

Nilsen, F., et al. (2014). "Use of indicator chemicals to characterize the plastic fragments ingested by Laysan albatross." Marine Pollution Bulletin **87**(1/2): 230-236.

Laysan albatross (Phoebastria immutabilis) ingest plastic marine debris of a wide range of shape, sizes and sources. To better characterize this plastic and provide insights regarding its provenance and persistence in the environment, we developed a simple method to classify plastic fragments of unknown origin according to the resin codes used by the Society of Plastics Industry. Known plastics were analyzed by gas chromatography-mass spectroscopy (GC-MS) to identify indicator chemicals characteristic of each plastic resin. Application of this method to fragments of ingested plastic debris from boluses of Laysan albatross from Kure Atoll, Hawai'i, yielded proportions of 0.8% High Density Polyethylene, 6.8% Polystyrene, 8.5% Polyethylene Terephthalate, 20.5% Polyvinyl Chloride and 68.4% Polypropylene. Some fragments were composed of multiple resin types. These results suggest that infrequently recycled plastics are the dominant fragments ingested by albatross, and that these are the most prevalent and persistent resin types in the marine environment.

Nimmo, C. (2016). Concern about plastic waste, New South Wales Nurses' Association. **73:** 7-7.

A letter to the editor about the level of plastic waste generated by New South Wales Health is presented.

Nir, R., et al. (1990). "Single-cell entrapment and microcolony development within uniform microspheres amenable to flow cytometry." Applied & Environmental Microbiology **56**(9): 2870-2875.

A method is presented for encapsulating single microbial cells in small spheres suitable for analysis and sorting by flow cytometry. The entrapped cells are able to multiply and form colonies contained within their respective microspheres. The system is based on ejecting the cells suspended in a gellable liquid through an orifice vibrating at ultrasonic frequencies, thus shearing the cell-containing jet into uniform droplets. When low-melting-temperature agarose was used, the droplets could be gelled into solid spheres during flight by appropriately directed

colling air streams. This gelling was accompanied by significant dehydration, resulting in a twofold decrease in bead diameter and a corresponding increase in agarose concentration. Nevertheless, the microbeads obtained were highly uniform and had diameters which could be precisely controlled in the range of 10 to 40 microns. A variety of bacterial and yeast species were entrapped in agarose beads by using this system. In all cases the cells were able to develop into microcolonies containing as many as several hundred cells. This system enables one to apply the powerful method of flow cytometry to the analysis and sorting of whole microbial colonies. Potential applications of this technology in various areas of microbiology are considered.

Nir, R., et al. (1990). "Flow cytometry sorting of viable bacteria and yeasts according to beta-galactosidase activity." Applied & Environmental Microbiology **56**(12): 3861-3866.

We describe a novel method for quantitative measurement of beta-galactosidase (beta-gal) levels in bacteria and yeasts by using flow cytometry, a method which allows viable microbial cells to be sorted on the basis of the expressed activity and to be recultivated. The method is based on encapsulating single cells in agarose microbeads 20 to 30 microns in diameter and analyzing the beta-gal activity of the colonies that develop (containing several hundred cells) by using the fluorogenic substrate fluorescein-di-beta-D-galactopyranoside (FDG). Three strains of Escherichia coli, containing different levels of beta-gal, served as a model system. A high degree of correlation was found between the average fluorescence measured per bead and the level of the enzyme in extracts of the respective strain. Although the use of FDG necessitates cell permeabilization, conditions were found under which a small part of each colony remained viable, yet most of the enzyme was exposed to the substrate. This allowed sorting of microcolonies and plating with close to 100% efficiency. The potential of the technique was demonstrated by selecting beta-gal-positive cells from an artificial mixture of beta-gal-positive and beta-gal-negative E. coli strains.

Nishida, M., et al. (2014). "A new insight into the mechanism of atherosclerosis in hemodialysis patients through the evaluation of scavenger receptor expressions in peripheral monocyte." Nephrology Dialysis Transplantation **3)**: iii234.

Introduction and Aims: Atherosclerosis is accelerated in hemodialysis (HD) patients and closely associated with their morbidity and mortality. The nature of atherosclerosis is considered as chronic sterile micro-inflammation. The class A and B scavenger receptors (SRs) in peripheral monocytes play a key role in promoting foam cell formation by binding and internalizing oxidized low-density lipoprotein (ox-LDL). In addition, macrophage-colony stimulating factor (M-CSF) might facilitate the atherosclerotic process by priming monocytes, predisposed toward SR over-expression. Method(s): Transcriptional levels of SR class A and class B (CD36) were simultaneously measured in peripheral monocytes by quantitative real-time RT-PCR, using the comparative threshold (Ct) [DELTADELTACt] method. GAPDH was chosen as an endogenous reference gene. The fold difference between a patient gene DELTACt and the average of control gene DELTACts was used as an index of relative quantity of the gene (2-DELTADELTACt). Peripheral monocytes were isolated using magnetically-labeled Whole Blood CD14+ MicroBeads (Miltenyi Biotec). Plasma level of M-CSF was measured with an M-CSF ELISA kit (R&D Systems). Subjects included 52 chronic HD patients and 23 healthy controls. The HD patients were classified into 2 groups in presence or absence of prevalent cardiovascular disease (CVD). The statistical difference between the two subjects was analyzed by the Mann-Whitney U test. Result(s): The relative expressions of SR-A and CD36 mRNA were significantly greater in monocytes from HD patients than in those from healthy controls (mean [95% CI of the mean]:

1.76 [2.27-3.26] versus 0.61 [0.88-1.40], P <0.0001; and 1.07 [1.60-2.20] versus 0.52 [0.88-1.32], P=0.0004, respectively). Each SR receptor expression was significantly higher in HD patients who were affected with CVD than in those who were not: SR-A, 1.78 [2.66-3.94] versus 1.30 [1.26-2.48], P=0.0013; and CD36, 1.21 [1.74-2.61] versus 0.55 [1.18-1.69], P=0.0089, respectively. Plasma concentration of M-CSF was approximately 6-fold higher in HD patients than in controls (1044 +/- 266 versus 162 +/- 47.5 pg/ml, P <0.0001). The concentrations were significantly correlated with both mRNA expressions of SR-A (r2 = 0.139, P = 0.0010) and CD36 (r2 = 0.052, P = 0.0478) in overall subjects (n = 75). Conclusion(s): Our study indicates that highly elevated M-CSF concentration may prime peripheral monocytes, and thus may facilitate their uptake of ox-LDL through the over-expression of SRs. This collaboration between M-CSF and SRs could be one of the hidden mechanisms for atherosclerosis in HD patients. Prospective studies are warranted to ascertain the association between SR expression and incidence of CVD. (Figure presented).

Nishiguchi, S., et al. (2003). "Peripheral blood mononuclear cells are possible extrahepatic replication sites for hepatitis C virus." Hepato-Gastroenterology **50**(53): 1301-1304.

BACKGROUND/AIMS: Hepatitis C virus is a major causative agent of chronic liver disease and hepatocellular carcinoma and is considered to be a hepatotropic virus. It remains controversial whether hepatitis C virus exists in peripheral blood mononuclear cells and replicates there. In order to resolve this issue, we performed nested RT-PCR (reverse transcription polymerase chain reaction) and RT-PCR in situ hybridization in peripheral blood mononuclear cells of patients with chronic hepatitis C.

METHODOLOGY: We collected peripheral blood mononuclear cells from patients with chronic hepatitis C, extracted total RNA from the samples, and performed nested RT-PCR to detect hepatitis C virus RNA in the peripheral blood mononuclear cells lysates. We also fixed peripheral blood mononuclear cells of the patients in 4% paraformaldehyde and performed RT-PCR in situ hybridization with a digoxigenin-labeled RNA probe to detect hepatitis C virus RNA in the cells.

RESULTS: Using these methods, we detected both positive- and negative-stranded hepatitis C virus RNA in peripheral blood mononuclear cells of hepatitis C patients. To determine in which cell population of peripheral blood mononuclear cells hepatitis C virus is present, we performed PCR in situ hybridization after incubation with fluorescent latex microbeads which could be phagocytozed by monocytes. We obtained positive signals of the replicative hepatitis C virus genome not only in lymphocytes but also in monocytes.

CONCLUSIONS: RT-PCR in situ hybridization with a nonradioactive probe was found to be useful for in situ detection of hepatitis C virus RNA. Our findings suggest that peripheral blood mononuclear cells may be extrahepatic replication sites for hepatitis C virus.

Nizarudin, S. and B. Deepak (2016). Thermocatalytic degradation: Solution for plastic waste management in Kerala. 2016 IEEE Region 10 Humanitarian Technology Conference, R10-HTC 2016, December 21, 2016 - December 23, 2016, Dayalbagh, Agra, India, Institute of Electrical and Electronics Engineers Inc.

Kerala is struggling with the menace of Plastic Waste management due to its direct effects such as space consumption and littering and aftereffects such as spread of diseases and provision of mosquito breeding. The issue is critical in terms of the social and health implications it is causing especially because of the plastic wastes. This paper sheds light into the current scenario and also suggests a method for the adaptation of thermocatalytic degradation for the disposal of the plastic waste. The suggested methodology is designed particularly to suit the lifestyle of people here with emphasis to energy investment, costs associated and eco-friendliness. The adaptation

is facilitated by the design of a user-friendly and compact equipment which can be installed and run hassle-free. The experiment involves the catalytic degradation of waste plastic at thermal conditions. The vapors so produced are collected and processed thereby obtaining mixed composition of hydrocarbons. 2016 IEEE.

Nizzetto, L., et al. (2016). "A theoretical assessment of microplastic transport in river catchments and their retention by soils and river sediments." Environmental Science. Processes & Impacts **18**(8): 1050-1059.

The presence of microplastics (MPs) in the environment is a problem of growing concern. While research has focused on MP occurrence and impacts in the marine environment, very little is known about their release on land, storage in soils and sediments and transport by run-off and rivers. This study describes a first theoretical assessment of these processes. A mathematical model of catchment hydrology, soil erosion and sediment budgets was upgraded to enable description of MP fate. The Thames River in the UK was used as a case study. A general lack of data on MP emissions to soils and rivers and the mass of MPs in agricultural soils, limits the present work to serve as a purely theoretical, nevertheless rigorous, assessment that can be used to guide future monitoring and impact evaluations. The fundamental assumption on which modelling is based is that the same physical controls on soil erosion and natural sediment transport (for which model calibration and validation are possible), also control MP transport and storage. Depending on sub-catchment soil characteristics and precipitation patterns, approximately 16-38% of the heavier-than-water MPs hypothetically added to soils (e.g. through routine applications of sewage sludge) are predicted to be stored locally. In the stream, MPs < 0.2 mm are generally not retained, regardless of their density. Larger MPs with densities marginally higher than water can instead be retained in the sediment. It is, however, anticipated that high flow periods can remobilize this pool. Sediments of river sections experiencing low stream power are likely hotspots for deposition of MPs. Exposure and impact assessments should prioritize these environments.

Nizzetto, L., et al. (2016). "Are Agricultural Soils Dumps for Microplastics of Urban Origin?" Environmental Science and Technology **50**(20): 10777-10779.

Nizzetto, L., et al. (2016). "Pollution: Do microplastics spill on to farm soils?" Nature **537**(7621): 488.

Njenga, M., et al. (2013). "Implications of Charcoal Briquette Produced by Local Communities on Livelihoods and Environment in Nairobi Kenya." International Journal of Renewable Energy Development **2**(1): 19.

The residents of Nairobi, Kenya, use 700 tonnes of charcoal per day, producing about 88 tonnes of charcoal dust that is found in most of the charcoal retailing stalls that is disposed of in water drainage systems or in black garbage heaps. The high costs of cooking fuel results in poor households using unhealthy materials such as plastic waste. Further, poor households are opting to cook foods that take a short time to prepare irrespective of their nutritional value. This article presents experiences with community self-help groups producing charcoal fuel briquettes from charcoal dust in poorer nieghbourhoods of Nairobi for home use and sale. Households that produced charcoal fuel briquettes for own use and those that bought them saved 70% and 30% of money spent on cooking energy respectively. The charcoal fuel briquettes have been found to be environmentally beneficial since they produce less smoke and increase total cooking energy by more than 15%, thereby saving an equivalent volume of trees that would be cut down for charcoal. Charcoal briquette production is a viable opportunity for good quality and affordable cooking fuel. Bioenergy and waste management initiatives should promote recovery of organic by-products for charcoal briquette production.

Nnorom, I. C. and O. Osibanjo (2009). "Toxicity characterization of waste mobile phone plastics." Journal of Hazardous Materials **161**(1): 183-188.

Abstract: Waste plastic housing units (N =60) of mobile phones (of different models, and brands), were collected and analyzed for lead, cadmium, nickel and silver using atomic absorption spectrophotometry after acid digestion using a 1:1 mixture of H_2SO_4 and HNO_3. The mean (±S.D.) and range of the results are 58.3±50.4mg/kg (5.0–340mg/kg) for Pb, 69.9±145mg/kg (4.6–1005mg/kg) for Cd, 432±1905mg/kg (5.0–11,000mg/kg) for Ni, and 403±1888mg/kg (5.0–12,500mg/kg) for Ag. Approximately 90% of the results for the various metals were ≤100mg/kg. Results greater than 300mg/kg were generally less than 7% for each metal and could be attributed to exogenous contamination of the samples. These results suggest that there may not be any immediate danger from end-of-life (EoL) mobile phone plastic housing if appropriately treated/managed. However, considering the large quantities generated and the present low-end management practices in most developing countries, such as open burning, there appears a genuine concern over the potential for environmental pollution and toxicity to man and the ecology. [Copyright &y& Elsevier]

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Nobre, C. R., et al. (2015). "Assessment of microplastic toxicity to embryonic development of the sea urchin Lytechinus variegatus (Echinodermata: Echinoidea)." Marine Pollution Bulletin **92**(1/2): 99-104.

Apart from the physiological impacts on marine organisms caused by ingesting microplastics, the toxicity caused by substances leaching from these particles into the environment requires investigation. To understand this potential risk, we evaluated the toxicity of virgin (raw) and beach-stranded plastic pellets to the development of embryos of Lytechinus variegatus, simulating transfers of chemical compounds to interstitial water and water column by assays of pellet-water interface and elutriate, respectively. Both assays showed that virgin pellets had toxic effects, increasing anomalous embryonic development by 58.1% and 66.5%, respectively. The toxicity of stranded pellets was lower than virgin pellets, and was observed only for pellet-water interface assay. These results show that (i) plastic pellets act as a vector of pollutants, especially for plastic additives found on virgin particles; and that (ii) the toxicity of leached chemicals from pellets depends on the exposure pathway and on the environmental compartment in which pellets accumulate.

Nocon, W., et al. (2018). "Microplastics in surface water under strong anthropopression." Desalination and Water Treatment **134**: 174-181.

The occurrence of microplastics in the aquatic environment is discussed in the scientific literature mainly in the aspect of "large garbage spots" formed especially in the oceans. It is estimated that about 80% of plastics found in seas and oceans are introduced there via rivers. It seems to be very important the recognition of microplastics problems occurring in rivers and the substantive preparation for taking up the challenges posed by EU legal acts. The research was aimed at identifying the problem of microplastics contamination of surface water subjected to

strong anthropogenic influence. The research objects presented in the article are rivers flowing through urbanized areas. They are characterized by a high degree of transformation of the catchment and riverbed. Samples were taken from the Bytomka River, the Klodnica River and the Bielszowicki Stream. In case of the Bytomka River and the Klodnica River samples were collected upstream and downstream waste water treatment plants (WWTPs). Whereas samples from the Bielszowicki Stream were collected downstream the coal mine. The research showed that typical components of the microplastics in these samples were foil film fragments observed in all sampling points. There were also textile fibers, granules and particles of irregular shape, which are difficult to identify. It has been observed that the amount of microplastics particles is significantly higher in sampling points located under WWTPs. The research shows the need to identify sources of microplastics in surface water and to determine the degree of their harmfulness to aquatic ecosystems.

Nollens, H. H., et al. (2016). "Evaluation of anti-Erysipelothrix rhusiopathiae IgG response in bottlenose dolphins Tursiops truncatus to a commercial pig vaccine." Diseases of Aquatic Organisms **121**(3): 249-256.

Erysipelothrix rhusiopathiae is the causative agent of erysipeloid in humans and of erysipelas in various animals, including bottlenose dolphins Tursiops truncatus, in which an infection has the potential to cause peracute septicemia and death. The purpose of this study was to evaluate the efficacy of using an off-label porcine (ER BAC PLUSReg., Zoetis) E. rhusiopathiae bactrin in a bottlenose dolphin vaccination program by determining the anti-E. rhusiopathiae antibody levels in vaccinated dolphins over a 10 yr period. Serum samples (n=88) were analyzed using a modified fluorescent microbead immunoassay from 54 dolphins, including 3 individuals with no history of vaccination and 51 dolphins with an average of 5 vaccinations, 3 of which had previously recovered from a natural E. rhusiopathiae infection. A mean 311-fold increase in the immunoglobulin G (IgG) antibody index was measured in a subsample of 10 dolphins 14 d after the first booster vaccination. Serum IgG antibody titers were influenced by number of vaccines received (r²=0.47, p<0.05) but not by age, gender, history of natural infection, adverse vaccine reaction, vaccination interval or time since last vaccination. The commercial pig bacterin was deemed effective in generating humoral immunity against E. rhusiopathiae in dolphins. However, since the probability of an adverse reaction toward the vaccine was moderately correlated (p=0.07, r²=0.1) with number of vaccines administered, more research is needed to determine the optimal vaccination interval.

Nolte, M. W., et al. (2012). "Inhibition of coagulation factor XIIa: A promising treatment of embolic silent brain ischemia?" Hamostaseologie **32 (1)**: A27.

Aim: Improving imaging modalities reveal that silent brain ischemia (SBI), thought to be caused by diffuse microembolism from e.g. fragmented thrombi or air, can be observed in many patients after cardiovascular surgeries and invasive vascular interventions. Although its clinical symptoms are initially less tangible, presence of SBI increases the risk of dementia and stroke later in life. However, currently no adequate treatment exists. Therefore, the aim of this research was a) to better understand the pathophysiology of SBI and b) to identify promising therapeutic targets. Method(s): SBI was induced in Balb/c mice by a one-sided injection of either 500 fluorescent microbeads or 10muL of fluorescent fractionated clot into the internal carotid artery. Immediately after SBI induction, rHA-Infestin-4, a recombinant inhibitor of factor (F) XIIa, was injected i.v. in both models (200mg/kg). Then, SPECT-CT imaging of FXIII activity was performed 3 hours later, while MRI of myeloperoxidase (MPO) activity and TTC staining was performed 3 days later (including further daily injections). Presence of fluorescent emboli was

verified by fluorescence imaging and all results were compared to untreated controls. Only mice without overt stroke symptoms were included in the study. Result(s): Using sensitive molecular imaging, we found abnormal activation of the coagulation cascade and inflammation close to where emboli lodge in the brain. In both SBI models, rHA-Infestin-4 significantly reduced ischemic damage (54% (microbead) and 66% (clot) reduction of TTC-negative area) and pathological coagulation (35% (microbead) and 39% (clot) reduction of FXIII activity) without increasing hemorrhagic frequency. MPO activity was unchanged compared to untreated controls. Conclusion(s): Focal intracerebral clotting and inflammatory activity are part of the pathophysiology underlying SBI. Inhibiting FXIIa with rHA-Infestin-4 may present a safe and effective treatment to decrease the morbidity from SBI.

Nolte, T. M., et al. (2017). "The toxicity of plastic nanoparticles to green algae as influenced by surface modification, medium hardness and cellular adsorption." Aquatic Toxicology **183**: 11-20.

To investigate processes possibly underlying accumulation and ecological effects of plastic nano-particles we have characterized their interaction with the cell wall of green algae. More specifically, we have investigated the influence of particle surface functionality and water hardness (Ca²⁺ concentration) on particle adsorption to algae cell walls. Polystyrene nanoparticles with different functional groups (non-functionalized, -COOH and -NH₂) as well as coated (starch and PEG) gold nanoparticles were applied in these studies. Depletion measurements and atomic force microscopy (AFM) showed that adsorption of neutral and positively charged plastic nanoparticles onto the cell wall of P. subcapitata was stronger than that of negatively charged plastic particles.

Nomura, T., et al. (2013). "TGF-beta under non-inflammatory cytokine milieu converts naive CD4+ T cells into thymictype Helios+ regulatory T cells." Journal of Investigative Dermatology **1)**: S27.

CD4+Foxp3+ regulatory T (Treg) cells control various immune responses including contact hypersensitivity, and maintain homeostasis of cutaneous immune system. Adoptive therapy using Treg cells has been proposed to control cutaneous immune diseases. However, clinical use of Treg cells is hampered by contaminated quasi-Treg cells, which abandon their suppressive function by losing Foxp3. Helios, an Ikaros family transcription factor, is a good marker to identify thymic-type Treg cells, which express Foxp3 constitutively and are recognized as bona fide Treg cells. In this study, we aimed to convert naive CD4+ T cells into thymic-type Treg cells that express Helios. To address this issue, we screened optimal condition for conversion in vitro by monitoring the expression of Helios and Foxp3 as their markers. Stimulation with plate-bound anti-CD3epsilon in the presence of TGF-beta/IL-2 converted naive CD4+ T cells into induced-type Treg cells which express Foxp3 but not Helios. Contrary, conversion by anti-CD3epsilon/CD28 conjugated microbeads with TGF-beta/IL-2 resulted in Helios expression in half of the converted (Foxp3+) cells. The latter conversion was dependent on TGF-betaR signaling because SB431542, a TGF-betaR inhibitor, abrogated the expression of both Helios and Foxp3. Furthermore, IFN-gamma induced Helios but inhibited Foxp3 expression while IL-4 inhibited both Helios and Foxp3. Thus, we conclude that TGF-beta under non-inflammatory cytokine milieu converts CD3epsilon/CD28-stimulated naive CD4+ T cells into thymic-type Treg cells. Th1-cytokines seem to engender Helios+ non-regulatory T cell subset whose function and fate remain unexplored. On the other hand, Th2-cytokines interfere conversion. These findings will be exploitable for controlling immune response in the skin.

Nor, N. H. and J. P. Obbard (2014). "Microplastics in Singapore's coastal mangrove ecosystems." Marine Pollution Bulletin **79**(1-2): 278-283.

The prevalence of microplastics was studied in seven intertidal mangroves habitats of Singapore. Microplastics were extracted from mangrove sediments via a floatation method, and then counted and categorized according to particle shape and size. Representative microplastics from Berlayar Creek, Sungei Buloh, Pasir Ris and Lim Chu Kang were isolated for polymer identification using Attenuated Total Reflectance-Fourier Transform Infrared (ATR-FTIR) spectroscopy. Microplastics were identified in all seven habitats, with the highest concentration found in sediments at Lim Chu Kang in the northwest of Singapore. The majority of microplastics were fibrous and smaller than 20 mum. A total of four polymer types were identified, including polyethylene, polypropylene, nylon and polyvinyl chloride. The relationship between abundance of microplastics and sediment grain size was also investigated, but no relationship was apparent. The presence of microplastics is likely due to the degradation of marine plastic debris accumulating in the mangroves.

Nordgreen, A., et al. (2007). "Development of lipid microbeads for delivery of lipid and water-soluble materials to Artema." Aquaculture **273**(4): 614.

Lipid spray beads (LSB) containing high concentrations of phospholipids were produced in order to improve their dispersion in both fresh and saltwater. The beads were developed to deliver both fat-soluble and water-soluble micronutrients to Artemia and other suspension feeders. LSB were prepared by spraying molted lipid into a chamber that was cooled with liquid nitrogen in order to solidify the lipid beads. Addition of soy lecithin to LSB did not affect retention of glycine when the beads were suspended in distilled water. There was an initial loss of 80% incorporated glycine after LSB were suspended in water for 20min. Artemia readily ingested riboflavin-containing LSB and their full guts were evident within 30min of feeding. The riboflavin content of Artemia could be increased from 55 ± 0.6 mg kg^sup -1^ (dw) to 329 ± 62 mg kg^sup -1^ (dw) after 1h enrichment. LSB prepared with phospholipids are promising vehicles for enrichment of suspension-feeding organisms used as feed for larval marine fish and crustaceans as well as other suspension feeders. [PUBLICATION ABSTRACT]

Noriega, V., et al. (2010). "Dynamics of chimerism in regulatory t lymphocytes (Treg; CD4+/CD25+) after allogeneic stem cell transplantation." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

Introduction: CD4+CD25+ regulatory T-cells (Treg) play an important role in inducing and maintaining allogeneic tolerance and can inhibit graft-versus-host disease (GVHD) after allogeneic stem cell transplantation (SCT). However, the dynamics of donor and recipient Treg cell populations after Allo-SCT has not been studied yet. Objective(s): To analyze the dynamics of chimerism in Tregs and compare it to that of T lymphocytes (TL; CD3+) and whole blood leukocytes (WBL). Material(s) and Method(s): The study includes 53 patients subjected to Allo-SCT (myeloablative and non-myeloablative). PB samples were obtained weekly during the first month and every 14 days after day +30 until complete chimerism (CC) was achieved, and at fixed time-points (+30, +60, +90, +180, +365) thereafter. TL and Tregs were purified from PB until CC was achieved using inmunomagnetic technology (Miltenyi Biotec; CD3+ Microbeads and CD4+/CD25+ Treg Isolation Kit, respectively). Chimerism analysis was performed by microsatellite PCR (STR-PCR; AmpFlSTR SGM Plus; Applied Biosystems) on genomic DNA obtained from WBL as well as on cell lysates obtained from purified TL and Tregs. Complete chimerism was considered in samples with percentage of recipient cells <1% (sensitivity of the STR-PCR) for WBL samples and <5% (minimum purity of 95% as estimated by flow cytometry) for purified cell lineages. Result(s): Median follow up for the whole cohort of patients was 338 days. CC was spontaneously achieved in WBL, TL and Tregs in 45/53 patients (85%) in a median time of 35.41, 38.8 and 42.5 days respectively. 5/3 patients (9%) suffered from graft failure/rejection showing mixed chimerism (MC) with increasing percentages of recipient cells both in WBL and leukocyte lineages. 3/53 patients (6%) maintained mixed chimerism (MC) in WBL and leukocyte lineages at day +180, with no signs of graft rejection or disease relapse. Analysis of the chimerism dynamics of those patients who spontaneously achieve CC revealed two different groups: Group 1 included 25/45 patients who achieved CC at the same time in WBL, TL and Tregs. Group 2 included 20/45 patients who achieved CC in WBL while maintaining MC in TL and Tregs. Interestingly enough, 9/20 patients from Group 2 maintained MC in Tregs 7-75 days after achieving CC in both WBL and TL (Figure 1). In a preliminary analysis, the small sample size precluded from obtaining statistically significant associations between the dynamics of chimerism in Tregs and the development of complications such as relapse or GVHD after SCT. (Figure presented) Conclusion(s): To our knowledge, this is the first study dealing with Treg chimerism after SCT. We have shown it is feasible and can be performed on a routine basis together with standard lineage specific chimerism follow up. Although there is an association between chimerism dynamics in Tregs and TL, this is not absolute and a percentage of patients maintain residual Tregs of recipient origin after WTL and TL have become of complete donor origin. In this small cohort, Treg chimerism did not influence the development of post-SCT complications. Analysis of a larger and more homogeneous cohort would allow establishing the usefulness of Treg chimerism testing for the management of transplanted patients.

Norrby, K. (2006). "In vivo models of angiogenesis." Journal of Cellular & Molecular Medicine **10**(3): 588-612.

The process of building new blood vessels (angiogenesis) and controlling the propagation of blood vessels (anti-angiogenesis) are fundamental to human health, as they play key roles in wound healing and tissue growth. More than 500 million people may stand to benefit from anti- or pro-angiogenic treatments in the coming decades [National Cancer Institute (USA), Cancer Bulletin, volume 3, no. 9, 2006]. The use of animal models to assay angiogenesis is crucial to the search for therapeutic agents that inhibit angiogenesis in the clinical setting. Examples of persons that would benefit from these therapies are cancer patients, as cancer growth and spread is angiogenesis-dependent, and patients with aberrant angiogenesis in the eye, which may lead to blindness or defective sight. Recently, anti-angiogenesis therapies have been introduced successfully in the clinic, representing a turning point in tumor therapy and the treatment of macular degeneration and heralding a new era for the treatment of several commonly occurring angiogenesis-related diseases. On the other hand, pro-angiogenic therapies that promote compensatory angiogenesis in hypoxic tissues, such as those subjected to ischemia in myocardial or cerebral hypoxia due to occluding lesions in the coronary or cerebral arteries, respectively, and in cases of poor wound healing, are also being developed. In this review, the current major and newly introduced preclinical angiogenesis assays are described and discussed in terms of their specific advantages and disadvantages from the biological, technical, economical and ethical perspectives. These assays include the corneal micropocket, chick chorioallantoic membrane, rodent mesentery, subcutaneous (s.c.) sponge/matrix/alginate microbead, s.c. Matrigel plug, s.c. disc, and s.c. directed in vivo angiogenesis assays, as well as, the zebrafish system and several additional assays. A note on quantitative techniques for assessing angiogenesis in patients is also included. The currently utilized preclinical assays are not equivalent in terms of efficacy or relevance to human disease. Some of these assays have significance for screening, while others are used primarily in studies of dosage-effects, molecular structure activities, and the combined effects of two or more agents on angiogenesis. When invited to write this review, I was asked to describe in some detail the rodent

mesenteric-window angiogenesis assay, which has not received extensive coverage in previous reviews. [References: 158]

Norregaard, P., et al. (1996). "Gastric emptying of pancreatin granules and dietary lipids in pancreatic insufficiency." Alimentary Pharmacology & Therapeutics **10**(3): 427-432.

AIM: To investigate the emptying of enzyme granules and dietary lipids in patients with pancreatic insufficiency secondary to chronic pancreatitis.

PATIENTS AND METHODS: Seven patients with chronic pancreatitis and exocrine pancreatic insufficiency ingested a test meal including colloidal 99m-technetium-radiolabelled liver pate, and swallowed two pancreatin capsules, in which half of the granules had been replaced with 111-indium-radiolabelled plastic particles of comparable physical dimensions. The passage of the two isotopes was followed simultaneously by gamma camera imaging for direct visual judgement and calculation of mean gastric emptying time.

RESULTS: Pancreatin granules and dietary lipids were observed to empty simultaneously. In the duodenum the particles and the test meal were well mixed. Mean gastric emptying time of radiolabelled liver pate and radiolabelled plastic particles could be calculated in six patients. The median of these values were 47 and 43 min, respectively (P = 0.69).

CONCLUSION: Pancreatin granules sized 1.0-1.5 mm seem to empty together with dietary lipids.

Novotna, K., et al. (2019). "Microplastics in drinking water treatment - Current knowledge and research needs." Science of the Total Environment **667**: 730-740.

Microplastics (MPs) have recently been detected in oceans, seas and freshwater bodies worldwide, yet few studies have revealed the occurrence of MPs in potable water. Although the potential toxicological effects of MPs are still largely unknown, their presence in water intended for human consumption deserves attention. Drinking water treatment plants (DWTPs) pose a barrier for MPs to enter drinking water; thus, the fate of MPs at DWTPs is of great interest. This review includes a summary of the available information on MPs in drinking water sources and in potable water, discusses the current knowledge on MP removal by different water treatment processes, and identifies the research needs regarding MP removal by DWTP technologies. A comparison of MPs with other common pollution agents is also provided. We concluded that special attention should be given to small-size MPs (in the range of several micrometres) and that the relationship between MP character and behaviour during distinct treatment processes should be explored.

Nowek, M. (2016). Performance of sand-lime products made with plastic waste. Les Ulis, EDP Sciences. **10**.

The paper describes the studies on the sand-lime (silicate) masonry units modified with recycled plastics in various forms: regranulate, regrind and powder. The following materials were examined: high impact polystyrene (HIPS) and acrylonitrile butadiene styrene (ABS). The results of the functional properties tests, such as compressive strength, softening behavior, bulk density and water absorption are presented in the article. The microstructure of the products was analyzed using SEM and XRD methods.Obtained results show that the properties of modified product largely depend on the type, form and amount of used polymer. The highest compressive strength was achieved with 15% of HIPS regranulate in the product (by weight). ABS does not improve the strength of the sample, however, it does block the capillary action in the sand-lime product. The lowest softening coefficient was obtained in the sample modified with HIPS regranulate. The examined polymers contributed to decrease in bulk density of the samples as well as lowered their water absorption. The samples with pulverized polymer have the worst properties. All the results are compared with those of the traditional sand-lime bricks and sand-lime product modified with other additives. The analysis indicate that silicate masonry units with post-production and post-consumption plastic waste can possess interesting functional properties what brings a new potential possibility to dispose of still growing number of plastic waste.

Nuelle, M. T., et al. (2014). "A new analytical approach for monitoring microplastics in marine sediments." Environmental Pollution **184**: 161-169.

A two-step method was developed to extract microplastics from sediments. First, 1 kg sediments was pre-extracted using the air-induced overflow (AIO) method, based on fluidisation in a sodium chloride (NaCl) solution. The original sediment mass was reduced by up to 80%. As a consequence, it was possible to reduce the volume of sodium iodide (NaI) solution used for the subsequent flotation step. Recoveries of the whole procedure for polyethylene, polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET), polystyrene and polyurethane with sizes of approximately 1 mm were between 91 and 99%. After being stored for one week in a 35% H2O2 solution, 92% of selected biogenic material had dissolved completely or had lost its colour, whereas the tested polymers were resistant. Microplastics were extracted from three sediment samples collected from the North Sea island Norderney. Using pyrolysis gas chromatography/mass spectrometry, these microplastics were identified as PP, PVC and PET.

Nunes Kirchner, C., et al. (2010). "Diffusion and reaction in microbead agglomerates." Analytical Chemistry **82**(7): 2626-2635.

Scanning electrochemical microscopy has been used to analyze the flux of p-aminonophenol (PAP) produced by agglomerates of polymeric microbeads modified with galactosidase as a model system for the bead-based heterogeneous immunoassays. With the use of mixtures of enzyme-modified and bare beads in defined ratio, agglomerates with different saturation levels of the enzyme modification were produced. The PAP flux depends on the intrinsic kinetics of the galactosidase, the local availability of the substrate p-aminophenyl-beta-D-galactopyranoside (PAPG), and the external mass transport conditions in the surrounding of the agglomerate and the internal mass transport within the bead agglomerate. The internal mass transport is influenced by the diffusional shielding of the modified beads by unmodified beads. SECM in combination with optical microscopy was used to determine experimentally the external flux. These data are in quantitative agreement with boundary element simulation considering the SECM microelectrode as an interacting probe and treating the Michaelis-Menten kinetics of the enzyme as nonlinear boundary conditions with two independent concentration variables [PAP] and [PAPG]. The PAPG concentration at the surface of the bead agglomerate was taken as a boundary condition for the analysis of the internal mass transport condition as a function of the enzyme saturation in the bead agglomerate. The results of this analysis are represented as PAP flux per contributing modified bead and the flux from freely suspended galactosidase-modified beads. These numbers are compared to the same number from the SECM experiments. It is shown that depending on the enzyme saturation level a different situation can arise where either beads located at the outer surface of the agglomerate dominate the contribution to the measured external flux or where the contribution of buried beads cannot be neglected for explaining the measured external flux.

Nunes, S., et al. (2007). "Tar Formation and Destruction in a Simulated Downdraft, Fixed-Bed Gasifier: Reactor Design and Initial Results." Energy & Fuels **21**(5): 3028-3035.

A suite of improved technologies is being developed to minimize the environmental impact of biomass/waste fired gasification processes. Downdraft, fixed-bed reactors are particularly favored because of their ability to destroy the majority of tars produced from the fuel volatiles. However, there is some concern about the impact of the low residual tar concentration on the long-term operational reliability. A two-stage laboratory scale fixed-bed reactor has been constructed for studying the release and destruction of tars in downdraft gasifiers. The reactor has been commissioned and its performance demonstrated using several biomass feedstocks. Experiments using the first stage only have shown that as the temperature is raised from 250 to 450 degree C, the gas and tar yields increase at the expense of the char residue. Four different biomass/waste materials (eucalyptus wood, sludge, plastic waste, and silver birch wood) showed qualitatively similar behavior. Volatile yields appear to stabilize around 450 degree C. With silver birch wood, the tar yield reached 47% of the initial fuel. Preliminary tests using a char bed in the second stage have been completed. The presence of the throat and the second-stage char bed results in a substantial reduction in the quantity of tar leaving the reactor. With a hot empty second stage (at 800 degree C), the tar content was reduced to 5.3% (by wt of initial fuel charge) in the exit gas from the reactor. Packing the second stage with char (at 800 degree C) further decreased the tar content to less than 0.1%. Gas analyses have been performed, showing that some of the initial tar is broken down mainly to CO and CH sub(4) in the second stage of the reactor. Further work is in progress to study the impact of the operating conditions in the second stage on the residual tar concentrations and gas analysis.

Núñez, M., et al. (2009). "Temporary structures as a generator of waste in covered trade fairs." Waste Management **29**(7): 2011-2017.

Events like trade fairs are a complex service activity with a considerable economic, social and environmental impact due, among other factors, to their high level of waste generation. There are few studies of the environmental impact associated with waste generation and typology. An environmental analysis methodology has been developed to characterise the waste associated with the temporary structures used at trade fair events: stands and communal spaces. This methodology has been checked in a pilot test at 6 closed trade fairs in Barcelona, with a range of between 60 and 4400 exhibitors. The methodology developed has made possible to obtain a waste generation profile according to the size of the fair and the types of stands. The stages with the largest amount of temporary structure wastes generated are the assembly and the dismantling of the trade fair. The results indicate that the most common wastes generated are the protective plastic from carpets at the assembly stage and the carpet itself at the dismantling stage. The stand carpet is collected in bulk, while the carpet from the communal spaces is recycled. As the size of the fair increases, and with it the proportion of stands with customised design (or non-reusable stands), the quantity of wood and hazardous waste increases. [Copyright &y& Elsevier]

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Nunley, D. R., et al. (2013). "Clinical association of humoral and T-lymphocytic rejection responses in human lung transplantation." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **187**(MeetingAbstracts).

Introduction: Over the last 25 years of human lung transplantation (LTX), acute cellular rejection

(ACR) has been determined by the presence of a perivascular lymphocytic infiltration identified on biopsy specimens of the allograft (T-cell response). Recently, the significance of the recipient's humoral response to the allograft has been explored. The association of these two types of responses and their clinical interaction is uncertain. Method(s): A retrospective review was conducted of LTX recipients who had one or more determinations for the development of donor specific antibodies (DSA). Throughout the first year following LTX, each recipient also had sequential allograft biopsies, some of which were contemporaneous with the DSA determinations. Biopsies were assigned a grade of '0' (no ACR) to '4' (severe ACR). To ascertain the degree of ACR experienced throughout the first year following LTX, an acute rejection score (ARS) was generated for each recipient (cumulative grade of ACR divided by the number of biopsies graded). The DSA assay was performed by incubating the recipient's serum with an array of single antigen micro beads coated with purified single HLA antigen proteins (One Lambda). After incubation with a detector antibody the beads were analyzed for fluorescent signal on a Luminex microarray instrument. Signals greater than 1000 mean fluorescence intensity were interpreted as 'positive' for DSA. Result(s): Fifty-two allograft biopsies and 32 DSA determinations were performed in 11 LTX recipients. Each DSA determination was accompanied by a contemporaneous allograft biopsy. Nine determinations were 'positive' for DSA with the accompanying grades of ACR being: ACR=0 (4), ACR=1 (4), ACR=2 (1), ACR=3 (0), and ACR=4 (0). Of the remaining 23 'negative' determinations, the accompanying ACR grades were: ACR=0 (14), ACR=1 (6), ACR=2 (3), ACR=3 (0), ACR=4 (0). No correlation between the presence of DSA and the grade of ACR was identified (rs = 0.22, p=0.27). The sensitivity and specificity of a 'positive' DSA determination for identifying any non-zero grade of ACR on the biopsy was 41.6% and 75% respectively, while the positive predictive value was 50% and the negative predictive value was 68.2%. The ARS ranged from 0.2 to 2.0, and likewise did not correlate with the presence of DSA (rs = 0.03, p=0.93). Conclusion(s): In LTX the development of a recipient humoral response to donor antigens correlated poorly with the T-cell mediated ACR response. The role of humoral rejection and specifically any association with the T-cell mediated ACR response remains to be clarified.

Nur Khaliesah Abdul, M. and M. Latifah Abd (2018). "Potential recyclable materials derived from riverine litter at log boom Sungai Batu in Kuala Lumpur." The Journal of Material Cycles and Waste Management **20**(2): 1063-1072.

Monitoring the riverine litter was essential for the aesthetical value and reducing the negative impacts toward the human health, environment and socio-economic aspects. Riverine litter is mainly made up from the land-based sources. The lack of historical data on riverine litter generation and composition can affect the efficiency of policy makers in making any decision on riverine litter management plan. The purpose of this study is to assess the quantification of types and abundance of riverine litter at log boom Sungai Batu in Kuala Lumpur. The field sampling has been conducted for 14 days of operation day at log boom Sungai Batu, Kuala Lumpur, within the period month of March until April. The quantification of riverine litter and its composition was based on the time interval during the operation day. The result shows that the Event 3 has recorded the high abundance of riverine litter with 4654.6 kg/operation day. This study also shows that the river is highly dominated with plastic waste with 39% (62.96 ± 15.38 kg/operation day). This study provides the baseline information for the local authority and relevant agencies in reducing the riverine litter which subsequently provide a sustainable environmental and socio-economic condition.

Nurse, R. H., et al. (1976). "Recycling and Disposal of Plastics Waste in South Africa." South Africa

National Scientific Programmes Unit Report No 4, 1976. 14 ref, 13 tab, 2 fig.

Only the main thermoplastic types (high and low density polyethylene, polyvinyl chloride, polystyrene and polypropylene) are recyclable. These plastic types represent 67% of the total consumption of plastics in 1974. Approximately 130 000 tons of plastic waste generated in 1975 were available for recycling. Economic gain for the recycler is the strongest motivation for recycling. Resource conservation, reduction of waste disposal costs and ecological considerations are less important factors. Approximately 15 000 tons, or 12% of recyclable plastic is currently being recycled. A growth rate in recycled plastic of 12.5% per annum is expected until 1981. Due to the fact that plastic wastes provide no special problems in currently used waste disposal systems, it is concluded that there is no need for further research directed specifically at the disposal aspect of plastic in urban waste. (So Afr Water Info Ctr)

Nyangoga, H., et al. (2009). "Synthesis and use of pHEMA microbeads with human EA.hy 926 endothelial cells." Journal of Biomedical Materials Research. Part B, Applied Biomaterials **89**(2): 501-507.

Cancer has become a major problem in public health and the resulting bone metastases a worsening factor. Facing it, different strategies have been proposed and mechanisms involved in tumor angiogenesis are being studied. Enhanced permeability retention (EPR) effect is a key step in designing new anticancer drugs. We have prepared poly 2-hydroxyethyl methacrylate (pHEMA) microbeads to target human endothelial EA.hy 926 cells, a cell line derived from human umbilical vein endothelial cells. Microbeads were synthesized by emulsion precipitation method and carried positive or negative charges. EA.hy 926 cells were cultured in 24-well plates and microbeads were deposited on cells at various times. Scanning and transmission electron microscopy, flow cytometry, confocal microscopy, and three-dimensional (3D) reconstruction were used to characterize microbeads and their location outside and inside cells. Microbeads were uptaken by endothelial cells with a better internalization for negatively charged microbeads. 3D reconstruction of confocal optical sections clearly evidenced the uptake and internalization of microbeads by endothelial cells. pHEMA microbeads could represent potential drug carrier in tumor model of metastases.

Nypelo, T., et al. (2014). "Microbeads and hollow microcapsules obtained by self-assembly of pickering magneto-responsive cellulose nanocrystals." Acs Applied Materials & Interfaces **6**(19): 16851-16858.

Cellulose microbeads can be used as immobilization supports. We report on the design and preparation of magneto-responsive cellulose microbeads and microcapsules by self-assembled shells of cellulose nanocrystals (CNC) carrying magnetic CoFe2O4 nanoparticles, that is, a mixture of isotropic and anisotropic nanomaterials. The magnetic CNCs formed a structured layer, a mesh, consisting of CNCs and magnetic particles bound together on the surface of distinct droplets of hexadecane and styrene dispersed in water. Because of the presence of CNCs the highly crystalline mesh was targeted to provide an improved barrier property of the microbead shell compared to neat polymer shells, while the magnetic particles provided the magnetic response. In situ polymerization of the styrene phase led to the formation of solid microbeads (~8 mum diameter) consisting of polystyrene (PS) cores encapsulated in the magnetic CNC shells (shell-to-core mass ratio of 4:96). The obtained solid microbeads were ferromagnetic (saturation magnetization of ~60 emu per gram of the magnetic phase). The magnetic functionality enables easy separation of substances immobilized on the beads. Such a functionality was tested in removal of a dye from water. The microbeads were further utilized to synthesize hollow microcapsules by solubilization of the PS core. The CNC-based, magneto-responsive solid microbeads and hollow microcapsules were characterized by electron microscopy (morphology), X-ray diffraction (phase composition), and magnetometry (magnetic properties). Such hybrid systems can be used in the design of materials and devices for application in colloidal stabilization, concentration, separation, and delivery, among others.

O'neill, K. M., et al. (2017). "Distinct effects on the dendritic arbor occur by microbead versus bath administration of brain-derived neurotrophic factor." Cellular and Molecular Life Sciences **74**(23): 4369-4385.

Proper communication among neurons depends on an appropriately formed dendritic arbor, and thus, aberrant changes to the arbor are implicated in many pathologies, ranging from cognitive disorders to neurodegenerative diseases. Due to the importance of dendritic shape to neuronal network function, the morphology of dendrites is tightly controlled and is influenced by both intrinsic and extrinsic factors. In this work, we examine how brain-derived neurotrophic factor (BDNF), one of the most well-studied extrinsic regulators of dendritic branching, affects the arbor when it is applied locally via microbeads to cultures of hippocampal neurons. We found that local application of BDNF increases both proximal and distal branching in a time-dependent manner and that local BDNF application attenuates pruning of dendrites that occurs with neuronal maturation. Additionally, we examined whether cytosolic PSD-95 interactor (cypin), an intrinsic regulator of dendritic branching, plays a role in these changes and found strong evidence for the involvement of cypin in BDNF-promoted increases in dendrites after 24 but not 48 h of application. This current study extends our previous work in which we found that bath application of BDNF for 72 h, but not shorter times, increases proximal dendrite branching and that this increase occurs through transcriptional regulation of cypin. Moreover, this current work illustrates how dendritic branching is regulated differently by the same growth factor depending on its spatial localization, suggesting a novel pathway for modulation of dendritic branching locally.

Oana, K., et al. (2015). "Applicability assessment of ceramic microbeads coated with hydroxyapatite-binding silver/titanium dioxide ceramic composite earthplusTM to the eradication of Legionella in rainwater storage tanks for household use." International Journal of Nanomedicine **10**: 4971-4979.

Water environments appear to be the habitats of Legionella species. Legionellosis is considered as a preventable illness because bacterial reservoirs can be controlled and removed. Roof-harvested rainwater has attracted significant attention not only as a groundwater recharge but also as a potential alternative source of nonpotable water. We successfully developed ceramic microbeads coated with hydroxyapatite-binding silver/titanium dioxide ceramic composite earthplusTM using the thermal spraying method. The ceramic microbeads were demonstrated to have bactericidal activities against not only Legionella but also coliform and heterotrophic bacteria. Immersing the ceramic microbeads in household rainwater storage tanks was demonstrated to yield the favorable eradication of Legionella organisms. Not only rapid-acting but also long-lasting bactericidal activities of the ceramic microbead were exhibited against Legionella pneumophila. However, time-dependent attenuation of the bactericidal activities against Legionella were also noted in the sustainability appraisal experiment. Therefore, the problems to be overcome surely remain in constantly managing the Legionella-pollution by means of immersing the ceramic microbeads. The results of our investigation apparently indicate that the earthplusTM-coated ceramic microbeads would become the favorable tool for Legionella measures in household rainwater storage tanks, which may become the natural reservoir for Legionella species. Our investigation would justify further research and data collection to obtain more reliable procedures to microbiologically regulate the Legionella in rainwater storage tanks.

Obbard, R. W., et al. (2014). "Global warming releases microplastic legacy frozen in Arctic Sea ice." Earth's Future **2**(6): 315-320.

When sea ice forms it scavenges and concentrates particulates from the water column, which then become trapped until the ice melts. In recent years, melting has led to record lows in Arctic Sea ice extent, the most recent in September 2012. Global climate models, such as that of Gregory et al. (2002), suggest that the decline in Arctic Sea ice volume (3.4% per decade) will actually exceed the decline in sea ice extent, something that Laxon et al. (2013) have shown supported by satellite data. The extent to which melting ice could release anthropogenic particulates back to the open ocean has not yet been examined. Here we show that Arctic Sea ice from remote locations contains concentrations of microplastics are several orders of magnitude greater than those that have been previously reported in highly contaminated surface waters, such as those of the Pacific Gyre. Our findings indicate that microplastics have accumulated far from population centers and that polar sea ice represents a major historic global sink of man-made particulates. The potential for substantial quantities of legacy microplastic contamination to be released to the ocean as the ice melts therefore needs to be evaluated, as do the physical and toxicological effects of plastics on marine life.

Obeidat, M., et al. (2019). "Optimizing the response, precision, and cost of a DNA double-strand break dosimeter." Physics in Medicine & Biology **64**(10): 10NT02.

We developed a dosimeter that measures biological damage following delivery of therapeutic beams in the form of double-strand breaks (DSBs) to DNA. The dosimeter contains DNA strands that are labeled on one end with biotin and on the other with fluorescein and attached to magnetic microbeads. Following irradiation, a magnet is used to separate broken from unbroken DNA strands. Then, fluorescence is utilized to measure the relative amount of broken DNA and determine the probability for DSB. The long-term goal for this research is to evaluate whether this type of biologically based dosimeter holds any advantages over the conventional techniques. The purpose of this work was to optimize the dosimeter fabrication and usage to enable higher precision for the long-term research goal. More specifically, the goal was to optimize the DNA dosimeter using three metrics: the response, precision, and cost per dosimeter. Six aspects of the dosimeter fabrication and usage were varied and evaluated for their effect on the metrics: (1) the type of magnetic microbeads, (2) the microbead to DNA mass ratio at attachment, (3) the type of suspension buffer used during irradiation, (4) the concentration of the DNA dosimeter during irradiation, (5) the time waited between fabrication and irradiation of the dosimeter, and (6) the time waited between irradiation and read out of the response. In brief, the best results were achieved with the dosimeter when attaching 4.2 micro g of DNA with 1 mg of MyOne T1 microbeads and by suspending the microbead-connected DNA strands with 200 micro l of phosphate-buffered saline for irradiation. Also, better results were achieved when waiting a day after fabrication before irradiating the dosimeter and also waiting an hour after irradiation to measure the response. This manuscript is meant to serve as guide for others who would like to replicate this DNA dose measurement technique.

Oberbeckmann, S., et al. (2017). "Environmental Factors Support the Formation of Specific Bacterial Assemblages on Microplastics." Frontiers in Microbiology **8**: 2709.

While the global distribution of microplastics (MP) in the marine environment is currently being critically evaluated, the potential role of MP as a vector for distinct microbial assemblages or even pathogenic bacteria is hardly understood. To gain a deeper understanding, we investigated how different in situ conditions contribute to the composition and specificity of MP-associated bacterial communities in relation to communities on natural particles. Polystyrene (PS), polyethylene (PE), and wooden pellets were incubated for 2 weeks along an environmental gradient, ranging from marine (coastal Baltic Sea) to freshwater (waste water treatment plant, WWTP) conditions. The associated assemblages as well as the water communities were investigated applying high-throughput 16S rRNA gene sequencing. Our setup allowed for the first time to determine MP-dependent and -independent assemblage factors as subject to different environmental conditions in one system. Most importantly, plastic-specific assemblages were found to develop solely under certain conditions, such as lower nutrient concentration and higher salinity, while the bacterial genus Erythrobacter, known for the ability to utilize polycyclic aromatic hydrocarbons (PAH), was found specifically on MP across a broader section of the gradient. We discovered no enrichment of potential pathogens on PE or PS; however, the abundant colonization of MP in a WWTP by certain bacteria commonly associated with antibiotic resistance suggests MP as a possible hotspot for horizontal gene transfer. Taken together, our study clarifies that the surrounding environment prevailingly shapes the biofilm communities, but that MP-specific assemblage factors exist. These findings point to the ecological significance of specific MP-promoted bacterial populations in aquatic environments and particularly in plastic accumulation zones.

Oberbeckmann, S., et al. (2015). "Marine microplastic-associated biofilms - a review." Environmental Chemistry **12**(5): 551-562.

The accumulation of plastic in the marine environment is a long-known issue, but the potential relevance of this pollution for the ocean has been recognised only recently. Within this context, microplastic fragments (<5 mm) represent an emerging topic. Owing to their small size, they are readily ingested by marine wildlife and can accumulate in the food web, along with associated toxins and microorganisms colonising the plastic. We are starting to understand that plastic biofilms are diverse and are, comparably with non-plastic biofilms, driven by a complex network of influences, mainly spatial and seasonal factors, but also polymer type, texture and size of the substratum. Within this context, we should raise the question about the potential of plastic particles to serve as vectors for harmful microorganisms. The main focus of the review is the discussion of first insights and research gaps related to microplastic-associated microbial biofilm communities.

Oberbeckmann, S., et al. (2014). "Spatial and seasonal variation in diversity and structure of microbial biofilms on marine plastics in Northern European waters." FEMS Microbiology Ecology **90**(2): 478-492.

Plastic pollution is now recognised as a major threat to marine environments and marine biota. Recent research highlights that diverse microbial species are found to colonise plastic surfaces (the plastisphere) within marine waters. Here, we investigate how the structure and diversity of marine plastisphere microbial community vary with respect to season, location and plastic substrate type. We performed a 6-week exposure experiment with polyethylene terephthalate (PET) bottles in the North Sea (UK) as well as sea surface sampling of plastic polymers in Northern European waters. Scanning electron microscopy revealed diverse plastisphere communities comprising prokaryotic and eukaryotic microorganisms. Denaturing gradient gel electrophoresis (DGGE) and sequencing analysis revealed that plastisphere microbial communities on PET fragments varied both with season and location and comprised of bacteria belonging to Bacteroidetes, Proteobacteria, Cyanobacteria and members of the eukaryotes Bacillariophyceae and Phaeophyceae. Polymers sampled from the sea surface mainly comprised polyethylene, polystyrene and polypropylene particles. Variation within plastisphere communities on different polymer types was observed, but communities were primarily dominated by Cyanobacteria. This research reveals that the composition of plastisphere microbial communities in marine waters varies with season, geographical location and plastic substrate type.

Obradovic, B., et al. (2012). "Novel alginate based nanocomposite hydrogels with incorporated silver nanoparticles." Journal of Materials Science-Materials in Medicine **23**(1): 99-107.

Alginate colloid solution containing electrochemically synthesized silver nanoparticles (AgNPs) was investigated regarding the nanoparticle stabilization and possibilities for production of alginate based nanocomposite hydrogels in different forms. AgNPs were shown to continue to grow in alginate solutions for additional 3 days after the synthesis by aggregative mechanism and Ostwald ripening. Thereafter, the colloid solution remains stable for 30 days and could be used alone or in mixtures with aqueous solutions of poly(vinyl alcohol) (PVA) and poly(N-vinyl-2-pyrrolidone) (PVP) while preserving AgNPs as verified by UV-Vis spectroscopy studies. We have optimized techniques for production of Ag/alginate microbeads and Ag/alginate/PVA beads, which were shown to efficiently release AgNPs decreasing the Escherichia coli concentration in suspensions for 99.9% over 24 h. Furthermore, Ag/hydrogel discs based on alginate, PVA and PVP were produced by freezing-thawing technique allowing adjustments of hydrogel composition and mechanical properties as demonstrated in compression studies performed in a biomimetic bioreactor.

Occhionero, M. A., et al. (2019). "Biodegradation of silobags by the wax moth larvae of Achroia grisella F. and Galleria mellonella L. (Lepidoptera, Pyralidae)." Biocell. Conference: 35th Annual Scientific Meeting of the Tucuman Biology Association. Argentina. **43**(Supplement 1).

Human consumption leads to an excess of plastic waste on the planet that results in 5,700 million tons not recycled per year. Some insects are able to consume and degrade plastics. In Tucuman, we recorded larvae of the moths Achroia grisella F. and Galleria mellonella L. (Pyralidae, Lepidoptera) consuming silobags (SB). Although we do not know the origin and mechanisms of plastic degrading enzymes, they could be related to bacteria on the body surface or in the digestive tract of larvae. The objectives of our work were to determine if the degrading agents are on the surface of the larvae and to evaluate differences in SB consumption among larvae bathed with antibiotics. To eliminate the superficial microbiota, we washed larvae with 6 (A. grisella) and 7 (G. melonella) antibiotics plus a control group (n=6-10 per treatment, respectively). We monitored the development of each larva in Petri dishes containing previously weighted SB disks. Comparing the initial vs. final SB weights, we did not find significant differences in SB consumption by species between treatments and control, but the larvae completed their development. We conclude that the degrading bacteria are not found in the body surface of the larvae and that this activity would be due to agents in the digestive tract. We are currently isolating the microbiota of the digestive tract for identification and studying the chemical composition of larval feces.

O'Connor, D., et al. (2019). "Microplastics undergo accelerated vertical migration in sand soil due to small size and wet-dry cycles." Environmental Pollution **249**: 527-534.

Microplastics (MPs) are an emerging concern and potential risk to marine and terrestrial environments. Surface soils are reported to act as a sink. However, MP vertical mobility in the subsurface remains uncertain due to a lack of scientific data. This study focused on MP penetration in sand soil column experiments. Here we report the mobility of five different MPs, which consisted of polyethylene (PE) and polypropylene (PP) particles of various sizes and densities. We observed that the smallest sized PE MPs (21mum) had the greatest movement potential. Moreover, it was found that when these MPs were subjected to greater numbers of wet-dry cycles, the penetration depth significantly increased, with an apparent linear relationship between depth and wet-dry cycle number (r²=0.817). In comparison, increasing the volume of infiltration liquid or the surface MP concentration had only negligible or weak effects on migration depth (r²=0.169 and 0.312, respectively). Based on the observed wet-dry cycle trend, we forecast 100-year penetration depths using weather data for 347 cities across China. The average penetration depth was calculated as 5.24m (95% CI=2.78-7.70m), with Beijing Municipality and Hebei, Henan and Hubei provinces being the most vulnerable to MP vertical dispersion. Our results suggest that soils may not only represent a sink for MPs, but also a feasible entryway to subsurface receptors, such as subterranean fauna or aquifers. Finally, research gaps are identified and suggested research directions are put forward to garner a better understanding MP vertical migration in soil.

Odabas, S., et al. (2008). "Separation of mesenchymal stem cells with magnetic nanosorbents carrying CD105 and CD73 antibodies in flow-through and batch systems." Journal of Chromatography B: Analytical Technologies in the Biomedical & Life Sciences **861**(1): 74-80.

The aim of this study is to develop magnetically loaded nanosorbents carrying specific monoclonal antibodies (namely CD105 and CD73) for separation of mesenchymal stem cells from cell suspensions. Super-paramagnetic magnetite (Fe3O4) nanoparticles were produced and then coated with a polymer layer containing carboxylic acid functional groups (average diameter: 153 nm and polydispersity index: 0.229). In order to obtain the nanosorbents, the monoclonal antibodies were immobilized via these functional groups with quite high coupling efficiencies up to 80%. These nanosorbents and also a commercially available one (i.e., microbeads carrying CD105 antibodies from Miltenyi Biotec., Germany) were used for separation of CD105+ and CD73+ mesenchymal stem cells from model cell suspension composed of peripheral blood (97.6%), human bone marrow cells (1.2%) and fibroblastic cells (1.2%). The initial concentrations of the CD105+ and CD73+ cells in this suspension were measured as 5.86% and 6.56%, respectively. A flow-through separation system and a very simple homemade batch separator unit were used. We were able to increase the concentration of CD105+ cells up to about 86% in the flow-through separation system with the nanosorbents produced in this study, which was even significantly better than the commercial one. The separation efficiencies were also very high, especially for the CD73+ cells (reached to about 64%) with the very simple and inexpensive homemade batch unit.

Odeku, O. A., et al. (2013). "Microbead design for sustained drug release using four natural gums." International Journal of Biological Macromolecules **58**: 113-120.

Four natural gums, namely albizia, cissus, irvingia and khaya gums have been characterized and evaluated as polymers for the formulation of microbeads for controlled delivery of diclofenac sodium. The natural gums were characterized for their material properties using standard methods. Diclofenac microbeads were prepared by ionotropic gelation using gel blends of the natural gums and sodium alginate at different ratios and zinc chloride solution (10%w/v) as the crosslinking agent. The microbeads were assessed using SEM, swelling characteristics, drug entrapment efficiencies and release properties. Data obtained from in vitro dissolution studies were fitted to various kinetic equations to determine the kinetics and mechanisms of drug release, and the similarity factor, f2, was used to compare the different formulations. The results showed that the natural gum polymers varied considerably in their material properties. Spherical and discrete microbeads with particle size of 1.48-2.41 mum were obtained with

entrapment efficiencies of 44.0-71.3%w/w. Drug release was found to depend on the type and concentration of polymer gum used with formulations containing gum:alginate ratio of 3:1 showing the highest dissolution times. Controlled release of diclofenac was obtained over for 5h. Drug release from the beads containing the polymer blends of the four gums and sodium alginate fitted the Korsmeyer-Peppas model which appeared to be dependent on the nature of natural gum in the polymer blend while the beads containing alginate alone fitted the Hopfenberg model. Beads containing albizia and cissus had comparable release profiles to those containing khaya (f2>50). The results suggest that the natural gums could be potentially useful for the formulation controlled release microbeads.

Odeku, O. A., et al. (2014). "Formulation and in vitro evaluation of natural gum-based microbeads for delivery of ibuprofen." Tropical Journal of Pharmaceutical Research **13**(10): 1577-1583.

Purpose: To investigate the effectiveness of three natural gums, namely albizia, cissus and khaya gums, as excipients for the formulation of ibuprofen microbeads. Methods: Ibuprofen microbeads were prepared by the ionotropic gelation method using the natural gums and their blends with sodium alginate at various concentrations using different chelating agents (calcium chloride, zinc chloride, calcium acetate and zinc acetate) at different concentrations. Microbeads were assessed using SEM, swelling characteristics, drug entrapment efficiencies, release properties and drug release kinetics. Results: The natural gums alone could not form stable microbeads in the different chelating agents. Stable small spherical discrete microbeads with particle size of 1.35 +/- 0.11 to 1.78 +/- 0.11 mm, were obtained using the blends of natural gum: alginate at total polymer concentration of 2% w/v using 10% w/v calcium chloride solution at a stirring speed of 300 rpm. The encapsulation efficiencies of the microbeads ranged from 35.3 to 79.8% and dissolution times, t<inf>15</inf> and t<inf>80</inf> increased with increase in the concentration of the natural gums present in the blends. Controlled release was obtained for over 4 h and the release was found to be by a combination of diffusion and erosion mechanisms from spherical formulations. Conclusion: The three natural gums would be useful in the formulation of ibuprofen microbeads and the type and concentration of natural gum in the polymer blend can be used to modulate the release properties of the microbeads. Copyright © Pharmacotherapy Group, Faculty of Pharmacy, University of Benin, Benin City, 300001 Nigeria. All rights reserved.

Odigure, J. O., et al. (2015). "Synthesis and Characterization of Lubricant Additives From Waste Plastic." Energy Sources Part A: Recovery, Utilization & Environmental Effects **37**(17): 1846-1852.

This study attempted to synthesize and characterize engine oil additives from plastic waste, i.e., low density polyethylene, high density polyethylene, and poly propylene for the purpose of improving the viscosity index and pour point of engine oils. To do this, the starting polymers were reacted with maleic anhydride in a chain growth addition polymerization. The reactions took place in a muffle furnace at 230°C. The product poly (alkenymaleic anhydride) was then reacted with a glycerol at 140°C in a step growth addition polyesterification in the presence of xylene and nitrogen. The product formed, i.e., monoester acid, was then reacted with diethylene triamine in a step growth condensation polyamidation to produce the additive. The results obtained showed that the utilization of the additive produced from poly propylene as an additive on the base oils, i.e., SN150, SN500, BS 150 and commercially available oil (YT3513), gave the best results. The optimum blending concentration of 60 g/dl was achieved for the base oils except BS 150, which was 50 g/dl. Results also indicated that the optimum weight percentage of the blended additives was 3 wt%, while the optimum viscosity index was 162, 160, 159, and 186 corresponding to an increment of 80, 64.42, 36.76, and 36. 76% for SN150, SN500, BS150, and YT3513, respectively. [ABSTRACT FROM PUBLISHER]

O'Donnell, B. and E. Lee (2019). "Characterizing Microplastic Fibers Using Raman Spectroscopy." Spectroscopy **34**(s6): 32-34,36-40.

Microplastics have become a growing area of research, as concern over harm to the environment, and potential harm to humans, has increased. Recently, legislation passed in California has mandated the testing for, and reporting of, plastic in drinking water (SB 1422). In this study, Raman spectroscopy is used to characterize two different commercial fabric fiber samples that include synthetic polymer materials. Both macro- and microscopic Raman measurements are carried out, and chemical identification of the individual components is made through database searches. Raman microscopy is demonstrated as a powerful technique for microplastic fiber characterization, especially for samples that contain mixtures of components, including multiple polymers, or additives.

O'Driscoll, K. K. M., et al. (2009). "The effect of floor surface on dairy cow immune function and locomotion score." Journal of Dairy Science **92**(9): 4249-4261.

This study evaluated the effect of 2 dairy cow housing systems on cow locomotion, immune status, and expression of genes associated with lameness during the dry and periparturient periods. Cows were assigned to freestall housing with either rubber (RUB; n=13) or concrete (CON; n=14) at the feed-bunk and alley immediately after their first calving, and managed on this system during all subsequent lactations. At dry off, cows were moved to a straw bedded-pack dry cow pen, and remained there until about 2 d before subsequent calving. To investigate whether greater exposure to RUB or CON increased the differences between cows on each treatment, cows at the end of either their first (n=16) or second (n=11) lactations were included in the experiment. Locomotion scores and blood samples were obtained at -60 (beginning of the dry period), -30, 0 (after calving), +10 and +18 d relative to calving. Leukocyte counts were obtained by using an automated cell counter. Phagocytic activity, and cells positive for CD14 and CD18 expression were measured by flow cytometry using labeled microbeads and antibodies. Expression of tachikinin 1(TAC1), histamine receptor 1 (H1), and metalloproteinase (MMP)13 in blood leukocytes was estimated using quantitative real-time PCR. Treatment effects were determined using a repeated measures model. Provision of rubber flooring did not improve dairy cow locomotion during the subsequent study period. However, time relative to calving had an effect on locomotion score and speed, which were worst on d 0, probably because of the discomfort associated with calving. An interaction occurred between treatment and time for neutrophil and lymphocyte counts. The RUB cows had greater neutrophil and lesser lymphocyte numbers postpartum than CON. These cows also had more cells positive for CD14 postpartum compared with prepartum. Moreover, RUB cows showed upregulation of MMP13 and TAC1 compared with CON. These genes are associated with lameness and pain detection respectively. Greater neutrophil to lymphocyte ratios and CD14 expression are associated with physiological stress or with activated immunity. Rubber flooring is associated with an increase in activity and standing. This may have resulted in indications of physiological stress and upregulation of genes associated with lameness and pain for RUB cows. However, this study did

not take into account the long-term effects of concrete or rubber flooring; for instance, occurrence of lameness or survivability within the herd.

Odumeru, J., et al. (2001). "Use of the bead beater for preparation of Mycobacterium paratuberculosis template DNA in milk." Canadian Journal of Veterinary Research **65**(4): 201-205.

Mycobacterium paratuberculosis is a recognized chronic enteric pathogen that can affect many different species of animals, including primates. It has been suggested that this organism is associated with Crohn's disease in humans, and that milk is a potential source of human exposure to this organism. The limit of the detection of M. paratuberculosis in milk samples by direct PCR was 10(5) cfu/mL if the traditional boiling method was used for template DNA preparation. In this study, an improved method for template DNA preparation was examined. The method involves the use of a bead beater, which breaks up bacterial cell wall mechanically by vibrating bacteria with microbeads at high speed. The effectiveness of this method for lysing M. paratuberculosis cells was compared to that of the freeze-thaw method, and use of commercial kits such as the InstaGene Matrix and the QIAamp Tissue Kit. The bead beater procedure was tested in combination with various cell lysis and template DNA preparation procedures to determine which of these steps improved the limit of detection of PCR assay that amplifies a 413 bp fragment of the IS900 gene.

Odun-Ayo, F., et al. (2015). "Chemoprevention of azoxymethane-induced colonic carcinogenesis in Balb/c mice using a modified pectin alginate probiotic." Anticancer Research **35**(9): 4765-4775.

Background: Increased intake of probiotic dietary fibre reduces colonic cancer risk. Modified citrus pectin (MCP) requires optimal bioactivity to inhibit galectin-3 (GAL-3) and vascular endothelial growth factor (VEGF). This study evaluated the preventative effect of modified pectin alginate (MCPA) probiotic microbeads on azoxymethane (AOM)-induced colonic carcinogenesis in Balb/c mice. Materials and Methods: Optimization of AOM dose duration: 10-15 mg/kg was administered for 2-4 weeks. The optimal AOM dose was initiated prior to intake of MCPA, alginate probiotic (AP) microbeads and MCP in Balb/c mice for 16 weeks; samples were analyzed for colonic histopathology and immunohistochemistry.

Odun-Ayo, F., et al. (2016). "Improving the survival of probiotic in simulated conditions and azoxymethane-induced colon tumour bearing mice using modified citrus pectin-alginate microencapsulation." African Journal of Traditional, Complementary and Alternative Medicines **13**(2): 101-109.

Background: For a probiotic to be viable it needs to be preserved at a recommended minimum level of 6-7 log₁₀ cfu/g in the product being consumed, as suggested by the International Dairy Federation. Different biopolymer matrices have been used for encapsulation of probiotic; however, loss of viability is still a challenge. Materials and Methods: Modified citrus pectin-alginate microbeads containing Lactobacillus acidophilus ATCC 4356 was developed. Efficiency of the microbeads was evaluated in simulated conditions of the gastrointestinal tract and in Balb/c mice induced with colon tumor. Genomic identification of faecal lactobacilli samples from treated mice was also performed.

Oertel, M., et al. (2007). "Comparison of hepatic properties and transplantation of Thy-1⁺ and Thy-1⁻ cells isolated from embryonic day 14 rat fetal liver." Hepatology **46**(4): 1236-1245.

Thy-1, a marker of hematopoietic progenitor cells, is also expressed in activated oval cells of rat liver. Thy-1⁺ cells are also in rat fetal liver and exhibit properties of bipotent

hepatic epithelial progenitor cells in culture. However, no information is available concerning liver repopulation by Thy-1⁺ fetal liver cells. Therefore, we isolated Thy-1⁺ and Thy-1⁻ cells from embryonic day (ED) 14 fetal liver and compared their gene expression characteristics in vitro and proliferative and differentiation potential after transplantation into adult rat liver. Fetal liver cells selected for Thy-1 expression using immunomagnetic microbeads were enriched from 5.2%-87.2% Thy-1⁺. The vast majority of alpha fetoprotein⁺, albumin⁺, cytokine-19⁺, and E-cadherin⁺ cells were found in cultured Thy-1⁻ cells, whereas nearly all CD45⁺ cells were in the Thy-1⁺ fraction. In normal rat liver, transplanted Thy-1⁺ cells produced only rare, small DPPIV⁺ cell clusters, very few of which exhibited a hepatocytic phenotype. In retrorsine-treated liver, transplanted Thy-1 ⁺ fetal liver cells achieved a 4.6%-23.5% repopulation. In contrast, Thy-1⁻ fetal liver cells substantially repopulated normal adult liver and totally repopulated retrorsine-treated liver. Regarding the stromal cell-derived factor (SDF)-1/chemokine (C-X-C motif) receptor 4 (CXCR4) axis for stem cell homing, Thy-1⁺ and Thy-1⁻ fetal hepatic epithelial cells equally expressed CXCR4. However, SDF-1alpha expression was augmented in bile ducts and oval cells in retrorsine/partial hepatectomy-treated liver, and this correlated with liver repopulation by Thy-1⁺ cells. Conclusion(s): Highly enriched Thy-1⁺ ED14 fetal liver cells proliferate and repopulate the liver only after extensive liver injury and represent a fetal hepatic progenitor cell population distinct from Thy-1⁻ stem/progenitor cells, which repopulate the normal adult liver. Copyright © 2007 by the American Association for the Study of Liver Diseases.

Ogonowski, M., et al. (2018). "Evidence for selective bacterial community structuring on microplastics." Environmental Microbiology **20**(8): 2796-2808.

In aquatic ecosystems, microplastics are a relatively new anthropogenic substrate that can readily be colonized by biofilm-forming organisms. To examine the effects of substrate type on microbial community assembly, we exposed ambient Baltic bacterioplankton to plastic substrates commonly found in marine environments (polyethylene, polypropylene and polystyrene) as well as native (cellulose) and inert (glass beads) particles for 2 weeks under controlled conditions. The source microbial communities and those of the biofilms were analyzed by Illumina sequencing of the 16S rRNA gene libraries. All biofilm communities displayed lower diversity and evenness compared with the source community, suggesting substrate-driven selection. Moreover, the plastics-associated communities were distinctly different from those on the non-plastic substrates. Whereas plastics hosted greater than twofold higher abundance of Burkholderiales, the non-plastic substrates had a significantly higher proportion of Actinobacteria and Cytophagia. Variation in the community structure, but not the cell abundance, across the treatments was strongly linked to the substrate hydrophobicity. Thus, microplastics host distinct bacterial communities, at least during early successional stages.

Ogonowski, M., et al. (2016). "The Effects of Natural and Anthropogenic Microparticles on Individual Fitness in Daphnia magna." PLoS ONE **11**(5).

Concerns are being raised that microplastic pollution can have detrimental effects on the feeding of aquatic invertebrates, including zooplankton. Both small plastic fragments (microplastics, MPs) produced by degradation of larger plastic waste (secondary MPs; SMPs) and microscopic plastic spheres used in cosmetic products and industry (primary MPs; PMPs) are ubiquitously present in the environment. However, despite the fact that most environmental MPs consist of weathered plastic debris with irregular shape and broad size distribution, experimental studies of organism responses to MP exposure have largely used uniformly sized spherical PMPs. Therefore, effects observed for PMPs in such experiments may not be representative for MP-effects in situ. Moreover, invertebrate filter-feeders are generally well adapted to the presence of refractory material in seston, which questions the potential of MPs at environmentally relevant concentrations to measurably affect digestion in these organisms. Here, we compared responses to MPs (PMPs and SMPs) and naturally occurring particles (kaolin clay) using the cladoceran Daphnia magna as a model organism. We manipulated food levels (0.4 and 9 µg C mL-1) and MP or kaolin contribution to the feeding suspension (<1 to 74%) and evaluated effects of MPs and kaolin on food uptake, growth, reproductive capacity of the daphnids, and maternal effects on offspring survival and feeding. Exposure to SMPs caused elevated mortality, increased inter-brood period and decreased reproduction albeit only at high MP levels in the feeding suspension (74% by particle count). No such effects were observed in either PMP or kaolin treatments. In daphnids exposed to any particle type at the low algal concentration, individual growth decreased by ~15%. By contrast, positive growth response to all particle types was observed at the high algal concentration with 17%, 54% and 40% increase for kaolin, PMP and SMP, respectively. When test particles comprised 22% in the feeding suspension, both MP types decreased food intake by 30%, while kaolin had no effect. Moreover, SMPs were found to homoaggregate in a concentration-dependent manner, which resulted in a 77% decrease of the ingested SMPs compared to PMPs. To better understand MP-processing in the gut, gut passage time (GPT) and evacuation rate of MPs were also assayed. SMPs and PMPs differed in their effects on daphnids; moreover, the particle effects were dependent on the MP: algae ratio in the suspension. When the MP contribution to the particle abundance in the medium changed from 1 to 4%, GPT for daphnids exposed to SMPs increased 2-fold. Our results suggest that MPs and, in particular, SMPs, have a greater capacity to negatively affect feeding in D. magna compared to naturally occurring mineral particles of similar size. Moreover, grazer responses observed in experiments with PMPs cannot be extrapolated to the field where SMPs dominate, because of the greater effects caused by the latter.

Ogonowski, M., et al. (2019). "Microplastic Intake, Its Biotic Drivers, and Hydrophobic Organic Contaminant Levels in the Baltic Herring." Frontiers in Environmental Science.

It is commonly accepted that microplastic (MP) ingestion can lead to lower food intake and bioaccumulation of hydrophobic organic contaminants (HOCs) in aquatic organisms. However, causal links between MP and contaminant levels in biota are poorly understood and in situ data are very limited. Here, we investigated whether HOC concentrations in herring muscle tissue (Clupea harengus membras) are related to MP ingestion using fish caught along the West coast of the Baltic Sea. The MP occurrence exhibited a large geographic variability, with MP found in 22.3% of the fish examined, and the population average being 0.9 MP ind-1. However, when only individuals containing MP were considered, the average MP burden was 3.9 MP ind-1. We also found that MP burden decreased with reproductive stage of the fish but increased with its body size. To predict MP abundance in fish guts, we constructed a mass-balance model using literature data on MP in the water column and physiological rates on ingestion and gut evacuation for clupeids of a similar size. The model output was in agreement with the observed values, thus supporting the validity of the results. Contaminant concentrations in the muscle tissue varied substantially across the study area but were unrelated to the MP levels in fish, suggesting a lack of direct links between the levels of HOCs and MP ingestion. Thus, despite

their ubiquity, MP are unlikely to have a measurable impact on food intake or the total body burden of hydrophobic contaminants in Baltic herring.

Ogret, Y., et al. (2014). "Investigation of lineage-specific and peripheral blood chimerism analysis in post-stem cell transplant patients." Tissue Antigens **84 (1)**: 55-56.

Monitoring engraftment is a key part of post-transplant treatment. Post-transplant chimerism may predict graft versus host disease (GVHD) but not relapse in patients undergoing allogeneic transplantation. Monitoring chimerism after transplant consecutively can also early document unstable mixed chimerism and rejection, which provide the basis for donor lymphocyte infusion (DLI). In the early post-transplant period, co-existence of host and donor cells can develop, especially in case of a reduced intensity conditioning (RIC) regimen. This status is referred to as mixed chimerism, whereas complete donor chimerism denotes the situation where all cell lineages are reconstituted by donor-derived cells. In this study, we analyzed the chimerism status of T cells and B cells allo-SCT patients by using multiplex STR-PCR and determined the correlation between these results and the clinical outcome, including cumulative incidence of GVHD and relapse. Our current method of chimerism analysis is based on analysis of polymorphic short tandem repeats (STRs) to uniquely define the source of DNA extracted from the buffy coat layer. 69 peripheral blood (PB) samples were collected from 9 patients at 30th, 90th and 180th day after allogeneic transplantation. Lineage-specific cell enrichment was performed by using CD3 and CD19 "Whole Blood Micro Beads", yielding T cells, B cells respectively. PCR amplifications of theDNAsamples were obtained by using Applied Biosystems Identifier STR kit. Mean age was 35.6 year, 4 of patients were female and 5 were male. Among the patients, nine achieved engraftment and nine patients achieved complete chimerism (CC) at 30th day after allogeneic transplantation. Peripheral blood chimerism was analyzed more than 4 times in all patients but, lineage-specific chimerism analysis was performed according to the clinician request for four patients who had relapse development. Peripheral blood chimerism analyses were as a CC, although T or B cells chimerism analyses were observed with mix or recipient-derived cells. Thus, the clinical relapse of patients was considered from the whole blood chimerism analysis, a more distinctive lineage-specific chimerism analysis on the prognosis of patients with early relapse and was able to provide access to important information.

Ogunola, O. S., et al. (2018). "Mitigation measures to avert the impacts of plastics and microplastics in the marine environment (a review)." Environmental Science & Pollution Research **25**(10): 9293-9310.

The increasing demand for and reliance on plastics as an everyday item, and rapid rise in their production and subsequent indiscriminate disposal, rise in human population and industrial growth, have made the material an important environmental concern and focus of interest of many research. Historically, plastic production has increased tremendously to over 250 million tonnes by 2009 with an annual increased rate of 9%. In 2015, the global consumption of plastic materials was reported to be > 300 million tonnes and is expected to surge exponentially. Because plastic polymers are ubiquitous, highly resistant to degradation, the influx of these persistent, complex materials is a risk to human and environmental health. Because microplastics are principally generated from the weathering or breakdown of larger plastics (macroplastics), it is noteworthy and expedient to discuss in detail, expatiate, and tackle this main source. Macro- and microplastic pollution has been reported on a global scale from the poles to the equator. The major problem of concern is that they strangulate and are ingested by a number of aquatic biota especially the filter feeders, such as molluscs, mussels, oysters, from where it enters the food chain and consequently could lead to physical and toxicological effects on aquatic organisms and human being as final consumers. To this end, in order to minimise the negative impacts posed by plastic pollution (macro- and microplastics), a plethora of strategies have been developed at various levels to reduce and manage the plastic wastes. The objective of this paper is to review some published literature on management measures of plastic wastes to curb occurrence and incidents of large- and microplastics pollution in the marine environments.

O'Hanlon, N. J., et al. (2017). "Seabirds and marine plastic debris in the northeastern Atlantic: A synthesis and recommendations for monitoring and research." Environmental Pollution **Part 2. 231**: 1291-1301.

Marine plastic pollution is an increasing, and global, environmental issue. Numerous marine species are affected by plastic debris through entanglement, nest incorporation, and ingestion, which can lead to lethal and sub-lethal impacts. However, in the northeastern Atlantic Ocean, an area of international importance for seabirds, there has been little effort to date to assess information from studies of wildlife and plastic to better understand the spatiotemporal variation of how marine plastic affects different seabird species. To improve our understanding of seabirds and marine plastic in this region, we completed a synthesis of the published and grey literature to obtain information on all known documented cases of plastic ingestion and nest incorporation by this group. We found that of 69 seabird species that commonly occur in the northeastern Atlantic, 25 had evidence of ingesting plastic. However, data on plastic ingestion was available for only 49% of all species, with 74% of investigated species recorded ingesting plastic. We found only three published studies on nest incorporation, for the Northern Gannet (Morus bassanus) and Black-legged Kittiwake (Rissa tridactyla). For many species, sample sizes were small or not reported, and only 39% of studies were from the 21st century, whilst information from multiple countries and years was only available for 11 species. This indicates that we actually know very little about the current prevalence of plastic ingestion and nest incorporation for many species, several of them globally threatened. Furthermore, in the majority of studies, the metrics reported were inadequate to carry out robust comparisons among locations and species or perform meta-analyses. We recommend multi-jurisdictional collaboration to obtain a more comprehensive and current understanding of how marine plastic is affecting seabirds in the northeastern Atlantic Ocean. Only 49% of commonly occurring northeastern Atlantic seabird species have been investigated for active interactions with marine plastic pollution, with 74% of these found to ingest plastic or incorporate it into their nests. Copyright © 2017

O'Hara, P. D., et al. (2019). "Seasonal variability in vulnerability for Cassin's Auklets (Ptychoramphus aleuticus) exposed to microplastic pollution in the Canadian Pacific region." Science of the Total Environment **649**: 50-60.

Marine plastic pollution is an emerging global conservation challenge, potentially impacting organisms at all trophic levels. However, currently it is unclear to what extent plastic pollution is impacting marine organisms at the population, species or multispecies level. In this study, we explore seasonal exposure (i.e., vulnerability) of Cassin's Auklet (Ptychoramphus aleuticus) to plastic pollution with exposure models during boreal summer and winter seasons. Based on these models, we infer exposure at the population level for this species, in the Canadian Pacific region where approximately 75% of the global population of this species breeds. The models quantify plastic exposure by determining seasonal core foraging areas and plastic concentrations found in those same areas. Core foraging areas were determined using a Generalized Additive Model based on at-sea observation data (collected year round: 1990-2010) and 50% Home Range Kernels based on aerial telemetry data (May and June 1999-2001). Plastic concentrations within these core areas were interpolated based on seawater microplastic concentrations from the summer of 2012. We found that during the boreal summer, Cassin's Auklets were exposed to relatively low concentrations of plastics. During the winter, auklet distribution shifted towards the coast where plastic concentrations are considerably higher. Model derived seasonal variability in exposure was consistent with necropsy results from bird carcasses recovered during the winter of 2014, and from a multiyear study on chick provisioning during the summer. Local oceanography likely plays a role in determining seasonal shifts in both marine bird as well microplastic concentrations, and hence exposure. As well, individual sensitivity (i.e., dose-dependent effect) may vary with annual cycles. Currently, research is focusing on determining how sensitive individual birds are to microplastic concentrations, and our models will help translate sensitivity found at the individual level to potential impacts at population or species level.

Ohashi, T., et al. (2010). "On-chip antibody immobilization for on-demand and rapid immunoassay on a microfluidic chip." Biomicrofluidics **4**(3): 32207.

Immunoassay is one of the important applications of microfluidic chips and many methodologies were reported for decreasing sample/reagent volume, shortening assay time, and so on. Micro-enzyme-linked immunosorbent assay (micro-ELISA) is our method that utilizes packed microbeads in the microfluidic channel and the immunoreactions are induced on the beads surface. Due to the large surface-to-volume ratio and small analytical volume, excellent performances have been verified in assay time and sample/reagent volume. In order to realize the micro-ELISA, one of the important processes is the immobilization of antibody on the beads surface. Previously, the immobilization process was performed in a macroscale tube by physisorption of antibody, and long time (2 h) and large amount of antibody (or high concentration) were required for the immobilization. In addition, the processes including the reaction and washing were laborious, and changing the analyte was not easy. In this research, we integrated the immobilization process into a microfluidic chip by applying the avidin-biotin surface chemistry. The integration enabled very fast (1 min) immobilization with very small amount of precious antibody consumption (100 ng) for one assay. Because the laborious immobilization process can be automatically performed on the microfluidic chip, ELISA method became very easy. On-demand immunoassay was also possible just by changing the antibodies without using large amount of precious antibodies. Finally, the analytical performance was investigated by measuring C-reactive protein and good performance (limit of detection <20 ng/ml) was verified.

Ohiwa, N., et al. (2008). "An Investigation on Thermal Recycling of Recycled Plastic Resin (Numerical Prediction of Unburnt Rate in PET-Resin Powder Combustion)." Journal of Environment and Engineering **3**(1): 158-169.

To burn PET-resin powder as an alternative or additional fuel and to realize effective thermal recycling of a great deal of wasted and recycled PET-resin, some practical studies have been made on the physical aspects of PET-powder combustion in the industrial burner. The results showed that a large amount of PET-powder up to about 80 % is exhausted without burn-up in the open atmospheric operation, whereas PET-powder is perfectly consumed in the high temperature in-furnace operation. Understanding of the relationship between the heating time and the unburnt rate of PET-powder is therefore necessary to get an important knowledge to reduce the amount of unburnt PET-powder. In this paper, the behavior of particle diameter is first modeled according to those experimentally measured, a particle-size histogram of

PET-powder is then transformed into a particle-number profile by stepping the particle diameter at 0.01 mu m intervals, and simple numerical prediction of the unburnt rate in the PET-powder combustion is finally attempted by introducing the parcel approximation. The results give good quantitative agreement between the unburnt rates of PET-powder measured experimentally and those predicted.

Ohta, K. and K. Tanaka (1999). "Simultaneous determination of common mono- and divalent cations in natural water samples by conductimetric detection ion chromatography with an unmodified silica gel column and oxalic acid /18-crown-6 as eluent." Analytica Chimica Acta **381**(2/3): 265-273.
An unmodified silica gel (Super Micro Beads Silica Gel B-5) was used as a cation-exchange stationary phase in the ion chromatographic (IC) determination of lithium(I), sodium(I), ammonium(I), potassium(I), magnesium(II) and calcium(II) cations in natural water samples using strongly acidic eluents; the method employed conductimetric detection. Excellent simultaneous separation of these cations was achieved in 15 minutes using a 15 cm SMBSG B-5 column and 1 mM oxalic acid/3 mM 18-crown 6 as the eluent. Calibration graphs were linear in the concentration ranges 0.005 to 1.0 mM, and detection limits ranged from 0.63 ug per litre for lithium(I) to 28 ug per litre for potassium(I). The proposed method was applied to the analysis of the 6 cations in various rain and river water samples. The results were in good agreement with those obtained by a conventional IC method using a TSK gel IC-CationI/II column and 2 mM nitric acid as the eluent.

Oi, K., et al. (2017). "CTLA4-IG directly inhibits osteoclast generation from human peripheral monocytes and tumor necrosis factor alpha-treated inflammatory monocytes." Arthritis and Rheumatology. Conference: American College of Rheumatology/Association of Rheumatology Health Professionals Annual Scientific Meeting, ACR/ARHP **69**(Supplement 10).
Background/Purpose: CTLA-4 is a surface protein on T lymphocytes, which negatively regulates the co-stimulation process between antigen-presenting cells and T cells. CTLA-4 binds to monocytes via CD80/CD86, which are precursor of osteoclast. In addition, CTLA-4 has been shown to directly inhibit osteoclast formation. However, little is known about the effect of CTLA-4 on osteoclast generation from human monocytes and monocytes exposed to inflammatory cytokines. The aim of this study was to evaluate the effect of a CTLA4-Ig (Abatacept) on osteoclastogenesis in human peripheral monocytes and TNFalpha-treated inflammatory monocytes. Method(s): Peripheral blood mononuclear cells are separated by Ficoll-Paque gradient centrifugation. Highly purified monocytes are prepared from prepared mononuclear cells using MACS microbeads (Pan Monocyte Isolation kit). In this study, more than 92 % of obtained cells are CD14-positive, as determined by flow cytometric analysis. Cultures were maintained in alpha-minimal essential medium for 7-14 days with both or either of M-CSF, RANKL and/or TNFalpha in the presence or absence of CTLA4-Ig. Osteoclasts were identified by TRAP staining and bone resorptive activity using the osteo assay surface multiwell plate. The expressions of CD80/CD86 on resting and TNFalpha-pretreated monocyte were determined by flow cytometric analysis. Result(s): Peripheral monocytes from healthy donors were incubated with M-CSF (50 ng/ml) and RANKL (100 ng/ml) in the presence of increasing doses of CTLA4-Ig for 5~7 days. After the culture, generated osteoclasts were determined by TRAP staining and bone resorptive activity. CTLA-4 inhibited the osteoclast generation in a dose-dependent manner (in the range of 0 to 500 mug/ml). To examine the effect of CTLA4-Ig on monocytes exposed to inflammatory cytokines, peripheral monocytes were preincubated with TNFalpha for 48 hours, and then cultured with RANKL. When the expression of CD80/CD86 antigens on peripheral monocytes was analysed, CD86 was only expressed on resting monocytes.

Interestingly, TNFalpha pretreatment potently induced the expression of CD80, suggesting modification of action of CTLA-4. CTLA4-Ig more potently inhibited osteoclast generation from TNFalpha-treated monocytes than those from resting monocytes. Conclusion(s): CTLA4-Ig directly inhibits osteoclast generation from human peripheral monocytes. In addition, the inhibitory effect of CTLA4-Ig is more potent in TNFalpha-treated inflammatory monocytes than resting monocytes, suggesting that CTLA4-Ig could inhibit osteoclast generation in inflammatory monocytes at inflamed joints of RA.

Ojha, N. K., et al. (2019). "Membrane potential manipulation with visible flash lamp illumination of targeted microbeads." Biochemical & Biophysical Research Communications **517**(2): 297-302.

The electrical membrane potential (V_m) is a key dynamical variable of excitable membranes. Despite the tremendous success of optogenetic methods to modulate V_m with light, there are some shortcomings, such as the need of genetic manipulation and limited time resolution. Direct optical stimulation of gold nanoparticles targeted to cells is an attractive alternative because the absorbed energy heats the membrane and, thus, generates capacitive current sufficient to trigger action potentials [1, Carvalho-de-Souza et al., 2015]. However, focused laser light is required and precise location and binding of the nanoparticles cannot be assessed with a conventional microscope. We therefore examined a complementary method to manipulate V_m in a spatio-temporal fashion by non-focused visible flashlight stimulation (Xenon discharge lamp, 385-485nm, ~500mus) of superparamagnetic microbeads. Flashlight stimulation of single beads targeted to cells resulted in transient inward currents under whole-cell patch-clamp control. The waveform of the current reflected the first time derivative of the local temperature induced by the absorbed light and subsequent heat dissipation. The maximal peak current as well as the temperature excursion scaled with the proximity to the plasma membrane. Transient illumination of light-absorbing beads, targeted to specific cellular sites via protein-protein interaction or direct micromanipulation, may provide means of rapid and spatially confined heating and electrical cell stimulation.

Oka, A., et al. (2010). "Decreased production of IL-10 in TLR9-activated peripheral blood B cells in inflammatory bowel disease." Gastroenterology **1)**: S740.

(Background & Aim) A regulatory B cell subset expressing interleukin (IL)-10 plays essential roles to maintain innate immunity and autoimmunity in various organs. Lack or loss of this subset exacerbated symptoms in experimental mice models with immune-mediated disorders. However, its role in the pathogenesis of human diseases, including inflammatory bowel disease (IBD), is largely unknown. We examined TLR-mediated production of IL-10 in human peripheral blood B cells and investigated its role in the pathogenesis of IBD. (Materials and Methods) We studied 35 patients with ulcerative colitis (UC), 30 with Crohn's disease (CD), and 45 healthy subjects. The expressions of CD19, CD1d, CD5, TLR4, RP105, and TLR9 in peripheral blood B cells were analyzed by flow cytometry. In Vitro, B cells were separated from isolated mononuclear cells magnetically by positive selection with CD19 microbeads, and purified B cells were cultured in 96-well plates (4 x 105/well) and stimulated with LPS or CpG DNA for 3 days, then IL-10 contents in culture media were measured using enzyme immunoassays. Also, the intracellular contents of IL-10 in TLR ligand-stimulated B cells were analyzed by flow cytometry, after staining with CD5 and CD1d. Further, multiple regression analysis was used to determine significant factors affecting TLR-mediated production of IL-10 in TLR-mediated B cells of IBD patients in relation to clinical parameters. (Results) Expression patterns of several cellular markers evaluated by flow cytometry in B cells isolated from IBD patients were similar to those of the healthy controls. Although IL- 10 production was induced in TLR ligand-mediated B cells, the level in CpG-DNA-stimulated cells was significantly higher than that in LPS-stimulated cells. B cells expressing IL-10 were mainly located in a population characterized by the cell surface markers CD19^{high} and CD1d^{high}. Interestingly, the production of IL-10 stimulated by CpG DNA was significantly lower in B cells separated from the IBD patients than from the control subjects (mean values: control; 503 pg/ml, CD; 196 pg/ml, UC; 276 pg/ml). Multiple regression analysis showed that disease severity had a significant effect to decrease TLR9-mediated IL-10 production in the IBD patients. (Conclusion) We found decreased production of IL-10 in TLR9-activated intestinal B cells in both CD and UC patients, suggesting that the function of this regulatory subset of B cells may associated with the pathogenesis of IBD.

Okada, A. (1973). "Plastic wastes hazards and development of degradable plastics." Technocrat **6**(5): 56-59.

This paper describes some technically and economically feasible methods for disposing of plastic waste materials, discusses the role of degradable plastics and their present level of development, and outlines some considerations for the practical application of degradable plastics.

Okajima, I., et al. (2012). "Production of Composite Fuel with High Heating Value from Waste Mixture of Food and Plastic Using Subcritical Water." Journal of the Japan Institute of Energy **91**(10): 998-1006.

Waste mixture of food and plastics is one of the most refractory wastes, because conventional recycling techniques require the separation of the waste into each group before treatment. In this work, new recycling technique was developed to produce an excellent composite fuel using subcritical water. The waste mixture was agitated with sawdust as a plastic dispersed material in subcritical water at 200 degree C and 1.6 MPa for 30 min, and the composite fuel particles with less than 20 mm in size were produced. The fuel had a high heating value close to that of coal and the fixed carbon ratio was 93 %. The fuel was dried in a short time of one third of conventional drying period. This was because a part of the surface tissue and cell wall of the biomass was decomposed by subcritical water and water inside the biomass was evaporated easily. The roles of subcritical water were the stabilization of the dispersed melting plastic particles, the removal of toxic elements such as chlorine and sulfur, and the saving of drying energy and the realization of high energy efficiency more than 4.When the composite fuel was pressed into pellet, the pellet fuel ignited easily and burned in a biomass stove stably for long time. The concentrations of the toxic compounds in the combustion gas were far below the emission standard of small boiler. The composite fuel was demonstrated to be safe and clean.

Okamoto, Y., et al. (2013). "Identification of autoantibodies to tyrosyl-transfer RNA synthetase associated with anti-synthetase syndrome." Arthritis and Rheumatism **10)**: S880.

Background/Purpose: Autoantibodies directed against the aminoacyl transfer RNA (tRNA) synthetases are associated with myositis, arthritis, Raynaud's phenomenon, mechanic's hands, fever, and interstitial lung disease, clinically referred to as the anti-synthetase syndrome. A preliminary report has described the detection of an autoantibody to tyrosyl- tRNA synthetase (TyrRS) in only one patient with features of anti- synthetase syndrome. In addition, it has also been reported that TyrRS can be split into two fragments with distinct cytokine activities. We aimed to identify further patients with anti-TyrRS autoantibodies using other assays than previously reported methods and elucidate their clinical significance. Method(s): Multiple assays were performed to detect anti-TyrRS antibodies in the sera of patients with active polymyositis/dermatomyositis patients. First, recombinant human TyrRS protein coupled with a His-tag was expressed in Escherichia coli. Autoantibodies against the recombinant human TyrRS in sera of patients with polymyositis/dermatomyositis were quantified by employing solid phase direct enzyme-linked immunosorbent assay (ELISA). Second, the recombinant human TyrRS was electrophoresed and transferred to PVDF membranes. Western blot was performed with the serum samples and anti-human IgG secondary antibodies. Third, TyrRS-transfected HeLaS3 cells were immunoprecipitated with sample serum. Then, the antibody-protein complex captured with muMACSTM Protein G MicroBeads was loaded onto a muColumn. The eluted immunoprecipitates were subjected to the SDS-polyaclylamidegel electrophoresis, and western blotted with rabbit anti-TyrRS polyclonal antibodies. In addition, the titer of anti-TyrRS antibodies was evaluated by ELISA before and after treatment among the patients with positive anti-TyrRS antibodies at the initial evaluation. Control sera were obtained from normal healthy control subjects. The clinical features of the patients with positive anti-TyrRS antibodies were analyzed. This study was approved by the ethics committee of our institution, and the principles of the Helsinki Declaration were followed throughout the study. Result(s): Sera from three patients with polymyositis/dermatomyositis showed significantly high O.D. values in ELISA, significant bands of 59 kDa protein of TyrRS at the same place as anti-His tag antibody in Western blot, and significant bands at the same place as the recombinant human TyrRS in immunoprecipitation assay. These data strongly suggest that these sera had autoantibodies to TyrRS. These patients had myositis, interstitial lung disease, arthritis, Raynaud's phenomenon, and fever. In two of the three patients, anti-TyrRS antibody titers decreased as clinical diseases were ameliorated following treatment. Conclusion(s): This study reconfirmed the presence of anti-TyrRS antibody in the setting of the anti-synthetase syndrome and strengthens the association of anti-synthetases with these conditions.

Okan, M., et al. (2019). "Current approaches to waste polymer utilization and minimization: a review." Journal of Chemical Technology and Biotechnology **94**(1): 8-21.

The mass production of polymer products, in particular plastics, and their widespread use depending on the inherent advantages they have, make these materials ironically a threat to life on Earth. Polymer recycling is being considered as one of the most widely accepted remedies to the threat of growing amounts of plastic waste by both the public and scientists. In practice, recycling is associated with many difficulties, such as problems related to separation, sorting and cleaning operations, lack of fiscal subsidies, instability of selective garbage separation programs, high transport and electricity costs, etc. Still, a large section of society and the authorities agree on the necessity and importance of recycling to protect the environment, and natural habitats and resources for future generations in a balanced manner to conserve raw materials, and to reduce energy consumption, municipal solid waste production and greenhouse gas emission. The recycling effort is almost endless in itself and includes a variety of approaches such as refurbishing, mechanically reshaping, chemically treating, thermally utilizing, etc. Some novel approaches such as application in carbon capture or synthesis of carbon nanostructures from the plastic waste are among the new process technologies of recycling. From traditional and promising polymer waste utilization approaches, this review will highlight sustainable methods to reduce impacts of plastic waste on the environment. © 2018 Society of Chemical Industry.

O'Kane, D. J. and J. Lee (1990). "Encapsulated radiophosphorescent standards for day-to-day photometer calibration." Photochemistry & Photobiology **52**(4): 723-734.

Solid, unquenched, radiophosphorescent standards for use in the day-to-day calibration of bottom viewing photometers (luminometers) were prepared by encapsulating

commercially-available phosphor powders that are excited to phosphoresce by the beta- decay of 63Ni (t0.5 = 96 yr) or 14C (t0.5 = 5730 yr). The radionuclides are physically adsorbed on the phosphors by precipitation either as a "basic nickel carbonate" or as barium carbonate. The radioactive phosphors are then deposited by centrifugation as a thin layer at the bottom of the vials or tubes that are normally used in the photometer. The phosphor layer is infiltrated with a plastic resin and embedded. A light absorbing layer is subsequently cast over the phosphor layer to prevent stray light excitation of phosphorescence. The encapsulated photometer standards have remained mechanically and photometrically stable since their fabrication, which in some cases is 3 years ago. An equivalent level of visible luminescence emitted from the standards of up to 2.3 x 10(10) photons.s-1 was achieved by using an appropriate amount of radioactivity and the proper phosphor. The phosphor used in the standards could be chosen such that the radiophosphorescence emission spectrum corresponded approximately to the chemiluminescence or bioluminescence spectrum under investigation.

Okano, T., et al. (2011). "Appropriate Unit of Measurement to Quantify the Contamination of Beaches by Synthetic Marine Debris." Journal of Environmental Chemistry **21**(1): 69-74.

Serious pollution of the beach environment by plastic marine debris (litter) has been reported around the world. However, these reports are recorded in two types of measurement units: /m and /m super(2). Therefore, we investigated which measurement is the more appropriate unit to measure beach debris. Our analysis is based on our 146 surveys of anthropogenic debris larger than or almost equal to plastic resin pellets from November 2004 to November 2009 at five relatively deserted beaches in Tottori, Japan. A total of 173, 981 fragments and items with a total weight of 433kg were collected. Surprisingly, about ten percent were thermal-fused plastic lumps, presumably due to incomplete burning. The floating marine debris washed up on the beaches normally forms a wrack belt, and the debris in the belt is over half of the total number and weight of the debris from shoreline to upper wrack limit. Since the wrack belts are narrow, the depth of sandy beaches affects neither the wash-up of floating debris nor the formation of debris belts. In fact, the correlation coefficients between the depth of beach and the number and weight of debris are very low (r sub(n)=0.20 and r sub(w)=0.19). The quantity of beach debris is significantly correlated with the length of the beach line because the wrack belt is usually parallel to the shoreline. Since the floating debris is ideally washed up on a one-dimensional intersection between beach and water surfaces,the unit of measure to quantify beach debris ought to be defined by the length of the beach line.

Okazaki, Y., et al. (2010). "Quantification of circulating endothelial progenitor cells: Verification of the Eustar recommendations." Clinical and Experimental Rheumatology **58)**: S169-S170.

Objective: It has been proposed that defective vasculogenesis with reduced and/ or dysfunctional endothelial progenitor cells (EPCs) plays a role in the pathogenic process of vasculopathy in patients with systemic sclerosis (SSc). However, whether the number of circulating EPCs is reduced in SSc patients is a matter of debate. The working group of EUSTAR recently proposed the recommendations for evaluation of EPCs. In this study, we evaluated these recommendations by comparing two different methods. Method(s): Peripheral blood samples were obtained from 10 SSc (5 diffuse and 5 limited cutaneous SSc) and 10 healthy controls (HC), divided into two tubes, and simultaneously subjected to flow cytometry (FCM)-based procedures to quantify EPCs after different enrichment techniques: immunomagnetic enrichment of CD34+ cells (Kuwana, Lancet 2004;364:603) and rosette-based enrichment of lineage-negative (Lin-) cells (Allanore, Ann Rheum Dis 2008;67:1455). After incubation with Fc-receptor blocking reagent, the enriched fractions were subjected to triple

labeling with anti-CD34, anti-CD133, and anti-VEGFR2 antibodies in conjunction with or without a viability maker 7-AAD. Finally, EPCs defined as 7-AAD-CD34+CD133+VEGFR2+ cells were detected by FCM, and their absolute number was determined by its ratio to the Flow-countTM microbeads. Result(s): The EPC numbers determined by the CD34+ cell-enriched protocol without 7-AAD staining (original method by Kuwana) and the Lin-cell-enriched protocol without microbead quantification (original method by Allanore) were not correlated at all (r=0.12, p=0.6). However, the numbers were correlated when 7-AAD staining and microbead quantification were applied to both procedures (r=0.65,p=0.002). In the Lin-cell-enriched protocol, the correlation between EPC numbers obtained with and without microbead quantification was not statistically significant (r=0.41), probably due to contamination of erythrocytes and platelets in the Lin-cell fraction, which constituted >90% of cell counts. The EPC count was significantly reduced in SSc than HC by CD34+ cell-enriched protocol with 7-AAD (2.7 +/- 1.4 versus 6.4 +/- 3.5/ml, p=0.01) and by Lin-cell-enriched protocol combined with microbeads (2.1 +/- 2.2 versus 6.7 +/- 2.9/ml, p=0.001). However, the count measured by the Lin-cell-enriched protocol without microbeads was similar (61.0 +/- 60.4 for SSc versus 76.9 +/- 52.3/106 Lin-cells for HC, p=0.5). Conclusion(s): The EUSTAR recommendations are valid when they are combined with the FCM procedure to count the absolute number of antibody-labeled cells. Two different protocols that met the revised recommendations consistency showed reduced circulating EPC count in SSc patients.

Okkenhaug, G., et al. (2015). "The presence and leachability of antimony in different wastes and waste handling facilities in Norway." Environmental Science. Processes & Impacts **17**(11): 1880-1891.

The environmental behaviour of antimony (Sb) is gathering attention due to its increasingly extensive use in various products, particularly in plastics. Because of this it may be expected that plastic waste is an emission source for Sb in the environment. This study presents a comprehensive field investigation of Sb concentrations in diverse types of waste from waste handling facilities in Norway. The wastes included waste electrical and electronic equipment (WEEE), glass, vehicle fluff, combustibles, bottom ash, fly ash and digested sludge. The highest solid Sb concentrations were found in WEEE and vehicle plastic (from 1238 to 1715 mg kg(-1)) and vehicle fluff (from 34 to 4565 mg kg(-1)). The type of acid used to digest the diverse solid waste materials was also tested. It was found that HNO3:HCl extraction gave substantially lower, non-quantitative yields compared to HNO3:HF. The highest water-leachable concentration for wastes when mixed with water at a 1 : 10 ratio were observed for plastic (from 0.6 to 2.0 mg kg(-1)) and bottom ash (from 0.4 to 0.8 mg kg(-1)). For all of the considered waste fractions, Sb(v) was the dominant species in the leachates, even though Sb(iii) as Sb2O3 is mainly used in plastics and other products, indicating rapid oxidation in water. This study also presents for the first time a comparison of Sb concentrations in leachate at waste handling facilities using both active grab samples and DGT passive samples. Grab samples target the total suspended Sb, whereas DGT targets the sum of free- and other chemically labile species. The grab sample concentrations (from 0.5 to 50 mug L(-1)) were lower than the predicted no-effect concentration (PNEC) of 113 mug L(-1). The DGT concentrations were substantially lower (from 0.05 to 9.93 mug L(-1)) than the grab samples, indicating much of the Sb is present in a non-available colloidal form. In addition, air samples were taken from the chimney and areas within combustible waste incinerators, as well as from the vent of WEEE sorting facility. The WEEE vent had the highest Sb concentration (from <100 to 2200 ng m(-3)), which were orders of magnitude higher than the air surrounding the combustible shredder (from 25 to 217 ng m(-3)), and the incinerator chimney (from <30 to 100 ng m(-3)). From these results, it seems evident that Sb from waste is not an environmental concern in Norway, and that Sb is mostly readily

recovered from plastic and bottom ash.

Okoffo, E. D., et al. (2019). "Wastewater treatment plants as a source of plastics in the environment: a review of occurrence, methods for identification, quantification and fate (Electronic supplementary information (ESI) available. See DOI: 10.1039/c9ew00428a)." Environmental Science. Water Research & Technology **5**(11): 1908-1931.

Plastics accumulate in the natural environment due to their durability and low recycling volumes. Wastewater treatments plants (WWTPs) have been identified as important sources for the release of plastics into aquatic and terrestrial environments that may lead to further contamination. This review provides a comprehensive summary of current knowledge on plastic pollution from WWTPs. Specifically, this article presents the current status on the sources of plastics entering WWTPs via influent, the occurrence of plastics in WWTP influent, treated effluent and sewage sludge as well as the techniques used for sampling and analysing plastics in WWTP derived samples. The fate and transfer of plastics from WWTPs to aquatic and terrestrial ecosystems is also discussed. While various studies have reported the presence of plastics in WWTP samples, which have certainly improved our level of understanding on the fate of plastics within the WWTP treatment chain, many unanswered questions still remain. A major gap is the lack of standardized methods and robust analytical techniques for the sampling, identification and quantification of plastics including nano-sized plastics in WWTP derived samples, leading to the potential underestimation of total plastics. To aid comparison of data generated by different researchers, we advocate for the harmonisation of sampling approaches, extraction methods, analytical techniques and reporting units for plastics abundance. Future studies should focus on enhanced methods that can also include estimates of nano-sized plastics.

Okudan, A., et al. (2019). "Cu(II) Sorption Performance of Novel Chitosan/Ter-(vinyl pivalate-maleic anhydride-N-tert-butylacrylamide) Microcapsules." Journal of Polymers & the Environment **27**(11): 2454-2463.

In this study, first, the ter-polymerization reaction between vinyl pivalate (VP), maleic anhydride (MA), and N-tert-butylacrylamide (NTBA) was done in inert atmosphere (N2). FT-IR and 1HNMR spectroscopy was applied to study the chemical composition of the obtained ter-polymers. MA content of the ter-polymers was determined by following the chemical titration method. Second, novel chitosan/ter-(vinyl-pivalate-maleic-anhydride-N-tert-butylacrylamide) microcapsules were synthesized. In microcapsule production, chitosan polymer served as a matrix for acrylamide ter-polymers with four different molar ratios. The microcapsules were characterized by FT-IR and SEM analyses. Cu(II) sorption efficiency of the microcapsules were tested at different pH levels, temperature, sorbent dosage, and metal ion concentration. Comparison with blank chitosan microbeads revealed that incorporation of acrylamide ter-polymers into the cross-linked chitosan matrix increased the metal sorption. Sorption capacities of the sorbents were recorded; blank chitosan microbeads: 67.03 mg g−1, and chitosan/acrylamide ter-polymer microcapsules: in range of 75.39–98.64 mg g−1. The findings demonstrated chitosan/acrylamide ter-polymer microcapsules can be utilized in sorption of Cu(II) ions in water treatment [ABSTRACT FROM AUTHOR]

Okunlola, A., et al. (2015). "Design of cissus-alginate microbeads revealing mucoprotection properties in anti-inflammatory therapy." International Journal of Biological Macromolecules **79**: 226-234s.

Cissus gum was used as polymer with sodium alginate in the formulation of diclofenac microbeads and the in vivo mucoprotective properties of the polymer in anti-inflammatory therapy was assessed in rats with carrageenan-induced paw oedema in comparison to diclofenac powder and commercial diclofenac tablet. A full 2³ factorial experimental design has been used to investigate the influence of concentration of cissus gum, concentration of calcium acetate and stirring speed on properties of the microbeads. Optimized small discrete microbeads with size of 1.22+or-0.10 mm, entrapment efficiency of 84.6% and t₈₀ of 15.2+or-3.5 h were obtained at ratio of cissus gum:alginate (1:1), low concentration of calcium acetate (5%, w/v) and high stirring speed (400 rpm). The in vivo studies showed that the ranking of percentage inhibition of inflammation after 3 h was diclofenac powder > commercial tablet=cissus > alginate. Histological damage score and parietal cell density were lower while crypt depth and mucosal width were significantly higher (P <0.05) in the groups administered with the diclofenac microbeads than those administered with diclofenac powder and commercial tablet, suggesting the mucoprotective property of the gum. Thus, cissus gum could be suitable as polymer in the formulation of non-steroidal anti-inflammatory drugs ensuring sustained release while reducing gastric side effects.

Okunlola, A., et al. (2012). "Formulation optimization of floating microbeads containing modified Chinese yam starch using factorial design." Journal of Excipients and Food Chemicals **3**(1): 17-25.

Controlled release floating metformin hydrochloride microbeads were prepared and optimized using a blend of varying concentrations of freeze-dried pregelatinized Chinese yam starch (Dioscorea oppositifolia L) and sodium alginate. Floating microbeads were prepared by the ionotropic gelation method using 10% w/v calcium chloride as the cross-linking agent and sodium bicarbonate as the gas releasing agent. A full 3² factorial design was used to investigate the influence of two variables: concentrations of starch (X<inf>1</inf>) and sodium bicarbonate (X<inf>2</inf>) on the swelling, floating lag time and amount of drug released after 1 hour (Q<inf>1</inf>) and 10 hours (Q<inf>10</inf>). Potential variables such as the concentrations of drug and total polymer were kept constant. The results showed that the properties of the floating microbeads were significantly (p<0.01) affected by the concentration of the modified Chinese yam starch. Buoyancy and drug release appeared to be facilitated by increased concentrations of both starch and sodium bicarbonate in the formulation. The results also show that an optimized formulation of metformin hydrochloride could be obtained with the potential for gastroretentive controlled drug delivery using a blend of freeze-dried pregelatinized Chinese yam starch and sodium alginate. © IPEC-Americas Inc.

Oleinikov, V. A. (2011). "[Semiconductor fluorescent nanocrystals (quantum dots) in biological biochips]." Bioorganicheskaia Khimiia **37**(2): 171-189.

Comprehension of biological processes in cells, tissues and organisms requires identification and analysis of numerous biological objects, mechanisms of their action and regulation. Microarray (biochips) technology is a rare tool to solve this problem. It is based on high-throughput recognition of a target to the probe and has the potential to measure simultaneously the presence of numerous molecules in multiplexed testes, all contained in a small drop of test fluid. Biochips allow the parallel analysis of genomic or proteomic content in healthy versus disease-affected or altered tissues or cells. The signals read-out from the biochips is done with organic dyes which often suffer from photobleaching, low brightness and background

fluorescence. Recent data show that the use of fluorescent nanocrystals "quantum dots" (QDs) allows push away these restrictions. The QDs are sufficiently bright to be detected as individual particles, extremely resistant to photobleaching and provide unique possibilities for multiplexing thus supplying the microarray technology with the novel read-out option enabling the sensitivity of detection reaching the single molecule level. This paper is aimed at the development of the approaches to the QDs application in microarray-based detection. Possibilities of QDs application both in solid state (planar) biochips as well as intensively developing technique of suspension biochips (bead-based assays or liquid biochips) are demonstrated. The latter are more and more applied for simultaneous identification of very large numbers of molecules in proteomics, genomics, drug screening and clinical diagnostics. This assays base on spectral encoded elements (as a rule polymer microbeads). The benefits of using optically encoded microbeads (instead of the solid-state two-dimensional arrays) are derived from the freedom of bead to move in three dimensions. Polymeric beads optically encoded with organic dyes allow for a limited number of unique codes, whereas the use of semiconductor nanocrystals as fluorescent tags improves the beads multiplexed imaging capabilities, photostability and sensitivity of the biological objects detection. Additionally, an employment in suspension biochips of Frster resonance energy transfer (FRET) allows improving detection specificity. The absence of fluorescent background from non-interacting with the beads dye-labelled antibodies additionally increases the sensitivity of detection and further facilitates the multiplexing capabilities of nanocrystals-based detection and diagnostics. So the combination of the biochips and QDs techniques allow increasing detection sensitivity and significantly raising the number of detected objects (multiplexing capacities). Such combination should provide the breakthrough in proteomics, particularly in new drugs development, clinical diagnostics, new disease markers identification, better understanding of intracellular mechanisms.

Olgasi, C., et al. (2015). "Correcting the bleeding phenotype in hemophilia A using lentivirally FVIII-corrected endothelial cells differentiated from hemophilic induced Pluripotent Stem Cells (iPSCs)." Human Gene Therapy **26 (10)**: A29-A30.

Hemophilia A (HA) is an X-linked bleeding disorder caused by factor VIII (FVIII) deficiency. Somatic cells can be reprogrammed generating autologous, disease-free iPSCs, differentiated into targets cells relevant for gene and cell therapy. We generated FVIII-corrected patient-specific iPSCs from peripheral blood cells and differentiated into functional endothelial cells (ECs), secreting FVIII after transplantation in HA mouse model. CD34 + cells were isolated from peripheral blood of healthy and hemophilic donors and reprogrammed with a Cre- Lox LV carrying OCT4, SOX2 and KLF4. Reprogrammed CD34 + cells originated ESC-like-iPSCs + colonies for AP staining and stem cell markers. EBs expressed germ layers specific markers and differentiated in osteogenic, chondrogenic and adipose tissues. iPSCs showed increased telomeres length and normal karyotype. FVIII-corrected HA-iPSCs expressed hBDD-FVIII by lentiviral vectors under the control of an ECspecific promoter (VEC). iPSCs differentiated into ECs, acquired endothelial-like morphology, expressed ECs markers and formed tubules when cultured in matrigel. VEC-GFP-LV transduced ECs were transplanted intraportal in NOD/ SCID(NS)-gammaNull mice engrafted and proliferated in the livers up to 12 weeks later. Finally, healthy and FVIII-corrected ECiPSC- derived linked to Cytodex microbeads were transplanted in NS hemophilic mice. aPTT was performed 3 and 7 days later and FVIII activity was 2% in mice transplanted with healthy cells and 5% in mice received FVIII-corrected HA cells. Immunofluorescent staining showed the presence of transplanted EC associated with beads recovered from injected mice. In conclusion, our cells engrafted, proliferated and expressed FVIII from differentiated, gene corrected and reprogrammed factor-free iPSCs confirming the

suitability of this approach for HA gene-cell-therapy.

Olivatto, G. P., et al. (2019). "Microplastic contamination in surface waters in Guanabara Bay, Rio de Janeiro, Brazil." Marine Pollution Bulletin **139**: 157-162.

Microplastics (MPs) are contaminants of environmental concern that represent a threat to marine systems. Here we report data on the abundance and characteristics of MPs collected from surface waters of the urban Guanabara Bay. Samples were collected, by horizontal trawling of a plankton net on two occasions (summer of 2016). The MPs were obtained from samples by sieving and particles were manually sorted with microscope. Characterization of MPs was accomplished by gravimetry and digital image processing (for quantification and morphology categorization), and chemical composition identified by infrared spectroscopy and elemental analyses. Total MPs ranged from 1.40 to 21.3particles/m³, which places Guanabara Bay amongst the most contaminated coastal systems worldwide by microplastics. Polyethylene and polypropylene polymers <=1mm were the most abundant particles. Therefore, the occurrence of MPs in Guanabara Bay is relevant to understand ecological hazards of exposition to marine biota and merits further investigation.

Oliveira, M. and M. Almeida (2019). "The why and how of micro(nano)plastic research." TrAC - Trends in Analytical Chemistry **114**: 196-201.

The presence of small plastic particles in the environment, reported for the first time in the 1970's, has only recently been recognized as a global issue. Although environmental awareness continues to grow, so does its consumption and associated risks. The number of studies reporting the presence of microplastics, has grown exponentially as did the concern over plastic degradation into smaller particles like nanoplastics, a potentially more pernicious form of plastic pollution. The reported effects of micro(nano)plastics on biota range from depletion of energy reserves and altered metabolism to immunological, neurotoxic effects and behavioral effects. This paper presents a critical review of current scientific knowledge in terms of reasons to study the effects of small plastics present in the environment, what has been assessed so far; most common methodologies. Research and technical developments requirements are also presented. Overall, it is clear the need for standardization of procedures and communication of results. Copyright © 2019 Elsevier B.V.

Oliveira, M., et al. (2019). "A micro(nano)plastic boomerang tale: A never ending story?" TrAC - Trends in Analytical Chemistry **112**: 196-200.

Plastics are an integral but largely inconspicuous part of human daily routines. Associated with a high production and single use nature of several products, small plastic particles became ubiquitous. Due to processes like water currents and winds, plastics may occur far from their place of origin and affect biota at different environmental compartments. In the environment plastics can degrade into increasingly smaller particles, reaching a nanometer size which increases their potential to be incorporated by organisms. Currently it is recognized that the plastics in the environment are reaching humans via contaminated food, drinks, and air but their effects on humans are largely unknown. In this paper, the potential exposure routes and effects to humans are discussed and approaches to decrease impact of microplastics to humans presented. Copyright © 2019 Elsevier B.V.

Oliveira, M., et al. (2019). "Are ecosystem services provided by insects "bugged" by micro (nano)plastics?" TrAC - Trends in Analytical Chemistry **113**: 317-320.

Although the study of the effects of microplastics increased in the last years, terrestrial

ecosystems remain less studied. In fact, the effects of microplastics in insects, the most abundant group of animals and major providers of key Ecosystem Services, are not well known despite the potential cascading negative effects on the ecosystems functioning in the habitats where they occur. In this paper, a revision on available studies on microplastics contamination is provided and potential consequences to major Ecosystem Services provided by insects are discussed, using the Common International Classification of Ecosystem Services (CICES) methodology. The revision underpinned probable and potential impacts for all tree CICES divisions, i.e.: Provision, Regulation and Maintenance and Cultural Services. The available studies seem to show that different groups react differently to microplastics contamination, which clearly indicates that the effects in Ecosystem Services provided by insects need a more empirical and targeted approach. Copyright © 2019 Elsevier B.V.

Oliveira, M., et al. (2013). "Single and combined effects of microplastics and pyrene on juveniles (0+ group) of the common goby Pomatoschistus microps (Teleostei, Gobiidae)." Ecological Indicators **34**: 641-647.

Microplastic particles have increasingly been detected in aquatic biota, from zooplankton to fish, raising concern for potential effects on aquatic organisms. In addition, they may potentially influence the toxicity of other contaminants in the marine environment. The aim of this study was to clarify whether polyethylene microspheres (1-5 micro m) modulate short-term toxicity of the polycyclic aromatic hydrocarbon pyrene to juveniles (0+ group) of the common goby (Pomatoschistus microps). Fish were exposed for 96 h to pyrene (20 and 200 micro g L⁻¹) in the absence and presence of microplastics (0, 18.4 and 184 micro g L⁻¹). Mortality, bile pyrene metabolites, and biomarkers involved in neurotransmission, aerobic energy production, biotransformation and oxidative stress were quantified. Microplastics delayed pyrene-induced fish mortality and increased the concentration of bile pyrene metabolites. Microplastics, alone or in combination with pyrene, significantly reduced acetylcholinesterase (AChE) activity, an effect also observed for pyrene alone. The mixture also decreased isocitrate dehydrogenase (IDH) activity. No significant effects were found for glutathione S-transferase activity or lipid peroxidation. Overall, results show that: (i) microplastics modulate either the bioavailability or biotransformation of pyrene; (ii) simultaneous exposure to microplastics and pyrene decrease the energy available through the aerobic pathway of energy production; and (iii) microplastics inhibit AChE activity. The mechanism for AChE inhibition appeared to be different for pyrene and microplastics, since simultaneous exposure to both did not increase significantly the inhibitory effect. The observed neurotoxic effects of microplastics per se and the effects on IDH activity of the two stressors combined are of concern because they may increase mortality in natural fish populations. More studies need to be carried out on possible combined effects of microplastics and polycyclic aromatic hydrocarbons on fish, particularly juveniles.

Oliveira, P., et al. (2018). "Effects of microplastics and mercury in the freshwater bivalve Corbicula fluminea (Muller, 1774): Filtration rate, biochemical biomarkers and mercury bioconcentration." Ecotoxicology and Environmental Safety **164**: 155-163.

The main objectives of this study were to investigate the effects of a mixture of microplastics and mercury on Corbicula fluminea, the post-exposure recovery, and the potential of microplastics to influence the bioconcentration of mercury by this species. Bivalves were collected in the field and acclimated to laboratory conditions for 14 days. Then, a 14-day bioassay was carried out. Bivalves were exposed for 8 days to clean medium (control), microplastics (0.13 mg/L), mercury (30 micro g/L) and to a mixture (same concentrations) of

both substances. The post-exposure recovery was investigated through 6 additional days in clean medium. After 8 and 14 days, the following endpoints were analysed: the post-exposure filtration rate (FR); the activity of cholinesterase enzymes (ChE), NADP-dependent isocitrate dehydrogenase (IDH), octopine dehydrogenase, catalase, glutathione reductase, glutathione peroxidase and glutathione S-transferases (GST), and the levels of lipid peroxidation (LPO). After 8 days of exposure to mercury, the bioconcentration factors (BCF) were 55 in bivalves exposed to the metal alone and 25 in bivalves exposed to the mixture. Thus, microplastics reduced the bioconcentration of mercury by C. fluminea. Bivalves exposed to microplastics, mercury or to the mixture had significantly ($p <= 0.05$) decreased FR and increased LPO levels, indicating fitness reduction and lipid oxidative damage. In addition, bivalves exposed to microplastics alone had significant ($p <= 0.05$) reduction of adductor muscle ChE activity, indicating neurotoxicity. Moreover, bivalves exposed to mercury alone had significantly ($p <= 0.05$) inhibited IDH activity, suggesting alterations in cellular energy production. Antagonism between microplastics and mercury in FR, ChE activity, GST activity and LPO levels was found. Six days of post-exposure recovery in clean medium was not enough to totally reverse the toxic effects induced by the substances nor to eliminate completely the mercury from the bivalve's body. These findings have implications to animal, ecosystem and human health. Copyright © 2018 The Authors

Oliviero, M., et al. (2019). "Leachates of micronized plastic toys provoke embryotoxic effects upon sea urchin Paracentrotus lividus." Environmental Pollution **247**: 706-715.

Microplastics are defined as plastic fragments <5 mm, and they are found in the ocean where they can impact on the ecosystem. Once released in seawater, microplastics can be internalized by organisms due to their small size, moreover they can also leach out several additives used in plastic manufacturing, such as plasticizers, flame retardants, etc., resulting toxic for biota. The aim of this study was to test the toxicity of micronized PVC products with three different colors, upon Paracentrotus lividus embryos. In particular, we assessed the effects of micronized plastics and microplastic leachates. Results showed a decrease of larval length in plutei exposed to low concentrations of micronized plastics, and a block of larval development in sea urchin embryos exposed to the highest dose. Virgin PVC polymer did not result toxic on P. lividus embryos, while an evident toxic effect due to leached substances in the medium was observed. In particular, the exposure to leachates induced a development arrest immediately after fertilization or morphological alterations in plutei. Finally, PVC products with different colors showed different toxicity, probably due to a different content and/or combination of heavy metals present in coloring agents.

Oltean, S., et al. (2014). "Platelet refractoriness management on the basis of HLA antibody specificity." Tissue Antigens **84 (1)**: 119.

Platelet refractoriness (PR) is defined as a posttransfusion platelet increment less than expected. It occurs due to non-immune causes and/or immunological mechanisms such as alloimmunization to HLA and/or platelet-specific antigens. For patients who are refractory to platelet transfusion as a result of HLA alloimmunization there are three strategies for identifying compatible platelet units: HLA-matching, crossmatching and antibody specificity prediction. HLA typing by sequence specific oligonucleotide-PCR, detection of anti-HLA antibodies by a Luminex-based microbead assay and identification of their specificity on the Luminex platform utilizing microbeads coated with individual HLA are performed in our transfusion service in cases of PR. In 18 of 29 patients (62%) investigated over 1 year (Jan 2013 - Jan 2014) for PR we detected anti-HLA class I antibodies and identified their specificity. The gender ratio (F/M) was

12/6 in the anti-HLA class I positive group as compared to 4/7 in the negative group. Ten (5F/5M) of 18 patients were transfused with leucocyte-depleted blood components before the occurrence of PR (in 8 the transfusion history was not available). Among the positive patients, the highest MFI (mean fluorescence intensity) in the antibody identification assay varied between 1731 and 15436 (median 10400) and the most frequent specificity for the highest MFI was anti-A2 (30%). Sixteen (89%) of the positive patients had a haematological disease that had required subsequent multiple platelet transfusions. HLA antibody identification proved to be a very valuable tool in providing platelets selected according to the patient's antibody specificity in those cases when they could not benefit of HLA-mached platelets.

Omar, H., et al. (2004). "Techno-Economic Feasibility Study of Manufacturing Yarn from Recycled Plastics." Polymer-Plastics Technology & Engineering **43**(6): 1687-1693.

Solid waste management is becoming a problem that demands a timely solution. Those people concerned with municipal solid waste (MSW), are faced with the problem of disposing of significant volumes of potentially hazardous waste materials. There are many sectors which can make use of this MSW. One such sector in Oman is plastic manufacturing that uses polyethylene yarn from which they make net bags for the fruit and vegetable market. The yarn is produced from 75 wt.% high-density polyethylene (HDPE), 12 wt.% polyethylene (PE), and 13 wt.% MB for color. The HDPE comes from Asian countries and constitutes about 35% of the total production cost. Replacement of HDPE with 35 wt.% Recycled Product is estimated to reduce production costs by 10%. Such a reduction in production costs will give these local Plastic manufacturers a competitive edge. On the other hand, the reduction of plastic waste reduces the environmental effects, creates different groups of buyers, receivers, dealers and recycling enterprises, and therefore new jobs. [ABSTRACT FROM AUTHOR]

Omer, A. M., et al. (2016). "Development of amphoteric alginate/aminated chitosan coated microbeads for oral protein delivery." International Journal of Biological Macromolecules **92**: 362-370.

A new amphoteric biopolymer carrier based on alginate and aminated chitosan coated microbeads (Alg/AmCS) was developed and characterized for bovine serum albumin (BSA) protein delivery. The amphoteric character was investigated through studying the swelling and in vitro BSA release behaviors of the developed microbeads in simulated gastric (SGF; pH1.2), intestinal (SIF; pH6.8), and colonic (SCF; pH7.4) fluids. The pH sensitivity was found to depend on the amount of AmCS in the coating medium. The results were interpreted from the view of the individual pH sensitivity of alginate and aminated chitosan in addition to the ionic interaction between them under the studied pHs. Besides; it was found that the BSA loading efficiency (LE) exceeded 82% regardless of the initial concentration of BSA. The released amount of BSA reached approximately 63% and 86% in SIF and SCF, respectively, using 0.25% AmCS. The stability of alginate microbeads in SCF was improved with increasing AmCS concentration in the coating medium up to 2%. Furthermore, the developed microbeads demonstrated their ability for biodegradation in addition to their antibacterial activities against selected bacterial strains. The results clearly suggested that Alg/AmCS coated microbeads could be suitable carriers for site-specific protein delivery in the intestinal and colon tracts. Copyright © 2016 Elsevier B.V.

Onay, H. and G. Dalgic (2019). "SEASONAL CHANGES IN THE FOOD SPECTRUM AND DAY-TIME RHYTHM OF FEEDING IN RED MULLET MULLUS BARBATUS (LINNAEUS, 1758) IN THE SOUTHEAST BLACK SEA." Fresenius Environmental Bulletin **28**(4): 2671-2268.

The diet of the red mullet Mullus barbatus was studied in the southeast Black Sea region of Turkey during the autumn, winter, summer and spring. In one year, the stomach contents of 760 individuals of M. barbatus, a confirmed omnivorous fish species, were examined (April 2017-March 2018), in addition to those of 180 additional individuals examined within a 24-h period (28 April 2018). Among the 14 prey groups identified in the stomachs of red mullet, the predominant one was Bivalvia, followed by Nematoda, Polychaeta, Brachyura and Cumacea. Data analysis revealed significant differences in prey species composition between seasons (ANOSIM, $R = 0.089$, $p < 0.001$). Moreover, the prey groups that constituted the majority of the diet changed significantly with a season. SIMPER analysis revealed that the prey item contributing the most to the differences between seasons was Bivalvia. Microplastic was also found in the samples. Analysis of the daily rhythm diet variation in stomach contents allowed the identification of 8 prey groups, namely Bivalvia, Amphipoda and Cumacea. In 24-hour examinations, feeding began in the first hours of the day, then showed an increase in the following hours and decreased after the evening. The results of this study could be used to describe the diversity of prey species and intraspecific food competition in the Black Sea. [ABSTRACT FROM AUTHOR]

O'Neill, G. J., et al. (2015). "Kinetics of immobilisation and release of tryptophan, riboflavin and peptides from whey protein microbeads." Food Chemistry **180**: 150-155.

This study investigated the kinetics of immobilisation and release of riboflavin, amino acids and peptides from whey microbeads. Blank whey microbeads were placed in solutions of the compounds. As the volume of microbeads added to the solution was increased, the uptake of the compounds increased, to a maximum of 95% for the pentapeptide and 56%, 57% and 45% for the dipeptide, riboflavin and tryptophan respectively, however, the rate of uptake remained constant. The rate of uptake increased with increasing molecule hydrophobicity. The opposite was observed in the release studies, the more hydrophobic compounds had lower release rate constants (kr). When whey microbeads are used as sorbents, they show excellent potential to immobilise small hydrophobic molecules and minimise subsequent diffusion, even in high moisture environments.

O'Neill, G. J., et al. (2015). "In vitro and in vivo evaluation of whey protein hydrogels for oral delivery of riboflavin." Journal of Functional Foods **19**(Part A): 512-521.

The release of riboflavin from whey microbeads under in vitro and in vivo gastrointestinal conditions was evaluated. Release of riboflavin from whey protein microbeads subjected to in vitro gastric digestion was rapid. To limit the release of riboflavin the microbeads were convection dried at 30 degrees C. Effects of temperature, pH and simulated gastric salts on the release of riboflavin from dried beads were examined. Dried microbeads underwent swelling at gastric and intestinal pH resulting in the release of 58 and 34% of riboflavin respectively in the

first hour. Drying significantly decreased the riboflavin release rate constant (k_r) from 0.1 to 0.016/min. Microbeads fed to piglets via oral gavage showed good resistance to gastrointestinal degradation as microbeads recovered from the colon 8.5 hours after ingestion were only partially degraded. This study showed that dried whey microbeads have potential as an encapsulation system for oral delivery of bioactives to the intestine.

Ongen, A. (2016). "Methane-rich syngas production by gasification of thermoset waste plastics." Clean Technologies & Environmental Policy **18**(3): 915-924.

Thermoset waste plastics from a cable materials company have been processed using pyrolysis/gasification in a fixed-bed steel reactor with cyclone separation unit to produce fuel gas mixture consisting primarily of H, CH, and CO. Initially, samples were pyrolysed at 600 °C and processed for gasification through 0.05 L min dry air at 750 °C. Following samples were conducted under direct gasification conditions at dry air flows varying 0.05, 0.1, and 0.2 L min at 750 °C. Transformation of solid residual, and liquid and gas products which were obtained at the end of the thermal processes conducted under varying conditions was monitored. Volume percentages of H, CH, and CO gases within the produced gas were instantly measured via continuous gas analyser. It was determined that thermoset plastic waste which can remain in the environment without disintegration decreases in mass by 94 % and solid forms being easy to control occur at the end of heat treatment. Within the scope of waste-to-energy, 3100 kcal m medium calorific value gas was produced through direct gasification 750 °C and optimum air volume was 0.05 L min. Data management and statistical analysis were carried out with SPSS software. Thermochemical processing of waste plastic from waste wire and cable materials in a fixed-bed steel reactor with a cyclone separator achieved promising results to produce synthetic fuel gas. [ABSTRACT FROM AUTHOR]

Onink, V., et al. (2019). "The Role of Ekman Currents, Geostrophy, and Stokes Drift in the Accumulation of Floating Microplastic." Journal of Geophysical Research. Oceans **124**(3): 1474-1490.

Floating microplastic in the oceans is known to accumulate in the subtropical ocean gyres, but unclear is still what causes that accumulation. We investigate the role of various physical processes, such as surface Ekman and geostrophic currents, surface Stokes drift, and mesoscale eddy activity, on the global surface distribution of floating microplastic with Lagrangian particle tracking using GlobCurrent and WaveWatch III reanalysis products. Globally, the locations of microplastic accumulation (accumulation zones) are largely determined by the Ekman currents. Simulations of the North Pacific and North Atlantic show that the locations of the modeled accumulation zones using GlobCurrent Total (Ekman+Geostrophic) currents generally agree with observed microplastic distributions in the North Pacific and with the zonal distribution in the North Atlantic. Geostrophic currents and Stokes drift do not contribute to large-scale microplastic accumulation in the subtropics, but Stokes drift leads to increased microplastic transport to Arctic regions. Since the WaveWatch III Stokes drift and GlobCurrent Ekman current data sets are not independent, combining Stokes drift with the other current components leads to an overestimation of Stokes drift effects and there is therefore a need for independent measurements of the different ocean circulation components. We investigate whether windage

would be appropriate as a proxy for Stokes drift but find discrepancies in the modeled direction and magnitude. In the North Pacific, we find that microplastic tends to accumulate in regions of relatively low eddy kinetic energy, indicating low mesoscale eddy activity, but we do not see similar trends in the North Atlantic. Plain Language Summary: Microplastic is a common form of pollution in the oceans, and high floating microplastic concentrations tend to be observed at the surface in the subtropical ocean gyres. These regions are commonly referred to as garbage patches. However, the physical processes that control the buildup in these regions are not yet fully understood. Therefore, we model microplastic transport with various surface current components that correspond to different physical processes. We do this with Lagrangian modeling, where microplastic is represented by virtual particles that are transported by ocean currents. We find good agreement between the modeled distribution with the full surface currents with observations in the North Pacific and North Atlantic and find that the microplastic accumulation is mainly due to the wind-driven Ekman currents. Meanwhile, wave-driven Stokes drift results in microplastic transport to Arctic regions. Since Stokes drift has not consistently been included in microplastic transport modeling, microplastic contamination of Arctic regions might be more severe than currently expected. Key Points: Ekman currents are the main process behind microplastic accumulation in the subtropical ocean gyresStokes drift contributes to microplastic transport to Arctic regionsWindage is, on a global scale, not an accurate proxy to model Stokes drift dynamics [ABSTRACT FROM AUTHOR]

Onwudili, J. A. and P. T. Williams (2016). "Catalytic supercritical water gasification of plastics with supported RuO2: A potential solution to hydrocarbons-water pollution problem." Process Safety & Environmental Protection: Transactions of the Institution of Chemical Engineers Part B **102**(Part B): 140-149.

Here we report on a potential catalytic process for efficient clean-up of plastic pollution in waters, such as the Great Pacific Garbage Patch (GPGP). Detailed catalytic mechanisms of RuO2 during supercritical water gasification of common polyolefin plastics including low-density polyethylene (LDPE), high-density polyethylene (HDPE), polypropylene (PP) and polystyrene (PP) have been investigated in a batch reactor at 450 °C for 60 min. All four plastics gave very high carbon gasification efficiencies (CGE) and hydrogen gasification efficiencies (HGE). Methane was the highest gas component, with a yield of up to 37 mol kg-1 LDPE using the 20 wt% RuO2 catalyst. Evaluation of the gas yields, CGE and HGE revealed that the conversion of PS involved thermal degradation, steam reforming and methanation; whereas hydrogenolysis was a possible additional mechanism during the conversion of aliphatic plastics. The process has the benefits of producing a clean-pressurized methanerich fuel gas as well as cleaning up hydrocarbons-polluted waters. [ABSTRACT FROM AUTHOR]

Opitz, S., et al. (2015). "The removal of Triton X-100 by dialysis is feasible!" Analytical and bioanalytical chemistry **407**(4): 1107-1118.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Triton X-100 has been widely used in many analytical and preparative protocols for a long time. Nevertheless, mass spectrometry, chromatographic separation, and spectrophotometric readout may be considerably hampered by this detergent due to signal suppression, complex formation, and high blank values, respectively. Additionally, Triton X-100 is not safe to remove prior to analytics. Here, microdialysis is introduced as a parallelizable, high-throughput method to clean samples from Triton X-100 with high efficacy and precision. To achieve this, we exploit the potential to considerably increase the critical micellar concentration of Triton X-100 by alteration of matrix properties. To that end, addition of several chaotropic compounds and organic solvents has been shown to increase the critical micellar concentration as well as the removal rate of the detergent. For application, matrix additives can be selected for analyte stability requirements out of a variety of compounds. Conveniently, all these additives are removable subsequently using the same microdialysis tool for downstream analytics requirements. Applicability and protocols are shown with proteomic sample preparation of purified proteins and complex protein mixtures prior to matrix-assisted laser desorption ionization (MALDI) mass spectrometry.

Oppenheimer, H., et al. (2012). "SET7/9 and SIRT1 induce promoter-driven collagen 2ALPHA1 expression in 3D cultured human chodrocytes." Annals of the Rheumatic Disease. Conference: Annual European Congress of Rheumatology of the European League Against Rheumatism, EULAR **71**(SUPPL. 3).

Background Osteoarthritis (OA) is characterized by disrupted balance between extracellular matrix (ECM) synthesis and breakdown, leading to loss of articular cartilage (AC) and severe joint pain-dysfunction. Collagen type IIalpha1 (Col2alpha1) is a predominant cartilage-type ECM component that forms densely packed fibers which provide tensile force to the tissue, enabling it to withstand mechanical compression. Previous published findings establish that the protein deacetylase SirT1 is a positive regulator of Col2alpha1 expression. SirT1 achieves this by recruiting PGC1a and Sox9 to the enhancer region of Col2alpha1. Additional data in SirT1 overexpressing chondrocytes show that SirT1 is enriched on the promoter region of actively transcribed Col2alpha1 and reduced during OA development. Objectives Here we propose to explore the SirT1-mediated promoter-driven mechanism of Col2alpha1 expression in human chondrocytes. Methods Isolated human OA-derived (passage 2) chondrocytes were encapsulated in three dimensional (3D) alginate hydrogel microbeads and systematically compared to their equivalent monolayer (2D) cultures. Col2alpha1 expression was examined via confocal microscopy immunofluorescence, quantitative PCR (qPCR) and immunoblot analyses. SirT1 protein and RNA levels were analyzed via immunoblot and qPCR analyses, respectively. Chromatin immunoprecipitation (ChIP) for SirT1, SirT1-associated chromatin modifying enzymes (CMEs) and histone modifications were carried out on the Col2alpha1 promoter site. Sequential ChIP was executed to characterize SirT1 complex formation with CMEs on the Col2alpha1-promoter of actively transcribed Col2alpha1. Results 3D-cultured human chondrocytes possessed augmented expression of Col2alpha1 as compared to their equivalent 2D cultures. ChIP analyses for the promoter of Col2alpha1 exhibited enrichment for SirT1 and the histone methyl transferase SET7/9 in 3D cultured chondrocytes vs. 2D cultures. Sequential-ChIP assays revealed that SirT1 and SET7/9 form a protein complex on the promoter

region of Col2alpha1 and show elevated marks of Histone 3 Lysine 4 trimethylation (3MeH3K4), where Col2a1 is actively transcribed. Contrary to the enrichment SirT1 on the Col2a1 promoter site, ChIP assays revealed enhanced acetylation of its histone target H4K16 during Col2a1 expression. Conclusions (i) 3D/2D experimental platforms provide a valuable tool for deciphering epigenetic mechanisms of gene regulation towards a better understanding of processes leading to tissue degeneration and disease, as in OA. (ii) Our preliminary data show that SirT1 and SET7/9 co-regulate COL2alpha1 expression through their enhanced association on its promoter region. Increased marks of histone acetylation especially in known SirT1 deacetylation targets (i.e. H4K16) may be a result the inhibitory effect of SET7/9 on the SirT1 deacetylase activity, consistent with previous reports. Expectedly, these investigations will provide mechanistic insight of cartilage ECM production, towards identifying novel epigenetic drug targets for the treatment of OA in susceptible individuals.

Oppenheimer, H., et al. (2013). "SET7/9 represses sirt1 to induce collagen type ii expression in3D cultured human chodrocytes." Osteoarthritis and Cartilage **1)**: S170.

Objective: Collagen type II (Col-II) plays a significant role in skeletal development and cartilage homeostasis and its loss with age is associated with degenerative joint diseases such as osteoarthritis (OA). Previously findings establish that the protein deacetylase SirT1 is required for enhanced expression of Col-IIa1, a major cartilage structural component of Col-II. Here we profile the mechanism by which SirT1 activates promoter-driven Col-IIa1 expression. Method(s): Chondrocytes derived from human osteoarthritic knee joints were encapsulated in three-dimensional alginate hydrogel microbeads (3D) and compared to paired monolayer (2D, passage 2) cultures derived from the same donor tissue. 3D-cultured cells displayed augmented expression of Col-IIa1 and were subject to serial chromatin immunoprecipitation (ChIP) and ChIP reChIP analyses to characterize epigenetic variations as compared to 2D cultures. Result(s): ChIP analyses exhibited enrichment for SirT1 and the histone methyl transferase Set7/9, which formed a complex in 3D cultures wherein Col-IIa1 was augmented in expression. Consistent with enriched Set7/9 levels on the Col-IIa1 promoter, ChIP data revealed enriched levels of trimethylation on histone 3 lysine 4 (3MeH3K4). Acetylated H3K9/14 and H4K16 on Col-IIa1 promoters of 3D-cultured chondrocytes were also elevated indicating that SirT1 is enzymatically repressed by Set7/9 on the transactivated Col-IIa1 promoter. Elevated marks of the Histone acetyl transferases GCN5 and P300 also supported the local enrichment of their acetylated histone marks (i.e. H3K9/ 14,H4K5 and H4K16). Conclusion(s): The data support that Set7/9 is capable of locally repressing SirT1 enzymatic activity on the promoter of Col-IIa1, resulting in its augmented expression dependent on cell morphology.

Oren, A., et al. (2005). "A comparative study of immunomagnetic methods used for separation of human natural killer cells from peripheral blood." Journal of Immunological Methods **303**(1-2): 1-10.

Immunomagnetic sorting of natural killer (NK) cells from the peripheral blood of healthy donors has been evaluated in a comparative study of composition, yield and activation of target cells obtained by positive (Dynabeads, Microbeads) and negative (Microbeads) sorting procedures. Positively sorted target cells were selected by expression of the NK cell marker CD56, whereas NK cells obtained by negative sorting were those remaining after steps to remove all non-NK cell leukocyte populations were accomplished. In positive sorting, both CD56+CD3- NK cells and CD56+CD3+ natural killer T (NKT) cells were included. The NKT cell fraction differed between individuals, but not between the positive sorting methods. Whereas 20-30% of positively sorted target cells were NKT cells, only approximately 3% of negatively sorted cells were CD3+. Contamination with monocytes and B cells was low (1-3%) in all methods studied. Sorting with

Microbeads (both positive and negative) gave higher cell yields than those obtained with Dynabeads (14% vs. 5% of total leukocyte numbers). A higher CD56 fluorescence intensity of NK cells and a better discrimination between the CD56bright and CD56dim NK cell subpopulations was obtained after negative sorting. Dynabeads-separated cells had, shortly after separation, a significantly higher expression (approximately 30%) of the early activation marker CD69 than cells either positively or negatively separated by Microbeads (approximately 8%). CD56+ cells positively sorted by Microbeads demonstrated a significantly higher production of TNF-alpha and IFN-gamma after IL-2 stimulation than Dynabeads-sorted cells. However, the cytotoxicity of cells obtained by the two positive sorting procedures did not differ. In conclusion, positive selection of CD56+ cells by Microbeads is better than Dynabeads, as determined from cell yield and procedure-associated cell activation and should be chosen for in vitro studies of NK/NKT cells. However, when pure NK cells and phenotypic subtypes are to be studied, negative sorting seems most appropriate.

Orhan, Y. and H. Bueyuekguengoer (2000). "Enhancement of biodegradability of disposable polyethylene in controlled biological soil." International Biodeterioration & Biodegradation **45**(1-2): 49-55.

Plastics as polyethylene are widely used in packaging and other agricultural applications. They accumulate in the environment at a rate of 25 million tons per year. Thus, the development and use of degradable plastics was proposed as a solution for plastic waste problem. Because of the ever-increasing use of plastic films, nowadays, biodegradability has become a useful characteristic for plastics. Conversely, the introduction of biodegradable plastics has generated a need for methods to evaluate the biodegradation of these polymers in landfills and solid waste treatment systems such as composting or anaerobic digestion treatment plants. The purpose of this study was to investigate the biodegradation of disposable low-density polyethylene bags containing starch (12%), autoxidizable fatty acid ester and catalytic agents in soil. Structurally this work intended to evaluate the capacity of Phanerochaete chrysosporium (ATCC 34541) to enhance polyethylene film biodegradation in soil microcosms. Soil samples inoculated with P. chrysosporium were mixed with LDPE/starch blend films and biological changes of the films and soil were monitored for 6 months. The biodegradation of polyethylene starch blend film has been determined by the physical, chemical and biological properties of the samples such as pH, biomass, CO sub(2) formation, percentage elongation, relative viscosity and FTIR spectrum.

Oriekhova, O. and S. Stoll (2018). "Heteroaggregation of nanoplastic particles in the presence of inorganic colloids and natural organic matter." Environmental Science: Nano **5**(3): 792-799.

The presence and accumulation of micro- and nanoplastics in marine and fresh waters represent a huge environmental concern. Due to the complexity of nanoplastic surface chemistry and impact of the surrounding aquatic environment, the fate of nanoplastics is still difficult to evaluate. Our study aims to explore the effect of different water components such as natural organic matter and inorganic colloids as well as water composition on the stability of polystyrene nanoplastics. Heteroaggregation experiments are performed under contrasting conditions by considering mixtures of three components: nanoplastics, Fe_2O_3 and alginate and at different concentration ratios. It is found that the charge neutralization mechanism in most cases is responsible for the formation of large heteroaggregates. A shift in the optimal heteroaggregation concentration is observed in the presence of alginate indicating competitive effects between alginate and Fe_2O_3. The formation of primary heteroaggregates is found to be a requisite before the formation of large structures. The behavior of polystyrene nanoplastics is also studied here in natural water from the Rhône river. Nanoplastic particles are found to

rapidly change their surface charge from positive to negative and form small heteroaggregates at low concentration. Increasing the nanoplastic particle concentration is found to result in the formation of large heteroaggregates when the isoelectric point is achieved indicating the importance of nanoplastic surface charge neutralization.

Orte, M. R. d., et al. (2019). "Response of bleached and symbiotic sea anemones to plastic microfiber exposure." Environmental Pollution **249**: 512-517.

Microplastics are emerging contaminants in the marine environment. They enter the ocean in a variety of sizes and shapes, with plastic microfiber being the prevalent form in seawater and in the guts of biota. Most of the laboratory experiments on microplastics has been performed with spheres, so knowledge on the interactions of microfibers and marine organisms is limited. In this study we examined the ingestion of microfibers by the sea anemone Aiptasia pallida using three different types of polymers: nylon, polyester and polypropylene. The polymers were offered to both symbiotic (with algal symbionts) and bleached (without algal symbionts) anemones. The polymers were introduced either alone or mixed with brine shrimp homogenate. We observed a higher percentage of nylon ingestion compared to the other polymers when plastic was offered in the absence of shrimp. In contrast, we observed over 80% of the anemones taking up all types of polymers when the plastics were offered in the presence of shrimp. Retention time differed significantly between symbiotic and bleached anemones with faster egestion in symbiotic anemones. Our results suggest that ingestion of microfibers by sea anemones is dependent both on the type of polymers and on the presence of chemical cues of prey in seawater. The decreased ability of bleached anemones to reject plastic microfiber indicates that the susceptibility of anthozoans to plastic pollution is exacerbated by previous exposure to other stressors. This is particularly concerning given that coral reef ecosystems are facing increases in the frequency and intensity of bleaching events due to ocean warming.

Ortega Lopez, J., et al. (1993). "Lactose hydrolysis by immobilized beta -galactosidase on nylon-6: a novel spin-basket reactor." Biotechnology Techniques **7**(11): 775-780.

beta -D-Galactosidase from Kluyveromyces marxianus var. lactis immobilized on nylon-6 microbeads was used to hydrolyse lactose in skim milk (28.6% TS) using a novel spin-basket reactor. >75% of lactose was hydrolysed at 34 degrees C and a flow rate of 1.5 litres/h within a short time period (<7 min). The spin-basket reactor configuration had the kinetic advantage of a packed-bed reactor, and none of the plugging typically seen in packed column methods was experienced. The activity of the immobilized enzyme remained virtually unchanged after 52 days of alternate use and storage at 4 degrees C; after 29 months 53% of the original enzyme activity remained. It is suggested that a short washing cycle could be introduced to reduce the loss of enzyme activity caused by microbial contamination and to increase the operational life of the enzyme. This system satisfied requirements for industrial application in that it demonstrated high efficiency and stability and had a reactor configuration which was appropriate for continuous operation.

Ortiz, N. (2018). Eps antibiotics: photodecomposition and biocarbon adsorption. London, Emerging pollutants
Intech**:** 79-97 27 ref.

The emerging pollutants (EPs) are considered a global monitoring challenge, present in the environment in very reduced concentrations, and the proper methods for sampling and analysis are still in development. Many published types of research considering the EPs identification only depend on the analytical methodology and a more efficient higher number of EPs. The quantitative determination of the prioritized EPs in water needs advanced and ultra-sensitive instrumental techniques applied in water, water-suspended mater, soil, and biota. The regulatory framework of the water-quality parameters does not often include the microplastics, EPs, and their metabolites; especially, the groundwater water-quality monitoring and control are urgent but not yet achieved. The EPs sources in water are the sewage, industrial, and agricultural waste discard, and the UN estimated that the wastewater produced annually is about 1500 km³, about six times more water than existing in all rivers of the word. In 2015, in China, which has a fast-growing economy, the water is a scarce resource with just 8% of the world's fresh water to meet the water needs of the 22% of the world's population.

Ory, N., et al. (2018). "Low prevalence of microplastic contamination in planktivorous fish species from the southeast Pacific Ocean." Marine Pollution Bulletin **127**: 211-216.

The gut contents of 292 planktivorous fish, from four families (Atherinopsidae, Clupeidae, Engraulidae and Scombridae) and seven species, captured along the coast of the southeast Pacific, were examined for microplastic contamination. Only a small fraction of all studied fish (2.1%; 6 individuals) contained microplastic particles in their digestive tract. Microplastics found were degraded hard fragments and threads, ranging from 1.1 to 4.9 (3.8 +/- SD 2.4) mm in length, and of various colours, which suggests that the planktivorous fish species examined herein did not capture microplastics on the basis of their colour. The low prevalence of microplastic contamination in planktivorous fishes found in this study suggests that the risk of accidental ingestion by these species might be limited in the coastal upwelled waters of the southeast Pacific, perhaps due to small human population and highly dynamic oceanographic processes. Copyright © 2017 Elsevier Ltd

Ory, N. C., et al. (2018). "Capture, swallowing, and egestion of microplastics by a planktivorous juvenile fish." Environmental Pollution **240**: 566-573.

Microplastics (<5 mm) have been found in many fish species, from most marine environments. However, the mechanisms underlying microplastic ingestion by fish are still unclear, although they are important to determine the pathway of microplastics along marine food webs. Here we conducted experiments in the laboratory to examine microplastic ingestion (capture and swallowing) and egestion by juveniles of the planktivorous palm ruff, Seriolella violacea (Centrolophidae). As expected, fish captured preferentially black microplastics, similar to food pellets, whereas microplastics of other colours (blue, translucent, and yellow) were mostly co-captured when floating close to food pellets. Microplastics captured without food were almost always spit out, and were only swallowed when they were mixed with food in the fish's mouth. Food probably produced a 'gustatory trap' that impeded the fish to discriminate and reject the microplastics. Most fish (93% of total) egested all the microplastics after 7 days, on average, and 49 days at most, substantially longer than food pellets (<2 days). No acute detrimental effects of microplastics on fish were observable, but potential sublethal effects of microplastics on the fish physiological and behavioural responses still need to be tested. This study highlights that visually-oriented planktivorous fish, many species of which are of commercial value and ecological importance within marine food webs, are susceptible to ingest microplastics resembling or floating close to their planktonic prey.

Ory, N. C., et al. (2017). "Amberstripe scad Decapterus muroadsi (Carangidae) fish ingest blue microplastics resembling their copepod prey along the coast of Rapa Nui (Easter Island) in the South Pacific subtropical gyre." Science of the Total Environment **586**: 430-437.

An increasing number of studies have described the presence of microplastics (<=5 mm) in many

different fish species, raising ecological concerns. The factors influencing the ingestion of microplastics by fish remain unclear despite their importance to a better understanding of the routes of microplastics through marine food webs. Here, we compare microplastics and planktonic organisms in surface waters and as food items of 20 Amberstripe scads (Decapterus muroadsi) captured along the coast of Rapa Nui (Easter Island) to assess the hypothesis that fish ingest microplastics resembling their natural prey. Sixteen (80%) of the scad had ingested one to five microplastics, mainly blue polyethylene fragments that were similar in colour and size to blue copepod species consumed by the same fish. These results suggest that planktivorous fish, as a consequence of their feeding behaviour as visual predators, are directly exposed to floating microplastics. This threat may be exacerbated in the clear oceanic waters of the subtropical gyres, where anthropogenic litter accumulates in great quantity. Our study highlights the menace of microplastic contamination on the integrity of fragile remote ecosystems and the urgent need for efficient plastic waste management.

Osama, A. M., et al. (1999). "Construction and characterization of bacterial artificial chromosome library of Egyptian cotton (Gossypium barbadense L.)." Egyptian Journal of Agricultural Research **77**(4): 1769-1787.

Bacterial artificial chromosome (BAC) libraries for the Gossypium barbadense cultivars Giza 70, Giza 86, and Giza 75 were constructed and characterized. The isolation and purification of high molecular weight DNA from nuclei embedded in agarose microbeads was an essential part of this work. Several experimental parameters were investigated, including optimization of megabase-size DNA restriction enzyme digest and CHEF gel conditions to achieve the highest resolution and separation of such DNA. Fragments ranging in size from 200 to 500 kb were size selected and recovered from agarose gel to be used in BAC library construction. BAC vector pBeloBAC II, derived from endogenous Escherichia coli F-factor plasmid, was used in library construction. Different insert : vector ligation ratios examined indicated 15:1 to be the optimum. The maximum construct-host transformation efficiency was calculated at 1.8 kV electroporation voltage. Purification and isolation of BAC clones was followed by restriction enzyme digestion using NotI to characterize insert sizes. Characterization of insert sizes and integrity was achieved by using CHEF gel electrophoresis conditions at 6V/cm, 5 and 15 sec initial and final switch times, respectively, and 12 degrees C temperature for 12 h. BAC libraries for Giza 70, Giza 86 and Giza 75 contained 45 237, 45 742 and 46 531 clones, respectively, with an average insert size of 100 kb. Considering the haploid genome size for cotton to be 2118 Mb, the BAC libraries contain 2.12 haploid genome equivalents. The BAC libraries constructed for Giza 70, Giza 86 and Giza 75 provide 88% probability of isolating a specific genomic region and are optimized for future gene identification, isolation, target gene mapping and chromosome walking.

Osborn, S. L., et al. (2015). "Inosculation of Blood Vessels Allows Early Perfusion and Vitality of Bladder Grafts-Implications for Bioengineered Bladder Wall." Tissue Engineering, Part A: Tissue Engineering **21**(11-12): 1906-1915.

Bioengineered bladder tissue is needed for patients with neurogenic bladder disease as well as for cancer. Current technologies in bladder tissue engineering have been hampered by an inability to efficiently initiate blood supply to the graft, ultimately leading to complications that include graft contraction, ischemia, and perforation. To date, the biological mechanisms of vascularization on transplant have not been suitably investigated for urologic tissues. To better understand the mechanisms of neovascularization on bladder wall transplant, a chimeric mouse model was generated such that angiogenesis and vasculogenesis could be independently assessed in vivo. Green fluorescence protein (GFP) transgenic mice received bone marrow transplants from beta -galactosidase (LacZ) transgenic animals and then subsequent bladder wall transplants from wild-type donor mice. Before euthanization, the aorta was infused with fluorescent microbeads (fluorospheres) to identify perfused vessels. The contributions of GFP (angiogenesis) and LacZ (vasculogenesis) to the formation of CD31-expressing blood vessels within the wild-type graft were evaluated by immunohistochemistry at different time points and locations within the graft (proximal, middle, and distal) to provide a spatiotemporal analysis of neovascularization. The GFP index, a measure of angiogenic host ingrowth, was significantly higher at proximal versus mid or distal regions in animals 2-16 weeks post-transplant. However, GFP index did not increase over time in any area. Within 7 days post-transplant, perfusion of primarily wild-type, donor blood vessels in the most distal areas of the graft was observed by intraluminal fluorospheres. In addition, chimeric host-donor (GFP-wild type) blood vessels were evident in proximal areas. The contribution of vasculogenesis to vascularization of the graft was limited, as LacZ cells were not specifically associated with the endothelial cells of blood vessels, but rather found primarily in areas of inflammation. The data suggest that angiogenesis of host blood vessels into the proximal region leads to inosculation between host and donor vessels and subsequent perfusion of the graft via pre-existing graft vessels within the first week after transplant. As such, the engineering of graft blood vessels and the promotion of inosculation might prevent graft contraction, thereby potentiating the use of bioengineered bladder tissue for transplantation.

Osborne, L. D., et al. (2012). "12-Channel high-throughput microscope for cancer cell mechanics." Molecular Biology of the Cell. Conference: Annual Meeting of the American Society for Cell Biology, ASCB **23**(24).

Understanding how cell behavior and function relates to physical structure is a major goal of current cell mechanics studies. Elucidating this relationship is especially important in the study of cancer biology related to dramatic phenotypic changes as seen in epithelial to mesenchymal transitions. Although much interest is given to studying the signaling pathways that govern how normal cell function and structure become abnormal during cancer progression, these changes convolute already difficult and highly variable mechanical measurements of single cells. To address the need of minimizing single measurement variability as well as the desire to explore the large signaling-protein parameter spaces of cancer biology, we have developed an automated high throughput microscope system that utilizes passive microbead diffusion to characterize cell mechanics. Here, we report on the instrumentation advances of our system, including 12 independently controllable optical paths - each of which is capable of video rate image acquisition in brightfield and two-channel fluorescence, and is equipped with electronically tunable autofocus. In all, video data collection across a 96-well plate takes as little as 10 minutes. A data analysis pipeline then identifies and tracks microbeads, filters and applies statistical analysis to mechanical measurements, and occurs completely unsupervised. We show that the thermal diffusion of micron-sized beads connected to integrin surface receptors via fibronectin can distinguish ovarian, pancreatic and skin cancers with varying metastatic potentials. With sampling sizes in the thousands, we report elastic moduli differences between cancer cell types as well as the effect of pharmaceutical treatments aimed to alter actin cytoskeletal structures. Our results support previously published work describing the inverse relationship between mechanical stiffness and invasion behavior, and ultimately, demonstrate the value of our high throughput instrument and passive rheology assay as a screening tool for studying relevant signaling pathways involved in cancer cell mechanics.

Oskin, B. (2011). "The road less traveled." New Scientist **211**(2827): 54-55.

The article looks at sources of funding for scientific research other than grants from the U.S. National Institutes of Health (NIH) or the National Science Foundation (NSF). Renee Reijo Pera of Stanford University does research on human embryonic stem cells which is funded by the university, nonprofit organizations, and private donors. Environmentalist Mary Maxwell used crowdfunding to study plastic pollution, while the biomedical research institution Stowers Institute fully funds scientists.

Osmann, B., et al. (2019). "Comment on "exposure to microplastics (<10 mum) associated to plastic bottles mineral water consumption: The first quantitative study by Zuccarello et al." Water Research **162**: 516-517.

Microplastics in food is a relatively new research field with only few studies available so far. Scientists have been pointing out that some of these studies apply questionable analytical methods. Nevertheless, media often use such results to gain attention of the readers. It is therefore of particular significance, that only those scientific studies are published, clearly presenting valid data on the content of microplastics in food. Unfortunately, the study by Zuccarello et al. shows very critical aspects regarding analytical methods used and conclusions made. The applied procedure is not described and, therefore, does not allow any assessment by other groups, which is indispensable prerequisite of any scientific publication. Moreover, the analytical method used for the identification and quantification of microplastic particles - SEM-EDX - is not sound and not validated. Therefore, in our opinion the results on the contamination of bottled mineral water with microplastics published by Zuccarello et al. are more than questionable.

Osmann, B. E., et al. (2018). "Small-sized microplastics and pigmented particles in bottled mineral water." Water Research **141**: 307-316.

Up to now, only a few studies about microparticle contamination of bottled mineral water have been published. The smallest analysed particle size was 5mum. However, due to toxicological reasons, especially microparticles smaller than 1.5mum are critically discussed. Therefore, in the present study, 32 samples of bottled mineral water were investigated for contamination by microplastics, pigment and additive particles. Due to the application of aluminium coated polycarbonate membrane filters and micro-Raman spectroscopy, a lowest analysed particle size of 1mum was achieved. Microplastics were found in water from all bottle types: in single use and reusable bottles made of poly(ethylene terephthalate) (PET) as well as in glass bottles. The amount of microplastics in mineral water varied from 2649+/-2857 per litre in single use PET bottles up to 6292+/-10521 per litre in glass bottles. While in plastic bottles, the predominant polymer type was PET; in glass bottles various polymers such as polyethylene or styrene-butadiene-copolymer were found. Hence, besides the packaging itself, other contamination sources have to be considered. Pigment particles were detected in high amounts in reusable, paper labelled bottles (195047+/-330810 pigment particles per litre in glass and 23594+/-25518 pigment particles per litre in reusable paper labelled PET bottles). Pigment types found in water samples were the same as used for label printing, indicating the bottle cleaning process as possible contamination route. Furthermore, on average 708+/-1024 particles per litre of the additive Tris(2,4-di-tert-butylphenyl)phosphite were found in reusable PET bottles. This additive might be leached out from the bottle material itself. Over 90% of the detected microplastics and pigment particles were smaller than 5mum and thus not covered by previous studies. In summary, this is the first study reporting about microplastics, pigment and additive particles found in bottled mineral water samples with a smallest analysed particle size of 1mum.

Osmann, B. E., et al. (2017). "Development of an optimal filter substrate for the identification of small microplastic particles in food by micro-Raman spectroscopy." Analytical & Bioanalytical Chemistry **409**(16): 4099-4109.

When analysing microplastics in food, due to toxicological reasons it is important to achieve clear identification of particles down to a size of at least 1 mum. One reliable, optical analytical technique allowing this is micro-Raman spectroscopy. After isolation of particles via filtration, analysis is typically performed directly on the filter surface. In order to obtain high qualitative Raman spectra, the material of the membrane filters should not show any interference in terms of background and Raman signals during spectrum acquisition. To facilitate the usage of automatic particle detection, membrane filters should also show specific optical properties. In this work, beside eight different, commercially available membrane filters, three newly designed metal-coated polycarbonate membrane filters were tested to fulfil these requirements. We found that aluminium-coated polycarbonate membrane filters had ideal characteristics as a substrate for micro-Raman spectroscopy. Its spectrum shows no or minimal interference with particle spectra, depending on the laser wavelength. Furthermore, automatic particle detection can be applied when analysing the filter surface under dark-field illumination. With this new membrane filter, analytics free of interference of microplastics down to a size of 1 mum becomes possible. Thus, an important size class of these contaminants can now be visualized and spectrally identified. Graphical abstract A newly developed aluminium coated polycarbonate membrane filter enables automatic particle detection and generation of high qualitative Raman spectra allowing identification of small microplastics.

Ossmann, B., et al. (2019). "Comment on "exposure to microplastics (<10 Mm) associated to plastic bottles mineral water consumption: The first quantitative study by Zuccarello et al. [Water Research 157 (2019) 365-371]"." Water Research **162**: 516-517.

Microplastics in food is a relatively new research field with only few studies available so far. Scientists have been pointing out that some of these studies apply questionable analytical methods. Nevertheless, media often use such results to gain attention of the readers. It is therefore of particular significance, that only those scientific studies are published, clearly presenting valid data on the content of microplastics in food. Unfortunately, the study by Zuccarello et al. shows very critical aspects regarding analytical methods used and conclusions made. The applied procedure is not described and, therefore, does not allow any assessment by other groups, which is indispensable prerequisite of any scientific publication. Moreover, the analytical method used for the identification and quantification of microplastic particles - SEM-EDX - is not sound and not validated. Therefore, in our opinion the results on the contamination of bottled mineral water with microplastics published by Zuccarello et al. are more than questionable. Copyright © 2019 Elsevier Ltd

Ostendorff, H. P., et al. (2013). "Multiplexed VeraCode bead-based serological immunoassay for colorectal cancer." Journal of Immunological Methods **400-401**: 58-69.

Colorectal cancer (CRC) is the second leading cause of cancer deaths in the US and Western world. Despite increased screening and advances in treatment, the mortality rate (ca. 50,000/year) and high national health-care burden for CRC are likely to remain high unless an effective non-invasive screening test for CRC is instituted for a large segment of the population. Blood-based protein biomarkers hold great promise for early disease diagnosis and personalized medicine; yet robust and reproducible multiplexing platforms and methodologies have lagged behind their genomic counterparts. Here, we report the development of a novel, multiplexed, hybrid immunoassay for CRC that is formatted on barcoded VeraCodeTM micro-beads, which

have until now only been used for genomic assays. The method combines a sandwich immunoassay format for detection of serum protein biomarkers with an antigen assay for autoantibody detection. The serum protein biomarkers CEA and GDF15 as well as autoantibodies to the p53 tumor associated antigen (TAA) were used to exemplify the method. This multiplex biomarker panel was configured to run on Illumina's holographically barcoded VeraCodeTM micro-bead platform, which is capable of measuring hundreds of analytes simultaneously in a single well from small volumes of blood (<50 muL) using a 96-well industry standard microtiter plate. This novel use of the VeraCodeTM micro-bead platform translates into a potentially low volume, high throughput, multiplexed assay for CRC, for the purposes of biomarker validation, as well as patient screening, diagnostics and prognostics. In an evaluation of a 186 patient sera training set (CRC and normal), we obtained a diagnostic sensitivity of 54% and a specificity of 98%. We anticipate that by expanding and refining the biomarkers in this initial panel, and performing more extensive clinical validations, such an assay could ultimately provide a basis for CRC population screening to complement the more invasive, expensive and low throughput (but highly sensitive and specific) colonoscopy.

Ostrowski, L. E., et al. (2019). "Mucociliary transport in vitro: Effect of mucin concentration, reducing agents, and DNA on rheological properties and transport rate." American Journal of Respiratory and Critical Care Medicine. Conference **199**(9).

Rationale: Mucus obstruction is a common feature of many airway diseases, including chronic obstructive pulmonary disease (COPD), cystic fibrosis (CF), primary ciliary dyskinesia (PCD), and asthma. Improved treatments for these diseases require a thorough understanding of how changes in mucus composition affect mucociliary clearance (MCC) and how different therapeutics affect mucus rheology and mucociliary transport. We have developed an in vitro system in which well-differentiated cultures of primary human airway epithelial cells continuously transport mucus, allowing carefully controlled investigations of a wide-range of experimental and therapeutic manipulations. METHOD(S): Early passage human bronchial epithelial (HBE) cells were cultured at the air/liquid interface in modified culture inserts as previously published (Sears, Yin, Ostrowski; Am J Physiol Lung Cell Mol Physiol. 2015). In these modified inserts, the presence of a central ring encourages the development of circular mucociliary transport (MCT) that is maintained for extended periods. For these studies, cultures demonstrating circular transport were washed to remove endogenous mucus. To provide a standard mucus for comparisons, bovine submaxillary mucus (BSM) was used. BSM at different concentrations that simulate healthy and disease states, as well as mucus treated with therapeutic agents, was labeled with fluorescent microbeads and added to the washed cultures and the rate of MCT was determined. In parallel, mucus rheology (viscosity, elasticity) was measured in the same BSM preparations. Controls typically included measuring MCT in the same culture using BSM with and without the experimental treatment, and studies were performed using cultured cells from multiple different donors. RESULT(S): Mucociliary transport was reduced when higher concentrations of BSM that mimic pathological mucus (50 mg/ml) were compared to lower concentrations that mimic healthy mucus (20 mg/ml). Treatment of the high concentration BSM with the reducing agent tris(2-carboxyethyl)phosphine (TCEP) reduced viscosity and increased the rate of MCT by ~2-fold. Addition of a small amount of high molecular weight DNA (0.02%) increased mucus viscosity and significantly reduced MCT. CONCLUSION(S): Our data show that well-differentiated cultures of HBE cells grown under conditions that promote MCT provide a useful system to investigate MCC in vitro. Further, these cultures can be utilized to investigate the effect of potential therapeutic agents under carefully controlled conditions. Interestingly, these data show that a relatively small amount of high

molecular weight DNA has a significant effect on the rate of MCT. Future studies will compare the effectiveness of different therapeutic approaches, alone and in combination, to improve the treatment of muco-obstructive diseases.

Otsyina, H. R., et al. (2018). "Knowledge, attitude, and practices on usage, disposal, and effect of plastic bags on sheep and goats." Tropical Animal Health & Production **50**(5): 997-1003.

The objective of this study was to evaluate knowledge, attitudes, and practices of people in the Nairobi and Kajiado Counties, Kenya, on the usage, disposal, and effect of plastic waste on sheep and goats (shoats). A semi-structured questionnaire was used to collect data from 384 respondents in four communities in the two counties. Most of the people irrespective of their age, occupation, and educational status used plastic bags of some type on a daily basis. A high proportion of the respondents (37.0%, 142) used plastic bags because of the low cost. Approximately, 79.1% (304) disposed used plastic bags in open dumps. A total of 147 (38.3%) households kept shoats. Out of these, 38.1% (56) purchased feed and also allowed their animals to roam. Most of them (45.3%, 174) thought that lack of feed for the animals was the main reason why shoats roam and scavenge at refuse dump sites and road sides. A large proportion of the respondents (44.5%, 143) mentioned death of animals as the ultimate consequence of ingestion of waste plastic bags. Though, the respondents were aware that indiscriminate disposal of used plastic bags could result in death of the animals from which they derive their livelihoods, they nevertheless continued with the practice. There is a need for a paradigm shift in the way and manner plastic bags are used and disposed.

Ott, D. E. (2009). "Chapter 2: Purification of HIV-1 Virions by Subtilisin Digestion or CD45 Immunoaffimty Depletion for Biochemical Studies." Methods in Molecular Biology **485**: 15-25.

The presence of cellular proteins outside and inside retroviruses can indicate the roles they play in viral biology. However, experiments examining retroviruses can be complicated by the contamination of even highly purified virion preparations with nonvinal particles (either microvesicles or exosomes). Two useful methods have been developed that can remove contaminating particles from virus stocks to produce highly pure virus preparations. One approach, the subtilisin digestion procedure, enzymatically removes the proteins outside the virions. While this method is well suited for the analysis of the interior proteins in the virions, it removes the extracellular domains of the integral membrane proteins on the virion. To preserve the proteins on the exterior of the virion for biochemical studies, a CD45 immunoaffinity depletion procedure that removes vesicles by capture with antibody-linked microbeads is employed. These methods allow for the isolation of highly purified virion preparations that are suitable for a wide variety of experiments, including the biochemical characterization of cellular proteins both on and in HIV virions, examination of virion/cell interactions, and imaging of virions.

Ott, D. E. (2009). "Purification of HIV-1 virions by subtilisin digestion or CD45 immunoaffinity depletion for biochemical studies." Methods in Molecular Biology **485**: 15-25.

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Ottaviani, M., et al. (2019). "Remote sensing of the ocean surface refractive index via short-wave infrared polarimetry." Remote Sensing of Environment **221**: 14.

The linear polarization of sunlight reflected by ocean surfaces in the short-wave infrared (SWIR), at geometries where specular reflection dominates the signal, is a direct function of the refractive index of the surface microlayer (SML). This simple physical concept is at the base of a novel technique presented in this study. We invert observations obtained by the airborne Research Scanning Polarimeter (RSP) in the sunglint region, where each pixel's radiance is dominated by the signal originating from the wave slopes oriented precisely to cause specular reflection. The SWIR wavelength ensures minimization of aerosol interference when radiance travels through the atmosphere; strong absorption by the water body then limits the penetration depth to the first micrometer or so, effectively probing the SML. The resulting Degree of Linear Polarization (DoLP) is then governed by the refractive index via the Fresnel law for the specific pixel geometry, independently of the windspeed. The selected dataset concerns several field deployments from both low- and high-altitude aircraft, including total reflectance measurements with the sole purpose of accounting for the residual aerosol effect. Stable retrievals from transects above pure seawater yielded values of refractive index that match the values published in the literature within an accuracy of 5×10^{-4}. Flying over the oil spill caused by the explosion of the Deepwater Horizon platform, detected variations were found compatible with the presence of an oil slick. The robustness of the results, guaranteed by the high RSP polarimetric accuracy (≤ 0.2%), opens the possibility for remote-sensing detection of other entities that similarly affect the refractive index including whitecaps, microplastics, biological gels, seaweed and grass mats.

Otto, G., et al. (2016). "A flow-cytometry-based method for detecting simultaneously five allergens in a complex food matrix." Journal of Food Science & Technology-Mysore **53**(12): 4179-4186.

To avoid carry-over contamination with allergens, food manufacturers implement quality control strategies relying primarily on detection of allergenic proteins by ELISA. Although sensitive and specific, this method allowed detection of only one allergen per analysis and effective control policies were thus based on multiplying the number of tests done in order to cover the whole range of allergens. We present in this work an immunoassay for the simultaneous detection of milk, egg, peanut, mustard and crustaceans in cookies samples. The method was based on a combination of flow cytometry with competitive ELISA where microbeads were used as sorbent surface. The test was able to detect the presence of the five allergens with median inhibitory concentrations (IC_{50}) ranging from 2.5 to 15 mg/kg according to the allergen to be detected. The lowest concentrations of contaminants inducing a significant difference of signal between non-contaminated controls and test samples were 2 mg/kg of peanut, 5 mg/kg of crustaceans, 5 mg/kg of milk, 5 mg/kg of mustard and 10 mg/kg of egg. Assay sensitivity was influenced by the concentration of primary antibodies added to the sample extract for the competition and by the concentration of allergenic proteins bound to the surface of the microbeads.

Ou, L. J., et al. (2009). "DNA encapsulating liposome based rolling circle amplification immunoassay as a versatile platform for ultrasensitive detection of protein." Analytical Chemistry **81**(23): 9664-9673.

A novel rolling circle amplification (RCA) immunoassay based on DNA-encapsulating liposomes, liposome-RCA immunoassay, was developed for ultrasensitive protein detection. This technique utilized antibody-modified liposomes with DNA prime probes encapsulated as the detection reagent in the sandwiched immunoassays. The DNA prime probes were released from liposomes and then initiated a linear RCA reaction, generating a long tandem repeated sequences that could be selectively and sensitively detected by a microbead-based fluorescence assay. The developed technique offered very high sensitivity due to primary amplification via releasing numerous DNA primers from a liposome followed by a secondary RCA amplification. A biobarcode design was incorporated in the technique, which allowed the strategy to be directly implemented for multiplex assay of multiple proteins. Also, the technique allowed easy preparation of the DNA-carrying antibody reagent and the implementation with simple instrumentation. The technique was demonstrated for the determination of prostate-specific antigen (PSA), a highly selective biomarker associated with prostate cancer. The results revealed that the technique exhibited a dynamic response to PSA over a 6-decade concentration range from 0.1 fg mL(-1) to 0.1 ng mL(-1) with a limit of detection as low as 0.08 fg mL(-1) and a high dose-response sensitivity. The liposome-RCA immunoassay holds great promise as a versatile, sensitive, and robust platform to combine the nucleic acid amplification with immunoassay for ultrasensitive protein detection.

Ou, L. T. and M. Alexander (1974). "Influence of glass microbeads on growth, activity and morphological changes of Bacillus megaterium." Archives of Microbiology **101**(1): 35-44.

Oudshoorn, M., et al. (2013). "Improving the biocompatibilty of alginate/poly-lornithine capsules through the masking of amines and pegylation." Cytotherapy **1)**: S44.

Living Cell Technologies (LCT) Ltd uses encapsulation to isolate porcine pancreatic islets from the recepient's immune system to prevent rejection in xenotransplantation. This capsule is composed of an alginate bead coated with poly-L-orithine (PLO) and alginate (APA). One of the main problems with this capsule is the exposure of PLO which has a net positive charge and exposed amine groups. Here we present the approach LCT is using to modify the surface of PLO by masking exposed amine groups and the positive charge, using Sulfo-NHS-acetate and PEGylated compounds. Sulfo-NHS-acetate is commonly used to block amine groups on proteins by capping amino groups with a more favourable acyl group. PEGylated compounds covalently attach through amine esters, shielding the surface of the microcapsule with a nonionic water-soluble polymer. Both approaches aim to reduce protein adsorption and and the onset of the immune response. In vitro experiments have investigated modifications to the encapsulation procedure using the following coating scheme: AlginatePLO/PLO/x, where x is sulfo-NHS-acetate, BS (PEG) 9 or MS (PEG) 12 at concentrations over the range of 1-10 mM. Micro-beads are formed by pumping the alginate, porcine islet mix through a needle supplied with a coaxial airflow into a CaCl2 bath, PLO is used to coat the external surface of the bead, followed by the amine masking reagent. Capsules are then treated with sodium citrate to remove the alginate core. Capsules were characterised using light and fluorescent microscopy, flourescent imaging and Transmission electron microscopy (TEM). Capsule size, uniformity and defects were also assessed. Islet viability and insulin release were monitored over the course of a month. All conditions tested showed excellent islet viabilty and no reduction in insulin release when compared to the control.

Owens, E. L., et al. (2011). "Material Flow Analysis Applied to Household Solid Waste and Marine Litter on a Small Island Developing State." Journal of Environmental Engineering **137**(10): 937-944.

Small island developing states (SIDS) have limited access to imported goods, and their associated patterns of consumption and waste generation are affected by space limitations. They are also impacted by the global presence of marine litter that reaches their shores from the ocean. A material flow analysis (MFA) was applied to household solid waste and marine litter collected from Kayangel Island in the Republic of Palau to provide a comprehensive characterization and spatial accounting of the inflow of nonputrescible materials that become solid waste. Approximately 15,100 kg of nonputrescible solid waste are generated annually on Kayangel Island (0.42 kg per capita per day), with 57% being marine litter derived from the ocean and 43% derived from household activities. Household generation of nonputrescible solid waste (that ignores inputs of marine litter) ranged from 0.14-0.18 kg/capita-day for the school in session and nonschool periods, respectively. The most significant waste categories (by mass) include mixed material and nonrecyclable plastic wastes from both household sources and ocean-derived marine litter. Once nonputrescible solid waste is introduced, 0.39 kg per capita per day accumulates, 0.02 kg per capita per day is removed from the island via shipping, and 0.01 kg per capita per day is processed by open pit burning. Applying an MFA to solid waste on a SIDS links local and global solid waste generation with material fates, and may assist solid waste management practices. [ABSTRACT FROM AUTHOR]

Owolodun, O. A., et al. (2013). "Development of a fluorescent microbead-based immunoassay for the detection of hepatitis E virus IgG antibodies in pigs and comparison to an enzyme-linked immunoassay." Journal of Virological Methods **193**(2): 278-283.

Swine hepatitis E virus (HEV) is a zoonotic virus and pigs are considered as an important reservoir. Swine HEV infection is widespread and most pig herds are infected. Humans can be infected with swine HEV via consumption of undercooked pork or through direct contact with infected pigs. To minimize the risk of zoonotic transmission, sensitive tools to assess the HEV infection status of pigs and pork products are needed. The objective of this study was to develop a fluorescent microbead-based immunoassay (FMIA) for the detection of IgG antibodies against swine HEV and compare it to an in-house enzyme-linked immunoassay (ELISA). Three sets of samples were utilized: (A) samples from pigs infected experimentally with different strains of HEV (positive controls, n= 72), (B) samples from known HEV-negative pigs (negative controls, n= 62) and (C) samples from pigs of unknown HEV infection status (n= 182). All samples were tested by both ELISA and FMIA. The results on the experimental samples with known HEV exposure indicate that both assays have a specificity of 100% while the sensitivity ranges from 84.6% (ELISA) to 92.3% (FMIA). The overall prevalence of HEV IgG antibodies in field samples from pigs with unknown HEV exposure was 21.9% (40/182) for the ELISA and 21.4% (39/182) for the FMIA. The two assays had an almost perfect overall agreement (Kappa= 0.92). © 2013 Elsevier B.V.

Oz, N., et al. (2019). "Investigation of heavy metal adsorption on microplastics." Applied Ecology and Environmental Research **17**(4): 7301-7310.

Microplastics and heavy metals represent two pollutant classes which have adverse impacts on aquatic ecosystems. This study has investigated the adsorption of two heavy metals [Lead (Pb)II and Aluminum (Al)III] on three different types of microplastics [polyethylene terephthalate (PET), polyamide (PA), ethylene vinyl acetate (EVA)]. The Scanning Electron Microscope (SEM) analysis has shown that microplastics have different surface characteristics. The effects of parameters such as the pH of solution, duration of contact, initial concentration and temperature on adsorption capacity have been examined. Experimental results have been applied to the adsorption isotherm models of Langmuir and Freundlich and it has been seen that the Freundlich model has been seen as more suitable than the Langmuir model. Moreover, the pseudo-second kinetic has been found to be more appropriate than the pseudo-first kinetic model. Adsorption percentages have changed according to the type of microplastic and working conditions. Finally, the study has investigated the potential of microplastics to act as an instrument of transport for heavy metals to the food chain and for their bioaccumulation.

Ozawa, M. and P. J. Hansen (2010). "A novel method for purification of inner cell mass and trophectoderm cells from bovine blastocysts using magnetic activated cell sorting." Reproduction, Fertility and Development **23 (1)**: 174-175.

The first distinct lineage differentiation in the mammalian embryo occurs at the blastocyst stage when blastomeres are segregated into inner cell mass (ICM) or trophectoderm (TE). Obtaining purified TE or ICM can be useful for understanding regulation of early development and differentiation. Although several methods have been reported to separate TE and ICM (e.g. immunosurgery, mechanical dissection using a micromanipulator, or manual selection following trypsinization), limitations exist with these methods. Here, we describe a simple and effective method to sort cells of the blastocyst using magnetic activated cell sorting (MACS) following disaggregation of the blastocyst into single cells using trypsin. Bovine blastocysts were produced in vitro and the zona pellucida removed with a short exposure to acidic Tyrode's solution. Zona-free blastocysts were incubated with concanavalin A conjugated to fluorescein isothiocyanate (FITC) to label the outer layer of the blastocyst. The blastocysts were then exposed to Hoechst 33342 to label nuclei of all blastomeres. The blastocysts were treated with 0.05% (wt/vol) trypsin, and then disaggregated into single blastomeres by repeating pipetting using a finely drawn, flame-polished mouth micropipette. Single blastomeres were incubated with magnetic microbeads conjugated to anti-FITC and subjected to MACS separation. A fraction of sorted cells was observed under a fluorescence microscope. The remainder were subjected tomRNAextraction, and NANOG (ICM marker) and CDX2 (TE marker)mRNA were quantified by quantitative PCR. After disaggregation of the blastocyst, 2 types of single blastomeres were observed: cells that were positive for both FITC and Hoechst 33342 (TE cells) and cells that were negative for FITC but positive for Hoechst 33342 (ICM cells). Before MACS, about two-thirds of the disaggregated blastomeres labelled with Hoechst 33342 were also labelled with FITC, while one-third were FITC negative. After MACS, the percent of dual-labelled cells in the FITC positive fraction was 91.2%, whereas the incidence of dual-labelled cells in the FITC negative fraction was only 7.8+/-3.0%. A total of 11.5 mug of RNA per blastocyst was recovered from cells isolated by MACS. This represents 80% of the RNA present in intact blastocysts and suggests a high rate of recovery of blastomeres during the purification process. Furthermore, relative expression level of NANOG was lower in the FITC-positive fraction than in the FITC-negative fraction (0.30+/-0.05 v. 3.1+/-0.6, respectively, relative to gene expression level in whole blastocysts). Conversely, the relative expression level of CDX2 was higher in the FITC-positive fraction than in the FITC-negative fraction (3.2+/-0.09 v. 0.30+/-0.9, respectively). Results indicate that highly purified TE cells or ICM cells can be collected using MACS. This simple method can be used to

study differentiation of the mammalian embryo as well as to prepare embryonic cells of specific lineages for cell therapy.

Ozawa, M., et al. (2009). "Human neutrophil antigen (HNA)-specific antibodies are associated with renal allograft loss." Human Immunology **1)**: S163.

Aim: Antibodies to human neutrophil antigens (HNA) and HLA antibodies are the two known causes of transfusion-related acute lung injury (TRALI). To date, no reported studies have evaluated the impact of HNA antibodies on transplantation, perhaps due to lack of readily available detection assay for HNA antibodies. Here we report on the detection of HNA antibodies in renal transplant recipients using the newly developed microbead HNA assay. Method(s): Soluble HNA-1a, HNA-1b, HNA-1c, HNA-2, HNA-4, and HNA-5 antigens purified from recombinant cell lines or human granulocytes were coated onto microbeads. A total of 158 post-transplant sera from renal recipients from 14 transplant centers who had lost graft with no detectable HLA or MICA antibodies were tested for HNA antibodies using these single antigen beads. Additional 90 patients from the same cohort, who still had functioning graft, were tested as the control. Result(s): HNA antibodies were found in 10 (6%) of the 158 patients who had graft loss, while only one (1%) of the 90 patients with functioning graft had HNA antibodies (p=0.05). The most frequent specificity was anti-HNA-1b, followed by HNA-1a and HNA-2. Interestingly, half of the patients who had HNA antibodies were male, and half were female, however, there were marked differences in the strength of antibodies between the males and females; the mean MFI of HNA antibodies in males was 1941, while the mean MFI among the females was 12221. Conclusion(s): HNA antibodies have been associated with kidney graft failure for the first time in this study. 6% of patients, who had graft failure without HLA or MICA antibodies, had HNA antibodies, compared to 1% of patients with good function.

Ozdemir, F. T., et al. (2016). "Immune and inflammatory gene expressions are different in Behcet's disease compared to those in Familial Mediterranean Fever." Europan Journal of Rheumatology **3**(4): 146-152.

OBJECTIVE: The immune classification of Behcet's disease (BD) is still controversial. In this study, we aimed to compare the immune/inflammatory gene expressions in BD with those in familial Mediterranean fever (FMF), an autoinflammatory disorder with innate immune activation.

MATERIAL AND METHODS: CD4+ T cells and CD14+ monocytes were isolated from the peripheral blood mononuclear cells of Behcet's disease patients (n=10), FMF (n=6) patients, and healthy controls (n=4) with microbeads, and then, the mRNA was isolated. The expressions of 440 genes associated with immune and inflammatory responses were studied with a focused DNA microarray using a chemiluminescent tagging system. Changes above 1.5-fold and below 0.8-fold were accepted to be significant.

RESULTS: In BD patients, in the CD4+ T-lymphocyte subset, interleukin 18 receptor accessory protein (1.7-fold), IL-7 receptor (1.9-fold), and prokineticin 2 (2.5-fold) were all increased compared to those in FMF patients, whereas chemokine (C-X3-C motif) receptor-1 (CX3CR1) (0.7-fold) and endothelial cell growth factor-1 (0.6-fold) were decreased. In the CD14+ monocyte population, the V-fos FBJ murine osteosarcoma viral oncogene homolog (1.5-fold), Interleukin-8 (IL-8) (2.1-fold), and Tumor Necrosis Factor alpha (TNF-alpha) (1.8-fold) were all increased, whereas the chemokine (C-C motif) ligand 5 (CCL5) (0.6-fold), C-C chemokine receptor type 7 (0.6-fold), and CX3CR1 (0.7-fold) were decreased, again when compared to those in FMF. Compared to healthy controls in the CD4+ T-lymphocyte population, in both BD and FMF patients, pro-platelet basic protein and CD27 had elevated expression. In BD and FMF patients, 24 and 19 genes, respectively, were downregulated, with 15 overlapping genes between both disorders. In the CD14+ monocytes population, chemokine (C-C motif) receptor-1 (CCR1) was upregulated both in BD and FMF patients compared to that in the controls, whereas CCL5 was downregulated.

CONCLUSION: Immune and inflammatory gene expressions seem to be variable in both the innate (CD14+) and adaptive (CD4+) immune responses in BD and FMF patients compared to those in controls, suggesting differences in immune regulation between the two disorders.

Ozer, E. T., et al. (2017). "Dummy molecularly imprinted microbeads as solid-phase extraction material for selective determination of phthalate esters in water." Journal of Chromatography. A **1500**: 53-60.

The aim of this study was to investigate the usability of newly synthesized dummy molecularly imprinted microbeads (DMIMs) as a solid phase extraction (SPE) material to determine six phthalate esters (PEs) in water by GC-MS analysis. Diethyl phthalate (DEP) was used as a dummy template to prepare poly(ethylene glycol dimethacrylate N-methacryloyl-l-tryptophan methyl ester) [PEMATrp)] DMIMs by using suspension polymerization. The PEMATrp DMIMs were characterized by using Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS) and scanning electron microscopy (SEM). Firstly, the adsorption capacities of the DMIMs prepared in different template molecule (DEP) to functional monomer (MATrp) ratios were investigated by using DEP solutions in the concentration range of 1-500mg/L at pH 3.0. Styrene and vanillic acid were used to evaluate the selectivity of the prepared DMIMs towards the template molecule (DEP). Then, the best analytical conditions were investigated for the simultaneous determination of dimethyl phthalate (DMP), diethyl phthalate (DEP), di-n-butyl phthalate (DBP), benzylbutyl phthalate (BBP), di-(2-ethylhexyl) phthalate (DEHP) and di-n-octyl phthalate (DnOP) in aqueous media by using the PEMATrp DMIMs as SPE material. Validation experiments showed that the PEMATrp DMIMs-SPE method had good linearity at 12.5-250.0mug/L (0.988-0.999), good precision (1.2-5.9%), and limits of detection in a range of 0.31-0.41mug/L.

Özsin, G. and A. E. Pütün (2019). "TGA/MS/FT-IR study for kinetic evaluation and evolved gas analysis of a biomass/PVC co-pyrolysis process." Energy Conversion and Management **182**: 143.

This study aims to investigate the thermal behaviours of a specific biomass and a polymer sample through co-pyrolytic degradation. Therefore, a non-edible food processing waste (cherry seed: CS) and a typical plastic waste (polyvinyl chloride (PVC)) were selected and their interaction was studied using a combined TGA/MS/FT-IR system. By the help of TGA data, the non-isothermal kinetic analysis was performed using four different kinetic methods [Friedman, Flynn-Wall-Ozawa (FWO), Vyazovkin and distributed activation energy (DAEM)]. The kinetic results showed that the activation energy values were in agreement over the conversion degree values between 0.1 and 0.9. For determination of the synergistic or inhibitive interactions, theoretical and experimental thermogravimetry values were also compared. Moreover, in situ determination of the main pyrolytic and co-pyrolytic degradation compounds such as methyl, water, methoxy, hydrogen chloride, carbon dioxide and benzene with respect to temperature and time was studied for the first time. By this way, primary and secondary reactions related to methylation, dehydration, aromatization, fragmentation, dehydrochlorination were interpreted. Consequently, PVC was found to change pyrolytic degradation behaviour of lignocellulosic biomass by changing reactivity, activation energy and reaction mechanisms.

P, R. (2010). "UP TO SPEED: TWO MONTHS, ONE PAGE." Sierra **95**(4): 19-19.

The article offers anecdotal information about the environment. The Atlantic and Indian Oceans are said to contain as much floating plastic waste materials as the Pacific Ocean. With causes

unknown, more than 300 right whales largely constituted by calves have died near the coast of Argentina. The U.S. Environmental Protection Agency (EPA) finalized regulations that require a 42-percent increase in automobile gas mileage by 2016.

Paasch, U., et al. (2003). "Transduction of apoptotic signals in ejaculated spermatozoa after cryopreservation via activation of caspases. [German]." Journal fur Fertilitat und Reproduktion **13**(2): 22-31.

Objective: To study the relation between disintegration of plasma membrane and the activation of caspases, the transducers of apoptotic signals for programmed cell death in ejaculated spermatozoa. The spermatozoa were subpopulated by magnetic activated cell sorting (MACS) in dependence on sperm binding to superparamagnetic annexin V-conjugated microbeads (ANMB). The binding indicates an exposure of phosphatidylserine to the outer membrane (EPS) as an early event of apoptosis or a disturbance of membrane integrity. The resulting two populations were investigated for active caspases (aCP) 8, 9, 1 and 3, which mediate the main pathways of apoptosis. Method(s): Twenty semen samples of 10 healthy volunteers were splitted to get two aliquots, which were examined before and after cryopreservation. The fresh or cryopreserved semen samples were further aliquoted into two by MACS getting ANMB-negative- and ANMB-positive-subpopulations in dependence on the sperm membrane integrity. Afterwards, the aCP 8, 9, 1 and 3 were detected in both subpopulations. Result(s): The aCPs were localized predominantly in the postacrosmal region except aCP9 which was found in the midpiece. The cryopreservation led to a significantly increased number of sperm showing an activation of all caspases investigated (15.7 % in native vs. 40.8 % in cryopreserved spermatozoa, $p < 0.01$). The MACS separation in dependence on binding of ANMB to PS resulted in a significant depletion ($p < 0.01$) of sperm with aCP within the ANMB-negative spermatozoa with intact membranes. The percentage of sperm with aCP within the ANMB-negative fraction was not significantly influenced by cryopreservation. The cryopreservation increased the probability that spermatozoa with aCP8, aCP9, aCP1 and aCP3 may also develop a disintegration of plasma membrane and appear in the ANMB-positive fraction. Conclusion(s): For the first time it is reported that initiator and effector caspases of the main pathways of apoptosis are present and ready to be coordinately activated in ejaculated spermatozoa. Activated caspases were found especially in spermatozoa with disturbed membranes, but spermatozoa with intact membranes do also house a small amount of aCP. The annexin V-MACS separation resulted in a significant depletion of spermatozoa having aCP within the ANMB-negative fraction. Hence a wide spectrum of cell cytosceletal proteins and membrane components are targets of caspases, they very likely contribute to a decrease in the fertilization capacity.

Paben, J. (2017). "China announces 'Sword' crackdown on illegal material imports." Resource Recycling **36**(3): 8-9.

The article reports on the plan of China's General Administration of Customs (GAC) to launch an initiative to curtail foreign waste such as plastics, industrial waste, electronics and other household waste materials. Topics include the initiative as part of a larger plan known as National Sword 2017 that targets the smuggling of agricultural and resource products, drugs, and guns, the role of the Institute of Scrap Recycling Industries (ISRI), and details on the measures announced by GAC.

Pace, G. S., et al. (2012). Development of the heat melt compactor for waste management during long duration human space missions. 42nd International Conference on Environmental Systems 2012, ICES 2012.

Solid Waste handling and management in space habitats poses serious challenges for long duration human space missions. These wastes typically contain a high quantity of plastic from packaging as well as personal hygiene wastes, wet and dry wipes, gloves, duct tape, and unused food items. The unused food and personal hygiene wastes present substrates for growth of microorganisms that can seriously affect astronaut health and consequently mission success. The heat melt compaction process uses heat to sterilize and dry the waste, and the plastic content to bond and encapsulate the various waste items into a hard tile. The tile that is produced in the heat melt compaction process is tough, extremely compact, and has a predictable shape that allows the efficient use of very limited spacecraft storage volume. The encapsulation of the waste in the melted plastic isolates the growth substrate from spacecraft cabin air to prevent reinoculation of the waste. Plastic wastes contain a high percentage of hydrogen which is considered a desirable material for radiation shielding because it does not produce secondary radiation. Collaborative work with MSFC personnel on evaluating the effectiveness of tiles produced in the Heat Melt Compactor as a shielding material against radiation is in progress. Progress on the development of the next generation Heat Melt Compactor hardware is also presented.

Pacheco, A., et al. (2018). "Toxicological interactions induced by chronic exposure to gold nanoparticles and microplastics mixtures in Daphnia magna." Science of the Total Environment **628**(629): 474-483.

The effects of emerging environmental contaminants on human and environmental health is of high concern, especially those potentially induced by mixtures. The main goal of the present study was to assess the chronic effects of mixtures of citrate stabilized ~5 nm gold nanoparticles (AuNP) and 1-5 micro m microplastics (MP) on Daphnia magna. A 21-day bioassay was carried out. The effect criteria were parental mortality, somatic growth and several reproductive parameters. AuNP induced parental mortality, reduced the total offspring and caused immobile juveniles and aborted eggs. MP induced parental mortality, delayed the first brood release, decreased the number of broods released, the total offspring, and caused immobile juveniles. All the mixtures caused higher toxicity than AuNP and MP alone. Based on parental mortality, evidences of antagonism between AuNP and MP were observed at low concentrations of both mixture components, whereas evidences of synergism at high concentrations were found. Chronic (21-day) exposure of D. magna to AuNPs, MP, and their mixtures can impair development, reproduction, ultimately leading to death.

Paciorek-Sadowska, J., et al. (2019). "New Poly(lactide-urethane-isocyanurate) Foams Based on Bio-Polylactide Waste." Polymers **11**(3): 12.

The article presents the results of research on the synthesis of a new eco-polyol based on polylactide (PLA) waste and its use for the production of rigid polyurethane-polyisocyanurate (RPU/PIR) foams. The obtained recycling-based polyol was subjected to analytical, physicochemical and spectroscopic tests (FTIR, 1H NMR, ¹³C NMR) to confirm its suitability for the synthesis of polyurethane materials. Then, it was used to partially replace petrochemical polyol in polyurethane formulation. The obtained RPU/PIR foams were characterized by lower apparent density, brittleness, and water absorption. In addition, foams modified by eco-polyol had higher flame retardancy, as compared to reference foam. The results of the research show that the use of PLA polyol based on plastic waste may be an alternative to petrochemical polyols. This research matches with the current trends of sustainable development and green chemistry.

Packialakshmi, N. and N. R. Badhru (2015). "Screening and identification of efficient

polyhydroxybutyrate producing bacteria from plastic wastes dumped soil samples." World Journal of Pharmaceutical Research **4**(10): 1785-1794.

The soil samples were collected from the polythene and plastic waste dumped site area of Sankarapuram. The collected samples were subjected to serial dilution and plating technique. The isolated microbial strains were identified based on their cultural morphological and biochemical study. To identify the PHB producers from nonproducers Carbol fuchsin staining was carried, for this staining Bacillus species found to have dark colored granules within their cells. For further confirmation PHB producers were stained with Sudan black, the results observed as dark black to purple granules against pink back ground when counter stained with Safranin. Polythene bag degradation (broth and tray method) by Bacillus species were observed for one month. After the incubation color changes softness of plastics were observed due to the degrading action of microbes. The green gram seeds were inoculated in 3 pots each pot treated with Bacillus strain I, II, III, the growth rate were analyzed. Compared with other two strain the Bacillus megaterium gave the maximum growth. The FT-IR analysis identified the functional groups.

Paco, A., et al. (2017). "Biodegradation of polyethylene microplastics by the marine fungus Zalerion maritimum." Science of the Total Environment **586**: 10-15.

Plastic yearly production has surpassed the 300milliontons mark and recycling has all but failed in constituting a viable solution for the disposal of plastic waste. As these materials continue to accumulate in the environment, namely, in rivers and oceans, in the form of macro-, meso-, micro- and nanoplastics, it becomes of the utmost urgency to find new ways to curtail this environmental threat. Multiple efforts have been made to identify and isolate microorganisms capable of utilizing synthetic polymers and recent results point towards the viability of a solution for this problem based on the biodegradation of plastics resorting to selected microbial strains. Herein, the response of the fungus Zalerion maritimum to different times of exposition to polyethylene (PE) pellets, in a minimum growth medium, was evaluated, based on the quantified mass differences in both the fungus and the microplastic pellets used. Additionally, molecular changes were assessed through attenuated total reflectance Fourier transform Infrared Spectroscopy (FTIR-ATR) and Nuclear Magnetic Resonance (NMR).

Padet, L. and R. Bazin (2013). "IVIg prevents the in vitro activation of T cells by neutralizing the T cell activators." Immunology Letters **150**(1-2): 54-60.

Clinical observations in patients treated with IVIg revealed significant modulations in T cell populations and functions. However, it is unclear whether IVIg acts directly on activated T cells to suppress their functions. To clarify the exact mechanism of IVIg action, we studied its effect on T cells activated using anti-CD3/CD28 microbeads to mimic stimulatory signals provided by accessory cells. We report here that IVIg reduces T cell proliferation and cytokine secretion by interfering with the ability of anti-CD3/CD28 microbeads to deliver activating signals to T cells. We further show that the interference occurs between IVIg and anti-CD3/CD28 microbeads and does not involve T cells. In conclusion, our work suggests that T cells are not a direct target of IVIg and that the modulation of T cell populations and functions observed in treated patients is the indirect consequence of a direct effect of IVIg on accessory cells. © 2013 Elsevier B.V.

Padgelwar, S., et al. (2019). "Plastic waste management and current scenario in India: a review."

India has the second largest population in the world after China with 1.324 billion of people which become significant for industrialisation and rapid urbanisation. Since India is a developing country, people from villages started migrating to cities which creates the large amount of solid waste daily, resulting inenvironmental problem for cities. Among all solid waste, 14% of waste is coming from plastic waste, out of which most plastic generates from household use, industrial product, food packaging and water bottles. Also, a few states in India have a coastal region which generates plastic waste from recreational activities on the seashore. Inappropriate dumping of such waste collected outside the villages and cities which creates unhealthy and chaotic conditions which not only affect the health of the people staying around it but also create landfill problems results in major environmental implications contributing to pollution of ground water. To minimise the consumption of plastic, efforts have to be taken considering the use of renewable raw material to innovative products through recent development in technology. Also, daily use of plastic should be avoided which helps to improve healthy environmental conditions. The present study focusses on the rate of plastic being used in all the states of India, which is being segregated from solid waste coming from municipal waste and other sources. The review also includes the comparison of consumption of plastic in various states across India. A sustainable solution to recycle the plastic waste towards reducing environmental losses. 2019, 2019 Informa UK Limited, trading as Taylor & Francis Group.

Paffenhofer, G. A. and M. Koster (2020). "The Effects of Microplastics on Dolioletta gegenbauri (Tunicata, Thaliacea)." Archives of Environmental Contamination & Toxicology **78**(1): 94-105.

Oceanographic studies revealed the abundance of minute plastic particles in coastal regions. Such particles, called microplastics, are abundant in sizes smaller than 100 micro m ESD (Equivalent Spherical Diameter) and can be collected and ingested by planktonic copepods. Those animals are the most abundant metazoans on our planet. Abundantly co-occurring with planktonic copepods in subtropical and temperate neritic waters are doliolids (Tunicata, Thaliacea), which can dominate subtropical shelves because of their high asexual reproductive performance. Our studies were designed to examine the effects of polystyrene beads at low abundance, compared with phytoplankton, on abundantly occurring gonozooids of Dolioletta gegenbauri. Our findings reveal that such abundance of microplastic particles, in the presence of environmental concentrations of phytoplankton, reduces rates of feeding, growth, and oxygen consumption of this tunicate. Feeding rates on phytoplankton in the presence of beads were reduced by up to 58%, growth rates by up to 85%, and oxygen consumption rates by up to 33%. We conclude that such microplastic particles could limit the often in situ encountered pronounced proliferation of this tunicate species (Deibel in: Bone (ed) The biology of pelagic tunicates, Oxford University Press, Oxford, 1998).

Paget, R. J. (1974). "The treatment of plastic waste." Polymers Paint Colour J **164**(3876): 652-653.

This article develops the various courses of action or paths the treatment of plastic waste will follow and highlights some of the main difficulties. After briefly defining the general problem, the author discusses the three main methods of treating plastic wastes; recycling, reclaiming, and pyrolysis. It is shown that the necessity to recycle must become a fundamental part of society's future due to rapid and irreplaceable demand upon fossil fuels.

Pagter, E., et al. (2018). "Microplastics in Galway Bay: A comparison of sampling and separation methods." Marine Pollution Bulletin **135**: 932-940.

Microplastics, an emerging pollutant, are recognised as having a ubiquitous distribution in the environment. Currently several benthic sampling tools are being employed to collect subtidal marine sediment, however, there are no comparative studies on the efficiency of these tools to sample for microplastics or the subsequent extraction methods of microplastics from these marine sediments. This study addresses these knowledge gaps by comparing commonly applied benthic sampling tools (Van Veen grab, box corer, gravity corer) and a variety of density separation methods (elutriation column, sodium chloride solution, sodium tungstate dihydrate solution) for microplastic collection and processing. Each sampling tool was tested at the same station and the collected sediment was used to assess the extraction performance for the different density separation techniques. No statistically significant differences were found between the concentrations of microplastics extracted for any of the sampling tools. However, there were significant differences between the density separation methods using sodium tungstate dihydrate and sodium chloride solution and the elutriation method. This preliminary study provides evidence that the sampling tools tested are both suitable and proficient at determining the abundance of microplastics in sediments. Sodium tungstate dihydrate proved to be a novel and feasible option for dense liquid separation of microplastics in subtidal marine sediments. These results will allow for more confidence in data quality when comparing future surveys applying different benthic sampling tools. Copyright © 2018 Elsevier Ltd

Pajic-Lijakovic, I. (2013). "Micro-environmentally restricted hybridoma cell growth within polysaccharide hydrogel microbeads." Bio-Medical Materials & Engineering **23**(5): 361-371.

The mechanism of micro-environmentally restricted hybridoma cell growth caused by action of local mechanical compression stress generated within various polysaccharide hydrogel matrixes is estimated by comparing the growth of hybridoma cells within (1) 1.5% Ca-alginate microbeads from Bugarski et al. [in: Fundamentals of Animal Cells Immobilization and Microencapsulation, M.F.A. Goosen, ed., CRC Press, Boca Raton, FL, 1993, p. 267] and (2) 1.3% alginate-agarose microbeads from Shen et al. [Animal Cell Technology: Basic & Applied Aspects, H. Murakami ed., Kluwer Academic Publishers, The Netherlands, 1992, p. 173].Consideration of restricted cell growth dynamics based on developed kinetic model and kinetic 3D Monte Carlo simulation include: (1) changes the fraction of active proliferating cells in the exponential phase and (2) changes of non-proliferating cell concentration in the plateau phase.Higher value of the specific decrease of active fraction of proliferating cells kappa is obtained for 1.3% alginate-agarose compared to 1.5% alginate microbeads. It corresponds to higher compression stress generated within hydrogel matrix during cell growth obtained for 1.3% alginate-agarose microbeads.

Pajic-Lijakovic, I., et al. (2007). "Ca-alginate hydrogel mechanical transformations--the influence on yeast cell growth dynamics." Journal of Biotechnology **129**(3): 446-452.

A mathematical model was formulated to describe yeast cell growth within the Ca-alginate microbead during air-lift bioreactor cultivation. Model development was based on experimentally obtained data for the intra-bead cell concentration profile, after reached the equilibrium state, as well as, total yeast cell concentration per microbed and microbead volume as function of time. Relatively uniform cell concentration in the carrier matrix indicated that no internal nutrient diffusion limitations, but microenvironmental restriction, affected dominantly the dynamics of cell growth. Also interesting phenomenon of very different rates of cell number growth during cultivation is observed. After some critical time, the growth rate of cell colonies decreased drastically, but than suddenly increased again under all other experimental condition been the same. It is interpreted as disintegration of gel network and opening new free space for growth of cell clusters. These complex phenomena are modeled using the thermodynamical, free energy formalism. The particular form of free energy functional is proposed to describe various kinds of interactions, which affected the dynamics of cell growth and cause pseudo-phase transition of hydrogel. The good agreement of experimentally obtained data and model predictions are obtained. In that way the model provides both, the quantitative tools for further technological optimization of the process and deeper insight into dynamics of cell growth mechanism.

Pajic-Lijakovic, I., et al. (2007). "Investigation of Ca-alginate hydrogel rheological behaviour in conjunction with immobilized yeast cell growth dynamics." Journal of Microencapsulation **24**(5): 420-429.

The rheological model is developed to elucidate the mechanism of Ca-alginate microbead deformation in the course of cell growth within. It is a complex process influenced by relaxation of the expanded polymer network inside a bead, and forces generated by cell growth inside the bead and interactions between solvent, network parts and cells as well. The resulting effects are measured experimentally by estimating isotropic volumetric deformations of beads with yeast cells as function of time and cell concentration per bead. The mathematical model of the process is developed based on a modified general Zener model with fractional derivatives. It is particularly suitable for incorporating effects of different nature also during different stages of such complex process development. The results of theoretical analyses using the model developed and comparison with experimental values obtained, indicate a high impact of partial decomposition, i.e. plastic response of polymer network inside a bead due to cell growth, on bead deformation. For comparison, corresponding deformation measurements and modelling were performed on the same network system exposed to swelling in the solvent, but without the cells. In this case elastic forces are dominant, indicating different mechanism of relaxation without the influence of cells, in agreement with previous conclusions.

Pajic-Lijakovic, I., et al. (2008). "Modeling of microenvironmetal restricted yeast cell growth within Ca-alginate microbead." Minerva Biotecnologica **20**(2): 99-102.

Aim. A phase-field mathematical model was formulated to describe yeast cell growth within the Ca-alginate microbead during air-lift bioreactor cultivation. Model development was based on experimentally obtained data for the intra-bead yeast cell volume fraction profile within the microbead after reaching the equilibrium state for cells (150 h), as well as, total yeast cell volume fraction per microbead and microbead volume as functions time. Microbead with growing yeast cells is treated as a two-phase system. One phase represents the cell agglomerates, while the other is the alginate hydrogel matrices. The interactions between phases are simulated using the Langevin class, non-conservative phase-field model based on the reduction of the modeling resolution. The model considered the growth of small domains of one phase (cell agglomerates) as nucleation. Methods. Total yeast cell volume fraction in the beads was estimated by using Thoma counting chamber after dissolution of beads. Local cell volume fraction per microbead layers is calculated from experimentally determined surface fraction of cells for various micro-bead cross sections by image analysis. Microbead volume is estimated by measuring the microbead diameter. Diameters of microbeads were measured using the optical microscope equipped with a micrometric device. Results. The proposed model offered the only one model parameter, which represents the specific measure of microenvironmental restrictive action to die cell growth dynamics. The optimal value of this model parameter is obtained by comparison analysis between experimental data and model predictions. Conclusion. Besides giving useful insights into the dynamics of restrictive cell growth within the Ca-alginate microbead, the model can be used as a tool to design/optimize the performance of microbead and studying the microenvironmental restrictive mechanism action of the cell growth.

Pakes, S. P., et al. (1984). "Comparison of tests for the diagnosis of spontaneous encephalitozoonosis in rabbits." Laboratory Animal Science **34**(4): 356-359.

The immunofluorescence, complement fixation, microagglutination serological tests, intradermal skin test, and detection of histological lesions were compared in the diagnosis of encephalitozoonosis in rabbits. The India ink and microbead agglutination reactions were compared with immunofluorescence and complement fixation by testing 11 single or pooled serum samples. Serological tests correlated best with each other and less well with intradermal tests or presence of lesions. Immunofluorescence, India ink reaction and microbead agglutination were equally useful in detecting antibodies to Encephalitozoon cuniculi. The intradermal test correlated best with the presence of detectable lesions.

Pal, R., et al. (2011). "Preparation and characterization of sodium alginate-carbopol-934P based mucoadhesive microbeads." Der Pharmacia Lettre **3**(5): 1-11.

The purpose of the research work was to formulate and evaluate oral sustained release microspheres of clarithromycin for the treatment of Helicobacter pylori. The stomach specific alginate carbopol microbeads were selected in order to improve patient compliance by simplifying its administration, improving its therapeutic effect and reducing its dose related side effects. To eradicate the H. pylori, stomach specific alginate carbopol microbeads were prepared, by orifice ion-gelation process using different ratio of polymers. The microbeads were characterized by particle size, percentage drug entrapment efficiency, % adhering, antibacterial activity in terms of % Growth Inhibition [GI] and stability study. Sizes of microbeads were found in the range of 800-980 mum, SEM photomicrograph showed microbeads with smooth surface and spherical shapes. The percentage drug entrapment was up to 80 %. In vitro drug release studies were performed in phosphate buffer saline [PBS, pH 7.4] and simulated gastric fluid [SGF, pH 1.2] at 37+/-2degreeC. In vitro and in vivo mucoadhesive study was performed on albino rats, which showed that microbeads were remained adhered to mucus membrane of stomach for longer period of time. The efficacy of formulation was determined in term of its percentage growth of inhibition on H. pylori. The Stability studies were performed at different storage conditions. The site specific as well as sustained release of antibiotic could decrease the likelihood of significant systemic toxicity and may provide selective delivery of biologically active molecules on the site of action. The developed systems could possibly improve site specific release of drug at bacterial site and selectively kill the micro organism.

Palanisamy, R., et al. (2011). "Epiallele quantification using molecular inversion probes." Analytical Chemistry **83**(7): 2631-2637.

The location and level of DNA methylation within a genome is emerging as an important biomarker for cancer diagnosis. Despite its potential, it is difficult to comprehensively analyze the epialleles that are often found in a biological sample. Therefore, an assay utilizing molecular inversion probes was designed and used to expose and quantify epialleles in heterogeneously methylated bisulphite treated genomic DNA. Different CpG dinucleotides were able to be rapidly quantified with high resolution, sensitivity and specificity over a large dynamic range using rapid flow cytometric readout of multiplexable microbead DNA biosensors.

Palatinus, A., et al. (2019). "Marine litter in the Croatian part of the middle Adriatic Sea: Simultaneous assessment of floating and seabed macro and micro litter abundance and composition." Marine Pollution Bulletin **139**: 427-439.

In this study, abundance, distribution and composition of floating and seabed macro and micro litter in the Central Adriatic Sea were assessed. Floating macro litter observations were made. Floating and seabed micro litter were sampled with manta net and Van Veen grab, respectively. Micro litter particles visually found under the microscope were chemically analyzed with Fourier Transform Infrared microscope. Average calculated concentrations of floating macro (175

items/km²), floating micro (127 thousand particles/km²) and seabed micro litter (36 particles/100 g dry weight) show similar values as other published studies from the Mediterranean Sea. A statistically significant ($p < 0.01$) correlation between the floating micro and macro litter concentrations was found for the sites located in the channel waters. Disagreement between model and observations revealed gaps in our knowledge concerning the sea circulation and litter sources. Simultaneous samplings and observations of marine litter in different marine compartments proved possible, efficient and informative. Copyright © 2019 Elsevier Ltd

Paler, M. K. O., et al. (2019). "Plastic waste occurrence on a beach off southwestern Luzon, Philippines." Marine Pollution Bulletin **141**: 416-419.

The Philippines is one of the countries with the highest plastic waste inputs into the ocean yet there is dearth of information on the level of contamination by plastic wastes in local marine ecosystems. This study aims to provide a plastic litter profile in a local beach as an initial report on plastic waste contamination in a typical coast. Likewise, microplastic (MP) occurrence is measured to establish baseline data on MP level.

Palmer, C. S., et al. (2012). "Glut1: Establishing a new paradigm for HIV-1 infection by regulating glucose metabolism and activation in CD4+ T cells in HIV-1-positive subjects." Journal of the International AIDS Society **3)**: 9.

Background: A characteristic feature of the early phase of mammalian cells to metabolic stress is an increase in the rate of glucose uptake and metabolism. Glucose transporter 1 (Glut1) is the major glucose transporter in T cells and its expression is increased on CD4+T cells during chronic HIV-1 infection in vivo (Palmer et al., Abstract 1, IAS, 2012).We therefore seek to determine the impact of increased Glut1 expression on glucose metabolism in CD4+T cells from HIV-1-infected subjects. Method(s): The cell surface expression of Glut1 and glucose uptake (2- NBDG) was monitored in CD4+T cells from HIV-1 infected treatment naive or HIV- controls subjects by flow cytometry. Hexokinase and glycolytic activity was measured by the intracellular concentrations of Glucose-6-phosphate (G-6-P) and L-lactate, respectively. Intracellular PTEN, pAkt (T308) and pAkt (S473) levels determined PI3KmTOR activity. In vitro HIV-1 infection was performed on PBMCs activated with anti-CD3/CD28 microbeads and IL-7 and incubated with the CXCR4-using NL4.3-GFP virus. Result(s): Basal glucose uptake, G-6-P, L-lactate, intracellular p-Akt (T308) and p-Akt (S473) were significantly higher in CD4+Glut1+ vs CD4+Glut1- cells. This corresponded with an overall increased glucose uptake and glycolysis and lower levels of PTEN expression in CD4+T cells from HIV-1+subject vs seronegative individuals. Anti-CD3/CD28-induced Glut1 expression on CD4+ T cells was sensitive to specific inhibition of the Class1B PI3K-y and mTORC1 pathways which also blocked HIV-1 infection of CD4+T cells in vitro. Conclusion(s): CD4+T cells from HIV-1 infected patients have increased glucose uptake and glycolytic activity mediated at least in part by the PI3k-y-mTORC1 pathway. Increased Glut1 cell surface expression and glycolysis in CD4+T cells may increase their susceptibility to HIV-1 infection and foster their depletion due to hypermetabolism. Approaches to normalize Glut1 expression or glycolysis in CD4+T cells may offer a platform for interventions to slow HIV-1 disease progression.

Palmon, A., et al. "High-efficiency immunomagnetic isolation of solid tissue-originated integrin-expressing adult stem cells." Methods.

Isolation of highly pure specific cell types is crucial for successful adult stem cell-based therapy. As the number of such cells in adult tissue is low, an extremely efficient method is needed for their isolation. Here, we describe cell-separation methodologies based on magnetic-affinity cell

sorting (MACS) MicroBeads with monoclonal antibodies against specific membrane proteins conjugated to superparamagnetic particles. Cells labeled with MACS MicroBeads are retained in a magnetic field within a MACS column placed in a MACS separator, allowing fast and efficient separation. Both positively labeled and non-labeled fractions can be used directly for downstream applications as the separated cell fractions remain viable with no functional impairment. As immunomagnetic separation depends on the interaction between a cell's membrane and the magnetically labeled antibody, separation of specific cells originating from solid tissues is more complex and demands a cell-dissociating pretreatment. In this paper, we detail the use of immunomagnetic separation for the purpose of regenerating damaged salivary gland (SG) function in animal and human models of irradiated head and neck cancer. Each year 500,000 new cases of head and neck cancer occur worldwide. Most of these patients lose SG function following irradiation therapy. SGs contain integrin alpha6beta1-expressing epithelial stem cells. We hypothesized that these cells can be isolated, multiplied in culture and auto-implanted into the irradiated SGs to regenerate damaged SG function. © 2011 Elsevier Inc. All rights reserved.

Palombini, F. L., et al. (2018). "Occurrence and recovery of small-sized plastic debris from a Brazilian beach: characterization, recycling, and mechanical analysis." Environmental Science & Pollution Research **25**(26): 26218-26227.

Small-sized plastic debris are an increasing global concern, particularly in environmental protected areas. Consequently, tourism-based economy of poor coastal regions is also impaired. Nevertheless, little interest has been shown about recycling approaches of such materials, mostly because of the natural degradation of polymers on these conditions. This research presents the report of the occurrence of plastic debris nearby Lencois Maranhenses National Park, on the northeast Brazilian coast, aiming to provide a feasible method for recycling. We collected more than 80 samples from the sediment and classified them via FT-IR. Degraded polypropylene samples were selected for blending with virgin material using different concentration rates, and were mechanically tested. Tensile testing results suggest that 5% recycled material concentration mixture has suitable mechanical properties on the elastic regime for applications on new parts. Our findings show that particular interest should be addressed on the recovery of commodity plastic debris from environmental protected areas.

Paltiel, O., et al. (2000). "Translocation t(14;18) in healthy individuals: preliminary study of its association with family history and agricultural exposure." Annals of Oncology **11 Suppl 1**: 75-80.

BACKGROUND: The t(14;18) translocation, present in 90% of follicular non-Hodgkin's lymphomas (NHL), has been found to exist in low levels in healthy persons. Its clinical/prognostic significance in healthy populations is unknown, and risk factors for its development have not been determined. Our objectives were to assess the prevalence of t(14;18) in individuals without NHL, comparing residents of agricultural settlements (kibbutzim) with city dwellers, as well as first degree relatives of NHL cases.

PATIENTS AND METHODS: Residents of kibbutzim and members of two control groups: 1) Jerusalem residents--randomly selected hospital administrative workers and 2) first degree family members of lymphoma patients were interviewed extensively regarding exposures and had blood drawn for t(14;18) determination. The translocation was detected after B-cell purification of blood samples with CD-19 microbeads (Mini-Macs) using nested PCR. The method detects the translocation in a BCL2 positive cell line after dilutions of up to 1:10(5) with normal peripheral blood lymphocytes.

RESULTS: Nineteen of two hundred thirty healthy individuals (8.3%) tested were found to be positive for

t(14;18). No statistically significant differences in the prevalence of t(14;18) were detected among the rural and urban populations. Five of thirty-four (11.9%) family members tested positive for t(14;18). No age or sex differences between t(14;18) positive and negative individuals were found. No significant association with exposure to specific agricultural or other chemicals was found.

CONCLUSIONS: The presence of the t(14;18) translocation in healthy individuals was not associated with agricultural residence in this preliminary study. Whether relatives of patients with NHL are at increased risk will require further study in larger populations. Specific exposures affecting the onset of this translocation have not been ruled out. The significance of this translocation in healthy individuals remains unknown.

Pan, C., et al. (2015). "Neuroprotective effect of AAV-mediated cell-specific expression of GDNF in Muller glial cells versus retinal ganglion cells in a murine model of glaucoma." Investigative Ophthalmology and Visual Science **56 (7)**: 2421.

Purpose: To compare the neuroprotective effects of intravitreal AAV vectormediated expression of GDNF in Muller glial cells (ShH10.GDNF) versus retinal ganglion cells (RGC) (AAV2.GDNF) in the murine model of microbead-induced ocular hypertension. Method(s): Polystyrene microbeads were injected into the anterior chamber of adult mice to elevate intraocular pressure (IOP) and induce glaucoma. An intravitreal injection containing 1x10¹⁰ vector genomes of either ShH10.GDNF or AAV2.GDNF was administered concomitantly. IOP was measured by TonoLab tonometry at weekly intervals. Mice were sacrificed at four weeks and RGC loss and optic nerve axon (ONA) loss was quantified. Enzyme-linked immunosorbent assay (ELISA) was performed to determine GDNF expression in the retina and optic nerve. Result(s): Increased IOP was confirmed in microbead-injected eyes by tonometer. Neither Sh10.GDNF nor AAV2.GDNF had any effect on IOP. At four weeks, uninjected control eyes and microbead-injected eyes had a mean RGC count of 3065 +/- 410 cells/mm² (n=15) and 1573 +/- 75 cells/mm² (n=12). Microbead-injected eyes that received either ShH10.GDNF or AAV2.GDNF demonstrated 2185 +/- 78 cells/mm² (n=13) and 1689+/- 77 cells/mm² (n=12) respectively. At four weeks, uninjected control eyes and microbead-injected eyes had a mean ONA count of 538842 +/- 88924 axons/mm² (n=15) and 220716 +/- 76253 axons/mm² (n=15). Microbead-injected eyes that received either ShH10.GDNF or AAV2.GDNF demonstrated 367415 +/- 19701 axons/mm² (n=8) and 281800 +/- 16044 axons/mm (n=12) respectively. Thus, microbead-injected eyes treated with ShH10.GDNF contained ~130% increase in viable RGCs and axons at four weeks compared to eyes treated with AAV2.GDNF (p<0.05). Intravitreous ShH10.GDNF and AAV2.GDNF resulted in increased GDNF levels (pg GDNF/mg total protein) in the retina compared to uninjected eyes (5433 and 10874 vs 5.5) and optic nerve (2474 and 4310 vs 40) (n=10). Conclusion(s): Intravitreal ShH10.GDNF and AAV2.GDNF result in GDNF expression in the retina and optic nerve with no effect on IOP. Although ELISA results showed relatively higher expression in retina and optic nerve tissues with AAV2 compared to ShH10, the ShH10 vector had a stronger neuroprotective effect on RGC and axon survival indicating that specific cellular targeting or indirect pathways may be an important consideration in the treatment of glaucoma.

Pan, Z., et al. (2019). "Microplastics in the Northwestern Pacific: Abundance, distribution, and characteristics." Science of the Total Environment **Part 2. 650**: 1913-1922.

Prevalence of microplastics (MPs) throughout the world's oceans has raised growing concerns due to its detrimental effects on the environment and living organisms. Most recent studies of

MPs, however, have focused on the estuaries and coastal regions. There is a lack of study of MPs pollution in the open ocean. In the present study, we conducted field observations to investigate the abundance, spatial distribution, and characteristics (composite, size, color, shape and surface morphology) of MPs at the surface of the Northwestern Pacific Ocean. Samples of MPs were collected at 18 field stations in the Northwestern Pacific Ocean using a surface manta trawl with a mesh size of ~330 mum and width of 1 m from August 25 to September 26, 2017. The MPs were characterized using light microscopy, Micro-Raman spectroscopy, and scanning electron microscopy (SEM). Our field survey results indicate the ubiquity of MPs at all stations with an abundance from 6.4 x 10² items km⁻² to 4.2 x 10⁴ items km⁻² and an average abundance of 1.0 x 10⁴ items km⁻². The Micro-Raman spectroscopic analysis of the MPs samples collected during our field survey indicates that the dominant MPs is polyethylene (57.8%), followed by polypropylene (36.0%) and nylon (3.4%). The individual chemical compositions of MPs from the stations within the latitude range 123-146degreeE are comparable with each other, with PE being the dominating composition. Similar chemical fingerprints were observed at these field stations, suggesting that the MPs originated from similar sources. In contrast, the major MPs at the field stations adjacent to Japan is polypropylene, which may originate from the nearby land along the coast of Japan. Physical oceanography parameters were also collected at these stations. The spatial distribution of MPs is largely attributed to the combined effects of flow pattern, adjacent ocean circulation eddies, the Kuroshio and Kuroshio Extension system. Copyright © 2018 The Authors

Pan, Z., et al. (2019). "Environmental implications of microplastic pollution in the Northwestern Pacific Ocean." Marine Pollution Bulletin **146**: 215-224.

Microplastics (MPs) contamination has been recognized as one of major threats to coastal marine environments. Although studies evidenced severe MPs contaminations to the Pacific Ocean, environmental implications of MPs concentrations, distributions, and characteristics have not been evaluated in sufficient detail. Here, we report on the distribution, abundance, and characteristics of MPs at the surface of the Northwestern Pacific Ocean, from which environmental implications are assessed. A manta trawl with a mesh size of ~330mum and a rectangular net opening of 0.45x1m was used to collect MPs samples on May 11-June 3, 2018. The MPs samples were sequentially isolated, digested, filtered, and characterized using an optical microscope, micro-Raman spectroscopy, and scanning electron microscopy. The results indicate the heterogeneity in abundance, shapes, color, and sizes of MPs. The study provides strong environmental implications such as sources, environmental degradation, residence time, transportation routes, and biological interactions.

Pan, Z., et al. (2019). "Prevalence of microplastic pollution in the Northwestern Pacific Ocean." Chemosphere **225**: 735-744.

People are increasingly aware of ubiquitous microplastic (MP) pollution in the world's ocean due to its far-reaching harmful impacts on marine ecosystem and potential hazards to human health, yet surprisingly comparatively limited studies about the abundance, source, transport, and fate of MPs in the Northwestern Pacific Ocean are available. We conducted the field survey of MPs pollution at the surface of the Northwestern Pacific Ocean between August 25 and September 26, 2017. MPs were collected from 18 sampling stations in the Northwestern Pacific Ocean using a manta trawl net with a mesh size of ~330mum and a rectangular net opening of 0.45x1m. The abundance, shape, color, size, chemical composition, and surface morphology were characterized using light microscopy, mu-Raman spectroscopy, and scanning electron

microscopy (SEM). The results show surface MPs at concentrations ranging over two orders of magnitude (6.4x10² to 4.2x10⁴ particles km⁻²) and a mean abundance of 1.0x10⁴ particles km⁻². The most concentrated MPs were found at XTJ3-9, which may be associated with the convergence of surface currents collectively affected by the Kuroshio and its extension, adjacent eddies, and flow regimes. Polyethylene accounts for 57.8% of enumerated MPs, followed by polypropylene (36.0%) and nylon (3.4%). Pellets, sheets, lines, and films are major forms which may be linked to the breakdown of larger particles, aging processes, and movement over long distances by prevailing currents. Four possible MPs migration pathways were proposed based on the source-specific distribution, chemical fingerprints, size distribution patterns, and the observed physical oceanographic parameters.

Panda, A. K., et al. (2010). "Thermolysis of waste plastics to liquid fuel: A suitable method for plastic waste management and manufacture of value added products - A world prospective." Renewable & Sustainable Energy Reviews **14**(1): 233-248.

The present rate of economic growth is unsustainable without saving of fossil energy like crude oil, natural gas or coal. Thus mankind has to rely on the alternate/renewable energy sources like biomass, hydropower, geothermal energy, wind energy, solar energy, nuclear energy, etc. On the other hand, suitable waste management strategy is another important aspect of sustainable development. The growth of welfare levels in modern society during the past decades has brought about a huge increase in the production of all kinds of commodities, which indirectly generate waste. Plastics have been one of the materials with the fastest growth because of their wide range of applications due to versatility and relatively low cost. Since the duration of life of plastic products is relatively small, there is a vast plastics waste stream that reaches each year to the final recipients creating a serious environmental problem. Again, because disposal of post consumer plastics is increasingly being constrained by legislation and escalating costs, there is considerable demand for alternatives to disposal or land filling. Advanced research in the field of green chemistry could yield biodegradable/green polymers but is too limited at this point of time to substitute the non-biodegradable plastics in different applications. Once standards are developed for degradable plastics they can be used to evaluate the specific formulations of materials which will find best application in this state as regards their performance and use characteristics. Among the alternatives available are source reduction, reuse, recycling, and recovery of the inherent energy value through waste- to-energy incineration and processed fuel applications. Production of liquid fuel would be a better alternative as the calorific value of the plastics is comparable to that of fuels, around 40 MJ/kg. Each of these options potentially reduces waste and conserves natural resources. Plastics recycling, continues to progress with a wide range of old and new technologies. Many research projects have been undertaken on chemical recycling of waste plastics to fuel and monomer. This is also reflected by a number of pilot, demonstration, and commercial plants processing various types of plastic wastes in Germany, Japan, USA, India, and elsewhere. Further investigations are required to enhance the generation of value added products (fuel) with low investments without affecting the environment. The paper reviews the available literature in this field of active research and identifies the gaps that need further attention.

Pandey, A. K., et al. (2012). "Fabrication and evaluation of tinidazole microbeads for colon targeting." Asian Pacific Journal of Tropical Disease **1**(20).

Objective: The purpose of present investigation was to develop and evaluate multiparticulate system exploiting pH-sensitive property and specific biodegradability of calcium alginate microbeads, for colon-targeted delivery of Tinidazole for the treatment of amoebic colitis.

Panebianco, A., et al. (2019). "First discoveries of microplastics in terrestrial snails." Food Control **106**(106722).

Microplastics (MPs) are widely recognized as pollutants of the marine environment, while their presence, diffusion and distribution in the terrestrial ecosystem have been investigated so far. The aim of this study is to evaluate, for the first time, the presence of microplastics in three different species of edible snails belonging to the genus Helix (H. aperta, H. aspersa and H. pomatia) in order to improve the knowledge about the distribution of MPs in the terrestrial ecosystem, and the consequent MPs human exposure deriving from their consumption. Their breeding techniques, the frequent response in rural areas close to agricultural activities and their food behavior, suggest us that they can be exposed to the main contamination sources of MPs in terrestrial ecosystem. A total of 425 specimens were collected in nature or in breeding and divided in 85 samples (5 snails for each sample). All the specimens belonging to the H. aspersa (44 samples) and H. pomatia (4 samples) were in active life phase, while those belonging to the H. aperta (37 samples) species were in resting phase. The digestion of the samples was carried out through the nitric acid and a stereomicroscope was used for the physical identification of MPs. Out of 85 samples of snails examined, 44 (51.75%) presented MPs. A total of 78 MPs were isolated, ranging from 1 to 3 in each sample, with a mean value of 0.92+or-1.21 particles/sample and an amount of 0.07+or-0.01 MPs/g. Among these 78 MPs, 43 were plastic line with variable length between 200 micro m and 2500 micro m and the remaining 35 plastic fragments, whose longest lengths varied between 200 micro m and 1000 micro m. Although the quantity of MPs/g found is relatively low, in any case their presence in terrestrial snails contributes to the risk assessment of human exposure deriving from their consumption.

Panicker, P. K. and A. Magid (2016). Microwave plasma gasification for the restoration of urban rivers and lakes, and the elimination of oceanic garbage patches. ASME 2016 10th International Conference on Energy Sustainability, ES 2016, collocated with the ASME 2016 Power Conference and the ASME 2016 14th International Conference on Fuel Cell Science, Engineering and Technology, June 26, 2016 - June 30, 2016, Charlotte, NC, United states, American Society of Mechanical Engineers.

This review paper describes techniques proposed for applying microwave-induced plasma gasification (MIPG) for cleaning rivers, lakes and oceans of synthetic and organic waste pollutants by converting the waste materials into energy and useful raw materials. Rivers close to urban centers tend to get filled with manmade waste materials, such as plastics and paper, gradually forming floating masses that further trap biological materials and animals. In addition, sewage from residences and industries, as well as rainwater runoff pour into rivers and lakes carrying solid wastes into the water bodies. As a result, the water surfaces get covered with a stagnant, thick layer of synthetic and biological refuse which kill the fish, harm animals and birds, and breed disease-carrying vectors. Such destruction of water bodies is especially common in developing countries which lack the technology or the means to clean up the rivers. A terrible consequence of plastic and synthetic waste being dumped irresponsibly into the oceans is the presence of several large floating masses of garbage in the worlds' oceans, formed by the action of gyres, or circulating ocean currents. In the Pacific Ocean, there are numerous debris fields that have been labeled the Great Pacific Garbage Patch. These patches contain whole plastic litters as well as smaller pieces of plastic, called microplastics, which are tiny fragments that were broken down by the action of waves. These waste products are ingested by animals, birds and fishes, causing death or harm. Some of the waste get washed ashore on beaches along with dead marine life. The best solution for eliminating all of the above waste management problems is by the application of MIPG systems to convert solid waste materials and contaminated water into syngas, organic fuels and raw materials. MIPG is the most efficient form of plasma gasification, which is able to process the most widest range of waste materials, while consuming only about a quarter of the energy released from the feedstock. MIPG systems can be scaled in size, power rating and wastetreatment capacity to match financial needs and waste processing requirements. MIPG systems can be set up in urban locations and on the shores of the waterbody, to filter and remove debris and contaminants and clean the water, while generating electric power to feed into the grid, and fuel or raw materials for industrial use. For eliminating the pelagic debris fields, the proposed design is to have ships fitted with waste collector and filtration systems that feeds the collected waste materials into a MIPG reactor, which converts the carbonaceous materials into syngas (H2 + CO). Some of the syngas made will be used to produce the electric power needed for running the plasma generator and onboard systems, while the remainder can be converted into methanol and other useful products through the Fischer-Tropsch process. This paper qualitatively describes the implementation schemes for the above processes, wherein MIPG technology will be used to clean up major waste problems affecting the earth's water bodies and to convert the waste into energy and raw materials in a sustainable and environmentally friendly manner, while reducing the dependence on fossil fuels and the release of carbon dioxide and methane into the atmosphere. Copyright 2016 by ASME.

Panizon, E., et al. (2015). "MARTINI Coarse-Grained Models of Polyethylene and Polypropylene." Journal of Physical Chemistry. B, Condensed Matter, Materials, Surfaces, Interfaces & Biophysical **119**(25): 8209-8216.

The understanding of the interaction of nanoplastics with living organisms is crucial both to assess the health hazards of degraded plastics and to design functional polymer nanoparticles with biomedical applications. In this paper, we develop two coarse-grained models of everyday use polymers, polyethylene (PE) and polypropylene (PP), aimed at the study of the interaction of hydrophobic plastics with lipid membranes. The models are compatible with the popular MARTINI force field for lipids, and they are developed using both structural and thermodynamic properties as targets in the parametrization. The models are then validated by showing their reliability at reproducing structural properties of the polymers, both linear and branched, in dilute conditions, in the melt, and in a PE-PP blend. PE and PP radius of gyration is correctly reproduced in all conditions, while PE-PP interactions in the blend are slightly overestimated. Partitioning of PP and PE oligomers in phosphatidylcholine membranes as obtained at CG level reproduces well atomistic data.

Pankaj, V. P. (2015). "Sustainable model of plastic waste management." International Journal of ChemTech Research **7**(1): 440-458.

In India, Plastic waste rising rapidly day by day due to increasing the living standards of human beings by leaps & bounds and due to increasing population.The plastic waste management is not developing in India however, India having Plastic Waste (Management and Handling) Rules, 2011. The collection, transportation and process of plastic waste management are unscientific and chaotic. Uncontrolled dumping of wastes on outskirts of towns and cities has created abundantlandfills, which are not only impossible to reclaim because of the haphazard manner of dumping, but also have serious environmental implications in terms of ground water pollution and contribution to global warming. Burning of plastic waste leads to air pollution, which is equivalent to vehicular emissions at times.In the absence of plastic waste segregation practices,

recycling has remained to be an informalsector working on outdated technology, but nevertheless flourishing owing to waste material availability and market demand of cheaper recycled products. Plastic recycling have been especially growing due to continuously increasing consumption levels of both the commodities. In this paper, I developa model of plastic waste management under the rule and regulation which has been given by CPCB, Ministry of Environment and etc. in India to maintain the balance of the ecosystem by proper managing the plastic wastes. Copyright © 2014, Sphinx Knowledge House. All rights reserved.

Pannetier, P., et al. (2019). "Toxicity assessment of pollutants sorbed on environmental sample microplastics collected on beaches: Part I - Adverse effects on fish cell line." Environmental Pollution **248**: 1088-1097.

Microplastics (MPs), are tiny plastic fragments from 1 micro m to 5 mm generally found in the aquatic environment which can be easily ingested by organisms and may cause chronic physical but also toxicological effects. Toxicological assays on fish cell lines are commonly used as an alternative tool to provide fast and reliable assessment of the toxic and ecotoxic properties of chemicals or mixtures. Rainbow trout liver cell line (RTLW-1) was used to evaluate the toxicity of pollutants sorbed to MPs sampled in sandy beaches from different islands around the world during the first Race for Water Odyssey in 2015. The collected MPs were analyzed for polymer composition and associated persistent organic pollutants: polycyclic aromatic hydrocarbons (PAHs), polychlorobiphenyls (PCBs) and dichlorodiphenyltrichloroethane (DDT). In addition, DMSO-extracts from virgin MPs, MPs artificially coated with B[a]P and environmental MPs were analyzed with different bioassays: MTT reduction assay (MTT), ethoxyresorufin-O-deethylase (EROD) assay and comet assay. Microplastics from sand beaches were dominated by polyethylene, followed by polypropylene fragments with variable proportions. Organic pollutants found on plastic from beach sampling was PAHs (2-71 ng g⁻¹). Samples from Bermuda (Somerset Long Bay) and Hawaii (Makapu'u) showed the highest concentration of PAHs and DDT respectively. No toxicity was observed for virgin microplastics. No cytotoxicity was observed on cells exposed to MP extract. However, EROD activity was induced and differently modulated depending on the MPs locations suggesting presence of different pollutants or additives in extract. DNA damage was observed after exposure to four microplastics samples on the six tested. Modification of EROD activity level and DNA damage rate highlight MPs extract toxicity on fish cell line.

Pannetier, P., et al. (2019). "Toxicity assessment of pollutants sorbed on environmental microplastics collected on beaches: Part II - Adverse effects on Japanese medaka early life stages." Environmental Pollution **248**: 1098-1107.

While microplastics are present in great abundance across all seas and oceans, little is known about their effects on marine life. In the aquatic environment, they can accumulate a variety of chemicals and can be ingested by many marine organisms including fish, with chronic physical and chemical effects. The purpose of this paper is to evaluate the toxic effects of pollutants sorbed at the surface of environmental microplastics (MPs), collected on various beaches from three islands of the Pacific Ocean. Developmental toxicity of virgin MPs or artificially coated with B[a]P and environmental MPs from Easter Island, Guam and Hawaii was evaluated on embryos and prolarvae of Japanese medaka. Mortality, hatching success, biometry, malformations, EROD activity and DNA damage were analyzed after exposure to DMSO extracts. No toxicity was observed for extracts of virgin MPs whatever the endpoint considered. Extracts of virgin MPs coated with 250 micro g.g⁻¹ of B(a)P induced lethal effects with high embryo mortality (+81%) and low hatching rate (-28%) and sublethal effects including biometry and

swimming behavior changes, increase of EROD activity (+94%) and DNA damage (+60%). Environmental MPs collected on the three selected islands exhibited different polymer, pollutant and toxicity patterns. The highest toxicity was detected for MPs extract from Hawai with head/body length and swimming speed decreases and induction of EROD activity and DNA stand breaks. This study reports the possible sublethal toxicity of organic pollutants sorbed on MPs to fish early life stages.

Pannetier, P., et al. (2020). "Environmental samples of microplastics induce significant toxic effects in fish larvae." Environment International **134**: 105047.

Microplastics (MPs) are present throughout aquatic ecosystems, and can be ingested by a wide variety of organisms. At present, the physical and chemical effects of environmental MPs on aquatic organisms are poorly documented. This study aims to examine the physiological and behavioral effects caused by fish consuming environmental microplastics at different life stages. MP samples were collected from beaches on three islands (Easter Island, Guam and Hawaii) located near the North and South gyres of the Pacific Ocean. Larvae and juveniles of Japanese Medaka were fed for 30days with three doses of MPs (0.01, 0.1 and 1% w/w in fish food) approximate to the concentrations measured in moderately and heavily contaminated ocean areas. Ingestion of MPs by medaka larvae caused (variously) death, decreased head/body ratios, increased EROD activity and DNA breaks and, alterations to swimming behavior. A diet of 0.1% MPs was the most toxic. Two-month-old juveniles fed with 0.01% MPs did not exhibit any symptoms except an increase in DNA breaks. Our results demonstrate ingestion and mainly sublethal effects of environmental MPs in early life stages of fish at realistic MP concentrations. The toxicity of microplastics varies from one sample to another, depending on polymer composition, weathering and pollutant content. This study examines the ecological consequences microplastic build-up in aquatic ecosystems, more particularly in coastal marine areas, which serve as breeding and growing grounds for a number of aquatic species.

Panno, S. V., et al. (2019). "Microplastic Contamination in Karst Groundwater Systems." Ground Water **57**(2): 189-196.

Groundwater in karst aquifers constitutes about 25% of drinking water sources globally. Karst aquifers are open systems, susceptible to contamination by surface-borne pollutants. In this study, springs and wells from two karst aquifers in Illinois, USA, were found to contain microplastics and other anthropogenic contaminants. All microplastics were fibers, with a maximum concentration of 15.2 particles/L. The presence of microplastic was consistent with other parameters, including phosphate, chloride and triclosan, suggesting septic effluent as a source. More studies are needed on microplastic sources, abundance, and impacts on karst ecosystems.

Panti, C., et al. (2019). "Marine litter: One of the major threats for marine mammals. Outcomes from the European Cetacean Society workshop." Environmental Pollution **247**: 72-79.

Marine litter is a pollution problem affecting thousands of marine species in all the world's seas and oceans. Marine litter, in particular plastic, has negative impacts on marine wildlife primarily due to ingestion and entanglement. Since most marine mammal species negatively interact with marine litter, a first workshop under the framework of the European Cetacean Society Conference, was held in 2017 to bring together the main experts on the topic of marine mammals and marine litter from academic and research institutes, non-governmental organisations, foundations and International Agreements. The workshop was devoted to defining the impact of marine litter on marine mammals by reviewing current knowledge, methodological advances and new data available on this emerging issue. Some case studies were also presented from European waters, such as seals and cetaceans in the North, Baltic, and Mediterranean Seas. Here, we report the main findings of the workshop, including a discussion on the research needs, the main methodological gaps, an overview of new techniques for detecting the effects of marine litter (including microplastics) on marine mammals and, also, the use of citizen science to drive awareness. The final recommendations aim to establish priority research, to define harmonised methods to detect marine litter and microplastics, enforce networking among institutions and support data sharing. The information gathered will enhance awareness and communication between scientists, young people, citizens, other stakeholders and policy makers, and thereby facilitate better implementation of international directives (e.g., the Marine Strategy Framework Directive) in order to answer the question about the actual status of our oceans and finding solutions. To understand the sources, the transfer and the effects of marine litter, and therefore their impacts on marine mammal researchers need to apply a multidisciplinary standardized protocols. Copyright © 2019 Elsevier Ltd

Panti, C., et al. (2015). "Occurrence, relative abundance and spatial distribution of microplastics and zooplankton NW of Sardinia in the Pelagos Sanctuary Protected Area, Mediterranean Sea." Environmental Chemistry **12**(5): 618-626.

Floating plastic debris tends to fragment into smaller pieces, termed microplastics, which may increase the likelihood of ingestion of plastics by marine organisms entering the food web. This study analyses the amount and spatial distribution of microplastics and zooplankton in an area near Asinara National Park (NW Sardinia) and overlapping the Pelagos Sanctuary (Mediterranean Sea). Analysis showed microplastics in 81 % of the 27 samples analysed, with a mean value of 0.17 plus or minus 0.32 items m-3. From geographic information system processing of the data, microplastics appeared more abundant (by a factor of four) in the pelagic than in the neritic environment, and showed a size range of the same order as major zooplanktonic taxa determined in the area. These findings suggest a potential risk of mesozooplankton and species preying on plankton mistaking microplastics for food. Further functional and toxicological studies are therefore necessary to assess the hazard associated with microplastics in the marine food web.

Panyachanakul, T., et al. (2019). "Development of biodegradation process for Poly(DL-lactic acid)degradation by crude enzyme produced by Actinomadura keratinilytica strain T16-1." Electronic Journal of Biotechnology **40**: 52-57.

Background: Plastic waste is a serious problem because it is difficult to degrade, thereby leading to global environment problems. Poly(lactic acid)(PLA)is a biodegradable aliphatic polyester derived from renewable resources, and it can be degraded by various enzymes produced by microorganisms. This study focused on the scale-up and evaluated the bioprocess of PLA degradation by a crude microbial enzyme produced by Actinomadura keratinilytica strain T16-1 in a 5 L stirred tank bioreactor. Result(s): PLA degradation after 72 h in a 5 L bioreactor by using the enzyme of the strain T16-1 under controlled pH conditions resulted in lactic acid titers (mg/L)of 16,651 mg/L and a conversion efficiency of 89% at a controlled pH of 8.0. However, the PLA degradation process inadvertently produced lactic acid as a potential inhibitor, as shown in our experiments at various concentrations of lactic acid. Therefore, the dialysis method was performed to reduce the concentration of lactic acid. The experiment with a dialysis bag achieved PLA degradation by weight loss of 99.93%, whereas the one without dialysis achieved a degradation of less than approximately 14.75%. Therefore, the dialysis method was applied to degrade a commercial PLA material (tray)with a conversion efficiency of 32%, which was 6-fold more than that without dialysis. Conclusion(s): This is the first report demonstrating the scale-up of PLA degradation in a 5 L bioreactor and evaluating a potential method for enhancing PLA degradation efficiency. How to cite: Panyachanakul T, Sorachart B, Lumyong S, et al. Development of biodegradation process for Poly(DL-lactic acid)degradation by crude enzyme produced by Actinomadura keratinilytica strain T16-1. Electron J Biotechnol 2019;40. https://doi.org/10.1016/j.ejbt.2019.04.005 Copyright © 2019

Papadopoulou, A., et al. (2019). "Enzymatic PET Degradation." Chimia **73**(9): 743-749.

Plastic, in the form of packaging material, disposables, clothing and other articles with a short lifespan, has become an indispensable part of our everyday life. The increased production and use of plastic, however, accelerates the accumulation of plastic waste and poses an increasing burden on the environment with negative effects on biodiversity and human health. PET, a common thermoplastic, is recycled in many countries via thermal, mechanical and chemical means. Recently, several enzymes have been identified capable of degrading this recalcitrant plastic, opening possibilities for the biological recycling of the omnipresent material. In this review, we analyze the current knowledge of enzymatic PET degradation and discuss advances in improving the involved enzymes via protein engineering. Looking forward, the use of plastic degrading enzymes may facilitate sustainable plastic waste management and become an important tool for the realization of a circular plastic economy.

Paraboschi, E. M., et al. (2011). "Genetic association and altered gene expression of mir-155 in multiple sclerosis patients." International Journal of Molecular Sciences **12**(12): 8695-8712.

Multiple sclerosis (MS) is a complex autoimmune disease of the central nervous system characterized by chronic inflammation, demyelination, and axonal damage. As microRNA (miRNA)-dependent alterations in gene expression in hematopoietic cells are critical for mounting an appropriate immune response, miRNA deregulation may result in defects in immune tolerance. In this frame, we sought to explore the possible involvement of miRNAs in MS pathogenesis by monitoring the differential expression of 22 immunity-related miRNAs in peripheral blood mononuclear cells of MS patients and healthy controls, by using a microbead-based technology. Three miRNAs resulted >2 folds up-regulated in MS vs controls, whereas none resulted down-regulated. Interestingly, the most up-regulated miRNA (mir-155; fold change = 3.30; P = 0.013) was previously reported to be up-regulated also in MS brain lesions. Mir-155 up-regulation was confirmed by qPCR experiments. The role of mir-155 in MS susceptibility was also investigated by genotyping four single nucleotide polymorphisms (SNPs) mapping in the mir-155 genomic region. A haplotype of three SNPs, corresponding to a 12-kb region encompassing the last exon of BIC (the B-cell Integration Cluster non-coding RNA, from which mir-155 is processed), resulted associated with the disease status (P = 0.035; OR = 1.36, 95% CI = 1.05-1.77), suggesting that this locus strongly deserves further investigations.

Parenti, C. C., et al. (2019). "Evaluation of the infiltration of polystyrene nanobeads in zebrafish embryo tissues after short-term exposure and the related biochemical and behavioural effects." Environmental Pollution **254**(Part A).

One of the current main challenges faced by the scientific community is concerning the fate and toxicity of plastics, due to both the well-known threats made by larger plastic items spreading in ecosystems and their fragmentation into micro- and nanoparticles. Since the chemical and physical characteristics of these smaller plastic fragments are markedly different with respect to their bulk product, the potential toxicological effects in the environment need to be deeply investigated. To partially fill this gap of knowledge, the aim of this study was to evaluate the polystyrene nanobead intake in the tissues of zebrafish (Danio rerio) embryos and their related toxicity. Embryos at 72 h post fertilization (hpf) were exposed for 48 h to 0.5 micro m fluorescent polystyrene nanobeads at a concentration of 1 mg L⁻¹. Confocal microscopy was employed to investigate nanoplastic ingestion and tissue infiltration, while potential sub-lethal effects were evaluated by measuring several endpoints, which covered the adverse effects at the molecular (protein carbonylation), cellular (P-glycoprotein, activity of several antioxidant/detoxifying enzymes) and organism levels by evaluating of possible changes in the embryos' swimming behaviour. Imaging observations clearly highlighted the nanoplastics' uptake, showing nanobeads not only in the digestive tract, but also migrating to other tissues through the gut epithelium. Biomarker analyses revealed a significant decrease in cyclooxygenase activity and an induction of superoxide dismutase. The behavioural test highlighted a significant ($p<0.05$) variation in the turn angle between the control and exposed embryos. This study points out the capability of nanoplastics to infiltrate zebrafish embryo tissues, even after a short exposure, thus suggesting the need for deeper investigations following longer exposure times, and highlighting the potential of nanoplastics to cause toxicological effects on freshwater organisms, at the organism level.

Park, B. H., et al. (2017). "An integrated rotary microfluidic system with DNA extraction, loop-mediated isothermal amplification, and lateral flow strip based detection for point-of-care pathogen diagnostics." Biosensors & Bioelectronics **91**: 334-340.

Point-of-care (POC) molecular diagnostics plays a pivotal role for the prevention and treatment of infectious diseases. In spite of recent advancement in microfluidic based POC devices, there are still rooms for development to realize rapid, automatic and cost-effective sample-to-result genetic analysis. In this study, we propose an integrated rotary microfluidic system that is capable of performing glass microbead based DNA extraction, loop mediated isothermal amplification (LAMP), and colorimetric lateral flow strip based detection in a sequential manner with an optimized microfluidic design and a rotational speed control. Rotation direction-dependent coriolis force and siphon valving structures enable us to perform the fluidic control and metering, and the use of the lateral flow strip as a detection method renders all the analytical processes for nucleic acid test simplified and integrated without the need of expensive instruments or human intervention. As a proof of concept for point-of-care DNA diagnostics, we identified the food-borne bacterial pathogen which was contaminated in water or milk. Not only monoplex Salmonella Typhimurium but also multiplex Salmonella Typhimurium and Vibrio parahaemolyticus were analysed on the integrated rotary genetic analysis microsystem with a limit of detection of 50 CFU in 80min. In addition, three multiple samples were simultaneously analysed on a single device. The sample-to-result capability of the proposed microdevice provides great usefulness in the fields of clinical diagnostics, food safety and environment monitoring.

Park, B. L., et al. (2013). "Genome-wide association study of aspirin-exacerbated respiratory disease in a Korean population." Human Genetics **132**(3): 313-321.

Aspirin-exacerbated respiratory disease (AERD) is a nonallergic clinical syndrome characterized by a severe decline in forced expiratory volume in one second (FEV1) following the ingestion of non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin. The effects of genetic variants have not fully explained all of the observed individual differences to an aspirin challenge despite previous attempts to identify AERD-related genes. In the present study, we performed genome-wide association study (GWAS) and targeted association study in Korean asthmatics to identify new genetic factors associated with AERD. A total of 685 asthmatic patients without

AERD and 117 subjects with AERD were used for the GWAS of the first stage, and 996 asthmatics without AERD and 142 subjects with AERD were used for a follow-up study. A total of 702 SNPs were genotyped using the GoldenGate assay with the VeraCode microbead. GWAS revealed the top-ranked variants in 3' regions of the HLA-DPB1 gene. To investigate the detailed genetic effects of an associated region with the risk of AERD, a follow-up targeted association study with the 702 single nucleotide polymorphisms (SNPs) of 14 genes was performed on 802 Korean subjects. In a case-control analysis, HLA-DPB1 rs1042151 (Met105Val) shows the most significant association with the susceptibility of AERD (p = 5.11 x 10(-7); OR = 2.40). Moreover, rs1042151 also shows a gene dose for the percent decline of FEV1 after an aspirin challenge (p = 2.82 x 10(-7)). Our findings show that the HLA-DPB1 gene polymorphism may be the most susceptible genetic factor for the risk of AERD in Korean asthmatics and confirm the importance of HLA-DPB1 in the genetic etiology of AERD.

Park, D., et al. (2014). "Motility analysis of bacteria-based microrobot (bacteriobot) using chemical gradient microchamber." Biotechnology & Bioengineering **111**(1): 134-143.

A bacteria-based microrobot (bacteriobot) was proposed and investigated as a new type of active drug delivery system because of its useful advantages, such as active tumor targeting, bacteria-mediated tumor diagnosis, and therapy. In this study, we fabricated a bacteriobot with enhanced motility by selective attachment of flagellar bacteria (Salmonella typhimurium). Through selective bovine serum albumin (BSA) pattering on hydrophobic polystyrene (PS) microbeads, many S. typhimurium could be selectively attached only on the unpatterned surface of PS microbead. For the evaluation of the chemotactic motility of the bacteriobot, we developed a microfluidic chamber which can generate a stable concentration gradient of bacterial chemotactic chemicals. Prior to the evaluation of the bacteriobot, we first evaluated the directional chemotactic motility of S. typhimurium using the proposed microfluidic chamber, which contained a bacterial chemo-attractant (L-aspartic acid) and a chemo-repellent (NiSO4), respectively. Compared to density of the control group in the microfluidic chamber without any chemical gradient, S. typhimurium increased by about 16% in the L-aspartic acid gradient region and decreased by about 22% in the NiSO4 gradient region. Second, we evaluated the bacteriobot's directional motility by using this microfluidic chamber. The chemotactic directional motility of the bacteriobot increased by 14% and decreased by 13% in the concentration gradients of L-aspartic acid and NiSO4 , respectively. These results confirm that the bacteriobot with selectively patterned S. typhimurium shows chemotaxis motility very similar to that of S. typhimurium. Moreover, the directional motilities of the bacteria and bacteriobot could be demonstrated quantitatively through the proposed microfluidic chamber.

Park, E. J., et al. (2020). "Repeated-oral dose toxicity of polyethylene microplastics and the possible implications on reproduction and development of the next generation." Toxicology Letters **16**: 16.

With the increased distribution of microplastics in the environment, the potential for harmful effects on human health and ecosystems have become a global concern. Considering that polyethylene microplastics (PE-MPs) are among the most produced plastics worldwide, we administered PE-MPs (0.125, 0.5, 2 mg/day/mouse) by gavage to mice (10 mice/sex/dose) for 90 days. Compared to control, the body weight gain was significantly reduced in the male mice, and the proportion of neutrophils in the blood stream clearly increased in both sexes of mice. Persistence of a PE-MPs-like material and migration of granules to the mast cell membrane and accumulation of damaged organelles were observed in the stomachs and the spleens from the treated dams, respectively. Additionally, the IgA level in the blood stream was significantly elevated in the dams administered with PE-MPs compared to control, and the subpopulation of lymphocytes within the spleen was altered. Following, we performed an additional study to screen the effects of PE-MPs on reproduction and development (5 mice/sex/dose). Importantly, number of live births per dam, the sex ratio of pups, and body weight of pups was notably altered in groups treated with PE-MPs compared to the control group. Additionally, PE-MPs affected the subpopulation of lymphocytes within the spleen of the offspring, as did in the dams. Therefore, we propose that reproductive and developmental toxicity testing is warranted to evaluate the safety of microplastics. Additionally, we suggest that the IgA level may be used as a biomarker for harmful effects following exposure on microplastics.

Park, H. J. and Y. H. Khang (1995). "Production of cephalosporin C by immobilized Cephalosporium acremonium in polyethyleneimine-modified barium alginate." Enzyme and Microbial Technology **17**(5): 408-412.

Calcium, barium, and strontium alginates were studied to develop a suitable gel matrix for the immobilization of Cephalosporium acremonium. Barium alginate gave better results in both gel stability and cell activity than Ca- and Sr-alginates. The mechanical stability of Ba-alginate was greatly enhanced by use of polyethyleneimine (PEI). According to quantitative studies of two factors, PEI concentration and Ba-alginate bead size, cephalosporin C (CPC) production was predominantly influenced by the bead size alone. Thus, C. acremonium cells were immobilized in microbeads of PEI-modified Ba-alginate. Minimal production media, which increased CPC productivity 3.4-fold compared with chemically defined media, were used in fed-batch fermentations. Cephalosporin C was produced continuously for 30 days and CPC yields of immobilized cells in fed-batch fermentation increased about sevenfold as compared with those of free cells in batch fermentation. Immobilized cells in PEI-modified Ba-alginate were reusable for more than 30 days.

Park, H. J., et al. (2020). "National Reconnaissance Survey of Microplastics in Municipal Wastewater Treatment Plants in Korea." Environmental Science & Technology **14**: 14.

Large quantities of microplastics are thought to be emitted to freshwater environments via wastewater treatment plants (WWTPs). To evaluate the occurrence of microplastics in Korean WWTPs, a nationwide study was conducted for the first time in 50 representative WWTPs with large treatment capacities. Grab sampling and laboratory filtration were used for influents, whereas in situ filtration using a custom-made sampling device was used for effluents. The filtrates were pretreated using wet peroxidation and density separation prior to the identification of microplastics with a dissection microscope and Fourier-transform infrared spectroscopy. Pooled analyses of the microplastics revealed that they were predominantly fragment-shaped, and thermoplastics and synthetic fibers were the dominant microplastic materials in WWTPs. The concentration ranged from 10 to 470 L⁻¹ in influents and 0.004 to 0.51 L⁻¹ in effluents. The removal efficiency of microplastics during wastewater treatment was calculated to be 98.7-99.99% in 31 WWTPs. Additionally, WWTPs using advanced phosphorus removal processes exhibited higher removal efficiency than those not implementing such processes. Power-law distribution was successful in describing microplastic particle sizes down to 100 mum, although it was not applicable for smaller particles. This comprehensive monitoring study provides information on the current level and characteristics of microplastics in WWTPs in Korea.

Park, H. R., et al. (2005). "Factors effecting the Th2-like immune response after gamma-irradiation: low production of IL-12 heterodimer in antigen-presenting cells and small expression of the IL-12 receptor in T cells." International Journal of Radiation Biology **81**(3): 221-231.

Ionizing radiation is known to reduce the helper T (Th) 1-like function, but not the Th2-like function, resulting in a Th1/Th2 imbalance. While this has been known for some time, the mechanism behind the preferential suppression of the Th1?cell activation has not yet been explained. The aim is to elucidate the mechanism in the Th cell imbalance after ionizing irradiation. C57BL/6 mice, 7 weeks old, received whole-body?-irradiation (WBI) of 5?Gy. In all instances, the spleen and peritoneal cells were obtained from mice 7 weeks after irradiation. To distinguish Th1 and Th2?cell function, interferon (IFN)-? and interleukin (IL)-4 produced by these cells were analysed by an enzyme-linked immunosorbent assay (ELISA). To isolate the primary T cells, the anti-CD90.2 microbead-conjugated antibody was used and the labelled cells were separated by magnetic cell sorting (MACS). To investigate the influence of the IL-12p70 secreted by the antigen-presenting cells, ovalbumin (OVA)-primed peritoneal adherent cells (PAC) were fixed by 1% paraformaldehyde and co-cultured with OVA-specific Th cells in the presence of supernatant of PAC culture with OVA for 16?h. IL-12 receptor, signal transducers and activators of transcription 4 (STAT4) and IFN-? expression in the T cells of the WBI mice were detected by reverse transcriptase-polymerase chain reaction (RT-PCR). The spleen lymphocytes of WBI mice showed a depression of IFN-? production against OVA, although the total IL-12 was highly secreted. However, the heterodimer IL-12, biologically active protein, was induced less in WBI mice. Although the OVA-specific Th cells were co-cultured with fixed OVA-primed PAC obtained from normal mice, the OVA-specific Th cells showed a decreased IFN-? secretion in the presence of the culture supernatant of the activated PAC from the WBI mice. In addition, recombinant IL-12p70 restored the cytokine balance of the OVA-specific Th cells. However the cytokine balance of primary T cells from WBI mice was not completely restored by the normal antigen-presenting cells that abundantly secrete IL-12p70. It was assumed that after WBI, the regenerated T cells also have some problems. It was then observed that the IL-12 receptor expression and intracellular levels of the STAT4 were much lower in the T cells of the WBI mice. The results suggest that the shifted response of the helper T cells after WBI exposure is due not only due to a significant suppression of the secretion of the IL-12p70 in the antigen-presenting cells, but also to the lower expression of the IL-12 receptor on T cells.

Park, I. U., et al. (2019). "Performance of Treponemal Tests for the Diagnosis of Syphilis." Clinical Infectious Diseases **68**(6): 913-918.

BACKGROUND: Treponemal immunoassays are increasingly used for syphilis screening with the reverse sequence algorithm. There are few data describing performance of treponemal immunoassays compared to traditional treponemal tests in patients with and without syphilis.

METHODS: We calculated sensitivity and specificity of 7 treponemal assays: (1) ADVIA Centaur (chemiluminescence immunoassay [CIA]); (2) Bioplex 2200 (microbead immunoassay); (3) fluorescent treponemal antibody absorption test (FTA-ABS); (4) INNO-LIA (line immunoassay); (5) LIAISON CIA; (6) Treponema pallidum particle agglutination assay (TPPA); and (7) Trep-Sure (enzyme immunoassay [EIA]), using a reference standard combining clinical diagnosis and serology results. Sera were collected between May 2012-January 2013. Cases were characterized as: (1) current clinical diagnosis of syphilis: primary, secondary, early latent, late latent; (2) prior treated syphilis only; (3) no evidence of current syphilis, no prior history of syphilis, and at least 4 of 7 treponemal tests negative.

RESULTS: Among 959 participants, 262 had current syphilis, 294 had prior syphilis, and 403 did not have syphilis. FTA-ABS was less sensitive for primary syphilis (78.2%) than the immunoassays or TPPA (94.5%-96.4%) (all P <= .01). All immunoassays were 100% sensitive for secondary syphilis, 95.2%-100% sensitive for early latent disease, and 86.8%-98.5% sensitive in late latent disease. TPPA had 100% specificity.

CONCLUSIONS: Treponemal immunoassays demonstrated excellent sensitivity for secondary, early latent, and seropositive primary syphilis. Sensitivity of FTA-ABS in primary syphilis was poor. Given its high specificity and superior sensitivity, TPPA is preferred to adjudicate discordant results with the reverse sequence algorithm over the FTA-ABS.

Park, J., et al. (2019). "Assessment of endocrine-disrupting activities of alternative chemicals for bis(2-ethylhexyl)phthalate." Environmental Research **172**: 10-17.

Plastic products are closely intertwined with modern life. Some plasticizers used in making plastics, such as phthalates, are reported to be endocrine-disrupting chemicals. Plasticizers can be released into the environment, and health risks related to plasticizer exposure have been reported. In addition, due to plastic waste that flows into the ocean, microplastics have been found in marine products, including non-biological seawater products such as sea salt. Plastics can affect the body via a variety of pathways, and therefore safer alternative chemicals are needed. Three chemicals were evaluated: acetyl tributyl citrate (ATBC), triethyl 2-acetylcitrate (ATEC), and trihexyl O-acetylacitrate (ATHC), replacing bis(2-ethylhexyl)phthalate (DEHP), a typical plasticizer. The endocrine-disrupting activities of each chemical, including estrogenic or anti-estrogenic activity (test guideline (TG) No. 455), androgenic or anti-androgenic activity (TG No. 458), steroidogenesis (TG No. 456), and estrogenic properties via a short-term screening test using the uterotrophic assay (TG No. 440), were assessed in accordance with the Organisation for Economic Co-operation and Development guidelines for chemical testing. Our results showed that DEHP, ATBC, ATEC, ATHC possess no estrogenic activity, whereas DEHP, ATBC and ATHC demonstrate anti-estrogenic activity and ATBC anti-androgenic activity. DEHP and ATHC exhibited a disruption in steroidogenesis activities. Additional tests are necessary, but our results suggest that ATEC is a good candidate plasticizer providing a suitable alternative to DEHP.

Park, J. M., et al. (2014). "Fully automated circulating tumor cell isolation platform with large-volume capacity based on lab-on-a-disc." Analytical Chemistry **86**(8): 3735-3742.

Full automation with high purity for circulating tumor cell (CTC) isolation has been regarded as a key goal to make CTC analysis a "bench-to-bedside" technology. Here, we have developed a novel centrifugal microfluidic platform that can isolate the rare cells from a large volume of whole blood. To isolate CTCs from whole blood, we introduce a disc device having the biggest sample capacity as well as manipulating blood cells for the first time. The fully automated disc platform could handle 5 mL of blood by designing the blood chamber having a triangular obstacle structure (TOS) with lateral direction. To guarantee high purity that enables molecular analysis with the rare cells, CTCs were bound to the microbeads covered with anti-EpCAM to discriminate density between CTCs and blood cells and the CTCs being heavier than blood cells were only settled under a density gradient medium (DGM) layer. To understand the movement of CTCs under centrifugal force, we performed computational fluid dynamics simulation and found that their major trajectories were the boundary walls of the DGM chamber, thereby optimizing the chamber design. After whole blood was inserted into the blood chamber of the disc platform, size- and density-amplified cancer cells were isolated within 78 min, with minimal contamination as much as approximately 12 leukocytes per milliliter. As a model of molecular analysis toward personalized cancer treatment, we performed epidermal growth factor receptor (EGFR) mutation analysis with HCC827 lung cancer cells and the isolated cells were then successfully detected for the mutation by PCR clamping and direct sequencing.

Park, J. M., et al. (2012). "Highly efficient assay of circulating tumor cells by selective sedimentation with a density gradient medium and microfiltration from whole blood." Analytical Chemistry **84**(17):

7400-7407.

Isolation of circulating tumor cells (CTCs) by size exclusion can yield poor purity and low recovery rates, due to large variations in size of CTCs, which may overlap with leukocytes and render size-based filtration methods unreliable. This report presents a very sensitive, selective, fast, and novel method for isolation and detection of CTCs. Our assay platform consists of three steps: (i) capturing CTCs with anti-EpCAM conjugated microbeads, (ii) removal of unwanted hematologic cells (e.g., leukocytes, erythrocytes, etc.) by selective sedimentation of CTCs within a density gradient medium, and (iii) simple microfiltration to collect these cells. To demonstrate the efficacy of this assay, MCF-7 breast cancer cells (average diameter, 24 mum) and DMS-79 small cell lung cancer cells (average diameter, 10 mum) were used to model CTCs. We investigated the relative sedimentation rates for various cells and/or particles, such as CTCs conjugated with different types of microbeads, leukocytes, and erythrocytes, in order to maximize differences in the physical properties. We observed that greater than 99% of leukocytes in whole blood were effectively removed at an optimal centrifugal force, due to differences in their sedimentation rates, yielding a much purer sample compared to other filter-based methods. We also investigated not only the effect of filtration conditions on recovery rates and sample purity but also the sensitivity of our assay platform. Our results showed a near perfect recovery rate (~99%) for MCF-7 cells and very high recovery rate (~89%) for DMS-79 cells, with minimal amounts of leukocytes present.

Park, J. W. (2018). "Ecotoxicological effects of microplastics and the importance of multidisciplinary endeavors for risk assessment." Toxicology and Environmental Health Sciences **10 (4)**: S23.

Due to the economical and convenient use of plastics, global plastics production is rapidly increasing. The fact that half of the plastics produced so far have been produced in the last 13 years shows how fast the production and consumption of plastics have grown. Microplastics is fine plastic pieces less than 5 mm in size and is categorized as primary microplastics produced for a specific purpose and secondary microplastics which are naturally broken or worn from large plastics in the environment. In environment, microplastics can be worn to ultra-fine plastics of the nanometer level (nanoplastics) due to ultraviolet rays etc. Microplastics are found in sea, river and river around the world including Korea, and it is known that the level of microplastic pollution in Korea is higher than that of other countries. Important features of microplastics found in the environment are the wide variety of polymer types, sizes and shapes of microplastics. And these various physicochemical properties can cause various effects of microplastics on organisms and human body. In order to protect the environment and human from the risk of microplastics, it is necessary to accurately evaluate and predict the risk of microplastics. However, the research data are not sufficient yet. And it is unlikely that any conclusions about the risk of microplastics will be reached in the near future. This presentation will present the effects of (nano) microplastics on the environment and human which were investigated so far, and introduce the necessary research areas for future risk assessment studies.

Park, J. Y. and C. Gupta (2015). "Evaluating localism in the management of post-consumer plastic bottles in Honolulu, Hawai'i: perspectives from industrial ecology and political ecology." Journal of Environmental Management **154**: 299-306.

Localism or regionalization has become a popular topic in urban design, but recent critics raise the question of whether the local or regional scale is most desirable for industrial ecosystems. As a way to explore the claim that localized metabolism is more sustainable, this study examines the costs and benefits of two differentially scaled strategies for the management of post-consumer polyethylene terephthalate (PET) bottles originating in the city of Honolulu, Hawai'i: local incineration and trans-continental recycling. We first estimate total environmental impacts of two options using life cycle assessment, and then disaggregate them into local versus non-local impacts to examine the spatial distribution of costs and benefits. We further assess the environmental justification for localized waste management in relation to the broader socio-economic motivations that underlie the way that plastics are managed in Honolulu. In doing so we assess the scale at which waste management is optimized from an environmental standpoint as well as the non-environmental considerations such as security and safety that influence the politics of scale involved in urban metabolic design. By illustrating the trade-offs between a local versus global metabolic pathway for plastic waste, the results from our Honolulu case study are globally relevant for communities interested in sustainable urban design and in particular urban waste management.

Park, J. Y., et al. (2009). "Study of cellular behaviors on concave and convex microstructures fabricated from elastic PDMS membranes." Lab on a Chip **9**(14): 2043-2049.

Cells respond to geometrical cues, as well as to biochemical and mechanical stimuli. Recent progress in micro- and nano-technology has allowed researchers to create microbeads, micro-circular islands, and microposts, that can be used to examine the effect of geometrical cues on cellular behavior. Knowledge of changes in cell mechanics and morphology in response to geometric cues is important for understanding the basic behavior of cells during development and pathological processes. Most previous research in this area has focused on cell responses to two-dimensional planar or rectilinear structures. Very few studies have examined cell responses to three-dimensional curved structures because of the difficulty of fabricating such microstructures. Here we describe a novel method for the fabrication of convex and concave microstructures by use of a thin poly(dimethylsiloxane) (PDMS) membrane, SU-8 shadow mask, and negative air pressure without using any complicated silicon processes. We successfully fabricated concave and convex microstructures, with base diameters of 200-300 microm and depth (or height) of 50-150 microm (aspect ratios up to 1 : 0.5), and used these microstructures to study the responses of cultured L929 mouse fibroblast cells and human mesenchymal stem cells. These cells clearly sensed the three-dimensional microscale curvature and actively "escaped" from concave patterns, but not from those which were convex. Thus, it appears that microscale concave structures suppress cell adhesion and proliferation. We hypothesized that this might relate to deformation of the plasma membrane and subsequent opening of membrane channels. We anticipate that our system will be useful for various bio-MEMS (micro electro mechanical system) applications, including formation of uniformly-sized embryoid bodies, embryonic stem cell differentiation, and the fabrication of cell docking devices, microbioreactors, and microlenses as well as cell mechanics study.

Park, S.-H., et al. (2012). Comparing of various collagens for application of cartilage tissue engineering. 2012 2nd IEEE-EMBS Conference on Biomedical Engineering and Sciences, IECBES 2012, December 17, 2012 - December 19, 2012, Langkawi, Malaysia, IEEE Computer Society.

Mammalian collagens have been used as a base material for collagen matrices in tissue engineering applications. However, collagens of aquatic animals and human sources can potentially be utilized as a safe and viable substitute, because collagen products of bovine origin have been shown to be contaminated with some diseases. In the present study, we prepared and investigated collagen materials from several sources (bovine skin, porcine skin, amniotic membrane and starfish) as matrix biomaterials. Detailed investigations on their physicochemical and biological properties, such as amino acid composition, thermal transition temperature, molar mass, IR spectra, and cell response, suggested strong relations between their amino acid composition and intermolecular structure, thermal property, and cell response. Selectively, an amniotic membrane collagen scaffold was evaluated for cartilage tissue engineering in three types of three-dimensional 3D culture (sponge, gel and micro bead forms) and compared with a bovine matrix. Results showed that amniotic membrane collagen has a potential as an alternative source of collagen for use in tissue engineering. 2012 IEEE.

Park, S. J., et al. (2013). "Selective bacterial patterning using the submerged properties of microbeads on agarose gel." Biomedical Microdevices **15**(5): 793-799.

We proposed a new bacteria patterning method on the restricted region of microbeads, using the submerged property of polystyrene microbeads on various concentrations of agarose gel. Moreover, we fabricated a bacterial microrobot using attenuated Salmonella typhimurium through the new patterning methods. We controlled the submerged degree of polystyrene microbeads through the regulation of the hardness of the agarose gel. The polystyrene microbeads on agarose gel were transferred onto a poly-dimethylsiloxane (PDMS) surface for easy manipulation of the microbeads. Then, we treated the polystyrene microbeads on the PDMS surface with antibacterial adherent factors, such as O sub(2) plasma and bovine serum albumin (BSA). The Salmonella typhimurium was attached to the entire surface of the untreated polystyrene microbeads, whereas Salmonella typhimurium were only attached to the restricted surface region of the treated polystyrene microbeads through the proposed patterning method. The bacteria-attached microbeads gain motility by the propulsion of the attached bacteria, and the selective-bacteria-attached microbeads showed enhanced motility. Compared with whole-bacteria-attached polystyrene microbeads (1.74 plus or minus 1.62 mu m/s), the selective bacteria-attached polystyrene microbeads, using O sub(2) plasma and BSA, showed 9.18 plus or minus 1.88 mu m/s and 14.65 plus or minus 8.66 mu m/s faster moving velocities, respectively. Through the results, we expected that the proposed patterning methodology of microbeads could contribute to the development of biomedical bacterial microrobots.

Park, S. J., et al. (2014). "Monocyte-based microrobot with chemotactic motility for tumor theragnosis." Biotechnology & Bioengineering **111**(10): 2132-2138.

Biocompatibility, sensing, and self-actuation are very important features for a therapeutic biomedical microrobot. As a new concept for tumor theragnosis, this paper proposes a monocyte-based microrobots, which are combining the phagocytosis and engulfment activities containing human acute monocytic leukemia cell line (THP-1) with various sized polystyrene microbeads are engulfed instead of a therapeutic drug. For the validation of the blood vessel barrier-penetrating activity of the monocyte-based microrobot, we fabricate a new cell migration assay with monolayer-cultured endothelial cell (HUVEC), similar with the blood vessels. We perform the penetrating chemotactic motility of the monocyte-based microrobot using various types of the chemo-attractants, such as monocyte chemotactic protein (MCP)-1, human breast cancer cell lines (MCF7)-cell lysates, and -contained alginate spheroids. The monocyte-based microrobot show chemotactic transmigrating motilities similar with what an actual monocyte does. This new paradigm of a monocyte-based microrobot having various useful properties such as biocompatibility, sensing, and self-actuation can become the basis of a biomedical microrobot using monocytes for diagnosis and therapy of various diseases.

Park, S. Y. and C. G. Kim (2019). "Biodegradation of micro-polyethylene particles by bacterial colonization of a mixed microbial consortium isolated from a landfill site." Chemosphere **222**: 527-533.

In this study, we investigated the decomposition of micro-sized polyethylene (PE) by mesophilic

mixed bacterial culture isolates obtained from a municipal landfill sediment. Among these, Bacillus sp. and Paenibacillus sp. were more specifically enriched in the non-carbonaceous nutrient medium (i.e., Basal medium) as they were the most dominant species when they were exposed to PE microplastics. They reduced the dry weight of particles (14.7% after 60d) and the mean particle diameter (22.8% after 60d; obtained by field-emission scanning electron microscopy analysis). In the gas chromatography-mass spectrometer analysis of biologically aged particles, the amount and types of organic contents eluted from the PE microplastics were far lower in the early decomposition phase; however, they increased in the later phase. Thermal gravimetric analysis showed that the aged particles had higher thermal stability at temperatures greater than 570degreeC compared to the control, thereby suggesting that microplastics were degraded by enzymatic chain scission, which could in turn be ascribed to the greater refractory fractions of aged particles remaining at a high combustion temperature. It was further verified that PE particles could be biologically utilized as a sole carbon source and broken down during the test period.

Park, T. J., et al. (2020). "Occurrence of microplastics in the Han River and riverine fish in South Korea." Science of the Total Environment **708**: 134535.

Microplastic pollution has been paid attention due to the possibly global threat to human health and ecosystem in recent years. In this study, we investigated the distribution of microplastics in the Han River and its tributaries, South Korea, and in six species of inhabiting fish, namely carp (C. carpio), crucian carp (C. cuvieri), bluegill (L. macrochirus), bass (M. salmoides), catfish (S. asotus), and snakehead (C. argus). We found that the concentration of microplastics in the surface waters (0 m) was 0-42.9 particles/m³ (mean: 7.0 +/- 12.9 particles/m³) compared to 20.0-180.0 particles/m³ (mean: 102.0 +/- 50.3 particles/m³) at a depth of 2 m. Concentrations in the river tributaries ranged from 1.2 to 234.5 particles/m³ (mean: 91.1 +/- 72.3 particles/m³). The most common types the plastic identified were polyethylene (PE), silicone, and polystyrene, while polytetrafluoroethylene (PTFE), polyethylene, and polyester dominated in the tributaries. With respect to shape, >73% of the recovered microplastics were fragments and the rest were fibers in the water. We also measured the concentration of microplastics in the intestines of fish, which ranged from 4 to 48 particles/fish (mean: 22.0 +/- 16.0 particles/fish). The most common types of plastic found in the sampled fish were polytetrafluoroethylene (PFTE), polyethylene (PE), and rayon, and >94% of all the microplastic found in fish was in the form of fragments with the remainder being fibers. The concentrations of microplastic in the gills of fish ranged from 1 to 16 particles/fish (mean: 8.3 +/- 6.0 particles/fish). In contrast, no microplastic was found in the flesh of the sampled fish. Our results imply that the ingestion of microplastics by fish is more closely related to habitat rather than feeding habits.

Park, Y. H., et al. (2019). "Transcriptomic profiles of retinal ganglion cells are defined by the magnitude of intraocular pressure elevation in adult mice." Scientific Reports **9**(1): 2594.

Elevated intraocular pressure (IOP) is the major risk factor for glaucoma, a sight threatening disease of retinal ganglion cells (RGCs) and their axons. Despite the central importance of IOP, details of the impact of IOP elevation on RGC gene expression remain elusive. We developed a 4-step immunopanning protocol to extract adult mouse RGCs with high fidelity and used it to isolate RGCs from wild type mice exposed to 2 weeks of IOP elevation generated by the microbead model. IOP was elevated to 2 distinct levels which were defined as Mild (IOP increase >1 mmHg and <4 mmHg) and Moderate (IOP increase >=4 mmHg). RNA sequencing was used to compare the transcriptional environment at each IOP level. Differentially expressed genes were

markedly different between the 2 groups, and pathway analysis revealed frequently opposed responses between the IOP levels. These results suggest that the magnitude of IOP elevation has a critical impact on RGC transcriptional changes. Furthermore, it is possible that IOP-based set points exist within RGCs to impact the direction of transcriptional change. It is possible that this improved understanding of changes in RGC gene expression can ultimately lead to novel diagnostics and therapeutics for glaucoma.

Park, Y. M., et al. (2015). "Detection of CTX-II in serum and urine to diagnose osteoarthritis by using a fluoro-microbeads guiding chip." Biosensors & Bioelectronics **67**: 192-199.

This study reports a new strategy for simultaneous detection of the C-telopeptide fragments of type II collagen (CTX-II) as a biomarker of osteoarthritis (OA) using a fluoro-microbeads guiding chip. As osteoarthritis progresses, the joint components including matrix and cartilage are degraded by proteases. The degraded products such as CTX-II are released into the serum and urine, and the CTX-II concentration in body fluids reflects OA progression. Because the CTX-II has heterogeneous epitope structure in serum (sCTX-II; homodimers) and urine (uCTX-II; monomers or variant monomers), a multiple-sensing device enabling both sandwich and competitive-type immunoassays is required. For multiple assessments of serum and urinary CTX-II, we designed a fluoro-microbeads guiding chip (FMGC) containing multiple sensing areas and connecting channels. Using the approach, the sandwich (sCTX-II) and competition (uCTX-II) assays could be simultaneously performed on a single chip. We designed a fluidic control device enabling selective control of the open-close function of FMGC channels. The immune-specific signal was quantitatively analyzed by counting the number of fluorescent microbeads from the registered images. The results from the developed FMGC assay showed high correlation with those obtained in ELISA. The completion time of the FMGC assay was 24-fold and 3.5-fold shorter than the ELISA for urinary and serum CTX-II. Taken together, it enabled the simultaneous detection of both sCTX-II and uCTX-II. This FMGC-based assay would be a promising tool for monitoring of osteoarthritis.

Parkin, B., et al. (2012). "Clonal evolution and devolution following chemotherapy in adult acute myelogenous leukemia." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Introduction: Despite significant advances in the understanding of the biology of adult acute myelogenous leukemia (AML), overall survival remains poor due chiefly to the high rate of relapse after achieving complete remission as well as primary failure of induction chemotherapy. Efforts to further unravel the mechanisms leading to relapse and primary refractory disease are critical in order to guide the development of effective and durable treatment strategies for AML. To that end, this study seeks to elucidate the clonal relationship of AML in various disease phases. Method(s): We employed SNP 6.0 array-based genomic profiling of acquired copy number aberrations (aCNA) and copy neutral LOH (cnLOH) together with sequence analysis of recurrently mutated genes to characterize paired AML genomes. We analyzed 28 AML sample pairs from patients that achieved complete remission with chemotherapy and subsequently relapsed (median remission duration 272 days [range 25 - 1249 days]) and 11 sample pairs from patients with persistent disease following induction chemotherapy. AML cell samples were isolated with a Ficoll gradient, negatively selected using Miltenyi microbead columns, and then further purified with flow cytometric cell sorting. Processed DNA isolated from highly purified AML blasts and paired buccal DNA was hybridized to Affymetrix SNP 6.0 arrays. aCNA were visually identified using the dChip program in paired data displays and corroborated by algorithmic lesion scoring, and cnLOH was detected using internally developed software. In addition, 11 genes known to be recurrently mutated in AML (CEBPA, DNMT3A, IDH1, IDH2, RUNX1, BCORL1, NPM1, NRAS, KRAS, FLT3 and TP53) were resequenced in all 39 presentation samples to identify somatically acquired mutations. Genes found mutated in individual AML cases were subsequently tested for the persistence of the mutation in paired samples. Result(s): For the 28 paired specimens in the relapsed cohort, comparison of aCNA and cnLOH occurrences, gene mutation patterns and karyotypes revealed 6 cases that carried no aCNA/cnLOH at either presentation or relapse, but at presentation carried at least 1 gene mutation, all of which but one were stable in relapse (1 case lost a RUNX1 mutation but carried a t(8;21) in both disease stages); 11 cases that were characterized by the presence of aCNA/cnLOH at presentation, of which 55% (6 of 11) gained additional aCNA/cnLOH at relapse; 6 cases without aCNA/cnLOH at presentation that gained aCNA/cnLOH at relapse, of which 2 concurrently lost a FLT3-ITD or CEPBA mutation; and 5 cases that carried no informative genomic events. For the 11 paired specimens in the persistent AML cohort, the same comparison revealed 2 cases without aCNA/cnLOH before or after chemotherapy and stable gene mutations; 5 cases with aCNA/cnLOH at presentation that carried the same genomic lesions and gene mutations before and after chemotherapy; 3 cases with aCNA/cnLOH present at enrollment that lost some but not all of these aCNA/cnLOH and gained none after initial induction therapy; and 1 additional case that lost a FLT3-ITD. Comparative analysis of these patterns demonstrates that relapsed AML invariably represents reemergence or evolution of an antecedent clone. Furthermore, all individual aCNA or cnLOH detected at presentation persisted at relapse indicating that this lesion type is proximally involved in AML evolution. Analysis of informative paired persistent AML disease samples uncovered at least two coexisting dominant clones of which at least one was chemotherapy sensitive and one resistant. Conclusion(s): This detailed genomic analysis supports the conclusion that incomplete eradication of AML founder clones rather than stochastic emergence of fully unrelated novel clones underlies AML relapse and persistence with direct implications for clinical AML research.

Parks, J. W., et al. (2014). "Integration of programmable microfluidics and on-chip fluorescence detection for biosensing applications." Biomicrofluidics **8**(5): 054111.

We describe the integration of an actively controlled programmable microfluidic sample processor with on-chip optical fluorescence detection to create a single, hybrid sensor system. An array of lifting gate microvalves (automaton) is fabricated with soft lithography, which is reconfigurably joined to a liquid-core, anti-resonant reflecting optical waveguide (ARROW) silicon chip fabricated with conventional microfabrication. In the automaton, various sample handling steps such as mixing, transporting, splitting, isolating, and storing are achieved rapidly and precisely to detect viral nucleic acid targets, while the optofluidic chip provides single particle detection sensitivity using integrated optics. Specifically, an assay for detection of viral nucleic acid targets is implemented. Labeled target nucleic acids are first captured and isolated on magnetic microbeads in the automaton, followed by optical detection of single beads on the ARROW chip. The combination of automated microfluidic sample preparation and highly sensitive optical detection opens possibilities for portable instruments for point-of-use analysis of minute, low concentration biological samples.

Parks, M. S. (2002). "Practical considerations in converting to Renalin 100 for dialyzer reprocessing." Nephrology News & Issues **16**(12): 55, 59-62, 64.

It is clear from our findings (shown in Figs. 2, 3) that the cost of Renalin 100 is equal to or less than the cost of Renalin on a liter-to-liter basis. The decreased cost may be due to the elimination of the need to discard expired, diluted Renalin and the ability to use the small amount of Renalin 100 remaining in the container for making disinfectant solutions for disinfecting caps. The use of Renalin 100 leads to a 65% reduction in case count and storage space, as well as a 21% decrease in product weight. This means decreased costs in shipping and worker exertion to move this product. It is interesting that the 65% determination is virtually identical to the theoretical value advertised. The decreased waste generated was substantial. Cardboard waste was reduced by 78% and plastic waste was decreased by 72%. Even in this moderately sized facility this meant a decrease in waste generation of 780 lbs. annually. Extrapolation of this number across reprocessing centers in the United States would suggest that the widespread use of Renalin 100 would produce great domestic environmental gains. Because there is no diluting and mixing of Renalin 100, there is a substantial savings of time for personnel. The 95% time saving in this facility accounts for over two full weeks of technician time. In addition, the elimination of mixing and diluting decreases technician exposure to the sterilant. Finally, automated mixing and diluting eliminates the possibility of human error in preparing the sterilant and adds to the consistency of the reprocessing procedure.

Parr, J. F., et al. (1963). "A Glass Micro-Bead System for the Investigation of Soil Micro-Organisms." Nature **200**: 1227-1228.

Parsa, S. F., et al. (2018). "Early diagnosis of disease using microbead array technology: A review." Analytica Chimica Acta **1032**: 1-17.

Early diagnosis of diseases (before they become advanced and incurable) is essential to reduce morbidity and mortality rates. With the advent of novel technologies in clinical laboratory diagnosis, microbead-based arrays have come to be recognized as an efficient approach, that demonstrates useful advantages over traditional assay methods for multiple disease-related biomarkers. Multiplexed microbead assays provide a robust, rapid, specific, and cost-effective approach for high-throughput and simultaneous screening of many different targets. Biomolecular binding interactions occur after applying a biological sample (such as blood plasma, saliva, cerebrospinal fluid etc.) containing the target analyte(s) to a set of microbeads with different ligand-specificities that have been coded in planar or suspension arrays. The ligand-receptor binding activity is tracked by optical signals generated by means of flow cytometry analysis in the case of suspension arrays, or by image processing devices in the case of planar arrays. In this review paper, we discuss diagnosis of cancer, neurological and infectious diseases by using optically-encoded microbead-based arrays (both multiplexed and single-analyte assays) as a reliable tool for detection and quantification of various analytes.

Partovinia, A. and E. Vatankhah (2019). "Experimental investigation into size and sphericity of alginate micro-beads produced by electrospraying technique: Operational condition optimization." Carbohydrate Polymers **209**: 389-399.

Alginate spherical hydrogel beads have several applications in biomedical and biological processes in which the bead size and sphericity are critical factors affecting mass transfer phenomena. Electrospraying technology facilitates generation of small and almost uniform beads with higher diffusion rate resulting in process performance improvement. There are several key factors affecting particle size and shape behavior of electrosprayed alginate beads meanwhile interactions between these factors introduce complexity in determining appropriate conditions to produce spherical beads with the size of interest. Thus, the need to achieve reliable products has put growing emphasis on the use of modeling methodology to establish correlations between particle size and affecting variables as well as sphericity coefficient and meaningful factors. Obviously, a more applicable model based on intentionally manipulatable factors would spark a great deal of interest for practical engineering applications. In this regard we employed a central composite design (CCD) and response surface methodology (RSM) to model the diameter and sphericity coefficient of electrosprayed alginate beads for the first time. Two quadratic models were obtained in which the effectiveness order of the variables were found. We could benefit from this RSM-based empirical model not only for better understanding the complex physics of the electrospraying process, but also for selection of factors and their levels to produce alginate micro-beads with appropriate size and sphericity. The results indicate that the alginate concentration, voltage and needle size have the strongest influence on both response variables. The quite spherical beads with a minimum size of 130 mum can be obtained at alginate concentration of 1.5%, voltage of 11 kV, and needle size of 26 G.

Patawari, S. B. (2019). "Change in the air as import restrictions bite." Recycling International: 84-84.

Patawari, S. B. (2019). "Sustainability is the K Fair buzzword." Recycling International: 68-68.

Pate, J. A. and E. E. McKinnon (2016). "A citizen engagement approach to water advocacy: experiences from "eXXpedition Great Lakes"." Maritime Affairs: Journal of the National Maritime Foundation of India **12**(2): 99-108.

The Great Lakes are a group of interconnected lakes located on the Canada-United States border. Lake Superior, Michigan, Huron, Erie and Ontario form the largest group of freshwater lakes on Earth, and contain around 21% of the world's surface fresh water by volume. These lakes suffer from considerable microplastic contamination. Despite this awareness, citizens around the lakes struggle to take action. With over 80% of plastic debris in the world's water bodies being contributed from land, the solutions for eliminating microplastics have to come from changes in consumer behaviour and by stopping contamination at the source. "eXXpedition Great Lakes 2016" was designed as a one-day mass engagement event to bring the science of microplastics to citizens across the region, allowing them to experience first hand the presence and impact of this pollution. Volunteers collected water samples and conducted shoreline clean-ups on the Great Lakes and connecting waterways. Sailing vessels led by female scientists specialising in plastic pollution, human and environmental health were also launched from key cities in both Canada and the United States. The approach was to utilise the power of citizen engagement to promote clean-water advocacy and action in North America. By experiencing the issue of microplastics pollution first hand, it was hoped that participants would feel an increased sense of responsibility and consider protection of the environment as their duty, which would hopefully lead to changes in consumer behaviour. This paper shares the experiences during the event.

Patel, H. and D. Davidson (2014). "Control of pro-inflammatory cytokine release from human monocytes with the use of an interleukin-10 monoclonal antibody." Methods in Molecular Biology **1172**: 99-106.

The monocytes (MONOs) can be considered as "double-edge swords"; they have both important pro- inflammatory and anti-inflammatory functions manifested in part by cytokine production and release. Although MONOs are circulating cells, they are the major precursors of a variety of tissue-specific immune cells such as the alveolar macrophage, dendritic cells, microglial cells, and Kupffer cells. Unlike the polymorphonuclear leukocyte, which produces no or very little interleukin-10 (IL-10), the monocyte can produce this potent anti-inflammatory cytokine to control inflammation. IL-10, on an equimolar basis, is a more potent inhibitor of pro-inflammatory cytokines produced by monocytes than many antiinflammatory glucocorticoids which are used clinically. This chapter describes how to isolate monocytes from human blood and the use of IL-10 monoclonal antibody to determine the effect and timing of endogenous IL-10 release on the production and release of pro-inflammatory cytokines. Copyright © Springer Science+Business Media New York 2014.

Patel, H., et al. (2014). "External Cross-linked Mucoadhesive Microbeads for Prolonged Drug Release: Development and In vitro Characterization." Indian Journal of Pharmaceutical Sciences **76**(5): 437-444.

Mucoadhesive microbeads of low methoxyl pectin were prepared, either alone or in combinations with hydroxypropyl methyl cellulose, sodium carboxymethyl cellulose, methyl cellulose and carbopol 934P, by ionotropic gelation. The influence of copolymers on mucoadhesivity, microbeads characteristics and in vitro drug release was investigated. Spherical microbeads with 78.69+/-0.59 to 85.84+/-0.78% drug entrapment and of a size of 791.90+/-4.58 to 960.88+/-4.61 mum were prepared. The concentration of cross linking agent affects the encapsulation efficiency of microbeads. Mucoadhesiveness of microbeads was dependent on the concentration of copolymers. The formulations exhibiteda pH-dependent release and followed diffusion-controlled first-order kinetics.

Patel, J. K. and J. A. Kobashigawa (2013). "Thoracic organ transplantation: laboratory methods." Methods in Molecular Biology **1034**: 127-143.

Although great progress has been achieved in thoracic organ transplantation through the development of effective immunosuppression, there is still significant risk of rejection during the early post-transplant period, creating a need for routine monitoring for both acute antibody and cellular mediated rejection. The currently available multiplexed, microbead assays utilizing solubilized HLA antigens afford the capability of sensitive detection and identification of HLA and non-HLA specific antibodies. These assays are being used to assess the relative strength of donor specific antibodies; to permit performance of virtual crossmatches which can reduce the waiting time to transplantation; to monitor antibody levels during desensitization; and for heart transplants to monitor antibodies post-transplant. For cell mediated immune responses, the recent development of gene expression profiling has allowed noninvasive monitoring of heart transplant recipients yielding predictive values for acute cellular rejection. T cell immune monitoring in heart and lung transplant recipients has allowed individual tailoring of immunosuppression, particularly to minimize risk of infection. While the current antibody and cellular laboratory techniques have enhanced the ability to manage thoracic organ transplant recipients, future developments from improved understanding of microchimerism and graft tolerance may allow more refined allograft monitoring techniques.

Patel, P., et al. (2015). "Fully automated ultrasensitive digital immunoassay for troponin using single molecule array technology." Clinical Chemistry **1)**: S128.

Background: Ultra-sensitive cardiac troponin measurement offers a promising new tool for early detection and monitoring of cardiovascular disease. With growing interest in exploring as an early indicator of adverse heart health trends, the ability to quantitate troponin in healthy control populations is emerging as a highly desirable assay capability. We report analytical data from a fully automated digital immunoassay for cardiac troponin I (cTnI) based on single molecule array (Simoa) technology with a limit of detection 2 logs lower than contemporary high sensitivity troponin assays. Method(s): Reagents were developed for a paramagnetic bead-based ELISA for use in the Simoa HD-1 Analyzer. Anti-cTnI capture beads were prepared by covalent coupling of antibody to carboxy paramagnetic microbeads, detector antibody was biotinylated by standard methods, and an enzyme conjugate was prepared by covalent coupling of streptavidin and [[Unsupported Character - Symbol Font]]-galactosidase. The HD-1 Analyzer

first performs a 2-step sandwich immunoassay using 42 muL of serum or plasma sample, then transfers washed and labeled capture beads to a Simoa disc where the beads are singulated in 50-femtoliter microwells, sealed in the presence of substrate, and interrogated for presence of enzyme label. A single labeled cTnI molecule provides sufficient fluorescent signal in 30 seconds to be counted by the HD-1 optical system. At low cTnI concentration, the percentage of bead-containing wells in the array with a positive signal is proportional to the amount of cTnI present in the sample. At higher cTnI concentration, the total fluorescence signal is proportional to the cTnI in the sample. The concentration of cTnI is then interpolated from a standard curve (range to 300 pg/mL). Time to first result is 45 minutes. The assay was evaluated for sensitivity, recovery, linearity precision and normal range. Discrimination of healthy subjects from those with mild to moderate heart failure was also preliminarily assessed. Result(s): Limit of detection (2.5 SD) was 0.010 pg/mL across 26 runs. Limit of quantification (20% dose CV from diluted serum samples) was 0.079 pg/mL across 16 runs and 144 determinations. Recovery of cTnI spiked into normal serum averaged 80.5%. Mean linearity was 89.5%. Precision per EP5-A guideline included two serum-based panels, 1 plasma-based panel and two cTnI controls assayed in replicates of three twice per day for five days using a single calibration curve. ANOVA gave CV's <10% for all levels. Serum cTnI values from 97 healthy control samples ranged from 0.072 to 8.40 pg/mL, with a mean and 99th percentile of 1.01 and 8.40 pg/mL. Serum cTnI values from 375 patients with mild to moderate heart failure (NYHA classification II and III) ranged from 0.440 to 1770 pg/mL, with a median of 15.1 pg/mL. The heart failure samples had significantly higher cTnI concentrations than the healthy subjects (p=0.0002). Evaluation of the predictive value of the cTnI concentrations is ongoing. Conclusion(s): The results show the digital Simoa cTnI assay exhibited good general analytical properties and cTnI levels from healthy subjects were above the sensitivity limits. The assay represents a new enabling tool for ultra-sensitive cTnI measurement.

Patrick, S. M., et al. (2001). "Controlled Cell Deformation Produces Defined Areas of Contact between Cells and Ligand-Coated Surfaces." Annals of Biomedical Engineering **29**(1): 1-8.

A method which allows precise control of the time of initiation and the area of contact of T cells with immobilized ligands has been developed. Cells are trapped in an asymmetric film that can be quantitatively thinned by reducing the film's capillary pressure. Ligands adsorbed to the base of the apparatus are forced into close contact with the cells as the air-liquid interface is drawn down. Using interference microscopy and microbeads to indicate the film height, the amount of thinning can be controlled to within 1 µm. In this study, this system was used to produce contact areas of 182 and 356 µm^sup 2^ between T cells and anti-CD3 coated surfaces. These contact areas were measured using fluorescent dye exclusion microscopy. This apparatus can be used for quantitative studies of T cell activation, as is reported in Patrick et al., J. Immunol. Method. 24:97-108, 2000. © 2001 Biomedical Engineering Society. PAC01: 8717-d, 8764Rr[PUBLICATION ABSTRACT]

Pattanapanyasat, K., et al. (2010). "The use of glutaraldehyde-fixed chicken red blood cells as counting beads for performing affordable single-platform CD4(+) T-lymphocyte count in HIV-1-infected patients." Journal of Acquired Immune Deficiency Syndromes: JAIDS **53**(1): 47-54.

CD4(+) T-lymphocyte count is an important marker in management of HIV-1-infected patients. The standard single-platform (SP) flow cytometric (FCM) CD4(+) testing that uses the known reference microbeads is expensive; more affordable alternatives are therefore needed. We evaluated the use of glutaraldehyde-fixed chicken red blood cells (CRBCs) as counting beads as an alternative for enumerating CD4(+) T-lymphocyte counts in 87 HIV-1-infected patients. Linear regression analyses revealed an excellent correlation of the SP FCM using CRBCs with the standard SP bead-based FCM method (percentages, r(2) > 0.99; absolute counts, r(2) > 0.98) over the entire range including the clinically relevant range. Mean percent bias for the CRBC method was +0.35% [limits of agreement (LOA): -1.86% to +2.57%]. For absolute CD4(+) T-lymphocytes, the mean biases was -47.76 cells per microliter (LOA: -191.34 to +98.81 cells/microL) with much lower bias for CD4 T-lymphocyte counts <200 cells per microliter (LOA: -31.92 to +22.95 cells/microL). The use of CRBCs is comparable with the use of commercial microbeads. This has resulted in major cost savings to resource-limited countries where the health care system is under increasing pressure to operate cost effectively. This can greatly facilitate and ensure the success of the ongoing antiretroviral therapy program in these countries.

Pattanapanyasat, K., et al. (2007). "Evaluation of a single-platform microcapillary flow cytometer for enumeration of absolute CD4+ T-lymphocyte counts in HIV-1 infected Thai patients." Cytometry Part B - Clinical Cytometry **72**(5): 387-396.

Background: Various assays are used to enumerate peripheral blood absolute CD4+ T-lymphocytes. Flow cytometry is considered the gold standard for this purpose. However, the high cost of available flow cytometers and monoclonal antibody reagents make it difficult to implement such methods in the resource-poor settings. In this study, we evaluated a cheaper, recently developed single-platform microcapillary cytometer for CD4+ T-lymphocyte enumeration, the personal cell analyzer (PCA), from Guava Technologies. Method(s): CD4+ and CD8+ T-lymphocyte counts in whole blood samples from 250 HIV-1 infected Thais were determined, using a two-color reagent kit and the Guava PCA, and compared with the results obtained with two reference microbead-based methods from Becton Dickinson Biosciences: the three-color TruCOUNTTM tube method and the two-color FACSCountTM method. Statistical correlations and agreements were determined using linear correlation and Bland-Altman analysis. Result(s): Absolute CD4+ T-lymphocyte counts obtained using the Guava PCA method highly correlated with those obtained using TruCOUNT method (R² = 0.95, mean bias +13.1 cells/mul, limit of agreement [LOA] -117.9 to +144.1 cells/mul) and the FACSCount method (R² = 0.94, mean bias = +33.2 cells/mul, LOA -101.8 to +168.3 cells/mul). Absolute CD8+ T-lymphocyte counts obtained using the Guava PCA method also highly correlated with those obtained with the two reference methods (R² = 0.92 and 0.88, respectively). Conclusion(s): This study shows that the enumeration of CD4+ T-lymphocytes using the Guava microcapillary cytometer PCA method performed well when compared with the two reference bead-based methods. However, like the two reference methods, this new method needs substantial technical expertise. © 2007 Clinical Cytometry Society.

Pattanapanyasat, K. P., et al. (2010). "The Use of Glutaraldehyde-Fixed Chicken Red Blood Cells as Counting Beads for Performing Affordable Single-Platform CD4 + T-Lymphocyte Count in HIV-1 -Infected Patients: JAIDS JAIDS." Journal of Acquired Immune Deficiency Syndromes **53**(1): 47.

CD4... T-lymphocyte count is an important marker in management of HIV-1-infected patients. The standard single-platform (SP) flow cytometric (FCM) CD4... testing that uses the known reference microbeads is expensive; more affordable alternatives are therefore needed. We evaluated the use of glutaraldehyde-fixed chicken red blood cells (CRBCs) as counting beads as an alternative for enumerating CD4... T-lymphocyte counts in 87 HIV-1-infected patients. Linear regression analyses revealed an excellent correlation of the SP FCM using CRBCs with the standard SP bead-based FCM method (percentages, r... > 0.99; absolute counts, r... > 0.98) over

the entire range including the clinically relevant range. Mean percent bias for the CRBC method was +0.35% [limits of agreement (LOA): -1.86% to +2.57%]. For absolute CD4... T-lymphocytes, the mean biases was -47.76 cells per microliter (LOA: -191.34 to +98.81 cells/...L) with much lower bias for CD4... T-lymphocyte counts <200 cells per microliter (LOA: -31.92 to +22.95 cells/...L). The use of CRBCs is comparable with the use of commercial microbeads. This has resulted in major cost savings to resource-limited countries where the health care system is under increasing pressure to operate cost effectively. This can greatly facilitate and ensure the success of the ongoing antiretroviral therapy program in these countries. (ProQuest: ... denotes formulae/symbols omitted.)

Pattarayingsakul, W., et al. (2019). "The gastric sieve of penaeid shrimp species is a sub-micrometer nutrient filter." Journal of Experimental Biology **222**(Pt 10): 17.

Unlike that of vertebrates, the penaeid shrimp stomach is of ectodermic origin and is thus covered by a cuticle that is sloughed upon molting. It is composed of two chambers, here called the anterior and posterior stomach chambers, ASC and PSC, respectively. The PSC contains a filtration structure variously called a pyloric filter, filter press, gastric filter or gastric sieve (GS), and the last of these will be used here. The GS resembles an elongated, inverted-V, dome-like, chitinous structure with a midline ridge that is integral to the ventral base of the PSC. The dome surface is covered with a carpet-like layer of minute, comb-like setae bearing laterally branching setulae. This carpet serves as a selective filter that excludes large partially digested food particles but allows smaller particles and soluble materials to enter hepatopancreatic ducts that conduct them into the shrimp hepatopancreas (HP), where further digestion and absorption of nutrients takes place. Although the GS function is well known, its exclusion limit for particulate material has not been clearly defined. Using histological and ultra-structure analysis, we show that the GS sieve pore diameter is approximately 0.2-0.7 micro m in size, indicating a size exclusion limit of substantially less than 1 micro m. Using fluorescent microbeads, we show that particles of 1 micro m diameter could not pass through the GS but that particles of 0.1 micro m diameter did pass through to accumulate in longitudinal grooves and move on to the HP, where some were internalized by tubule epithelial cells. We found no significant difference in these sizes between the species Penaeus monodon and Penaeus vannamei or between juveniles and adults in P. vannamei This information will be of value for the design of particulate feed ingredients such as nutrients, therapeutic drugs and toxin-absorbing materials that may selectively target the stomach, intestine or HP of cultivated shrimp.

Patterson, J., et al. (2019). "Profiling microplastics in the Indian edible oyster, Magallana bilineata collected from the Tuticorin coast, Gulf of Mannar, Southeastern India." Science of the Total Environment **691**: 727-735.

The objective of this study is to quantify the extent of microplastic (MP) contamination in the Indian edible oyster (Magallana bilineata) and to understand how this relates to the MP contamination in its surrounding marine environment. Samples of water, sediment and oysters of different sizes were collected from three sites along Tuticorin coast in Gulf of Mannar in Southeast India. The mean abundance of MP in oysters was found to be 6.9 ± 3.84 items/individual and the mean concentration to be 0.81 ± 0.45 items/g of tissue. Polyethylene (PE) and polypropylene (PP) fibers were the dominant MP types in oysters (92% and 4%, respectively) and in seawater (75% and 25%, respectively), with PE fibers, ranging from 0.25 to 0.5 mm, being the most common. Both PE and PP are low-density polymers which are slow to sediment to the seafloor. This increases the potential of their availability in the environment and ingestion by the oysters. The largest oysters (14–16 cm) contained the highest abundance and

concentrations of MP, suggesting a greater proportion of MP in the water column is ingested with increasing size. The calculated microplastic index (0.02 to 0.99) also indicates that MP bioavailability increases with increasing size of oysters. The distribution patterns of MP abundance, shape and size in oysters more closely resemble those in water than in sediment. The surface morphology of the MPs reveals the characteristic pits and cracks which result from partial degradation through the weathering processes. Energy-dispersive X-ray spectroscopy analysis shows the presence of Ni and Fe in association with MP, and this probably indicates the fly-ash pollution and the petroleum-related activities in the surrounding area. Being sessile animals the oysters are good candidates for use as sentinel organisms for monitoring MP in specific marine environments. Unlabelled Image • MP distributions in oysters closely reflected those in surrounding seawater. • Mean abundance of 6.9 MP/individual and concentration of 0.81MP/g detected (ww). • MP abundance and concentration increases with increasing size of oysters. • PE fibers ranging from 0.25 to 0.5 mm were the most common MP in oysters. • Sediments contained a broader range of MP than seawater or oysters. [ABSTRACT FROM AUTHOR]

Paul, A., et al. (2019). "High-throughput NIR spectroscopic (NIRS) detection of microplastics in soil." Environmental Science & Pollution Research **26**(8): 7364-7374.

The increasing pollution of terrestrial and aquatic ecosystems with plastic debris leads to the accumulation of microscopic plastic particles of still unknown amount. To monitor the degree of contamination, analytical methods are urgently needed, which help to quantify microplastics (MP). Currently, time-costly purified materials enriched on filters are investigated both by micro-infrared spectroscopy and/or micro-Raman. Although yielding precise results, these techniques are time consuming, and are restricted to the analysis of a small part of the sample in the order of few micrograms. To overcome these problems, we tested a macroscopic dimensioned near-infrared (NIR) process-spectroscopic method in combination with chemometrics. For calibration, artificial MP/ soil mixtures containing defined ratios of polyethylene, polyethylene terephthalate, polypropylene, and polystyrene with diameters < 125 mum were prepared and measured by a process FT-NIR spectrometer equipped with a fiber-optic reflection probe. The resulting spectra were processed by chemometric models including support vector machine regression (SVR), and partial least squares discriminant analysis (PLS-DA). Validation of models by MP mixtures, MP-free soils, and real-world samples, e.g., fermenter residue, suggests a reliable detection and a possible classification of MP at levels above 0.5 to 1.0 mass% depending on the polymer. The benefit of the combined NIRS chemometric approach lies in the rapid assessment whether soil contains MP, without any chemical pretreatment. The method can be used with larger sample volumes and even allows for an online prediction and thus meets the demand of a high-throughput method.

Paul-Pont, I., et al. (2016). "Exposure of marine mussels Mytilus spp. to polystyrene microplastics: toxicity and influence on fluoranthene bioaccumulation." Environmental Pollution **216**: 724-737.

The effects of polystyrene microbeads (micro-PS; mix of 2 and 6 micro m; final concentration: 32 micro g L⁻¹) alone or in combination with fluoranthene (30 micro g

L⁻¹) on marine mussels Mytilus spp. were investigated after 7 days of exposure and 7 days of depuration under controlled laboratory conditions. Overall, fluoranthene was mostly associated to algae Chaetoceros muelleri (partition coefficient Log Kp=4.8) used as a food source for mussels during the experiment. When micro-PS were added in the system, a fraction of FLU transferred from the algae to the microbeads as suggested by the higher partition coefficient of micro-PS (Log Kp=6.6), which confirmed a high affinity of fluoranthene for polystyrene microparticles. However, this did not lead to a modification of fluoranthene bioaccumulation in exposed individuals, suggesting that micro-PS had a minor role in transferring fluoranthene to mussels tissues in comparison with waterborne and foodborne exposures. After depuration, a higher fluoranthene concentration was detected in mussels exposed to micro-PS and fluoranthene, as compared to mussels exposed to fluoranthene alone. This may be related to direct effect of micro-PS on detoxification mechanisms, as suggested by a down regulation of a P-glycoprotein involved in pollutant excretion, but other factors such as an impairment of the filtration activity or presence of remaining beads in the gut cannot be excluded. Micro-PS alone led to an increase in hemocyte mortality and triggered substantial modulation of cellular oxidative balance: increase in reactive oxygen species production in hemocytes and enhancement of anti-oxidant and glutathione-related enzymes in mussel tissues. Highest histopathological damages and levels of anti-oxidant markers were observed in mussels exposed to micro-PS together with fluoranthene. Overall these results suggest that under the experimental conditions of our study micro-PS led to direct toxic effects at tissue, cellular and molecular levels, and modulated fluoranthene kinetics and toxicity in marine mussels.

Pauly, D., et al. (2009). "Simultaneous quantification of five bacterial and plant toxins from complex matrices using a multiplexed fluorescent magnetic suspension assay." Analyst **134**(10): 2028-2039.

Proteotoxins such as ricin, abrin, botulinum neurotoxins type A and B (BoNT/A, BoNT/B) and staphylococcal enterotoxin B (SEB) are regarded as potential biological warfare agents which could be used for bioterrorism attacks on the food chain. In this study we used a novel immunisation strategy to generate high-affinity monoclonal and polyclonal antibodies against native ricin, BoNT/A, and BoNT/B. The antibodies were used along with antibodies against SEB and abrin to establish a highly sensitive magnetic and fluorescent multiplex bead array with excellent sensitivities between 2 ng/L and 546 ng/L from a minimal sample volume of 50 micro L. The assay was validated using 20 different related analytes and the assay precision was determined. Advancing the existing bead array technology, the novel magnetic and fluorescent microbeads proved amenable to enrichment procedures, by further increasing sensitivity to 0.3-85 ng/L, starting from a sample volume of 500 micro L. Furthermore, the method was successfully applied for the simultaneous identification of the target toxins spiked into complex food matrices like milk, baby food and yoghurt. On the basis of our results, the assay appears to be a good tool for large-scale screening of samples from the food supply chain.

Pauna, V. H., et al. (2019). "The issue of microplastics in marine ecosystems: A bibliometric network analysis." Marine Pollution Bulletin **149 (no pagination)**(110612).

Human activities lead to several impacts on marine ecosystems, among which a massive input of plastic entering the marine environment. This scenario has the potential to threaten ecosystem health and integrity, also reducing the ability of marine ecosystems to provide good and services on which human well-being relies. In this study, the global scientific literature on marine microplastics was explored by combining social network analysis and bibliometrics. Network maps displayed the relationships among keywords, authors, countries, and journals dealing with the issue of microplastics in marine ecosystems. The citation analysis of journals showed that

"Marine Pollution Bulletin" resulted the first among the scientific journals publishing articles on this subject. The results also highlighted that most research on the subject is focused on toxicology and environmental chemistry, while ecological studies focusing on the impact of microplastics at ecosystem level are still limited. Copyright © 2019 Elsevier Ltd

Pavlík, Z. P., et al. (2017). EXPERIMENTAL ANALYSIS OF LIGHT-WEIGHT CONCRETE INCORPORATING REGRANULATED WASTE POLYPROPYLENE. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **17:** 155-162.

Concrete production has high adverse effect on the quality of environment, and its sustainability is open question for material researchers and producers. In addressing the environmental concerns of concrete manufacturing and problems relating to the disposal of wastes and industrial by-product and also economic advantages, application of secondary raw materials in composition of concrete mix is of the particular importance both from the environmental and financial point of view. A substantial growth in the consumption of plastics is observed all over the world in recent years, which has led to huge quantities of plastic-related waste. Recycling of plastic waste to produce new materials like concrete or mortar appears as one of the best solution for disposing of plastic waste, due to its economic and ecological advantages. In this paper, light-weight concrete incorporating high volume of waste polypropylene was developed and experimentally tested. Regranulated polypropylene, a by-product of polypropylene tubes production, partially substituted fine natural silica aggregate in 10, 20, 30, 40 and 50 mass %. First, characterization of waste plastic was done. Specific attention was paid to thermal properties of regranulated polypropylene that were examined in dependence on compaction time. For the developed light-weight concrete, basic physical, mechanical and hygric properties were accessed. Since the thermal properties were of the particular importance, they were measured using transient impulse technique in dependence on moisture content, from the dry state to fully water saturated state. The tested light-weight concrete was found to be prospective construction material having improved thermal insulation function and acceptable mechanical strength. From the environmental and financial point of view, the reuse of waste polypropylene in concrete composition was beneficial taking into account plastics low biodegradability and safe disposal.

Pawar, C. T. and M. V. Joshi (2003). "Solid waste and its environmental impact in Ichalikaranji City, Maharashtra." Nature, Environment and Pollution Technology **2**(2): 237-240.

In the present investigation an attempt is made to analyze the impact of the solid waste on the environment and health of the people of Ichalkaranji city through the method of Leopold Matrix. The sources of data used for this paper are the empirical facts collected by circulating questionnaire among residents residing near waste depots. The waste constituents are referred from environmental status report of Ichalkaranji (2001-2002) prepared by Textile and Engineering Institute, Ichalkaranji. The solid waste details were collected through Municipal Health Department, Ichalkaranji. The analysis reveals that the worst impact maker factor is the mutton market waste followed by plastic waste, cotton waste, vegetable remains and so on. The people are aware of the cleanliness, decency and aesthetics of the city. The presence of uncontrolled dogs, pigs and cows also add to the problems of the people. The biodegradable waste can be converted into manure and can become a source of revenue. Structural demolitions may become useful landfills in marshy low lying areas. With regular, prompt transportation of solid waste much impact can be controlled. Metal scrap, glass and plastics can be assorted and resold. To conduct awareness programmes and demonstrations on minimization of refuse generation at source and that on avoiding the use of plastic bags is necessary.

Payne, R. (2019). "The environmental impact of prescribing." Prescriber **30**(6): 4.

Pazienza, P. and C. De Lucia (2020). "For a new plastics economy in agriculture: Policy reflections on the EU strategy from a local perspective." Journal of Cleaner Production **253**.

Plastic production and consumption around the world have seen a rapid increase since the end of World War II, with an expected peak in the next 20 years. Agriculture is among the causes of this due to its intensive farming practices and the use of various plastic materials. This produces both advantages (e.g. yield increase, early harvest, reduced use of chemicals) and disadvantages. The disadvantages are particularly related to a plastic waste management problem, from which the contamination of terrestrial, marine and air environments with severe consequences on food security and human health also derive. With the 2018 European Strategy for Plastics in a Circular Economy, the European Commission (EC) identifies a set of actions to reduce plastic pollution in the decades ahead. For the actual implementation of this strategic vision, however, innovative investment and appropriate policy tools need to be identified. This paper attempts to understand the acceptability of some ad-hoc policy tools among farmers by investigating their attitudes towards the application of subsidies, tax-credits and pay-back (this latter under an Extended Producer Responsibility (EPR) scheme) to abate agricultural plastic pollution with the aim of making this sector cleaner and more oriented to the implementation of the sustainability principles. While referring to the territory of the province of Foggia in southern Italy as a case study, we analyse the preferences expressed by 1,783 farmers by using a multinomial logistic regression. Key results suggest that large agricultural farms would favour the adoption of tax-credits. In contrast, small farms would consider more favourable the introduction of a pay-back tool to incentivize their contribution to plastic pollution abatement. The significance of the obtained results is twofold. First, farm size is a key element towards a differentiation of policy tools to adopt for plastic waste management in agriculture. Second, the differentiation of the above policy tools according to the farm dimension would lead to a cost-effectiveness management of agricultural plastic waste. 2020 Elsevier Ltd

Pazos, R. S., et al. (2018). "Microplastics integrating the coastal planktonic community in the inner zone of the Rio de la Plata estuary (South America)." Environmental Pollution **Part A. 243**: 134-142.

This study explores in plankton samples the abundance, distribution, size, types (fibres and fragments), colours of the microplastics (MPs) and its relation with the characteristics of the plankton (size and morphology) of the Rio de la Plata estuary. Water samples were collected in triplicate in freshwater-mixohaline tidal zone of the estuary, in ten sampling sites located along 150 km of coast, in two periods (September-November 2016 and April-June 2017). The results revealed the presence of MPs in all the samples analysed, with a dominance of fibres and sizes >500 <= 1000 mum, and blue colour being more frequent. The MPs distribution was significantly different among sampling sites, being more abundant in the most urbanized sites, sewage discharges and near the maximum turbidity front. The mean density, in the two samplings analysed, were 164 and 114 MPs m⁻³. The fibres amount was significantly different among sites. The MPs integrated a planktonic community dominated by pico-microphytoplankton, mainly conformed by filaments/chains and solitary forms and by micro-mesozooplankton. The comparative analysis of plankton and MPs demonstrated that a fraction of the latter showed a frequency range of size that coincides with the most common sizes of plankton (<=500 mum). The mean percentage of MPs items in relation to zooplankton was 0.36% (sampling 1) and 1.20% (sampling 2) and for phytoplankton was 0.0002% (sampling

1) and 0.0005% (sampling 2). The correlations between the MPs concentration and habitat quality (IHRPlata index) were statistically significant, on the contrary correlations between the MPs concentration and measured environmental variables were not found. The findings of this study emphasises the need for a better treatment of urban waste, which would contribute to reducing the entry of this pollutant into the ecosystem. The presence of microplastics in plankton samples on the coast of the Rio de la Plata estuary. Copyright © 2018 Elsevier Ltd

Pazos, R. S., et al. (2018). "Microplastics integrating the coastal planktonic community in the inner zone of the Río de la Plata estuary (South America)." Environmental Pollution **243**: 134-142.

This study explores in plankton samples the abundance, distribution, size, types (fibres and fragments), colours of the microplastics (MPs) and its relation with the characteristics of the plankton (size and morphology) of the Río de la Plata estuary. Water samples were collected in triplicate in freshwater-mixohaline tidal zone of the estuary, in ten sampling sites located along 150 km of coast, in two periods (September–November 2016 and April–June 2017). The results revealed the presence of MPs in all the samples analysed, with a dominance of fibres and sizes >500 ≤ 1000 µm, and blue colour being more frequent. The MPs distribution was significantly different among sampling sites, being more abundant in the most urbanized sites, sewage discharges and near the maximum turbidity front. The mean density, in the two samplings analysed, were 164 and 114 MPs m^{-3}. The fibres amount was significantly different among sites. The MPs integrated a planktonic community dominated by pico-microphytoplankton, mainly conformed by filaments/chains and solitary forms and by micro-mesozooplankton. The comparative analysis of plankton and MPs demonstrated that a fraction of the latter showed a frequency range of size that coincides with the most common sizes of plankton (≤500 µm). The mean percentage of MPs items in relation to zooplankton was 0.36% (sampling 1) and 1.20% (sampling 2) and for phytoplankton was 0.0002% (sampling 1) and 0.0005% (sampling 2). The correlations between the MPs concentration and habitat quality (IHRPlata index) were statistically significant, on the contrary correlations between the MPs concentration and measured environmental variables were not found. The findings of this study emphasises the need for a better treatment of urban waste, which would contribute to reducing the entry of this pollutant into the ecosystem. The presence of microplastics in plankton samples on the coast of the Río de la Plata estuary. Graphical abstract Image Highlights • The mean of microplastics (MPs) in the water column was 139 MPs m^{-3}. • The most frequent MPs sizes were >500 ≤ 1000 µm, with a higher fibres concentration. • The MPs were more abundant in the sites near cities, sewage effluents and the turbidity front. • A fraction of MPs showed a frequency range of size that coincides with the most common sizes of plankton. [ABSTRACT FROM AUTHOR]

Peda, C., et al. (2016). "Intestinal alterations in European sea bass Dicentrarchus labrax (Linnaeus, 1758) exposed to microplastics: preliminary results." Environmental Pollution **212**: 251-256.

This study investigates, for the first time, the intestinal responses of European sea bass Dicentrarchus labrax chronically exposed to microplastics through ingestion. Fish (n=162) were fed with 3 different treatment diets for 90 days: control, native polyvinyl chloride (PVC) and polluted polyvinyl chloride (PVC) pellets. Intestines were fixed and processed for histological analysis using standard techniques. Histopathological alterations were examined using a score value (from 0 to 4). The distal part of intestine in all samples proved to be the most affected by pathological alterations, showing a gradual change varying from moderate to severe related to exposure times. The histological picture that characterizes both groups especially after 90 days of exposure, suggests that the intestinal functions can be in some cases totally compromised. The worst condition is increasingly evident in the distal intestine of fish fed with polluted PVC pellets respect to control groups ($p<0.05$) to different exposure times. These first results underline the need to assess the impact of increasing microplastics pollution on the marine trophic web.

Pedrotti, M. L., et al. (2016). "Changes in the Floating Plastic Pollution of the Mediterranean Sea in Relation to the Distance to Land." PLoS ONE [Electronic Resource] **11**(8): e0161581.

The composition, size distribution, and abundance of floating plastic debris in surface waters of the Mediterranean Sea were analyzed in relation to distance to land. We combined data from previously published reports with an intensive sampling in inshore waters of the Northwestern Mediterranean. The highest plastic concentrations were found in regions distant from from land as well as in the first kilometer adjacent to the coastline. In this nearshore water strip, plastic concentrations were significantly correlated with the nearness to a coastal human population, with local areas close to large human settlements showing hundreds of thousands of plastic pieces per km2. The ratio of plastic to plankton abundance reached particularly high values for the coastal surface waters. Polyethylene, polypropylene and polyamides were the predominant plastic polymers at all distances from coast (86 to 97% of total items), although the diversity of polymers was higher in the 1-km coastal water strip due to a higher frequency of polystyrene or polyacrylic fibers. The plastic size distributions showed a gradual increase in abundance toward small sizes indicating an efficient removal of small plastics from the surface. Nevertheless, the relative abundance of small fragments (< 2 mm) was higher within the 1-km coastal water strip, suggesting a rapid fragmentation down along the shoreline, likely related with the washing ashore on the beaches. This study constitutes a first attempt to determine the impact of plastic debris in areas closest to Mediterranean coast. The presence of a high concentration of plastic including tiny plastic items could have significant environmental, health and economic impacts.

Peeken, I., et al. (2018). "Arctic sea ice is an important temporal sink and means of transport for microplastic." Nature communications **9**: 1-12.

Microplastics (MP) are recognized as a growing environmental hazard and have been identified as far as the remote Polar Regions, with particularly high concentrations of microplastics in sea ice. Little is known regarding the horizontal variability of MP within sea ice and how the underlying water body affects MP composition during sea ice growth. Here we show that sea ice MP has no uniform polymer composition and that, depending on the growth region and drift paths of the sea ice, unique MP patterns can be observed in different sea ice horizons. Thus even in remote regions such as the Arctic Ocean, certain MP indicate the presence of localized sources. Increasing exploitation of Arctic resources will likely lead to a higher MP load in the Arctic sea ice and will enhance the release of MP in the areas of strong seasonal sea ice melt and the outflow gateways.

Peeters, J. R., et al. (2015). "Forecasting waste compositions: A case study on plastic waste of electronic display housings." Waste Management **46**: 28-39.

Because of the rapid succession of technological developments, the architecture and material

composition of many products used in daily life have drastically changed over the last decades. As a result, well-adjusted recycling technologies need to be developed and installed to cope with these evolutions. This is essential to guarantee continued access to materials and to reduce the ecological impact of our material consumption. However, limited information is currently available on the material composition of arising waste streams and even less on how these waste streams will evolve. Therefore, this paper presents a methodology to forecast trends in the material composition of waste streams. To demonstrate the applicability and value of the proposed methodology, it is applied to forecast the evolution of plastic housing waste from flat panel display (FPD) TVs, FPD monitors, cathode ray tube (CRT) TVs and CRT monitors. The results of the presented forecasts indicate that a wide variety of plastic types and additives, such as flame retardants, are found in housings of similar products. The presented case study demonstrates that the proposed methodology allows the identification of trends in the evolution of the material composition of waste streams. In addition, it is demonstrated that the recycling sector will need to adapt its processes to deal with the increasing complexity of plastics of end-of-life electronic displays while respecting relevant directives.

Peez, N., et al. (2019). "Quantitative analysis of PET microplastics in environmental model samples using quantitative ¹H-NMR spectroscopy: validation of an optimized and consistent sample clean-up method." Analytical & Bioanalytical Chemistry **411**(28): 7409-7418.

Identification and quantification of microplastics (MP) in environmental samples is crucial for understanding the risk and distribution of MP in the environment. Currently, quantification of MP particles in environmental samples and the comparability of different matrices is a major research topic. Research also focusses on sample preparation, since environmental samples must be free of inorganic and organic matrix components for the MP analysis. Therefore, we would like to propose a new method that allows the comparison of the results of MP analysis from different environmental matrices and gives a MP concentration in mass of MP particles per gram of environmental sample. This is possible by developing and validating an optimized and consistent sample preparation scheme for quantitative analysis of MP particles in environmental model samples in conjunction with quantitative ¹H-NMR spectroscopy (qNMR). We evaluated for the first time the effects of different environmental matrices on identification and quantification of polyethylene terephthalate (PET) fibers using the qNMR method. Furthermore, high recovery rates were obtained from spiked environmental model samples (without matrix ~ 90%, sediment ~ 97%, freshwater ~ 94%, aquatic biofilm ~ 95%, and invertebrate matrix ~ 72%), demonstrating the high analytical potential of the method. Graphical abstract.

Peh, G. S., et al. (2012). "Optimization of human corneal endothelial cells for culture: the removal of corneal stromal fibroblast contamination using magnetic cell separation." International Journal of Biomaterials Print **2012**: 601302.

The culture of human corneal endothelial cells (CECs) is critical for the development of suitable graft alternative on biodegradable material, specifically for endothelial keratoplasty, which can potentially alleviate the global shortage of transplant-grade donor corneas available. However, the propagation of slow proliferative CECs in vitro can be hindered by rapid growing stromal corneal fibroblasts (CSFs) that may be coisolated in some cases. The purpose of this study was to evaluate a strategy using magnetic cell separation (MACS) technique to deplete the contaminating CSFs from CEC cultures using antifibroblast magnetic microbeads. Separated "labeled" and "flow-through" cell fractions were collected separately, cultured, and morphologically assessed. Cells from the "flow-through" fraction displayed compact polygonal morphology and expressed Na(+)/K(+)ATPase indicative of corneal endothelial cells, whilst cells from the "labeled" fraction were mostly elongated and fibroblastic. A separation efficacy of 96.88% was observed. Hence, MACS technique can be useful in the depletion of contaminating CSFs from within a culture of CECs.

Peiponen, K. E., et al. (2019). "Outlook on optical identification of micro- and nanoplastics in aquatic environments." Chemosphere **214**: 424-429.

Plastic pollution in natural water bodies is an emerging problem that requires quick actions. Recently, the role of micro- and nanoplastics in pollution and health issues has been realized and taken seriously. In this paper, we have studied optical properties, such as NIR spectra and refractive index, of some common plastic materials and present a method and data to screen especially problematic transparent plastics with rough surface in aquatic environments. We also give an outlook of possible optical measurement methods that could be used for detection of micro- and nanoplastics.

Peisino, L. E., et al. (2019). "Metal leaching analysis from a core-shell WEEE plastic synthetic aggregate." Sustainable Chemistry and Pharmacy **12 (no pagination)**(100134).

Plastic wastes from electrical and electronic equipment (WEEEP) contain an important amount of metals and brominated flame retardants. These contaminants are hazardous for human and environment, therefore the WEEE are considered dangerous wastes by the law. In order to revalue this waste, we developed a cement based stabilization strategy for these contaminants. The WEEEP was covered with a mixture of cement and a very fine aggregate. This strategy takes a core-shell concept to obtain a synthetic aggregate with potential use in the construction industry. To evaluate the concentration of metals in the waste, extractions with hot water followed by acid digestion were carried out in samples of WEEEP, and then we compared these values with the leached of metals from the synthetic aggregate. The quantification was made by atomic absorption technique. The most of the studied metals did not leached in hot water, except for the antimony, which leached in hot water from WEEEP but showed an important decrease in its concentration in the leached of the synthetic arid. Copyright © 2019

Peixoto, D., et al. (2019). "Uptake and effects of different concentrations of spherical polymer microparticles on Artemia franciscana." Ecotoxicology and Environmental Safety **176**: 211-218.

Artemia cysts have a huge economic importance for the aquaculture sector due to the fact that they are used as live feed for larviculture. Microplastics (MPs) are common and emergent pollutants in the aquatic environments, with unknown and potential long-term effects on planktonic species such as Artemia spp. When used as live feed, Artemia could transfer contaminants to fish along the food chain, with possible adverse effects on human health through their consumption. This study aims to assess the uptake of different concentrations of spherical polymer microparticles (FRM) (1-5 micro m diameter) and their associated chronic effects on feeding, growth, mortality, and reproductive success from juvenile to adult stage of brine shrimp Artemia franciscana. Individuals were exposed for 44 days to 0.4, 0.8 and 1.6 mg.L⁻¹ of FRM. No significant detrimental effects on growth, ingestion and mortality rates of A. franciscana were observed in all tested conditions. However, reproductive success was strongly affected by the increase of MP concentrations. The results of the present study showed that A. franciscana juveniles and adults were able to survive different experimental MP concentrations, but their reproductive success and progeny were significantly impacted by exposure to FRM particles.

Peixoto, D., et al. (2019). "Microplastic pollution in commercial salt for human consumption: A review."

Estuarine, Coastal and Shelf Science **219**: 161-168.

Microplastics (MPs) are plastic particles with less than 5 mm in size that are considered global environmental pollutants. The MPs present in the environment result from the successive breakdown of larger plastic pieces or from the direct input of micro- and nano-sized particles used in various industries and products available to consumers. Such MPs have been found in several wild species and other natural resources, including some consumed as food by humans, with possible adverse effects on ecosystem and human health. The central aim of this work was to review the published literature regarding the contamination of sea commercial salts (sea and terrestrial origins) and its possible impacts on human health. Moreover, to lead to a comprehensive understanding of the paradigm, a short introduction and revision of the environmental contamination by MPs and its effects are included. MPs have been found in commercial salts from 128 brands, from 38 different countries spanning over five continents. The concentration of MPs found in the samples analysed is lower than the concentrations of MPs reported in other resources, such as blue mussels. However, as commercial salts are used every day and by all humans, they constitute a long-term exposure route for the general population in addition to others (e.g., animals consumed as food by humans, water, air). Therefore, commercial salts contaminated with MPs may contribute to the potential long-term adverse effects resulting from human exposure to these particles. © 2019

Peller, J. R., et al. (2019). "Tracking the distribution of microfiber pollution in a southern Lake Michigan watershed through the analysis of water, sediment and air." Environmental Science. Processes & Impacts **21**(9): 1549-1559.

Microplastic waste is a worldwide problem, heavily afflicting marine and freshwater environments; the loading of this pollution in water, sediment and living organisms continues to escalate. Synthetic microfibers, resulting from the release of microscopic fibers from synthetic textiles, constitute the most prevalent type of microplastics pollution in aquatic environments. This study investigated the origin and distribution of synthetic microfibers in a representative Lake Michigan watershed in Indiana (USA) by analyzing water, sediment and air samples above and below wastewater treatment plant discharges, downstream in the watershed and water from the Lake Michigan shoreline. Synthetic microfibers were also quantified in wastewater from a local wastewater treatment plant (WWTP) and in laundry effluent. Laboratory testing of numerous fabrics suggests that Fenton oxidation, used to break down natural fibers, effectively eliminates non-polluting, natural fibers from the samples. However, the hydroxyl radical-mediated oxidation bleaches the dye from certain synthetic microfibers, which likely leads to under-reported values for these microplastics in natural samples. The data collected from the watershed samples indicate that approximately 4 billion synthetic microfibers are transported daily through the Lake Michigan tributary. Wastewater effluent is not the only source of synthetic microfibers, since surface water samples above the WWTP contained a similar load to downstream samples. Repeated sampling exhibited variability in the number of microfibers detected, substantiating the heterogeneous distribution of these pollutants and the requirement for multiple samples for a given site. The average load of synthetic microfibers from water sampled at the Lake Michigan shoreline was higher than the tributary water, suggesting the shoreline functions as a repository for the microfibers. Given the extent and potential consequences of this pollution, quantification of the ubiquitous plastic fibers can be instituted as part of the traditional total suspended solids (TSS) water quality monitoring parameter.

Pellini, G., et al. (2018). "Characterization of microplastic litter in the gastrointestinal tract of Solea solea

from the Adriatic Sea." Environmental Pollution **234**: 943-952.

Micro-plastic particles in the world's oceans represent a serious threat to both human health and marine ecosystems. Once released into the aquatic environment plastic litter is broken down to smaller pieces through photo-degradation and the physical actions of waves, wind, etc. The resulting particles may become so small that they are readily taken up by fish, crustaceans and mollusks. There is mounting evidence for the uptake of plastic particles by marine organisms that form part of the human food chain and this is driving urgent calls for further and deeper investigations into this pollution issue. The present study aimed at investigating for the first time the occurrence, amount, typology of microplastic litter in the gastrointestinal tract of Solea solea and its spatial distribution in the northern and central Adriatic Sea. This benthic flatfish was selected as it is a species of high commercial interest within the FAO GFCM (General Fisheries Commission for the Mediterranean) area 37 (Mediterranean and Black Sea) where around 15% of the overall global Solea solea production originates. The digestive tract contents of 533 individuals collected in fall during 2014 and 2015 from 60 sampling sites were examined for microplastics. These were recorded in 95% of sampled fish, with more than one microplastic item found in around 80% of the examined specimens. The most commonly found polymers were polyvinyl chloride, polypropylene, polyethylene, polyester, and polyamide, 72% as fragments and 28% as fibers. The mean number of ingested microplastics was 1.73 ± 0.05 items per fish in 2014 and 1.64 ± 0.1 in 2015. PVC and PA showed the highest densities in the northern Adriatic Sea, both inshore and off-shore while PE, PP and PET were more concentrated in coastal areas with the highest values offshore from the port of Rimini. [ABSTRACT FROM AUTHOR]

Pellis, A., et al. (2019). "Enzymatic synthesis of lignin derivable pyridine based polyesters for the substitution of petroleum derived plastics." Nature communications **10**(1): 1762.

Following concerns over increasing global plastic pollution, interest in the production and characterization of bio-based and biodegradable alternatives is rising. In the present work, the synthesis of a series of fully bio-based alternatives based on 2,4-, 2,5-, and 2,6-pyridinedicarboxylic acid-derived polymers produced via enzymatic catalysis are reported. A similar series of aromatic-aliphatic polyesters based on diethyl-2,5-furandicarboxylate and of the petroleum-based diethyl terephthalate and diethyl isophthalate were also synthesized. Here we show that the enzymatic synthesis starting from 2,4-diethyl pyridinedicarboxylate leads to the best polymers in terms of molecular weights (M_n = 14.3 and M_w of 32.1 kDa when combined with 1,8-octanediol) when polymerized in diphenyl ether. Polymerization in solventless conditions were also successful leading to the synthesis of bio-based oligoesters that can be further functionalized. DSC analysis show a clear similarity in the thermal behavior between 2,4-diethyl pyridinedicarboxylate and diethyl isophthalate (amorphous polymers) and between 2,5-diethyl pyridinedicarboxylate and diethyl terephthalate (crystalline polymers).

Peltomaa, R., et al. (2016). "Species-specific optical genosensors for the detection of mycotoxigenic Fusarium fungi in food samples." Analytica Chimica Acta **935**: 231-238.

Plant-pathogenic Fusarium species, Fusarium verticillioides and Fusarium proliferatum, are the major producers of fumonisins which are one of the most common mycotoxins found in maize. Herein, we report the development of specific and sensitive genosensors for detecting these two closely related Fusarium species in food samples. The sensors are based on species-specific capture and detection probes, which bind to the intergenic spacer region of rDNA (IGS). Oligonucleotide functionalized magnetic microbeads are used to capture the target DNA which is then detected using biotinylated detection probes and a streptavidin-coupled label. The developed genosensors had detection limits of 1.8 pM and 3.0 pM for F. proliferatum and F. verticillioides, respectively, using synthetic DNA targets. Furthermore, the biosensors were used to analyze natural fungal contamination of commercial maize samples. After amplification of the genomic DNA the sensors detected the presence of the fungi, in accordance with previous results obtained with PCR. No cross-reactivity between F. verticillioides and F. proliferatum, or other fungi species tested, was observed. The developed biosensors can provide a valuable tool to evaluate the potential for mycotoxin contamination in conditions where detection of mycotoxins directly is challenging.

Pelucchi, S., et al. (2011). "Genetic modifiers in HFE-hemochromatosis: Analysis of 355 TAG SNPs in an Italian population of C282Y homozygotes." American Journal of Hematology **86 (9)**: E45-E46.

Hemochromatosis (HH) may lead to tissue iron accumulation and iron-related complications. Penetrance and expression of HH largely differs among C282Y homozygotes and genetic components affecting the development of clinical manifestations are largely unknown. The main objectives of this study is to identify potential modifiers of iron accumulation in HFE-HH. We analysed 420 subjects including 308 unrelated C282Y homozygotes and 110 healthy controls selected from Units' databases and DNA banks. Serum ferritin (SF) levels, total iron removed (IR) and % of transferrin saturation (TS), as markers of HH expression, were normalized using a log transformation before testing for association. A linear regression model was implemented to evaluate the effect on these three phenotypes of covariates as age, sex and alcohol consumption. Age, sex and gender covariates were all significantly associated with SF and IR ($p<0.001$). SNPs were tested for genetic association by using a linear regression model adjusted for age, sex and alcohol consumption. For each phenotype we assumed an additive genetic model. The false discovery rate (FDR) method of Benjamini and Hochberg (J R Stat Soc B 1995) was applied to the minP test results to account for multiple comparisons. We considered FDR <0.1 as being noteworthy. The genetic analyses were performed using R (R Foundation for Statistical Computing, Vienna, Austria) and the library GenABEL (genome-wide SNP association analysis. R package version 1.6-4). Overall we selected 355 tagSNPs of whom 211 are located in 53 candidate genes and 144 in two regions of chromosome 19q (34.5-46Mb and 51-56.5Mb) previously identified as candidate region of variability in HFE-ko animal model (Bensaid M et al, 2004). SNPs were typed using the GoldenGate Assay on VeraCode microbeads supported by the BeadXpress Reader platform. After imposing the quality control measures, 22 subjects and 14 markers were excluded from the analysis. None of the remaining SNPs deviated from Hardy-Weinberg Equilibrium. 341 markers and 398 subjects (296 patients and 102 controls) were finally considered. SF associated ($p<0.05$) with several SNPs (rs12467409, rs13541, rs2662255, rs9325886 and rs17804636) belonging to candidate genes (BMPR2, RGMB, GDF2 and SMAD9) and with 7 SNPs located on chromosome 19q. IR associated with rs11684885, rs12467409, rs4678013, rs1800702, rs2794719, rs3780474, rs11204215, rs149411, rs762642, rs918587 belonging to candidate genes (EPAS1, BMPR2, CASR, HFE, ACO1, GDF2, SLC11A2, BMP4, CCN1) and with 6 SNPs located on chromosome 19q. Considering that HAMP is located on chromosome 19q we constructed an haplotype including 3 SNPs of HAMP (rs8101606, rs7251432 and rs12971321) and two SNPs in UBA2 and SARS2 genes (rs1559196 and

rs10412886) significantly associated with phenotype expression located at 5' and 3' from HAMP, respectively. The haplotype GAAGA was slightly associated with SF (frequency 0.055, p=0.033) and IR (frequency 0.56, p=0.049), haplotype AAGCA was more markedly associated with IR (frequency 0.12, p=0.0015), and haplotype GAAGG with TS (frequency 0.11, p=0.016). Besides age, gender and alcohol intake, phenotype expression in HFE-HH might be influenced by SNPs variation in genes involved in iron metabolisms. The observed association between phenotype variability and chromosome 19q regions needs to be further explored to understand whether it is related to HAMP locus or to other unknown modifier(s).

Penalver, R., et al. (2020). "An overview of microplastics characterization by thermal analysis." Chemosphere **242**: 125170.

Microplastics may be present in the environment as primary microplastics (manufactured) or secondary microplastics (result of the continuous degradation of larger plastic pieces into smaller fragments due to environmental, physicochemical and biotic factors). To fully understand the dynamics of microplastic particles and their environmental effects, harmonized, automated, cheap, rapid and reliable methodologies for sampling, extraction and characterization of microplastic need to be developed. This review focuses on the potential of thermal analytical techniques for microplastics characterization and highlights some of the new trends in this area.

Peng, B.-Y., et al. (2019). "Biodegradation of Polystyrene by Dark (Tenebrio obscurus) and Yellow (Tenebrio molitor) Mealworms (Coleoptera: Tenebrionidae)." Environmental Science & Technology **53**(9): 5256.

Yellow mealworms (larvae of Tenebrio molitor, Coleoptera: Tenebrionidae) have been proven to be capable of biodegrading polystyrene (PS) products. Using four geographic sources, we found that dark mealworms (larvae of Tenebrio obscurus) ate PS as well. We subsequently tested T. obscurus from Shandong, China for PS degradation capability. Our results demonstrated the ability for PS degradation within the gut of T. obscurus at greater rates than T. molitor. With expanded PS foam as the sole diet, the specific PS consumption rates for T. obscurus and T. molitor at similar sizes (2.0 cm, 62–64 mg per larva) were 32.44 ± 0.51 and 24.30 ± 1.34 mg 100 larvae–1 d–1, respectively. After 31 days, the molecular weight (Mn) of residual PS in frass (excrement) of T. obscurus decreased by 26.03%, remarkably higher than that of T. molitor (11.67%). Fourier transform infrared spectroscopy (FTIR) indicated formation of functional groups of intermediates and chemical modification. Thermo gravimetric analysis (TGA) suggested that T. obscurus larvae degraded PS effectively based on the proportion of PS residue. Co-fed corn flour to T. obscurus and wheat bran to T. molitor increased total PS consumption by 11.6% and 15.2%, respectively. Antibiotic gentamicin almost completely inhibited PS depolymerization. High-throughput sequencing revealed significant shifts in the gut microbial community in both Tenebrio species that were associated with the PS diet and PS biodegradation, with changes in three predominant families (Enterobacteriaceae, Spiroplasmataceae, and Enterococcaceae). The results indicate that PS biodegradability may be ubiquitous within the Tenebrio genus which could provide a bioresource for plastic waste biodegradation.

Peng, G., et al. (2020). "The ocean's ultimate trashcan: Hadal trenches as major depositories for plastic pollution." Water Research **168**: 115121.

Plastic debris and marine microplastics are being discharged into the ocean at an alarming scale and have been observed throughout the marine environment. Here we report microplastic in sediments of the Challenger Deep, the deepest known region on the planet, abyssal plains and hadal trenches located in the Pacific Ocean (4900 m-10,890 m). Microplastic abundance reached 71.1 items per kg dry weight sediment. That high concentrations are found at such remote depths, knowing the very slow sinking speed of microplastics, suggests that supporting mechanisms must be at-play. We discuss cascading processes that transport microplastics on their journey from land and oceanic gyres through intermediate waters to the deepest corners of the ocean. We propose that hadal trenches will be the ultimate sink for a significant proportion of the microplastics disposed in the ocean. The build-up of microplastics in hadal trenches could have large consequences for fragile deep-sea ecosystems.

Peng, G., et al. (2018). "Microplastics in freshwater river sediments in Shanghai, China: A case study of risk assessment in mega-cities." Environmental Pollution **234**: 448-456.

Microplastics, which are plastic debris with a particle diameter of less than 5 mm, have attracted growing attention in recent years. Its widespread distributions in a variety of habitats have urged scientists to understand deeper regarding their potential impact on the marine living resources. Most studies on microplastics hitherto are focused on the marine environment, and research on risk assessment methodology is still limited. To understand the distribution of microplastics in urban rivers, this study investigated river sediments in Shanghai, the largest urban area in China. Seven sites were sampled to ensure maximum coverage of the city's central districts, and a tidal flat was also included to compare with river samples. Density separation, microscopic inspection and mu-FT-IR analysis were conducted to analyze the characteristics of microplastics and the type of polymers. The average abundance of microplastics in six river sediment samples was 802 items per kilogram of dry weight. The abundance in rivers was one to two orders of magnitude higher than in the tidal flat. White microplastic spheres were most commonly distributed in river sediments. Seven types of microplastics were identified, of which polypropylene was the most prevailing polymers presented. The study then conducted risk assessment of microplastics in sediments based on the observed results, and proposed a framework of environmental risk assessment. After reviewing waste disposal related legislation and regulations in China, this study conclude that in situ data and legitimate estimations should be incorporated as part of the practice when developing environmental policies aiming to tackle microplastic pollution. Microplastic abundance in rivers was one to two orders of magnitude higher than in the tidal flat, and a framework of risk assessment was proposed. Copyright © 2017

Peng, G., et al. (2017). "Microplastics in sediments of the Changjiang Estuary, China." Environmental Pollution **225**: 283-290.

Microplastics are plastics that measure less than 5 mm in diameter. They enter the marine environment as primary sources directly from industrial uses, as well as secondary sources resulting from the degradation of large plastic debris. To improve the knowledge of microplastic pollution in China, we investigated samples from 53 estuarine sediment locations collected with a box corer within the Changjiang Estuary. Microplastics (<5 mm) were extracted from sediments by density separation, after which they were observed under a microscope and categorized according to shape, color and size. Identification was carried out using Micro-Fourier-Transform Infrared Spectroscopy (mu-FT-IR). The abundance of microplastics in the Changjiang Estuary was mapped. The mean concentration was 121 +/- 9 items per kg of dry weight, varying from 20 to 340 items per kg of dry weight. It was found that the concentration of microplastics was the highest on the southeast coast of Shanghai. The distribution pattern of microplastics may be affected by the Changjiang diluted water in summer. All of the microplastics collected were categorized according to shape, color and size. Among which fiber (93%), transparent (42%) and small microplastics (<1 mm) (58%) were the most abundant types. No clear correlation between microplastics and the finer sediment fraction was found. Rayon, polyester, and acrylic were the most abundant types of microplastics identified, indicating that the main source of microplastics in the Changjiang Estuary was from washing clothes (the primary source). It is possible to compare microplastic abundance in this study with the results of other related studies using the same quantification method. The identification of microplastics raises the awareness of microplastic pollution from drainage systems. The prevalence of microplastic pollution calls for monitoring microplastics at a national scale on a regular basis.

Peng, J., et al. (2017). "Current understanding of microplastics in the environment: Occurrence, fate, risks, and what we should do." Integrated Environmental Assessment & Management **13**(3): 476-482.

Microplastics pollution has been documented in the global environment, including at sea, in freshwater and in atmospheric fallout. Ingestion of microplastics by multiple kinds of organisms has been reported and has received increasing attention, because microplastics not only act as a source of toxic chemicals but also a sink for toxic chemicals. To better understand the great concerns about microplastics and associated toxic chemicals potential exposed to the organisms ingesting the debris, we should know more about the occurrence, fate, and risks of microplastics in the environment. What we should do depends on this better understanding. Integr Environ Assess Manag 2017;13:476-482. © 2017 SETAC.

Peng, L., et al. (2020). "Micro- and nano-plastics in marine environment: Source, distribution and threats - A review." Science of the Total Environment **698**: 134254.

Plastic litters have become the predominant components of marine debris due to extensive consumption plastics and mismanagement of plastic wastes. As part of the problem, microplastics (MPs) and nanoplastics (NPs) have generated special concerns due to their unique features that make them easy to transfer among oceans in the marine ecosystem, across different trophic levels inside the food web, and even across different tissues inside contaminated animals. Studies have demonstrated the almost omnipresence of MPs in the marine ecosystem, which present serious threats to the health of marine animals, causing symptoms such as malnutrition, inflammation, chemical poisoning, growth thwarting, decrease of fecundity, and death due to damages at individual, organ, tissue, cell, and molecule levels. The information on NPs in the marine ecosystem has been scarce due to the challenges in sampling and detecting these nano-scaled entities. In vitro and in vivo experiments have demonstrated that NPs have the potential to penetrate different biological barriers including the gastrointestinal barrier and the brain blood barrier and have been detected in many important organs such as brains, the circulation system and livers of sampled animals.

Peng, W., et al. (2014). "Surface evaluation and evolution during hydrodynamic effect polishing for quartz glass." Applied Optics **53**(29): 6913-6919.

Hydrodynamic effect polishing (HEP), a noncontact machining process, can realize the processed surface roughness as small as atomic level. To investigate the subsurface structure, the HEP processed quartz glass surface was etched by the hydrofluoric acid solution. It has been proved that HEP is a polishing method with the ability to process the surface with atomic-level flatness and damage-free surface/subsurface. It has been found that the microplastic scratches on the lap prepolished glass were obviously exposed when the thin redeposition layer was removed. Then the scratches were gradually removed and surface roughness decreased quickly as the removal depth increased. The surface becomes very smooth and the surface roughness maintains at an atomic level when the subsurface damage is removed clearly. The experimental results demonstrated that the defects such as the scratches parallel to the rotational axis of the wheel were firstly removed during the polishing process, and then the defects vertical to the wheel rotational axis were removed.

Pentecost, A., et al. (2010). "Deaggregation of nanodiamond powders using salt- and sugar-assisted milling." Acs Applied Materials & Interfaces **2**(11): 3289-3294.
Diamond particles of 5-10 nm in size can be produced in large quantities by denonating oxygen-lean explosives in a closed chamber. They have numerous useful properties and are used in applications ranging from lubricants to drug delivery. Aggregation of diamond nanoparticles is limiting wider use of this important carbon nanomaterial because most applications require single separated particles. We demonstrate that dry media assisted attrition milling is a simple, inexpensive, and efficient alternative to the current ways of deaggregating of nanodiamond. This technique uses water-soluble nontoxic and noncontaminating crystalline compounds, such as sodium chloride or sucrose. When milling is complete, the media can be easily removed from the product by water rinsing, which provides an advantage when compared to milling with ceramic microbeads. Using the dry media assisted milling with subsequent pH adjustment, it is possible to produce stable aqueous nanodiamond colloidal solutions with particles <10 nm in diameter, which corresponds to 1-2 primary nanodiamond particles. The study of milling kinetics and the characterization of the produced nanodiamond colloids led us to conclude that aggregates of less than 200 nm in diameter, observed at the tail of the pore size distribution of milled nanodiamond, are loosely bonded and rather dynamic in nature. Color change observed in ND colloids upon shifting their pH toward the basic end allowed us to demonstrate that the coloration comes from the light interaction with colloidal particles and not from an increase in nondiamond carbon content.

Percopo, C. M., et al. (2010). "Isolation of human eosinophils: microbead method has no impact on IL-5 sustained viability." Experimental Dermatology **19**(5): 467-469.
BACKGROUND/PURPOSE: In a recent issue of Experimental Dermatology (18, 2009, 654), Schefzyk et al. concluded that multi-antibody eosinophil isolation (Miltenyi) should be abandoned, as differential purity was minimal, and eosinophils underwent accelerated apoptosis when compared with those isolated with traditional anti-CD16 microbeads. Our intent was to investigate the universality of these findings.
METHODS: We isolated eosinophils from normal donor granulocyte packs using two methods, and evaluated purity, viability and annexin-V/propidium-iodide staining.
RESULTS: Purity was substantially greater when multi-antibody isolation was used for eosinophil isolation from granulocyte packs (98% vs 69%). No differential survival was detected when eosinophils were maintained in culture with or without interleukin-5.
CONCLUSIONS: Multi-antibody eosinophil isolation represents a substantial advantage over anti-CD-16 microbeads when isolating large numbers of eosinophils from concentrated leucocyte preparations. No differential survival was observed. While appropriate consideration of methods is always crucial, multi-antibody eosinophil isolation should not be abandoned completely.

Pereira, F. M., et al. (2016). "Hybrid Microfluidic Platform for Multifactorial Analysis Based on Electrical Impedance, Refractometry, Optical Absorption and Fluorescence." Micromachines **7**(10): 07.
This paper describes the development of a novel microfluidic platform for multifactorial analysis

integrating four label-free detection methods: electrical impedance, refractometry, optical absorption and fluorescence. We present the rationale for the design and the details of the microfabrication of this multifactorial hybrid microfluidic chip. The structure of the platform consists of a three-dimensionally patterned polydimethylsiloxane top part attached to a bottom SU-8 epoxy-based negative photoresist part, where microelectrodes and optical fibers are incorporated to enable impedance and optical analysis. As a proof of concept, the chip functions have been tested and explored, enabling a diversity of applications: (i) impedance-based identification of the size of micro beads, as well as counting and distinguishing of erythrocytes by their volume or membrane properties; (ii) simultaneous determination of the refractive index and optical absorption properties of solutions; and (iii) fluorescence-based bead counting.

Perez, A. A., et al. (2012). "Foaming characteristics of beta -lactoglobulin as affected by enzymatic hydrolysis and polysaccharide addition: relationships with the bulk and interfacial properties." Journal of Food Engineering **113**(1): 53-60.

The objective of this work was to study the effect of enzymatic hydrolysis and polysaccharide addition on the foaming characteristics of beta -lactoglobulin (beta -LG). Enzymatic treatment was performed in the hydrolysis degree (HD) range of 0.0-5.0% using bovine alpha -chymotrypsin II immobilized on agarose microbeads. Anionic non-surface active polysaccharides (PS), sodium alginate (SA) and lambda -carrageenan (lambda -C) were studied in the concentration range of 0.0-0.5 wt.%. Foaming characteristics were determined by conductimetric and optical methods and were linked to protein diffusion kinetics, film mechanical properties and biopolymer molecular dynamics in solution. Experiments were performed at constant temperature (20 degrees C), pH 7 and ionic strength 0.05 M. Limited hydrolysis improved the formation and stability of beta -LG foam possibly due to an increased protein diffusion rate and film dilatational elasticity. Furthermore, PS addition caused different effects on beta -LG foaming characteristics depending on the PS type, their relative concentration and extent of enzymatic treatment (HD). Diffusion rate and interfacial rheological behavior of mixed systems could exert a decisive role in foaming characteristics of beta -LG and its hydrolysates in close connection with biopolymer interactions in solution, e.g., macromolecule repulsion, protein segregation/aggregation and soluble complexes formation.

Perez-Martinez, A. (2019). Transfusion Clinique et Biologique **26 (3 Supplement)**: S25-S26.

Background: NKG2D is a C-type lectin-like transmembrane activating receptor present on the surface of natural killer (NK) cells, NKT cells, CD8 + gammadelta T cells and certain subsets of CD4 + T cells. In humans, there are two families of NKG2D ligands (NKG2DL): the MHC class I chain-related protein A (MICA) and B (MICB) family, and the UL16-binding proteins (ULBPs) family, also known as retinoic acid early transcript 1 (RAET1) proteins, which comprises six members (ULBP1 - 6). NKG2DL biogenesis is stimulated in cells under stress conditions as viral infection, cellular senescence and tumorigenesis. However, NKG2DL expression on healthy and unstressed cells has also been reported as dendritic cells, activated T cells, normal myelomonocytic cells and epithelial cells of gastric mucosa. NKG2DL are expressed on various tumor types including different pediatric solid and hematological malignancies, providing suitable targets for cancer therapy. Ligand engagement of human NKG2D triggers the phosphorylation of the signaling adaptor protein DNAX-activating protein of 10 kDa (DAP10) and the recruitment of either phosphatidylinositol-3-kinase (PI3 K) or a Grb2-Vav1 complex, both of which are required for full activation. NKG2D activation on NK cells results in cytokine secretion (including IFN-gamma, GM-CSF and MIP-1b) and exocytosis of cytotoxic granules. NKG2D expression can be modulated by different regulatory mechanisms. For instance, IL-4 and

TGF-beta decrease NKG2D surface expression and, thereby, NKG2D-mediated cytotoxic function. However, several cytokines as IL-2, IL-7 and IL-15 induce NKG2D expression. The activating receptor NKG2D is particularly relevant for cancer immunosurveillance. For instance, interaction between NKG2DL and NKG2D receptor is essential for NK-cell elimination of osteosarcoma tumor-initiating cells. However, tumor cells may develop immune scape strategies like ligand release (NKG2DLs) mediated by distinct matrix metalloproteinases, which reduces NKG2DL expression and may cause NKG2D receptor downregulation, thus limiting their clinical efficacy. In addition, chronic exposure of NKG2D receptor with membrane-bound ligand reduces NKG2D-mediated cytotoxic activity upon a trogocytosis process which produce induced-self recognition named fratricide. The use of NKG2D-CAR on memory (45RA-) T cells may overcome these limitations. In our experience, we have observed preclinical evidence of the efficacy of a NKG2D-CAR expressed on memory (45RA-) T cell based therapy as treatment for different pediatric cancers. In addition, we have developed a protocol to expand clinical grade NKG2D-CAR on memory (45RA-) T cells in a fully automated closed system, CliniMACS Prodigy. Finally, we report the safety of NKG2D-CAR on memory (45RA-) T cells infusions in two pediatric patients suffering from refractory acute leukemia. Patients and Methods: CD45RA+ cells were depleted from non-mobilized apheresis by using CD45RA microbeads and CliniMACS device. NKG2D-CAR T cells were obtained by lentiviral (NKG2D-41BB-CD3z) transduction of CD45RA-T cells (MOI = 2). The expression of NKG2DL was analyzed in primary samples of osteosarcoma (22 patients), as well as in the peripheral blood or bone marrow samples from 97 leukemia patients (AML = 13, B-ALL = 52 and T-ALL = 19), at different status of the disease (Diagnosis, Remission, Relapse/refractory). Three osteosarcoma and ten leukemia cell lines were also analyzed for NKG2DL expression by flow cytometry (FCM). Cytotoxicity of NKG2D-CAR on memory (45RA-) T cells against pediatric cancer cells was evaluated in vitro by performing 4-hours Europium-TDA assays. For the in vivo orthotopic model, 531MII YFP-luc human osteosarcoma cells were used as targets in NOD-scid IL2Rgnull mice. The effect of sNKG2DL on NKG2D-CAR T cells was explored by culturing with different concentrations of sNKG2DL for 7 days. Cell proliferation and CAR downregulation were measured by FCM. The production of IFN-gamma and TNF-alpha was measured in the supernatants by ELISA. The effect on cytotoxicity was evaluated in a 2 hours-degranulation assay by co-culturing sNKG2DL pretreated NKG2D-CAR T cells against K562 cell line. An automated manufacturing protocol to obtain clinical-grade NKG2D-CAR memory (45RA-) T cells were developed using CliniMACS Prodigy instrument. NKG2D-CAR memory (45RA-) T cells were infused into two patients. Patient #1 suffered from r/r biphenotypic ALL. She received two cycles of NKG2D CAR memory T cells infusions. In the first cycle, a total of 3 x 107 cells/kg were infused into three doses with no conditioning. In the second cycle, a total of 4 x 107 cells/kg were administered into two doses after lymphodepleting conditioning with Cy/Flu and low dose bortezomib. Patient#2 suffered from r/r B-ALL. She received a single dose of 1 x 107 cells/kg after lymphodepleting conditioning and low dose bortezomib. Result(s): NKG2DL were expressed in pediatric primary tumor cells and cell lines. We observed that NKG2DL expression changed with disease status. In osteosarcoma samples, metastatic tumors showed significantly higher expression of MICA, MICB and ULBP1. In leukemia samples, we found a trend of NKG2DL to decrease at diagnosis and relapse/refractory compared to remission. NKG2D-CAR on memory (45RA-) T cells were cytotoxic against 3 osteosarcoma cell lines and 8/10 leukemia cell lines with specific lysis over 50%. Myeloid and T-ALL cell lines were more susceptible to NKG2D-CAR T cells (specific lysis ranging from 50-78%) compared to B-ALL cell lines (19-52%). NKG2D-CAR memory (45RA-) T cells had considerable antitumor activity in a mouse model of human osteosarcoma, whereas untransduced T cells were ineffective. Physiological concentrations of sNKG2DL increased

NKG2D-CAR expression. However, supra-physiological levels of sNKG2DL decreased NKG2D-CAR expression up to 5 times and increased cell proliferation up to 4 times. The effects of sNKG2DL were dose-dependent and attenuated by IL-2. NKG2D-CAR memory (45RA-) T cells manufactured at CliniMACS Prodigy expanded up to 2076 +/- 697 million with 77,8 +/- 20% NKG2D-CAR expression and 76 +/- 10% viability. Harvested CAR T cells showed 90 +/- 14% of specific lysis against Jurkat cells and 31 +/- 16% against 531MII osteosarcoma cell line. Vector copy number was <= 5 in all validations except for one. CGH and karyotype showed no genetic alterations. Free viral particles were undetectable in the supernatants. No overexpression of myc/tert was found except for one validation. Endotoxins were <= 0.25 EU/ml. NKG2D CAR memory T cells infusions were well tolerated by patients, although a therapeutic effect was only observed in Patient#2. Conclusion(s): NKG2D-CAR expression on memory (CD45RA-) T cells are cytotoxic against pediatric tumor cells in vitro and in vivo, and thus could be a novel therapeutic approach for children suffering from cancer. Supraphysiological levels of sNKG2DL may downregulate NKG2D-CAR expression, that is softened by IL-2. The changes observed in NKG2DL surface expression at the different stages of the disease could be related to ligands shedding and immune escape. Automated manufacturing of clinical-grade NKG2D-CAR on memory (CD45RA-) T cells using CliniMACS Prodigy is feasible and reproducible. NKG2D CAR memory (CD45RA-) T cells infusions are essentially safe and therapeutic effect mainly relies on lymphodepleting conditioning, NKG2DL expression on tumor cells and sNKG2DL. Copyright © 2019

Perez-Pi, I., et al. (2019). "alpha-Synuclein-Confocal Nanoscanning (ASYN-CONA), a Bead-Based Assay for Detecting Early-Stage alpha-Synuclein Aggregation." Analytical Chemistry **91**(9): 5582-5590.

alpha-Synuclein fibrils are considered a hallmark of Parkinson's disease and other synucleinopathies. However, small oligomers that formed during the early stages of alpha-synuclein aggregation are thought to be the main toxic species causing disease. The formation of alpha-synuclein oligomers has proven difficult to follow, because of the heterogeneity and transient nature of the species formed. Here, a novel bead-based aggregation assay for monitoring the earliest stages of alpha-synuclein oligomerization, alpha-Synuclein-Confocal Nanoscanning (ASYN-CONA), is presented. The alpha-synuclein A91C single cysteine mutant is modified with a trifunctional chemical tag, which allows simultaneous fluorescent labeling with a green dye (tetramethylrhodamine, TMR) and attachment to microbeads. Beads with bound TMR-labeled alpha-synuclein are then incubated with a red dye (Cy5)-labeled variant of alpha-synuclein A91C, and EtOH (20%) to induce aggregation. Aggregation is detected by confocal scanning imaging, below the equatorial plane of the beads, which is known as the CONA technique. On-bead TMR-labeled alpha-synuclein and aggregated Cy5-labeled alpha-synuclein from the solution are quantitatively monitored in parallel by detection of fluorescent halos or "rings". alpha-Synuclein on-bead oligomerization results in a linear increase of red bead ring fluorescence intensity over a period of 5 h. Total internal reflection fluorescence microscopy was performed on oligomers cleaved from the beads, and it revealed that (i) oligomers are sufficiently stable in solution to investigate their composition, consisting of 6 +/- 1 monomer units, and (ii) oligomers containing a mean of 15 monomers bind Thioflavin-T. Various known inhibitors of alpha-synuclein aggregation were used to validate the ASYN-CONA assay for drug screening. Baicalein, curcumin, and rifampicin showed concentration-dependent inhibition of the alpha-synuclein aggregation and the IC₅₀ (the concentration of the compound at which the maxiumum intensity was reduced by one-half) were calculated.

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α-Synuclein fibrils are considered a hallmark of Parkinson's disease and other synucleinopathies. However, small oligomers that formed during the early stages of α-synuclein aggregation are thought to be the main toxic species causing disease. The formation of α-synuclein oligomers has proven difficult to follow, because of the heterogeneity and transient nature of the species formed. Here, a novel bead-based aggregation assay for monitoring the earliest stages of α-synuclein oligomerization, α-Synuclein–Confocal Nanoscanning (ASYN-CONA), is presented. The α-synuclein A91C single cysteine mutant is modified with a trifunctional chemical tag, which allows simultaneous fluorescent labeling with a green dye (tetramethylrhodamine, TMR) and attachment to microbeads. Beads with bound TMR-labeled α-synuclein are then incubated with a red dye (Cy5)-labeled variant of α-synuclein A91C, and EtOH (20%) to induce aggregation. Aggregation is detected by confocal scanning imaging, below the equatorial plane of the beads, which is known as the CONA technique. On-bead TMR-labeled α-synuclein and aggregated Cy5-labeled α-synuclein from the solution are quantitatively monitored in parallel by detection of fluorescent halos or "rings". α-Synuclein on-bead oligomerization results in a linear increase of red bead ring fluorescence intensity over a period of 5 h. Total internal reflection fluorescence microscopy was performed on oligomers cleaved from the beads, and it revealed that (i) oligomers are sufficiently stable in solution to investigate their composition, consisting of 6 ± 1 monomer units, and (ii) oligomers containing a mean of 15 monomers bind Thioflavin-T. Various known inhibitors of α-synuclein aggregation were used to validate the ASYN-CONA assay for drug screening. Baicalein, curcumin, and rifampicin showed concentration-dependent inhibition of the α-synuclein aggregation and the IC50 (the concentration of the compound at which the maxiumum intensity was reduced by one-half) were calculated.

Periyasamy-Thandavan, S., et al. (2012). "Differential expression of micrornas in human mesenchymal stem cells with age may be related to musculoskeletal disorders." Journal of Bone and Mineral Research. Conference **27**(SUPPL. 1).

Age-associated osteoporosis is one of the most common and debilitating types of bone disease. Although the mechanisms involved remain poorly defined, recent studies suggest that age-associated osteoporosis is a stem cell disease. Human mesenchymal stromal/stem cells (hMSCs) are multipotent stem cells that can differentiate into osteoblasts. MicroRNAs (miRNAs), a class of short single-stranded noncoding RNAs are post-transcriptional regulators that can modulate the homeostasis of multiple genes and associated pathways simultaneously. Changes in miRNA expression have been linked to the development of numerous disorders, including musculoskeletal disorders. While miRNAs are emerging as critical modulators of cell function and phenotype development little work has been done to determine their role in hMSC differentiation or in the regulation of bone metabolism with aging. Here, we directly isolated hMSC CD271 cells by using a kit (CD271 (APC) MicroBead Kit, Miltenyi Biotec Inc. CA.) from surgical bone marrow specimens of three young (under 40 yrs old) and three old (over 75 yrs old) patients, without plastic adhesion or culturing that might alter miRNA and gene expression. Total RNA was isolated from the hMSC CD271 cells and microarrays were performed using an Affymetrix GeneChip miRNA 2.0 Array, normalized using robust multichip average (RMA), and assessed by 2-way ANOVA analysis of young vs old hMSCs (with sex and age as the variables) using the Partek Genomics Suite. This genome-wide assessment of miRNA expression revealed multiple miRNAs whose expressions were altered with age. We identified six miRNAs (miR-579,-1244,-374ab,-671-5p,-370,-29abcd) that were significantly up-regulated in aged hMSCs. Predicted bone homeostasis targets of these miRNAs include SDF-1, BMP2, beta arrestin, SOX4, Leptin, IGF-1, VEGF, Collagen type 1 alpha1 and alpha2. Similarly, we identified 11 miRNAs including miR- 1231,-517-ac,-3180-5p that were significantly reduced in aged hMSCs. Predicted targets of these miRNAs included adipogenic genes such as PPAR-gamma or-alpha, AP2-alpha, and CD36. These results suggest that the differential miRNA expression in hMSCs with age may regulate age-associated changes that reduce osteogenic capacity and increase the adipogenic fate of these stem cells, and may help drive the development of osteoporosis. Targeting these miRNAs may be a potential therapeutic strategy to treat age-related musculoskeletal disorders.

Peronaci, M., et al. (2012). "Trascriptome analysis of bone marrow CD14+ monocytes revealed differential expression profiles in symptomatic multiple myeloma (MM) compared to smoldering MM and monoclonal gammopathy of undetermined significance." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Symptomatic multiple myeloma (MM), smoldering MM (SMM) and monoclonal gammopathy of uncertain significance (MGUS) are well known different pathological and clinical entities of plasma cell (PC) disorders. Nevertheless molecular studies performed on clonal CD138⁺ PC do not clear distinguished these disorders that share common alterations. Studies focusing on the presence of potential molecular alterations in the microenvironment cells are ongoing. Because monocytes are the cells primarily involved in osteoclastogenesis, angiogenesis and immune system disfuction, that are the hallmark of symptomatic MM compared to SMM and MGUS, in this study we have analyzed the transcriptional profile of the bone marrow (BM) CD14⁺ cells in these settings of patients. BM CD14⁺ monocytes were purified from a total cohort of 36 patients with PC disorders including 21 patients with symptomatic MM, 8 patients with SMM and 7 patients with MGUS. CD14⁺ cells were isolated from the CD138 negative fraction of BM samples of patients by immunomagnetic method with anti-CD14 monoclonal antibody conjugated with microbeads. The presence of potential haemopoietic and CD138⁺ contaminating cells was excluded by FACS analysis. Only samples with CD14 purity greater than 95% were analyzed by microarrays by GeneChip HG-U133Plus 2.0 arrays (Affymetrix) (13 MM, 8 SMM and 7 MGUS). Data obtained were then validated on selected genes by Real-Time quantitative PCR. A multiclass analysis identified 14 differentially expressed genes, which characterized MGUS vs SMM vs symptomatic MM. A supervised analysis between symptomatic MM vs. SMM and MGUS samples identified 101 genes differentially expressed in CD14⁺ (58 genes up-regulated in MM vs SMM and MGUS and 43 genes donwregulated). Interestingly, among the differentially expressed genes we found that cytokines and cytokine receptors (IL21, IL21R, IL15, IL15R), chemokines (CXCL10, CXCL11) and interferon-inducible proteins (IFI27, IFI44) were up-regulated in CD14⁺ of MM patients as compared to SMM and MGUS. A supervised analysis between MM and MGUS identified 6 differentially expressed genes in CD14⁺ whereas 37 genes distinguished MM and SMM patients. Notably the SLAMF7 (CS1) gene recently indentified as a therapeutic target in CD138⁺ MM cells was up-regulated in CD14⁺ monocytes of MM patients as compared either to MGUS alone or to MGUS plus SMM could be a potential candidate gene. Overall our preliminary results indicate that a different transcriptional fingerprint may be identified in BM CD14⁺ cells of patients with symptomatic MM as compared to those with indolent PC disorders such as SMM and MGUS with a greater number of differentially expressed genes between symptomatic MM and SMM patient rather than between MM and MGUS.

Perrechil, F. A., et al. (2012). "Development of Na-CN--[kappa]-carrageenan Microbeads for the Encapsulation of Lipophilic Compounds." Food Biophysics **7**(3): 264-275.

The ionotropic gelation of double-layered emulsions composed of sodium caseinate and κ-carrageenan at pH values of 7 and 3.5 was evaluated, in order to obtain potential encapsulation matrices for hydrophobic compounds. The influence of some of the extrusion process variables (nozzle diameter at fluid exit and collecting distance) on the microbead production was studied, as well as the stability of the microbeads. The fluid nozzle diameter showed little influence on the shape of the microbeads, with a slight tendency for a decrease in microbead diameter with increase in fluid nozzle diameter. On the other hand, the collecting distance strongly influenced the microbead shape and they became more spherical (aspect ratio was reduced from ~2.0 to ~1.4) as the collecting distance was increased from 10 cm to 50 cm. The emulsion pH did not affect the aspect ratio of the microbeads, but the diameter was greater for microbeads produced at pH 3.5. This difference was attributed to the kind of interactions occurring between the κ-carrageenan and sodium caseinate at these distinct pH values. The microbeads were highly unstable when dispersed in deionized water, sugar solutions and low salt concentrations, releasing the encapsulated oil. However, no release of oil from the microbeads was observed when they were dispersed in ethanol or potassium chloride solutions with concentrations above 0.75 %, although their shape was modified when dispersed in ethanol. In general, the results obtained demonstrated the viability of the extrusion process to produce biopolymer-based microbeads and the potential application of these systems.[PUBLICATION ABSTRACT]

Perrechil, F. A., et al. (2012). "Development of Na-CN - kappa -carrageenan microbeads for the encapsulation of lipophilic compounds." Food Biophysics **7**(3): 264-275.

The ionotropic gelation of double-layered emulsions composed of sodium caseinate and kappa -carrageenan at pH values of 7 and 3.5 was evaluated, in order to obtain potential encapsulation matrices for hydrophobic compounds. The influence of some of the extrusion process variables (nozzle diameter at fluid exit and collecting distance) on the microbead production was studied, as well as the stability of the microbeads. The fluid nozzle diameter showed little influence on the shape of the microbeads, with a slight tendency for a decrease in microbead diameter with increase in fluid nozzle diameter. On the other hand, the collecting distance strongly influenced the microbead shape and they became more spherical (aspect ratio was reduced from ~2.0 to ~1.4) as the collecting distance was increased from 10 cm to 50 cm. The emulsion pH did not affect the aspect ratio of the microbeads, but the diameter was greater for microbeads produced at pH 3.5. This difference was attributed to the kind of interactions occurring between the kappa -carrageenan and sodium caseinate at these distinct pH values. The microbeads were highly unstable when dispersed in deionized water, sugar solutions and low salt concentrations, releasing the encapsulated oil. However, no release of oil from the microbeads was observed when they were dispersed in ethanol or potassium chloride solutions with concentrations above 0.75%, although their shape was modified when dispersed in ethanol. In general, the results obtained demonstrated the viability of the extrusion process to produce biopolymer-based microbeads and the potential application of these systems.

Perren, W., et al. (2018). "Removal of Microbeads from Wastewater Using Electrocoagulation." ACS Omega **3**(3): 3357-3364.

The need for better microplastic removal from wastewater streams is clear, to prevent potential harm the microplastic may cause to the marine life. This paper aims to investigate the efficacy of electrocoagulation (EC), a well-known and established process, in the unexplored context of microplastic removal from wastewater streams. This premise was investigated using artificial wastewater containing polyethylene microbeads of different concentrations. The wastewater was then tested in a 1 L stirred-tank batch reactor. The effects of the wastewater characteristics (initial pH, NaCl concentration, and current density) on removal efficiency were studied. Microbead removal efficiencies in excess of 90% were observed in all experiments, thus suggesting that EC is an effective method of removing microplastic contaminants from wastewater streams. Electrocoagulation was found to be effective with removal efficiencies in excess of 90%, over pH values ranging from 3 to 10. The optimum removal efficiency of 99.24% was found at a pH of 7.5. An economic evaluation of the reactor operating costs revealed that the optimum NaCl concentration in the reactor is between 0 and 2 g/L, mainly due to the reduced energy requirements linked to higher water conductivity. In regard to the current density, the specific mass removal rate (kg/kWh) was the highest for the lowest tested current density of 11 A/m², indicating that low current density is more energy efficient for microbead removal.

Perugini, F., et al. (2005). "A Life Cycle Assessment of Mechanical and Feedstock Recycling Options for Management of Plastic Packaging Wastes." Environmental Progress **24**(2): 137-154.

Life cycle assessment (LCA) methodology is generally considered one of the best environmental management tools that can be used to compare alternative eco-performances of recycling or disposal systems. It considers the environment as a whole, including indirect releases, energy and material consumption, emissions in the environment, and waste disposal and follows each activity from the extraction of raw materials to the return of wastes to the ground (cradle-to-grave approach). The study refers to the whole Italian system for recycling of household plastic packaging wastes. The aim was to quantify the overall environmental performances of mechanical recycling of plastic containers in Italy and to compare them with those of conventional options of landfilling or incineration and of a couple of innovative processes of feedstock recycling, low-temperature fluidized bed pyrolysis, and high-pressure hydrogenation. The results confirm that recycling scenarios are always preferable to those of nonrecycling. They also highlight the good environmental performance of new plastic waste management schemes that couple feedstock and mechanical recycling processes.

Pessoni, L., et al. (2019). "Soap- and metal-free polystyrene latex particles as a nanoplastic model (Electronic supplementary information (ESI) available. See DOI: 10.1039/c9en00384c)." Environmental Science: Nano **6**(7): 2253-2258.

The ability of nanoplastics (NPTs) to bioaccumulate and cotransport pollutants in the whole organism is one of the most dangerous aspects of this form of plastic debris, defining a new class of emerging pollutants that is still largely unknown. In this context, it is essential to have accurate and representative models of nanoplastics to better understand their toxic effects. Models reported in the literature and commercial standards are far from mimicking the relevant properties for transporting pollutants, such as the size, shape, composition, purity, functionalization and surface morphology of nanoplastics sampled in the environment. Due to the lack of such nanoparticle models, we proposed an alternative nanoplastic model challenging three of the key properties affecting interactions with trace metals: purity, morphology and surface functionalization. NPTs with different surface functionalities (6–7 and 43–45 carboxylic groups per nm2), with smooth or raspberry-like surface morphologies, and that were monodisperse in size (PDI < 0.05) were synthesized using soap free emulsion polymerization. NPTs were stable over time as a function of the salinity and pH (potential zeta < −33 mV, pH = 4–6, salinities < 500 mM). These nanoplastics were free of additives such as surfactants and stabilizers, and their metal content was measured to be less than 100 ppt (Cr, Fe, Ni, Co, Zn, As, Se, Ag, Cd, Au, Gg, Ce and Pb). Their metal absorption capacity was evaluated on lead(ii) using AF4-ICPMS and electrochemistry and was characterized by a partition coefficient of lead between that of NPT and water, of approximately 105.

Peters, C. A. and S. P. Bratton (2016). "Urbanization is a major influence on microplastic ingestion by sunfish in the Brazos River Basin, Central Texas, USA." Environmental Pollution **210**: 380-387.

Microplastics, degraded and weathered polymer-based particles, and manufactured products ranging between 50 and 5000 micro m in size, are found within marine, freshwater, and estuarine environments. While numerous peer-reviewed papers have quantified the ingestion of microplastics by marine vertebrates, relatively few studies have focused on microplastic ingestion by freshwater organisms. This study documents microplastic and manufactured fiber ingestion by bluegill (Lepomis macrochirus) and longear (Lepomis megalotis) sunfish (Centrarchidae) from the Brazos River Basin, between Lake Whitney and Marlin, Texas, USA. Fourteen sample sites were studied and categorized into urban, downstream, and upstream areas. A total of 436 sunfish were collected, and 196 (45%) stomachs contained microplastics. Four percent (4%) of items sampled were debris on the macro size scale (i.e. >5 mm) and consisted of masses of plastic, metal, Styrofoam, or fishing material, while 96% of items sampled were in the form of microplastic threads. Fish length was statistically correlated to the number of microplastics detected (p=0.019). Fish collected from urban sites displayed the highest mean number of microplastics ingested, followed by downstream and upstream sites. Microplastics were associated with the ingestion of other debris items (e.g. sand and wood) and correlated to the ingestion of fish eggs, earthworms, and mollusks, suggesting that sunfish incidentally ingest microplastics during their normal feeding methods. The high frequency of microplastic ingestion suggest that further research is needed to determine the residence time of microplastics within the stomach and gut, potential for food web transfer, and adverse effects on wildlife and ecosystemic health.

Peters, C. A., et al. (2018). "Pyr-GC/MS analysis of microplastics extracted from the stomach content of benthivore fish from the Texas Gulf Coast." Marine Pollution Bulletin **137**: 91-95.

Fish ingestion of microplastic has been widely documented throughout freshwater, marine, and estuarine species. While numerous studies have quantified and characterized microplastic particles, analytical methods for polymer identification are limited. This study investigated the applicability of pyr-GC/MS for polymer identification of microplastics extracted from the stomach content of marine fish from the Texas Gulf Coast. A total of 43 microplastic particles were analyzed, inclusive of 30 fibers, 3 fragments, and 10 spheres. Polyvinyl chloride (PVC) and polyethylene terephthalate (PET) were the most commonly identified polymers (44.1%), followed by nylon (9.3%), silicone (2.3%), and epoxy resin (2.3%). Approximately 42% of samples could not be classified into a specific polymer class, due to a limited formation of pyrolytic products, low product abundance, or a lack of comparative standards. Diethyl phthalate, a known plasticizer, was found in 16.3% of the total sample, including PVC (14.3%), silicone (14.3%), nylon (14.3%), and sample unknowns (57.2%).

Peters, C. A., et al. (2017). "Foraging preferences influence microplastic ingestion by six marine fish species from the Texas Gulf Coast." Marine Pollution Bulletin **124**(1): 82-88.

This study evaluated the influence of foraging preferences on microplastic ingestion by six marine fish species from the Texas Gulf Coast. A total of 1381 fish were analyzed and 42.4% contained ingested microplastic, inclusive of fiber (86.4%), microbead (12.9%%), and fragment

(<1.0%) forms. Despite a substantial overlap in diet, ordination of ingested prey items clustered samples into distinctive species groupings, reflective of the foraging gradient among species. Orthopristis chrysoptera displayed the lowest overall frequency of microplastic ingestion and the most distinctive ordination grouping, indicating their selective invertebrate foraging preferences. Cluster analysis of O. chrysoptera most closely classified microplastic with the ingestion of benthic invertebrates, whereas the ingestion of microplastic by all other species most closely classified with the ingestion of vegetation and shrimp. O. chrysoptera, as selective invertebrate foragers, are less likely to ingest microplastics than species exhibiting generalist foraging preferences and methods of prey capture.

Peters, J., et al. (2013). "Colour-encoded paramagnetic microbead-based direct inhibition triplex flow cytometric immunoassay for ochratoxin A, fumonisins and zearalenone in cereals and cereal-based feed." Analytical & Bioanalytical Chemistry **405**(24): 7783-7794.

A combined (triplex) immunoassay for the simultaneous detection of three mycotoxins in grains was developed with superparamagnetic colour-encoded microbeads, in combination with two bead-dedicated flow cytometers. Monoclonal antibodies were coupled to the beads, and the amounts of bound mycotoxins were inversely related to the amounts of bound fluorescent labelled mycotoxins (inhibition immunoassay format). The selected monoclonal antibodies were tested for their target mycotoxins and for cross-reactivity with relevant metabolites and masked mycotoxins. In the triplex format, low levels of cross-interactions between the assays occurred at irrelevant high levels only. All three assays were influenced by the sample matrix of cereal extracts to some extent, and matrix-matched calibrations are recommended for quantitative screening purposes. In a preliminary in-house validation, the triplex assay was found to be reproducible, sensitive and sufficiently accurate for the quantitative screening at ML level. The triplex assay was critically compared to liquid chromatography-tandem mass spectrometry using reference materials and fortified blank material.

Peters, J. H., et al. (2008). "Clinical grade Treg: GMP isolation, improvement of purity by CD127^{pos} depletion, Treg expansion, and Treg cryopreservation." PLoS ONE **3 (9) (no pagination)**(e3161).

Background: Treg based immunotherapy is of great interest to facilitate tolerance in autoimmunity and transplantation. For clinical trials, it is essential to have a clinical grade Treg isolation protocol in accordance with Good Manufacturing Practice (GMP) guidelines. To obtain sufficient Treg for immunotherapy, subsequent ex vivo expansion might be needed. Methodology/Principal Findings: Treg were isolated from leukapheresis products by CliniMACS based GMP isolation strategies, using anti-CD25, anti-CD8 and anti-CD19 coated microbeads. CliniMACS isolation procedures led to 40-60% pure CD4^{pos}CD25^{high}FoxP3^{pos} Treg populations that were anergic and had moderate suppressive activity. Such CliniMACS isolated Treg populations could be expanded with maintenance of suppressive function. Alloantigen stimulated expansion caused an enrichment of alloantigen-specific Treg. Depletion of unwanted CD19^{pos} cells during CliniMACS Treg isolation proved necessary to prevent B-cell outgrowth during expansion. CD4^{pos}CD127^{pos} conventional T cells were the major contaminating cell type in CliniMACS isolated Treg populations. Depletion of CD127^{pos} cells improved the purity of CD4^{pos}CD25^{high}FoxP3^{pos} Treg in CliniMACS isolated cell populations to approximately 90%. Expanded CD127^{neg} CliniMACS isolated Treg populations showed very potent suppressive capacity and high FoxP3 expression. Furthermore,

our data show that cryopreservation of CliniMACS isolated Treg is feasible, but that activation after thawing is necessary to restore suppressive potential. Conclusions/Significance: The feasibility of Treg based therapy is widely accepted, provided that tailor-made clinical grade procedures for isolation and ex vivo cell handling are available. We here provide further support for this approach by showing that a high Treg purity can be reached, and that isolated cells can be cryopreserved and expanded successfully. © 2008 Peters et al.

Petousis, I., et al. (2007). "Transient behaviour of magnetic micro-bead chains rotating in a fluid by external fields." Lab on a Chip **7**(12): 1746-1751.

Magnetic micro-beads can facilitate many functions in lab-on-a-chip systems, such as bio-chemical labeling, selective transport, magnetic sensing and mixing. In order to investigate potential applications of magnetic micro-beads for mixing in micro fluidic systems, we developed a pin-jointed mechanism model that allows analysing the behaviour of rotating superparamagnetic bead chains. Our numerical model revealed the response of the chains on a rotating magnetic field over time. We could demonstrate that the governing parameters are the Mason number and number of beads in the chain. The results are in agreement with the simplified analytical model, assuming a straight chain, but also allow prediction of the transient chain shape. The modelled chains develop an anti-symmetric S-shape that is stable, if the Mason number for a given chain length does not surpass a critical value. Above that value, rupture occurs in the vicinity of the chain centre. However, variations in bead susceptibility can shift the location of rupture. Moreover, we performed experiments with superparamagnetic micro-beads in a small fluid volume exposed to a uniform rotating magnetic field. Our simulation could successfully predict the observed transient chain form and the time for chain rupture. The developed model can be used to design optimised bead based mixers in micro fluidic systems.

Petrackova, D., et al. (2013). "Surface hydrophobicity and roughness influences the morphology and biochemistry of streptomycetes during attached growth and differentiation." FEMS Microbiology Letters **342**(2): 147-156.

Streptomycetes, soil-dwelling mycelial bacteria, can colonise surface of organic soil debris and soil particles. We analysed the effects of two different inert surfaces, glass and zirconia/silica, on the growth and antibiotic production in Streptomyces granaticolor. The surfaces used were in the form of microbeads and were surrounded by liquid growth media. Following the production of the antibiotic granaticin, more biomass was formed as well as a greater amount of antibiotic per milligram of protein on the glass beads than on the zirconia/silica beads. Comparison of young mycelium (6 h) proteomes, obtained from the cultures attached to the glass and zirconia/silica beads, revealed three proteins with altered expression levels (dihydrolipoamide dehydrogenase, amidophosphoribosyltransferase and cystathionine beta-synthase) and one unique protein (glyceraldehyde-3-phosphate dehydrogenase) that was present only in cells grown on glass beads. All of the identified proteins function primarily as cytoplasmic enzymes involved in different parts of metabolism; however, in several microorganisms, they are exposed on the cell surface and have been shown to be involved in adhesion or biofilm formation.

Petrich, C. R., et al. (1998). "Encapsulated Cell Bioremediation: Evaluation on the Basis of Particle Tracer Tests." Ground Water **36**(5): 771-778.

Microencapsulation of degradative organisms enhances microorganism survivability (Stormo and Crawford 1994). The use of encapsulated cell microbeads for in situ biodegradation depends not only on microorganism survival but also on microbead transport characteristics. Two forced-gradient, recirculating-loop tracer experiments were conducted to evaluate the feasibility of encapsulated cell transport and bioremediation on the basis of polystyrene microsphere transport results. The tracer tests were conducted in a shallow, confined, unconsolidated, heterogeneous, sedimentary aquifer using bromide ion and 2 mu m, 5 mu m, and 15 mu m microsphere tracers. Significant differences were observed in the transport of bromide solute and polystyrene microspheres. Microspheres reached peak concentrations in monitoring wells before bromide, which was thought to reflect the influence of aquifer heterogeneity. Greater decreases in microsphere C/C sub(0) ratios were observed with distance from the injection wells than in bromide C/C sub(0) ratios, which was attributed to particle filtration and/or settling. Several methods might be considered for introducing encapsulated cell microbeads into a subsurface environment, including direct injection into a contaminated aquifer zone, injection through a recirculating ground water flow system, or emplacement in a subsurface microbial curtain in advance of a plume. However, the in situ use of encapsulated cells in an aquifer is probably limited to aquifers containing sufficiently large pore spaces, allowing passage of at least some encapsulated cells. The use of encapsulated cells may also be limited by differences in solute and microbead transport patterns and flowpath clogging by larger encapsulated cell microbeads.

Petroff, R., et al. (2019). "A Call to Include Indirect Effects of Marine Microplastics in Human Health Risk Assessments." Integrated Environmental Assessment & Management **15**(5): 819-820.

Petrossian, K., et al. (2007). "Lectin binding and effects in culture on human cancer and non-cancer cell lines: examination of issues of interest in drug design strategies." Acta Histochemica **109**(6): 491-500.

By using a non-cancer and a cancer cell line originally from the same tissue (colon), coupled with testing lectins for cell binding and for their effects on these cell lines in culture, this study describes a simple multi-parameter approach that has revealed some interesting results that could be useful in drug development strategies. Two human cell lines, CCL-220/Colo320DM (human colon cancer cells, tumorigenic in nude mice) and CRL-1459/CCD-18Co (non-malignant human colon cells) were tested for their ability to bind to agarose microbeads derivatized with two lectins, peanut agglutinin (Arachis hypogaea agglutinin, PNA) and Dolichos biflorus agglutinin (DBA), and the effects of these lectins were assessed in culture using the MTT assay. Both cell lines bound to DBA-derivatized microbeads, and binding was inhibited by N-acetyl-D-galactosamine, but not by L-fucose. Neither cell line bound to PNA-derivatized microbeads. Despite the lack of lectin binding using the rapid microbead method, PNA was mitogenic in culture at some time points and its mitogenic effect displayed a reverse-dose response. This was also seen with effects of DBA on cells in culture. While this is a simple study, the results were statistically highly significant and suggest that: (1) agents may not need to bind strongly to cells to exert biological effects, (2) cell line pairs derived from diseased and non-diseased tissue can provide useful comparative data on potential drug effects and (3) very low concentrations of potential drugs might be initially tested experimentally because reverse-dose responses should be considered.

Petry, M. V. and V. R. F. Benemann (2017). "Ingestion of marine debris by the White-chinned petrel (Procellaria aequinoctialis): is it increasing over time off southern Brazil?" Marine Pollution Bulletin **117**(1/2): 131-135.

Seabirds are amongst the most affected organisms by plastic pollution worldwide. Ingestion of marine debris has been reported in at least 122 species, and owing to the increasing global production and persistence of these anthropogenic materials within the marine environment, it is expected to be a growing problem to the marine fauna. Here we report evidence of an increasing frequency in marine debris ingestion and a decrease in the amount of plastic pellets ingested by White-chinned Petrels attending south Brazilian waters during the last three decades. Future studies comprising large temporal scales and large sample sizes are needed to better understand the trends of marine debris ingestion by seabirds. We expect our findings to highlight the need for prevention policies and mitigation measures to reduce the amount of solid litter in the oceans.

Pfitzenmaier, J., et al. (2007). "The detection and isolation of viable prostate-specific antigen positive epithelial cells by enrichment: a comparison to standard prostate-specific antigen reverse transcriptase polymerase chain reaction and its clinical relevance in prostate cancer." Urologic Oncology **25**(3): 214-220.

PURPOSE: To isolate prostate epithelial cells from the peripheral blood and bone marrow, and compare prostate-specific antigen (PSA) reverse transcriptase polymerase chain reaction (RT-PCR) performed on unenriched or epithelial enriched peripheral blood and bone marrow samples.

PATIENTS AND METHODS: Peripheral blood samples from 371 patients with prostate cancer and 141 controls, and bone marrow samples from 292 patients with prostate cancer and 43 controls were obtained. One aliquot was assessed with PSA RT-PCR. Another was enriched for epithelial cells with paramagnetic immune microbeads and assessed for: (1) PSA immunohistochemistry, (2) PSA RT-PCR, and (3) immunofluorescent detection of epithelial cells.

RESULTS: In the bone marrow ($P < 0.01$), but not the peripheral blood ($P = 0.62$), we observed significantly higher detection rates of disseminated PSA expressing epithelial cells after enrichment. The presence of epithelial cells with or without evidence of PSA production was uncommon among controls both in peripheral blood (1% and 0%) and bone marrow (11% and 0%). In patients with active prostate cancer, 46% to 74% had epithelial cells in peripheral blood, and 20% to 64% had PSA expressing epithelial cells. In bone marrow, 55% to 92% had epithelial cells, and 43% to 83% had PSA expressing epithelial cells. Particularly in bone marrow, circulating cells were frequently detected in men without evidence of disease after prostatectomy. With limited follow-up, the detection of epithelial cells or PSA expressing epithelial cells in peripheral blood or bone marrow before radical prostatectomy does not define a population of patients that will have biochemical failure.

CONCLUSIONS: Immunomagnetic enrichment frequently detects epithelial, presumably malignant, cells in the peripheral blood and, especially, the bone marrow of patients with prostate cancer. Viable cells can be acquired for gene expression and phenotyping studies.

Pflieger, M., et al. (2017). "Extraction of Organochlorine Pesticides from Plastic Pellets and Plastic Type Analysis." Journal of Visualized Experiments **125**(07): 01.

Plastic resin pellets, categorized as microplastics (<=5 mm in diameter), are small granules that can be unintentionally released to the environment during manufacturing and transport. Because of their environmental persistence, they are widely distributed in the oceans and on beaches all over the world. They can act as a vector of potentially toxic organic compounds (e.g., polychlorinated biphenyls) and might consequently negatively affect marine organisms. Their possible impacts along the food chain are not yet well understood. In order to assess the hazards associated with the occurrence of plastic pellets in the marine environment, it is necessary to develop methodologies that allow for rapid determination of associated organic contaminant levels. The present protocol describes the different steps required for sampling resin pellets, analyzing adsorbed organochlorine pesticides (OCPs) and identifying the plastic type. The focus is on the extraction of OCPs from plastic pellets by means of a pressurized fluid

extractor (PFE) and on the polymer chemical analysis applying Fourier Transform-InfraRed (FT-IR) spectroscopy. The developed methodology focuses on 11 OCPs and related compounds, including dichlorodiphenyltrichloroethane (DDT) and its two main metabolites, lindane and two production isomers, as well as the two biologically active isomers of technical endosulfan. This protocol constitutes a simple and rapid alternative to existing methodology for evaluating the concentration of organic contaminants adsorbed on plastic pieces.

Pham, C. K., et al. (2017). "Plastic ingestion in oceanic-stage loggerhead sea turtles (Caretta caretta) off the North Atlantic subtropical gyre." Marine Pollution Bulletin **121**(1/2): 222-229.

Juvenile oceanic-stage sea turtles are particularly vulnerable to the increasing quantity of plastic coming into the oceans. In this study, we analysed the gastrointestinal tracts of 24 juvenile oceanic-stage loggerheads (Caretta caretta) collected off the North Atlantic subtropical gyre, in the Azores region, a key feeding ground for juvenile loggerheads. Twenty individuals were found to have ingested marine debris (83%), composed exclusively of plastic items (primarily polyethylene and polypropylene) identified by micro -Fourier Transform Infrared Spectroscopy. Large microplastics (1-5 mm) represented 25% of the total number of debris and were found in 58% of the individuals sampled. Average number of items was 15.83+or-6.09 (+or-SE) per individual, corresponding to a mean dry mass of 1.07+or-0.41 g. The results of this study demonstrate that plastic pollution acts as another stressor for this critical life stage of loggerhead turtles in the North Atlantic.

Pham, N. M., et al. (2018). "A bead-based immunogold-silver staining assay on capillary-driven microfluidics." Biomedical Microdevices **20**(2): 41.

Point-of-care (POC) diagnostics are critically needed for the detection of infectious diseases, particularly in remote settings where accurate and appropriate diagnosis can save lives. However, it is difficult to implement immunoassays, and specifically immunoassays relying on signal amplification using silver staining, into POC diagnostic devices. Effective immobilization of antibodies in such devices is another challenge. Here, we present strategies for immobilizing capture antibodies (cAbs) in capillary-driven microfluidic chips and implementing a gold-catalyzed silver staining reaction. We illustrate these strategies using a species/anti-species immunoassay and the capillary assembly of fluorescent microbeads functionalized with cAbs in "bead lanes", which are engraved in microfluidic chips. The microfluidic chips are fabricated in silicon (Si) and sealed with a dry film resist. Rabbit IgG antibodies in samples are captured on the beads and bound by detection antibodies (dAbs) conjugated to gold nanoparticles. The gold nanoparticles catalyze the formation of a metallic film of silver, which attenuates fluorescence from the beads in an analyte-concentration dependent manner. The performance of these immunoassays was found comparable to that of assays performed in 96 well microtiter plates using "classical" enzyme-linked immunosorbent assay (ELISA). The proof-of-concept method developed here can detect 24.6 ng mL⁻¹ of rabbit IgG antibodies in PBS within 20 min, in comparison to 17.1 ng mL⁻¹ of the same antibodies using a ~140-min-long ELISA protocol. Furthermore, the concept presented here is flexible and necessitate volumes of samples and reagents in the range of just a few microliters.

Philip, M. and F. Al-Azzawi (2018). "Effects of Natural and Artificial Weathering on the Physical Properties of Recycled Poly(ethylene terephthalate)." Journal of Polymers & the Environment **26**(8): 3139-3148.

In accelerated weathering tests, specimens are exposed to higher radiation intensity, temperature and humidity than is likely under natural weathering in order to achieve rapid

degradation of the polymer in a convenient short time. In the current work, a correlation between the two environments is attempted so that a prediction of lifetimes in the natural environment can be achieved. During aging, surface flaws are created due to the chain scission process. This is initiated by the absorption of ultra-violet light and directly affects visual appearance and impact strength. After natural weathering, the material shows only plastic deformation in an impact test. However, after artificial weathering to 5000 h of UV exposure, there is a decrease of 85% in impact strength. Colour change occurs at a high rate in the early stages of UV exposure. Beyond 2000 h of exposure, the colour change approaches a steady state and a correlation between the changes under natural and artificial weathering becomes apparent for a potential prediction of lifetimes. From the analysis including the specular component (SCI), taking surface roughening into account, 1 year under natural weathering was found to be equivalent to 25 days under accelerated weathering. [ABSTRACT FROM AUTHOR]

Philippeos, C., et al. (2010). "Effects of ascitic fluid on alginate-encapsulated human hepatocytes in vitro." Hepatology **1)**: 1106A.
Human hepatocyte transplantation is an attractive option in the management of acute liver failure, however infusion of cells into the liver of a coagulopathic patient and the need for immunosuppression are major limiting factors. Intraperitoneal transplantation of microencapsulated hepatocytes without immunosuppression could address these issues. The aim of this study was to determine the function of microencapsulated human hepatocytes in vitro in the presence of ascitic fluid (AF), to which they would be exposed in the peritoneum. METHOD(S): Encapsulation of human hepatocytes was optimised by varying the alginate percentage, density of cells and the encapsulator frequency, amplitude, voltage and syringe speed settings. The optimum settings resulted in human hepatocyte microbeads (o 400-500Μm) in 1.5% clinical grade sodium alginate at a density of 2.5x106 cells/ml. Microbeads were either maintained in Williams' E medium (WEM) supplemented with insulin, dexamethasone, and antibiotics (humidified incubator; 37degreeC, 5% CO<inf>2</inf>), or AF, obtained from children, post liver transplant with ascites. Hepatocyte overall activity and viability were determined by MTT assay and fluorescein diacetate/ethidium bromide (FDA/EtBr) staining at days 1, 2, 3, and 7 of culture. Urea synthesis was assessed in WEM containing 5mM NH<inf>4</inf>Cl with urea colorimetrically measured in the supernatant. Data is presented as mean+/-SD per 100mg microbeads. RESULT(S): Optimisation experiments resulted in reproducible clinical grade alginate-encapsulated human hepatocytes. On average 2.86+/-0.40 Μg/ml urea and 8.34+/-0.30 ng/ml albumin were produced each day for 72h. Factor VII reached a concentration of 3.33+/-0.88 ng/ml after incubating microbeads for 7 days. Microbeads maintained in AF showed higher viability (FDA/EtBr staining) than those in medium, at all time points. Mitochondrial dehydrogenase activity (MTT assay) of microbeads cultured in AF was significantly greater (p<0.001) than control microbeads (not exposed to AF) cultured in WEM at both 24h (OD<inf>630</inf>= 0.149+/-0.013 vs. 0.086+/-0.008, respectively) and 7 days (OD<inf>630</inf>= 0.067+/-0.006 vs. 0.018+/-0.004) of culture. Urea production after 24h was highest from microbeads incubated in AF, 5.10+/-0.58 Μg/ml, compared to control microbeads producing 3.62+/-0.32 Μg/ml (p=0.018). After 7 days of culture AF and control

microbeads produced 2.53+/-0.06 Μg/ml and 1.42+/-0.14 Μg/ml urea, respectively (p<0.001). CONCLUSION(S): Incubation of alginate-encapsulated human hepatocytes in ascitic fluid did not have detrimental effects on overall cell metabolic activity and urea production.

Philippon, M. J., et al. (2011). "Contributions of the iliofemoral ligaments and the acetabular labrum in hip stability." Arthroscopy - Journal of Arthroscopic and Related Surgery **1)**: e96-e97.

Introduction: A variety of pathologic conditions have been associated with increased hip motion in recent years. Specifically, injuries to the capsular (iliofemoral-IF) ligaments and acetabular labrum have gained interest because they have been reported to serve as primary contributors to joint stability. However, the relative role of each of these structures in maintaining hip stability has not been shown. The purpose of this study was to determine the relative contributions of the acetabular labrum and IF ligaments in maintaining hip stability as measured by external rotation and anterior translation of the femur relative to the center of the acetabulum when performing the log roll test (also known as the dial test). Hypothesis: It was hypothesized that each of these structures are vital for the stability of the hip, with increased stability provided by the IF ligament compared to the labrum. Moreover, we hypothesized that once torn, these structures could be surgically repaired to restore the stability of the hip as measured by the log roll test. Method(s): Fifteen fresh-frozen cadaveric hips with no evidence of prior injury, arthritis, or other abnormalities were used for this study. Each specimen was selectively skeletonized by removing all musculature and soft tissue, leaving only the IF ligament and acetabular labrum intact. Four tantalum microbeads with a diameter of 1.0 mm were embedded into both the femoral head and pelvis of each hip. Each specimen was mounted into a custom built hip jig that positioned the pelvis laterally in the biplane fluoroscopy system. Designed to simulate the log roll test, the femoral shaft was centered and fixed in an apparatus that allowed for 5 N*m external rotation torques to be applied. The hips were tested by sectioning and later repairing the acetabular labrum (LabTorn) and IF ligament (LigTorn) in a randomized order. IF ligament tears were created through the entire medial and lateral arms of the ligament at a level 1 cm distal to the edge of the acetabulum, mimicking the positioning of a capsulotomy performed arthroscopically. Labral tears were created from the 12 o'clock to the 3 o'clock position on right hips and the corresponding anteriore superior location on left hips, which correlated with the most commonly reported labral tear locations. In specimens where the labral tear was created prior to the IF ligament tear, a 5 mm longitudinal incision was made in the anterior capsule and this tissue was reapproximated with a single #0 suture. The labrum was repaired (LabRepaired) using two 2.3 mm suture anchors. IF ligament repairs (LigRepaired) were completed using interrupted #0 sutures with care taken to re-approximate the ligament and not to overconstrain it. At each testing condition the hips were tested in the following positions: 10 deg extension, 0 deg, 10 deg flexion, and 40 deg flexion. In order to test the reliability of the testing apparatus, the BothTorn condition was repeated at each joint angle after a thirty minute time interval and values were compared to the respective conditions. Hip kinematics were determined as described in the literature [1]. Reconstructed from CT scans, the bone contours were detected semi-automatically from the fluoroscopy images using model based RSA (Medis Specials, Leiden, THE NETHERLANDS). The beads were automatically detected in each image and matched to its respective location in each view by finding the intersections of the rays originiating from the focus positions of the x-ray generators and extending to the centers of the detected beads in the imaging planes. A 2-way ANOVA with independent factors of hip position and sectioned condition was used to analyze the degree of external and internal rotations as well as translations. Adjusted Bonferroni/Dunn post hoc analyses were applied where appropriate with significance set at p<0.05. Result(s): Significant main effects were found for both the sectioned condition and hip flexion angle with regards to external rotation, but there was no interaction between the two. Post hoc analysis of the effect of sectioned condition revealed that external rotation significantly increased from the intact condition to the LigTorn condition and both torn condition (Intact: 41.5 = 7.4 deg vs. LigTorn: 54.4 = 6.6; p<0.0001; Both Torn: 61.5 = 5.7; p<0.0001), but there was not a significant increase in external rotation in the labral torn condition. This relationship was mirrored in the repair conditions. No significant reduction in external rotation was observed in the LabRepaired condition compared to the both torn condition, while the LigRepaired condition resulted in an average of 19.0 degrees less external rotation compared to the BothTorn condition (BothTorn: 61.5 deg = 5.7 vs. LigRepaired 42.5 = 6.1; p<0.0001). Additionally, the Intact and BothRepaired conditions did not display any differences in rotation (Intact: 41.5 = 7.4 deg vs Both-Repaired: 40.3 = 6.7 deg). For hip flexion angle, the average external rotation across all cuts significantly decreased by an average of 4.8 deg = 1.5 for each position as hip flexion decreased from 40degree flexion to 10degree extension. The reliability test showed no differences between the repeated BothTear conditions at any of the flexion angles, validating the testing apparatus for repeatability. Anterior/Posterior translations were observed to significantly vary across sectioned conditions but not across flexion angles. LigTorn, BothTorn, and LabRepaired all resulted in significantly greater translations than the Intact condition (LigTorn: 1.4 mm = 0.5; BothTorn: 2.2 mm = 0.2; LabRepaired: 1.1 = 0.2; vs. Intact: =0.4 mm < 0.1; p<0.001). Additionally, greater translations were observed for LigTorn when compared to that of the LabTorn (LigTorn: 1.4 mm = 0.5 vs. LabTorn: =0.5 +/- 0.3; p<0.001). No differences were observed between the Intact and BothRepaired conditions. Discussion(s): The results of this study indicate that the IF ligaments significantly regulated hip joint stability by limiting external rotation and anterior/posterior translation at varying hip angles (10degree extension, 0degree, 10degree flexion, and 40degree flexion.) The acetabular labrum only has a minor role in the stabilization of the hip during the log roll test and was most effective at limiting external rotation and anterior translation when paired with an intact or repaired IF ligament. These findings have significant clinical implications because they demonstrate that once torn, both the acetabular labrum and IF ligaments can be surgically repaired to restore the native stability observed in the hip. In addition, we recommend to repair the arthroscopic capsulotomy incision to avoid increased hip motion.

Philips, L. A., et al. (2017). "Holographic characterization of contaminants in water: Differentiation of suspended particles in heterogeneous dispersions." Water Research **122**: 431-439.

Determining the size distribution and composition of particles suspended in water can be challenging in heterogeneous multicomponent samples. Light scattering techniques can measure the distribution of particle sizes, but provide no basis for distinguishing different types of particles. Direct imaging techniques can categorize particles by shape, but offer few insights into their composition. Holographic characterization meets this need by directly measuring the size, refractive index, and three-dimensional position of individual particles in a suspension. The ability to measure an individual colloidal particle's refractive index is a unique capability of holographic characterization. Holographic characterization is fast enough, moreover, to build up population distribution data in real time, and to track time variations in the concentrations of different dispersed populations of particles. We demonstrate these capabilities using a model system consisting of polystyrene microbeads co-dispersed with bacteria in an oil-in-water emulsion. We also demonstrate how the holographic fingerprint of different contaminants can contribute to identifying their source.

Phillips, C. (2017). "Discerning ocean plastics: Activist, scientific, and artistic practices." Environment &

Planning A **49**(5): 1146-1162.

For almost 50 years scientists have been drawing attention to marine plastics, working to increase what we know about their incidence and impacts. However, how we come to know things is just as important as what we know. How do oceanic plastics become understood and how does this influence what we decide to do about them? Drawing upon discard studies and cultural geographies, this paper details processes of understanding and problematising marine debris by considering the practices of: an activist working with Indigenous communities to track and manage discarded fishing gear, a scientist investigating the influence of plastics in the lives of sea turtles, and Indigenous artists using oceanic debris as their material. Rather than categorising these knowledge as either lay or scientific, creating a sense of opposition, the concept of traces – material, immaterial, methodological – is employed to foreground the contingency and multiplicity involved. In this way, insight is gained about the materials, embodiments, affects and techniques involved in producing knowledge about oceanic plastics, as well as about how responses to this detritus become articulated and shared with wider publics. [ABSTRACT FROM AUTHOR]

Phillips, M. B. and T. H. Bonner (2015). "Occurrence and amount of microplastic ingested by fishes in watersheds of the Gulf of Mexico." Marine Pollution Bulletin **100**(1): 264-269.

Ingestion of microplastics by fishes could be an emerging environmental crisis because of the proliferation of plastic pollution in aquatic environments. Microplastics in marine ecosystems are well documented, however only one study has reported percent occurrence of microplastics in freshwater fishes. The purpose of this study was to quantify the occurrences and types of microplastics ingested by fishes within several freshwater drainages of the Gulf of Mexico and an estuary of the Gulf of Mexico. Among 535 fishes examined in this study, 8% of the freshwater fishes and 10% of the marine fishes had microplastics in their gut tract. Percentage occurrence of microplastics ingested by fishes in non-urbanized streams (5%) was less than that of one of the urbanized streams (Neches River; 29%). Percent occurrence of microplastics by habitat (i.e., benthic, pelagic) and trophic guilds (herbivore/omnivore, invertivore, carnivore) were similar. Low but widespread occurrences among drainages, habitat guilds, and trophic guilds indicate proliferation of plastic pollution within watersheds of the Gulf of Mexico, but consequences to fish health are unknown at this time.

Phillips, R. A. and C. M. Waluda (2020). "Albatrosses and petrels at South Georgia as sentinels of marine debris input from vessels in the southwest Atlantic Ocean." Environment International **136**: 105443.

Increasing amounts of anthropogenic debris enter the ocean because of mismanagement in coastal communities and, despite a global ban on deliberate dumping, also from vessels, endangering wildlife. Assessing marine plastic pollution directly is challenging, and an alternative is to use seabirds as bioindicators. Our analyses of long time-series (26-years) revealed substantial variation in the amount, characteristics and origin of marine debris (mainly macroplastics and mesoplastics, and excluding fishing gear) associated with seabirds at South Georgia, and, for two species, long-term increases in incidence since 1994. Annual debris recovery rates (items per capita) were 14 x higher in wandering albatrosses Diomedea exulans, and 6 x higher in grey-headed albatrosses Thalassarche chrysostoma and giant petrels Macronectes spp., than in black-browed albatrosses T. melanophris, partly related to differences in egestion (regurgitation), which clears items from the proventriculus. Although some debris types were common in all species, wandering albatrosses and giant petrels ingested higher proportions that were food-related or generic wrapping, gloves, clear or mixed colour, and packaged in South America. This was highly likely to originate from vessels, including the large South American fishing fleets with which they overlap. Debris associated with the two smaller albatrosses was more commonly shorter, rigid (miscellaneous plastic and bottle/tube caps), and packaged in East Asia. Grey-headed albatrosses are exposed to large and increasing amounts of user plastics transported from coastal South America in the Subantarctic Current, or discarded from vessels and circulating in the South Atlantic Gyre, whereas the lower debris ingestion by black-browed albatrosses suggests that plastic pollution in Antarctic waters remains relatively low. Current plastic loads in our study species seem unlikely to have an impact at the population level, but the results nevertheless affirm that marine plastics are a major, trans-boundary animal-welfare and environmental issue that needs to be addressed by much-improved waste-management practices and compliance-monitoring both on land and on vessels in the south Atlantic.

Phuong, L. T., et al. (2017). "The effect of textural attributes on the applicability of gel-based microcapsules as micro delivery system for probiotic bacteria." Acta Microbiologica et Immunologica Hungarica **64 (Supplement 1)**: 178.

Probiotic bacteria are common ingredients used in several food products, such as yogurt or other dairy products, due to their health-promoting effects in humans. For this property to be efficacious, sufficiently high number of viable probiotic cells should reach the large intestine. Cell microencapsulation (micro delivery system) provides a chance for probiotics to keep their viability and beneficial effects by being protected against harmful and often lethal external environment. One of the key issues that affects the efficiency of microencapsulation and the viability of cells is the selection of the capsule material. In this study, a probiotic bacterium (Lactobacillus casei 01) was incorporated into Ca-alginate, kappa-carrageenan-locust bean gum and gellan gum-xanthan gum microbeads. Moreover, the Ca-alginate based microgels were modified by combining with a variety of prebiotic components like lactulose, lactosucrose (LS40L and LS55L) and resistant starch, and by coating with polymers like chitosan and DEAE Sephadex A-50. The study focuses on the texture profile of these gel capsules and its relationship with encapsulation efficiency and viability of the bacteria exposed to simulated complex digestive (acidic and bile) conditions. The texture properties of the microgels were quantified by Brookfield LFRA Texture Analyzer. For obtaining springiness and mechanical strength related information both non-destructive and destructive texture measurements were carried out, respectively. Parameters such as hardness, area cycle, fracture force (brittleness) and adhesive force values were observed in both methods. Based on the statistical analysis of all these parameters, it was found that the resistant starch-alginate and the lactosucrose LS55L-alginate beads are the hardest whereas the gellan gum-xanthan gum and the chitosan coated alginate beads have the softest texture in overall. Pearson correlation analysis highlighted that there is no significant linearity between any of the texture related parameters and the encapsulation efficiency. According to the viability study, the hardest beads showed the most effectiveness at protecting L. casei 01 under simulated complex gastrointestinal conditions; however not the softest ones provided the least protection. Therefore, the texture profile of beads did not appear to have an obvious effect on the viability of enclosed probiotic bacteria under simulated complex gastrointestinal conditions.

Phuong, N. N., et al. (2018). "Microplastic abundance and characteristics in French Atlantic coastal sediments using a new extraction method." Environmental Pollution **243**(Pt A): 228-237.

The ubiquitous presence of microplastics (MPs) has been demonstrated in all environmental compartments in the recent years. They are detected in air, freshwater, soil, organisms and particularly in marine ecosystems. Since sediments are known to be the major sink of many organic and inorganic pollutants, the aim of this study was to develop and validate a fast and cheap methodology to assess the MP contamination in intertidal sediments from the Gulf of Biscay (Pays de la Loire region, France). Sediments were sampled at three locations (Pays de la Loire region, France) and during two seasons: October 2015 and March 2016. The analytical protocol involved MP extraction from dried sediments using milliQ water and a centrifugation technique. After a filtration step of supernatants, MPs were detected and directly identified on the membrane filters using muFTIR spectroscopy in reflection mode. For the first time, the number of replicates allowing to obtain a satisfying representativeness of the whole sampled sediment was also evaluated at 10 replicates of 25g each. The average number of MPs in sediments was 67 (+/-76) MPs/kg dw (N=60) with no significant difference between sites and seasons. Ten different compositions of MPs were defined by muFT-IR with a high proportion of polypropylene (PP) and polyethylene (PE), 38 and 24%, respectively. Among MPs, mainly fragments (84%) were observed with main size classes corresponding to [>100mum] and [50-100mum] but no particles>1mm could be found suggesting that mainly small microplastics (<1mm) were subject to vertical transport.

Phuong, N. N., et al. (2016). "Is there any consistency between the microplastics found in the field and those used in laboratory experiments?" Environmental Pollution **211**: 111-123.

The ubiquitous presence and persistency of microplastics (MPs) in aquatic environments are of particular concern since they represent an increasing threat to marine organisms and ecosystems. Great differences of concentrations and/or quantities in field samples have been observed depending on geographical location around the world. The main types reported have been polyethylene, polypropylene, and polystyrene. The presence of MPs in marine wildlife has been shown in many studies focusing on ingestion and accumulation in different tissues, whereas studies of the biological effects of MPs in the field are scarce. If the nature and abundance/concentrations of MPs have not been systematically determined in field samples, this is due to the fact that the identification of MPs from environmental samples requires mastery and execution of several steps and techniques. For this reason and due to differences in sampling techniques and sample preparation, it remains difficult to compare the published studies. Most laboratory experiments have been performed with MP concentrations of a higher order of magnitude than those found in the field. Consequently, the ingestion and associated effects observed in exposed organisms have corresponded to great contaminant stress, which does not mimic the natural environment. Medium contaminations are produced with only one type of polymer of a precise sizes and homogenous shape whereas the MPs present in the field are known to be a mix of many types, sizes and shapes of plastic. Moreover, MPs originating in marine environments can be colonized by organisms and constitute the sorption support for many organic compounds present in environment that are not easily reproducible in laboratory. Determination of the mechanical and chemical effects of MPs on organisms is still a challenging area of research. Among the potential chemical effects it is necessary to differentiate those related to polymer properties from those due to the sorption/desorption of organic compounds.

Piao, m., et al. (2019). "Research on ecotoxicology of microplastics on freshwater aquatic organisms."

Environmental Pollutants & Bioavailability **31**(1).
As a new type of pollutant, microplastics are an emerging scientific and social concern in the environment and are widely distributed in the aquatic environment and organism. Nowadays, researches on microplastic pollution mainly focus on the marine environment. As a bridge for the migration of microplastics from the terrestrial environment to the marine environment, the freshwater environment has been deserved more attention. Published articles on microplastics in freshwater environments were reviewed in this paper, and four typical behaviors of microplastics were summarized: biological ingestion, biological attachment, adsorption of pollutants and release of plasticizers. In addition, the progress in research and results on the ecological toxicity of microplastics to freshwater organisms was also analyzed. Finally, emphasis on future research on the toxicity of microplastics to freshwater aquatics organisms was made throughout this review as a tool in microplastic risk assessment research.

Piarulli, S., et al. (2019). "Microplastic in wild populations of the omnivorous crab Carcinus aestuarii: a review and a regional-scale test of extraction methods, including microfibres." Environmental Pollution **251**: 117-127.
Microplastic (MP) has become ubiquitous in the marine environment. Its threat to marine organisms has been demonstrated under laboratory conditions, yet studies on wild populations still face methodological difficulties. We reviewed the methods used to separate MP from soft animal tissues and highlighted a lack of standardised methodologies, particularly critical for synthetic microfibres. We further compared enzymatic and a potassium hydroxide (KOH)-based alkaline digestion protocols on wild crabs (Carcinus aestuarii) collected from three coastal lagoons in the north Adriatic Sea and on laboratory-prepared synthetic polyester (PES) of different colour and polypropylene (PP). We compared the cost-effectiveness of the two methods, together with the potential for adverse quantitative or qualitative effects on MP that could alter the capability of the polymers to be recognised via microscopic or spectroscopic techniques. Only 5.5% of the 180 examined crabs contained MP in their gastrointestinal tracts, with a notably high quantitative variability between individuals (from 1 to 117 particles per individual). All MP found was exclusively microfibres, mainly PES, with a mean length (+or-SE) of 0.5+or-0.03 mm. The two digestion methods provided comparable estimates on wild crabs and did not cause any visible physical or chemical alterations on laboratory-prepared microfibres treated for up to 4 days. KOH solution was faster and cheaper compared to the enzymatic extraction, involving fewer procedural steps and therefore reducing the risk of airborne contamination. With digestion times longer than 4 days, KOH caused morphological alterations of some of the PES microfibres, which did not occur with the enzymatic digestion. This suggests that KOH is effective for the digestion of small marine invertebrates or biological samples for which shorter digestion time is required, while enzymatic extraction should be considered as alternative for larger organisms or sample sizes requiring longer digestion times.

Piazza, A., et al. (2001). "Impact of donor-specific antibodies on chronic rejection occurrence and graft loss in renal transplantation: Posttransplant analysis using flow cytometric techniques." Transplantation **71**(8): 1106-1112.
Background. Improvements in immunosuppressive therapy have greatly reduced acute rejection (ARj) episodes, ensuring better short-term graft outcome, but have not modified long-term survival in renal transplantation. It is now well accepted that chronic rejection (CRj) can be determined by both immune and/or nonimmune mechanisms. The aim of this study was to evaluate the importance of the posttransplant humoral immune response towards mismatched HLA graft antigens in CRj occurrence and graft outcome. Methods. Serum samples from 120

nonpresensitized renal transplant recipients were prospectively screened for 1 year after surgery by means of flow cytometry cross-match (FCXM) and FlowPRA beads (microbeads coated with purified HLA class I and class II antigens) assays. All transplants were followed-up for 2 years or until graft removal. Results. FCXM monitoring identified donor-specific antibodies (DS-Abs) in 29 (24.2%) of 120 transplanted patients. Correlation with clinical data highlighted a higher incidence of ARj in DS-Abs-positive patients compared to negative patients (62% vs. 13%, P<0.00001). Furthermore, graft failure occurred more frequently among FCXM-positive patients than among negative patients (34% vs. 1%, P<0.00001). The deleterious effect of DS-Abs on graft function was confirmed by serum creatinine levels 2 years after transplantation. These were in fact higher in subjects producing DS-Abs than in subjects with only ARj (mean creatinine: 2.5+/-1.3 mg/dL vs.1.7+/-0.5 mg/dL, P=0.04). Flow-PRA analysis of DS-Ab HLA specificity highlighted the presence of anti-HLA class I antibodies in 85% of FCXM-positive patients, who also presented with a higher incidence of HLA-B mismatches than FCXM-negative patients (1.23+/-0.66 vs. 0.92+/-0.59, P=0.02). Conclusions. Flow cytometric techniques are precious tools for investigating the activation of the humoral response against HLA antigens of the graft in renal transplantation. DS-Abs production has a worse impact on organ function and survival than ARj episodes. These findings represent further proof of the threat posed by DS-Abs on long-term graft function and draw attention to the need for a specific immunosuppressive therapy aimed at counteracting the different kinds of immune activation toward graft.

Piccoli, G. B. and D. Mery (2017). "Sister Earth, Our Common Home: Toward a Sustainable, Planet Friendly Approach to Dialysis, a Paradigm of High Technology Medicine." Journal of Renal Nutrition **27**(6): 478-484.

In our high-technology, highly polluted world, medicine plays an important role balancing saving lives with the expenses of growing amounts of waste products, not only biologically dangerous (the potentially "contaminated" or "hazardous" waste) but also potentially harmful for the planet (nonrecyclable, plastic waste). Dialysis, the prototype of high-technology medicine, is central to these problems, as the present treatment of about 2 million patients produces an enormous quantity of waste (considering hazardous waste only about 2 kg per session, with 160 sessions per year, that is 320 kg per patient, or about 640,000 tons of hazardous waste per year for 2 million patients, roughly corresponding to 6 nuclear aircraft carriers). Furthermore, obsolete dialysis machines, and water treatments are discharged, adding to the "technological waste." Water produced by the reverse osmosis is also discharged; this is the only nonhazardous, nonpolluting waste, but in particular in dry areas, wasting water is a great ecologic concern. The present review is aimed at discussing strategies already in place and to be further implemented for reducing this particular "uremic toxin" for the earth: dialysis waste, including dialysis disposables, water, and dialysis machines.

Pico, Y., et al. (2020). "Pharmaceuticals, pesticides, personal care products and microplastics contamination assessment of Al-Hassa irrigation network (Saudi Arabia) and its shallow lakes." Science of the Total Environment **701**: 135021.

This study assess the presence of pharmaceutical and personal care products (PPCPs) and pesticides in different environmental compartments and microplastics in water of a characteristic lagoon wetland in Saudi Arabia to establish the transport, accumulation and fate of these pollutants in a water-stressed area under high anthropogenic pressure. In water, diazinon (up to 1016ng L⁻¹), caffeine (up to 20,663ng L⁻¹), diclofenac (up to 1390ng L⁻¹) and paracetamol (up to 3069ng L⁻¹) were at the highest concentrations. The substances with the highest frequency of detection were carbendazim, atorvastatin, caffeine, etoricoxib, lorazepam, metformin, ofloxacin, paracetamol, salicylic acid and tramadol. Considerably less pesticides and PPCPs at concentrations ranging from 0.01 to 126ngg⁻¹ dry weight (d.w.) were detected in the other matrices (sediment>>soil>plants). The concentration of microplastics in water ranged from 0.7 to 7.8 items/L in the Al-Asfar lake and from 1.1 to 9.0 items/L in the Al-Hubail lake. Risk assessment [using hazards quotients (HQ)] was used to highlight pesticides and PPCPs of major ecological concern that should be closely monitored to avoid adverse effects.

Picuno, P. and C. Sica (2004). "Mechanical and spectroradiometrical characteristics of agricultural recycled plastic films." Agricultural Engineering International **6**(04).

The increasing use of plastic materials in agriculture, particularly for protected cultivation, creates at the end of their use a large amount of plastic waste that, if not correctly managed, can produce negative effects on the landscape and on the whole ecosystem; mechanical recycling appears on the other hand one of the more suitable processes for a sound disposal of agricultural plastic films. This paper reports first results of a research project that investigates the possibility to mechanically recycle post-consume agricultural plastic films for the production of new regenerated film. Three different recycled films have been produced, characterized by mechanical tests and spectroradiometrical analysis, and compared to virgin LDPE films. The results show that all these recycled films have worse properties than the virgin material, so confirming that, without improvements in the formulation of blends and additives, the recycling of agricultural film into new regenerated film for agricultural application would remain a solution not interesting from a technical and economical point of view.

Picuno, P., et al. (2012). "Experimental tests and technical characteristics of regenerated films from agricultural plastics." Polymer Degradation and Stability **97**(9): 1654-1661.

Current agricultural practices require the use of large quantities of plastics, which contribute to a significant increase of the quantity and quality of agricultural production, but also require high quantities of plastic waste to be disposed in such way that will not have a negative effect on the landscape and the agro-ecosystem. In this paper the results of an experimental investigation of the possibilities of producing new regenerated plastic films through mechanical recycling, from post-consume agricultural plastic films are analysed. Six recycled films, made from agricultural low tunnel and greenhouse covering films as well as from HDPE bags for agrochemical packaging, have been extruded producing films of different thickness. These regenerated films were characterized by means of mechanical and spectrometric tests and SEM+EDS analysis. The obtained results show that without adding any additives into the blends good mechanical and spectral properties can be achieved by mixing the greenhouse and low tunnel recycled plastic film coverings.

Picuno, P., et al. (2010). "Mechanical properties of structural sections for recycling agricultural plastic film." Colture Protette **39**(6).

The use of plastic material in the European agriculture is continuously increasing; as a direct consequence, large amounts of plastic waste are generated, and they should be disposed in a correct way. The material reutilization through its mechanical recycling is an environmentally friendly alternative for the plastic waste disposal. With the aim to evaluate the mechanical characteristics of plastic products obtained by recycling different polymeric mixtures of agricultural plastic film, experimental tests were performed on different blends of heterogeneous material. New bars with prismatic shape from post-consume agricultural plastic film were produced through mechanical recycling, adding in some cases additives in the waste stream. In this paper the results of laboratory tests on some regenerated profiles are reported and discussed.

Piehl, S., et al. (2018). "Identification and quantification of macro- and microplastics on an agricultural farmland." Scientific Reports **8**(1): 17950.

Microplastic contamination of aquatic ecosystems is a high priority research topic, whereas the issue on terrestrial ecosystems has been widely neglected. At the same time, terrestrial ecosystems under human influence, such as agroecosystems, are likely to be contaminated by plastic debris. However, the extent of this contamination has not been determined at present. Via Fourier transform infrared (FTIR) analysis, we quantified for the first time the macro- and microplastic contamination on an agricultural farmland in southeast Germany. We found 206 macroplastic pieces per hectare and 0.34 +/- 0.36 microplastic particles per kilogram dry weight of soil. In general, polyethylene was the most common polymer type, followed by polystyrene and polypropylene. Films and fragments were the dominating categories found for microplastics, whereas predominantly films were found for macroplastics. Since we intentionally chose a study site where microplastic-containing fertilizers and agricultural plastic applications were never used, our findings report on plastic contamination on a site which only receives conventional agricultural treatment. However, the contamination is probably higher in areas where agricultural plastic applications, like greenhouses, mulch, or silage films, or plastic-containing fertilizers (sewage sludge, biowaste composts) are applied. Hence, further research on the extent of this contamination is needed with special regard to different cultivation practices.

Piera-Velazquez, S., et al. (2015). "Paracrine effect of proteins secreted by normal lung microvascular endothelial cells undergoing endothelial mesenchymal transition on the expression of genes associated with tissue fibrosis in normal human lung fibroblasts." Arthritis and Rheumatology. Conference: American College of Rheumatology/Association of Rheumatology Health Professionals Annual Scientific Meeting, ACR/ARHP **67**(SUPPL. 10).

Background/Purpose: Progressive tissue fibrosis and microvascular alterations are the hallmarks of Systemic Sclerosis (SSc). The mechanisms involved in SSc pathogenesis are complex and have not been fully elucidated. One notable feature of SSc is the extension of the pathologic process to normal tissues. The mechanisms involved in this topographic extension have remained elusive. Recent studies suggested that the phenotypic transition of endothelial cells (EC) into mesenchymal cells (endothelial to mesenchymal transition; EndoMT) may be involved in the progressive tissue fibrosis and fibroproliferative vasculopathy in SSc although the mechanisms involved have not been elucidated. We here suggest that one potential mechanism may be that EndoMT activated EC exert paracrine effects on normal/healthy fibroblasts and EC and induce them to express a profibrotic phenotype and transdifferentiate into activated profibrotic cells. The purpose of the study was to evaluate whether secreted molecules released by microvascular lung EC undergoing EndoMT exert paracrine effects on normal human pulmonary fibroblasts inducing them to become profibrotic. Method(s): Normal human lung fibroblasts and microvascular EC were isolated from normal lung tissues by enzymatic digestion with collagenase. The isolated cell suspension was incubated with CD45 microbeads to remove leukocytes. Fibroblasts and EC were isolated employing anti-human CD31 antibody magnetic beads. The CD31- fibroblasts and the CD31+ EC were expanded separately. For EndoMT induction the lung microvascular EC were treated with TGF-beta1 or TGF-beta2 for 48 h. Following a change of media to serum-free media for 24h the supernatants were collected and aliquotes added to triplicate wells of normal human lung fibroblasts. After 24h, culture

supernatants were isolated for Western blot analysis. The cells were lysed and total fibroblast RNA isolated and cDNA generated. Expression of various fibrosis-associated +genes was assessed by quantitative real time PCR. Validation of the gene expression results was performed employing Western blot analysis of secreted and intracellular proteins. Result(s): RTPCR results showed a marked increase in levels of COL1A2, COL3A1, FN1, CTGF and TGFbeta1 mRNA in normal lung fibroblasts treated with supernatants from normal lung microvascular EC pretreated with TGF-beta1 or TGF-beta2 compared to medium from untreated EC. Increased amounts of fibronectin were found in the media of lung fibroblasts treated with supernatants from the lung microvascular EC treated with TGF-beta1 or TGF-beta2. Conclusion(s): Treatment of normal lung fibroblasts with proteins released by cultured human lung microvascular EC induced to undergo EndoMT in vitro resulted in a profound change in the expression of numerous profibrotic genes. The results demonstrated potent paracrine effects of EndoMT-activated lung microvascular EC on normal target lung fibroblasts and suggest a novel mechanism for the progression of SSc-associated pulmonary fibrosis.

Pieszczek, L. and M. Daszykowski (2019). "Improvement of recyclable plastic waste detection - A novel strategy for the construction of rigorous classifiers based on the hyperspectral images." Chemometrics and Intelligent Laboratory Systems **187**: 28-40.

The objective of our study was to evaluate the advantages of the proposed validation framework for a rigorous one-class classifier that operates on the large sets of multivariate pixels that are obtained using the hyperspectral imaging technique that are considered to be individual samples. The performance of the validation strategy was evaluated experimentally using the hyperspectral images of post-consumer waste polymers (high-density polyethylene and polypropylene), which have very similar physico-chemical properties. Rigorous classification models using the partial least squares approach were constructed for the training samples from modeled groups of polymer items. Their aim was to support the process of sorting polymer waste items and to potentially provide a framework to construct an intelligent laboratory system. The results that were obtained in this study provide evidence that the pixel-based approach improves classification in terms of sensitivity and specificity. The models that described high-density polyethylene polymer items and that were built to represent individual pixels were characterized by a sensitivity of more than 98.6% and a specificity of more than 99.5%, whereas the models that were constructed for the polypropylene polymer items had a sensitivity of more than 93.4% and a specificity of more than 99.9%. Copyright © 2019 Elsevier B.V.

Pimenova, M., et al. (2012). "Cytogenetic characteristic of mesenchymal and hematopoetic progenitor cells in myelodysplastic syndromes and acute myeloid leukemias with myelodysplasia-related changes." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Background: Abnormal karyotype in bone marrow (BM) cells is detected in 30-70% of patients with myelodysplastic syndromes (MDS) and acute myeloid leukemias with myelodysplasia-related changes (AML). The same cytogenetic abnormalities are found in isolated CD34+ hematopoetic progenitor cells (HPCs) of these patients. According to recent studies cytogenetic abnormalities are described in 10-70% MDS and AML patients in BM derived mesenchymal stromal cells (MSCs) [Flores-Figueroa et al. 2008, Blau et al. 2011]. These abnormalities can be clonal and nonclonal (spontaneous). The goal of the study was to characterize and compare the cytogenetic changes in BM derived MSCs and in CD34+ HPCs isolated from BM and peripheral blood (PB) in MDS and AML patients. Patients and Methods: The data from 35 patients is presented: 6 pts with AML (1 pt with therapy-related AML), 29 pts

with MDS (refractory anemia - 4 pts, refractory cytopenia with multilineage dysplasia - 13 pts, refractory anemia with ringed sideroblasts - 2 pts, refractory anemia with excess blasts - 7 pts, 5q-syndrome - 3 pts). Median age was 60 years (range 19 to 77). Patients' assignment to different groups was made according to the 2008 World Health Organization (WHO) classification. Cytogenetic analysis was performed using G-banding and FISH. MSCs were derived from bone marrow mononuclear cells then plated in 75 cm3flacks and harvested after 2-5 passages. CD34+ HPCs were collected from BM and PB by magnetic separation with anti-CD34 MicroBead Kit human (Miltenyi Biotec). Result(s): BM karyotype was normal in 17 pts, cytogenetic abnormalities were found in 18 pts - 4 AML and 14 MDS: in 9 pts (2 AML/7 MDS) - isolated del(5q), monosomy 7, i(14), inv(3) or trisomy 8; in 8 pts (2 AMl/6 MDS) - two or more abnormalities; and 1 pt displayed only constitutional abnormality (inv(9)(p13q21)). It is worth to note that routine cytogenetic analysis didn't present any mitosis in 3 MDS pts however FISH analysis revealed del(5) and del(7) simultaneously in one of these pts, trisomy 8 in one pt and normal karyotype in another one pt. Cytogenetic analysis of MSCs was carried out in 23 pts - 4 AML and 19 MDS pts. BM karyotype was normal in 10 pts and abnormal in 13 pts. Karyotype in MSCs was normal in all AML pts and in 16 MDS pts. There were cytogenetic changes in 3 MDS pts: in 1 pt - constitutional inversion (inv9(p13q21)), in 1 pt - nonclonal translocation and constitutional inversion (46XY,t(2;22)(p10;q11),inv(9)(p13q21)[1]/46XY,inv(9)(p13q21)[19]) and in 1 pt - clonal abnormalities (46XY,add(2q)[7]/46XY[13]). Patient with clonal cytogenetic abnormalities in MSCs had complex karyotype in BM (45-46XY,-5,-13,der(19),add(q13?or p13?),-20,+marx2,+mar del(13q21)?[15]/45-46XY idem, +dmin[2]/46XY[3]), but these changes were different. Constitutional inversion was confirmed in both cases by cytogenetic analysis in PB lymphocytes. FISH analysis was performed in CD 34+ HPCs magnetically isolated from BM and PB in 24 pts. Fourteen of these pts had normal BM karyotype and we confirmed that using FISH with LSI (5q33-q34), LSI (7q31)/CEP 7, CEP 8 (Vysis). We used the same DNA probes for evaluation of CD34+ HPCs from BM and PB in pts with normal BM karyotype. We used FISH in 10 pts with ascertained cytogenetic abnormalities in BM to confirm these findings with DNA probes LSI (5q33-q34), LSI (7q31)/CEP 7, CEP 8, LSI AML1/ETO, CEP X/CEP Y, LSI (20q12) (Vysis). FISH analysis didn't reveal any aberration in BM and PB CD34+ HPCs in patients with normal BM karyotype. In pts with distinguished abnormalities in BM the same pattern was demonstrated by FISH in CD34+ HPCs. We counted the percent of abnormal nuclei per 200. The means of percentages by FISH of BM, BM CD 34+ HPCs and PB CD34+ HPCs didn't differ and constituted 65.8%, 73.1% and 74.8% respectively. Conclusion(s): Cytogenetic analysis in MSCs revealed aberrations only in MDS patients (3 from 16). No cytogenetic abnormalities in MSCs in AML pts was found. Karyotype in MSCs didn't coincide with BM karyotype in the same patients. Hematopoetic progenitor cells from BM and PB of MDS and AML patients displayed the same cytogenetic abnormalities as the full population of bone marrow cells. The data shows that hematopoetic and mesenchymal precursors in MDS and AML are cytogenetically distinct.

Pinet, O., et al. (2008). "Glass matrices for immobilizing nuclear waste containing molybdenum and phosphorus." Journal of Nuclear Materials **377**(2): 307-312.

Vitrification has been selected in France as the process for immobilizing high-level waste arising from spent fuel reprocessing. Some high-level solutions generated by reprocessing legacy fuel contain high molybdenum concentrations. Molybdenum is known to be sparingly soluble in conventional borosilicate glass, and work is in progress to find suitable glass formulations for such waste. The results of a basic study to identify borosilicate glasses composition zones of potential interest are discussed. A vast composition range was investigated by defining a fine mesh. The limits considered to delimit the range of the study were intentionally extended to identify formulations such as SiO2-B2O3-Al2O3-Na2O-P2O5 that are of interest for vitrifying molybdenum-rich waste. Observation of more than 50 tested mixtures revealed two composition zones of potential interest. One forms a homogeneous glass after melting at 1300 °C and rapid cooling; the other vitreous material comprises unconnected microbeads uniformly dispersed in a borosilicate glass.

Pinheiro, L. M., et al. (2019). "Do beachrocks affect microplastic deposition on the strandline of sandy beaches?" Marine Pollution Bulletin **141**: 569-572.

The strandline is one of the first deposition habitats of microplastics before they are integrated to the beach as a standing stock or finally removed. Beaches, entirely or partially protected by beachrocks, have different sediment dynamics and therefore may present variation in microplastic deposition. The aim of this work was to test if protected and unprotected (i.e., exposed to waves) areas of a sandy beach present different microplastic accumulation on the strandline - a habitat greatly influenced by both water and sediment dynamics. Microplastic (MP) amounts were significantly higher at the protected area (M_{protected}=642.6+/-514.8 MP m⁻², M_{exposed}=130.6+/-126.8 MP m⁻², Mann-Whitney U test, U=14.5, p=0.0009), showing that beachrocks influence microplastic accumulation on the beach face. Therefore, hard structures parallel to the beach may also affect microplastics deposition on beach sediments, being important to consider these structures on microplastic surveys.

Pinho, D., et al. (2017). "In vitro particulate analogue fluids for experimental studies of rheological and hemorheological behavior of glucose-rich RBC suspensions." Biomicrofluidics **11**(5): 054105.

Suspensions of healthy and pathological red blood cells (RBC) flowing in microfluidic devices are frequently used to perform in vitro blood experiments for a better understanding of human microcirculation hemodynamic phenomena. This work reports the development of particulate viscoelastic analogue fluids able to mimic the rheological and hemorheological behavior of pathological RBC suspensions flowing in microfluidic systems. The pathological RBCs were obtained by an incubation of healthy RBCs at a high concentration of glucose, representing the pathological stage of hyperglycaemia in diabetic complications, and analyses of their deformability and aggregation were carried out. Overall, the developed in vitro analogue fluids were composed of a suspension of semi-rigid microbeads in a carrier viscoelastic fluid made of dextran 40 and xanthan gum. All suspensions of healthy and pathological RBCs, as well as their particulate analogue fluids, were extensively characterized in steady shear flow, as well as in small and large amplitude oscillatory shear flow. In addition, the well-known cell-free layer (CFL) phenomenon occurring in microchannels was investigated in detail to provide comparisons between healthy and pathological in vitro RBC suspensions and their corresponding analogue fluids at different volume concentrations (5% and 20%). The experimental results have shown a similar rheological behavior between the samples containing a suspension of pathological RBCs and the proposed analogue fluids. Moreover, this work shows that the particulate in vitro analogue fluids used have the ability to mimic well the CFL phenomenon occurring downstream of a microchannel contraction for pathological RBC suspensions. The proposed particulate fluids provide a more realistic behavior of the flow properties of suspended RBCs when compared with existing non-particulate blood analogues, and consequently, they are advantageous for detailed investigations of microcirculation.

Pinky, R., et al. (2019). "Antimicrobial activity of potato starch-based active biodegradable nanocomposite films." Potato Research **62**(1): 69-83.

Food-borne pathogens such as Escherichia coli (E. coli) and Staphylococcus aureus (S. aureus) create a lot of problems worldwide and are a major concern of food producers and consumers. To protect the food from spoilage due to these bacteria, antimicrobial packaging is one of the most promising active packaging systems. Environmental concerns associated with plastic waste emphasized the development of packaging films from natural polymers such as starch. Therefore, in the present study, potato starch-based biodegradable and antimicrobial nanocomposite films were prepared with constant concentration of zinc oxide nanoparticles using casting method. Films were prepared using three antimicrobial agents, cinnamon oil, clove oil, and potassium sorbate and were tested against four microbes, S. aureus, E. coli, Salmonella typhi (S. typhi), and Campylobacter jejuni (C. jejuni). The films prepared with clove oil were most effective against S. aureus (22-100% inhibition), those prepared with cinnamon oil were effective against C. jejuni (19-22% inhibition) and growth of E. coli was inhibited (33-40% inhibition) to maximum extent by potassium sorbate incorporated films. However, for complete inhibition of C. jejuni and E. coli, higher concentrations of cinnamon oil and potassium sorbate are required. Increasing concentration of antimicrobial agents decreased the tensile strength of the films. Tensile strength decreased up to 13% in cinnamon oil films, 23% in clove oil films and up to 34% in potassium sorbate incorporated films. Based on the results, it can be concluded that cinnamon oil is a better antimicrobial agent due to its least effect on tensile strength and also due to its antibacterial effect against the three bacteria.

Pinochet, J., et al. (2019). "Marine invertebrate larvae love plastics: Habitat selection and settlement on artificial substrates." Environmental Pollution: 113571.

Global urbanization and plastic pollution has increased the availability and variety of substrates for sessile organisms, and are intensively used by invasive species for settlement. Despite extensive literature describing the strong association between artificial structures and invasive species, little effort has been directed towards identifying the larval traits that favor this selection. Larval selection and settlement are crucial as larvae actively search and interpret environmental cues to identify suitable habitats to settle. The aim of this research was to investigate if invertebrate larvae have a preference for a particular anthropogenic substrate, and how pre-settlement behaviors vary when encountering different substrates. We used two invasive bryozoan species, Bugula flabellata and Bugula neritina, which are commonly found in urbanized areas around the world. Energy expenditure during planktonic and benthonic stages, pre-settlement swimming/exploring behaviors, settlement and larval selectivity were quantified under laboratory conditions on different substrates (concrete, wood, polystyrene, polyvinyl chloride, polyethylene terephthalate and polycarbonate). The energy expenditure measured was higher in planktonic larvae than in early settled larvae. Larvae of both species swam less and explored more when exposed to plastic surfaces, suggesting a preference for this substrate and resulting in lower energy expenditures associated with searching for habitat. Larvae actively chose to settle on plastics rather than on wood or concrete substrates. The results suggest that for Bugula larvae, the likelihood of colonizing plastic surfaces is higher than other materials commonly found in urbanized coastal areas. The more quickly they adhere to artificial substrates the lower the energy expenditure, contributing to higher fitness in these individuals. The strong preference of invertebrate larvae for plastics can potentially extend the distribution range of many invasive marine species as they are able to travel long distances attached to floating debris. This phenomenon will likely exacerbate the introduction of exotic species into novel habitats.

Pinto da Costa, J., et al. (2019). "Micro(nano)plastics - Analytical challenges towards risk evaluation."

TrAC - Trends in Analytical Chemistry **111**: 173-184.
The quantification of micro- and nanoplastics in environmental matrices is an analytical challenge and pushes to the use of unrealistic high exposure concentrations in laboratory studies which can lead to manifestations of ecotoxicological effects and risks estimation that are transient under natural conditions. Moreover, in field studies, it is difficult to compare the data obtained due to the lack of sampling protocols, standardized methodologies and techniques for the identification and quantification of micro- and nanoplastics, owing to the inherent physical characteristics of the these materials. Also, the definition of exposure limits is difficult due to the challenge of analytical methodologies. Therefore, this paper aims to characterize the existent analytical challenges in each step from isolation to quantification of nano- and microplastics and their consequences in the estimation of risks. Copyright © 2018 Elsevier B.V.

Piotrowski, K., et al. (2011). "Assessment of resolution of molecular mosaic aneuploidy detection in molecular karyotyping technique by BACs-on-BEADSTM system." Chromosome Research **1)**: S221-S222.
Classical methods of prenatal diagnosis in amniocyte cultures have several disadvantages, particularly long time to the final diagnosis. Therefore, new methods of molecular karyotyping from amniocyte DNA without cell cultivation have been introduced. The BACS-on- BEADSTM technique is a relatively new method of molecular karyotyping, performed using multiplex BAC probes localized on microbeads, employing a small amount DNA (~50 ng) and giving a result within 24 h. This method reveals in one run simultaneously all classical aneuploidies and classical microdeletions. For this relatively short time of employment, there are limited data of resolution of this technique for mosaic detection. We performed several analyses of this resolution by producing "artificial" mosaics by admixture of amniocyte DNA with trisomies 13, 18 and 21 confirmed by classical methods with DNA of normal controls with measured proportion of 12.5%, 25%, 30%, 50%and 75% admixture of trisomic DNA to total DNA. DNA from amniotic cells was extracted using QIAamp DNA Blood Mini Kit samples. D concentrations were measured by a spectrophotometer Lambda Bio Plus and in all cases normalized. The level of detection differs between particular trisomies; in trisomy 21, this method regularly detects trisomy whether the concentration of trisomic DNA is 30% (in some but not all cases in 25% and rarely in 12.5%). In trisomies 13 and 18, the borderline of detection is higher and in both stays at the level of 50%.

Piskin, E., et al. (1996). "Protein A carrying monosize PMMA microbeads for the removal of HIgG from human plasma." International Journal of Artificial Organs **19**(5): 311-317.
Protein A-incorporated polymethylmethacrylate (PMMA) microbeads were investigated for specific removal of HIgG from human plasma. The microbeads were prepared by a phase inversion polymerization, and activated by periodate oxidation. Protein A was then incorporated by covalent binding onto these microbeads through hydroxyl groups coming from the stabilizer. The amount of incorporated protein A was controlled by the initial concentrations of protein A in the immobilization medium and pH. The maximum protein A immobilization of 0.615 mg protein A/g PMMA, was observed at a pH of 9.5 corresponding to an initial protein A concentration of 0.1 mg/ml. There was no HIgG adsorption onto the plain PMMA microbeads, while high HIgG adsorptions of up to 32 mg HIgG/g PMMA were achieved with human plasma.

Pita, F. and A. Castilho (2017). "Separation of plastics by froth flotation. The role of size, shape and density of the particles." Waste Management **60**: 91-99.
Over the last few years, new methods for plastic separation in mining have been developed. Froth flotation is one of these techniques, which is based on hydrophobicity differences

between particles. Unlike minerals, most of the plastics are naturally hydrophobic, thus requiring the addition of chemicals that promote the selective wettability of one of its components, for a flotation separation. The floatability of six granulated post-consumer plastic - Polystyrene (PS), Polymethyl methacrylate (PMMA), Polyethylene Terephthalate (PET-S, PET-D) and Polyvinyl Chloride (PVC-M, PVC-D) - in the presence of tannic acid (wetting agent), and the performance of the flotation separation of five bi-component plastic mixtures - PS/PMMA, PS/PET-S, PS/PET-D, PS/PVC-M and PS/PVC-D - were evaluated. Moreover, the effect of the contact angle, density, size and shape of the particles was also analysed.

Pitryuk, A. P., et al. (1974). "Microbial respiration in model porous systems." Pochvovedenie **8**: 131-136.
Glass micro beads (140 mu) placed in liquid nutrient medium stimulated bacterial respiration more than they stimulated yeast and fungal respiration. Larger beads (900 mu) stimulated yeast and fungal respiration more than they stimulated bacterial respiration. Microbial respiration in films of water on micro beads was greater on the small than on the large beads.

Pitt, J. A., et al. (2018). "Uptake, tissue distribution, and toxicity of polystyrene nanoparticles in developing zebrafish (Danio rerio)." Aquatic Toxicology **194**: 185-194.
Plastic pollution is a critical environmental concern and comprises the majority of anthropogenic debris in the ocean, including macro, micro, and likely nanoscale (less than 100 nm in at least one dimension) plastic particles. While the toxicity of macroplastics and microplastics is relatively well studied, the toxicity of nanoplastics is largely uncharacterized. Here, fluorescent polystyrene nanoparticles (PS NPs) were used to investigate the potential toxicity of nanoplastics in developing zebrafish (Danio rerio), as well as to characterize the uptake and distribution of the particles within embryos and larvae. Zebrafish embryos at 6 h post-fertilization (hpf) were exposed to PS NPs (0.1, 1, or 10 ppm) until 120 hpf. Our results demonstrate that PS NPs accumulated in the yolk sac as early as 24 hpf and migrated to the gastrointestinal tract, gallbladder, liver, pancreas, heart, and brain throughout development (48-120 hpf). Accumulation of PS NPs decreased during the depuration phase (120-168 hpf) in all organs, but at a slower rate in the pancreas and gastrointestinal tract. Notably, exposure to PS NPs did not induce significant mortality, deformities, or changes to mitochondrial bioenergetics, but did decrease the heart rate. Lastly, exposure to PS NPs altered larval behavior as evidenced by swimming hypoactivity in exposed larvae. Taken together, these data suggest that at least some nanoplastics can penetrate the chorion of developing zebrafish, accumulate in the tissues, and affect physiology and behavior, potentially affecting organismal fitness in contaminated aquatic ecosystems.

Pitt, J. A., et al. (2018). "Maternal transfer of nanoplastics to offspring in zebrafish (Danio rerio): a case study with nanopolystyrene." Science of the Total Environment **643**: 324-334.
Plastics are ubiquitous anthropogenic contaminants that are a growing concern in aquatic environments. The ecological implications of macroplastics pollution are well documented, but less is known about nanoplastics. The current study investigates the potential adverse effects of nanoplastics, which likely contribute to the ecological burden of plastic pollution. To this end, we examined whether a dietary exposure of adult zebrafish (Danio rerio) to polystyrene nanoparticles (PS NPs) could lead to the transfer of nanoplastics to the offspring, and whether nanoplastics exposure affects zebrafish physiology. Specifically, adult female and male zebrafish (F0 generation) were exposed to PS NPs via diet for one week and bred to produce the F1 generation. Four F1 groups were generated: control (unexposed females and males), maternal (exposed females), paternal (exposed males), and co-parental (exposed males and females).

Co-parental PS NP exposure did not significantly affect reproductive success. Assessment of tissues from F0 fish revealed that exposure to PS NPs significantly reduced glutathione reductase activity in brain, muscle, and testes, but did not affect mitochondrial function parameters in heart or gonads. Assessment of F1 embryos and larvae revealed that PS NPs were present in the yolk sac, gastrointestinal tract, liver, and pancreas of the maternally and co-parentally exposed F1 embryos/larvae. Bradycardia was also observed in embryos from maternal and co-parental exposure groups. In addition, the activity of glutathione reductase and the levels of thiols were reduced in F1 embryos/larvae from maternal and/or co-parental exposure groups. Mitochondrial function and locomotor activity were not affected in F1 larvae. This study demonstrates that (i) PS NPs are transferred from mothers to offspring, and (ii) exposure to PS NPs modifies the antioxidant system in adult tissues and F1 larvae. We conclude that PS NPs could bioaccumulate and be passed on to the offspring, but this does not lead to major physiological disturbances.

Pivnenko, K., et al. (2016). "Recycling of plastic waste: Presence of phthalates in plastics from households and industry." Waste Management **54**: 44-52.

Plastics recycling has the potential to substitute virgin plastics partially as a source of raw materials in plastic product manufacturing. Plastic as a material may contain a variety of chemicals, some potentially hazardous. Phthalates, for instance, are a group of chemicals produced in large volumes and are commonly used as plasticisers in plastics manufacturing. Potential impacts on human health require restricted use in selected applications and a need for the closer monitoring of potential sources of human exposure. Although the presence of phthalates in a variety of plastics has been recognised, the influence of plastic recycling on phthalate content has been hypothesised but not well documented. In the present work we analysed selected phthalates (DMP, DEP, DPP, DiBP, DBP, BBzP, DEHP, DCHP and DnOP) in samples of waste plastics as well as recycled and virgin plastics. DBP, DiBP and DEHP had the highest frequency of detection in the samples analysed, with 360mug/g, 460mug/g and 2700mug/g as the maximum measured concentrations, respectively. Among other, statistical analysis of the analytical results suggested that phthalates were potentially added in the later stages of plastic product manufacturing (labelling, gluing, etc.) and were not removed following recycling of household waste plastics. Furthermore, DEHP was identified as a potential indicator for phthalate contamination of plastics. Close monitoring of plastics intended for phthalates-sensitive applications is recommended if recycled plastics are to be used as raw material in production.

Pivnenko, K., et al. (2017). "Recycling of plastic waste: Screening for brominated flame retardants (BFRs)." Waste Management **69**: 101-109.

Flame retardants are chemicals vital for reducing risks of fire and preventing human casualties and property losses. Due to the abundance, low cost and high performance of bromine, brominated flame retardants (BFRs) have had a significant share of the market for years. Physical stability on the other hand, has resulted in dispersion and accumulation of selected BFRs in the environment and receiving biota. A wide range of plastic products may contain BFRs. This affects the quality of waste plastics as secondary resource: material recycling may potentially reintroduce the BFRs into new plastic product cycles and lead to increased exposure levels, e.g. through use of plastic packaging materials. To provide quantitative and qualitative data on presence of BFRs in plastics, we analysed bromophenols (tetrabromobisphenol A (TBBPA), dibromophenols (2,4- and 2,6-DBP) and 2,4,6-tribromophenol (2,4,6-TBP)), hexabromocyclododecane stereoisomers (alpha-, beta-, and gamma-HBCD), as well as selected

polybrominated diphenyl ethers (PBDEs) in samples of household waste plastics, virgin and recycled plastics. A considerable number of samples contained BFRs, with highest concentrations associated with acrylonitrile butadiene styrene (ABS, up to 26,000,000ngTBBPA/g) and polystyrene (PS, up to 330,000ngHBCD/g). Abundancy in low concentrations of some BFRs in plastic samples suggested either unintended addition in plastic products or degradation of higher molecular weight BFRs. The presence of currently restricted flame retardants (PBDEs and HBCD) identified in the plastic samples illustrates that circular material flows may be contaminated for extended periods. The screening clearly showed a need for improved documentation and monitoring of the presence of BFRs in plastic waste routed to recycling.

Pivokonsky, M., et al. (2018). "Occurrence of microplastics in raw and treated drinking water." Science of the Total Environment **643**: 1644-1651.

The study investigates the content of microplastic particles in freshwater and drinking water. Specifically, three water treatment plants (WTPs) supplied by different kinds of water bodies were selected and their raw and treated water was analysed for microplastics (MPs). Microplastics were found in all water samples and their average abundance ranged from 1473+/-34 to 3605+/-497particlesL⁻¹ in raw water and from 338+/-76 to 628+/-28particlesL⁻¹ in treated water, depending on the WTP. This study is one of very few that determine microplastics down to the size of 1mum, while MPs smaller than 10mum were the most plentiful in both raw and treated water samples, accounting for up to 95%. Further, MPs were divided into three categories according to their shape. Fragments clearly prevailed at two of the WTPs and fibres together with fragments predominated at one case. Despite 12 different materials forming the microplastics being identified, the majority of the MPs (>70%) comprised of PET (polyethylene terephthalate), PP (polypropylene) and PE (polyethylene). This study contributes to fill the knowledge gap in the field of emerging microplastic pollution of drinking water and water sources, which is of concern due to the potential exposure of microplastics to humans.

Piyadeatsoontorn, S., et al. (2019). "Encapsulating Viability of Multi-strain Lactobacilli as Potential Probiotic in Pigs." Probiotics & Antimicrobial Proteins **11**(2): 438-446.

Important aspects of the selection of probiotics to be used for mixing in animal feed include host species specificity and probiotic cell survival during production and storage of their products. The research was to screen and investigate some probiotic properties of lactic acid bacteria (LAB) isolated from pig fecal samples. One hundred and thirty-eight representative LAB isolates, which were isolated from 51 pig fecal samples, were tested for acid and bile tolerance, antimicrobial susceptibility, antibacterial activity, potential adhesion to the cell surface, and survival rates when stored in varied microencapsulation forms: freeze-dried, spray-dried, and micro-beads. The antibacterial activity results of the ten LAB isolates, which were acid- (pH 2, 3 h) and bile- (50% (v/v) fresh pig bile, 8 h) tolerant and suitable for resisting the five antibiotics commonly used for treating pig infections with pathogenic indicator strains, showed that three isolates (L21, L80, L103) had strong inhibition to Escherichia coli, Salmonella group B, and Salmonella group D using co-culturing and agar spot assays. The three isolates had high hydrophobicity (65-73%) and did not show antagonistic growth against each other. All three selected isolates had greater than 80% survival in freeze-dried and micro-bead forms at 25-30 degreeC after 2 days of storage (80.4-86.75%, 7.31-7.89 log CFU/ml). Sequence analysis of the 16S rRNA genes demonstrated that the three isolates belong to Lactobacillus plantarum (strain L21 and strain L80) and L. paraplantarum (strain L103). The single and multiple strains of these

bacteria may have potential use as probiotics in pig diets.

Planus, E., et al. (2005). "Apical rigidity of an epithelial cell monolayer evaluated by magnetic twisting cytometry: ICAM-1 versus integrin linkages to F-actin structure." Clinical Hemorheology & Microcirculation **33**(3): 277-291.

Using Magnetic Twisting Cytometry (MTC) technique, we attempted to characterize in vitro the rigidity of the lining tissue covering the lung alveolar wall from its apical face. We purposely used a cellular model constituted by a monolayer of human alveolar epithelial cell (A549) over which microbeads, fixed to InterCellular Adhesion Molecule (ICAM-1), exert a controlled mechanical stress. ICAM-1 expression was induced by Tumor Necrosis Factor-alpha (TNF-alpha). Rigidity measurements, performed in the course of cytochalasin D depolymerization, reveal the force transmitter role of the transmembrane receptor ICAM-1 and demonstrate that ICAM-1 and F-actin linkages confers mechanical rigidity to the apical face of the epithelial cell monolayer resembling that provided by integrins. These results confirm the ability of MTC in identifying transmembrane mechanoreceptors in relation with F-actin. Molecular linkages between ICAM-1 and F-actin were observed by spatial visualisations of the structure after double staining of F-actin and anti ICAM-1 antibody through confocal microscopy.

Plaseied, A., et al. (2017). "Self-Healing Coatings to Mitigate Post-Impact Corrosion." Corrosion **73**(9): 1091-1097.

Self-healing polymeric coatings have offered tremendous potential for repairing damage and extending the service life and safety of metallic structures. There have been many challenges associated with the catalyst activated version of the self-healing oligomer filled microcapsule coating additives (or microbeads) technology, but a non-catalyst version appears more promising. The objective ofthis study was to identify the effect of self-healing coatings in an epoxy coating system containing the non-catalyst microbeads on post-impact corrosion mitigation of water infrastructure. Experimental results showed that coatings containing microbeads did not fully prevent corrosion of the post-impact exposed metal substrate over the exposure period for this study, especially in salt fog and immersion conditions. However, this coating showed less coating degradation compared to the coating without the presence of microbeads.

Pliszka, S. R., et al. (2017). "Efficacy and Safety of HLD200, Delayed-Release and Extended-Release Methylphenidate, in Children with Attention-Deficit/Hyperactivity Disorder." Journal of Child and Adolescent Psychopharmacology **27**(6): 474-482.

Objective: Evening-dosed HLD200 is a delayed-release and extended-release methylphenidate (DR/ER-MPH) formulation consisting of uniform, dual-layered microbeads with an inner drug-loaded core. DR/ER-MPH is designed to delay the initial release of drug by 8-10 hours, and thereafter, provide a controlled, extended drug release to target onset of effect upon awakening that lasts into the evening. This phase 3 study evaluated the safety and efficacy of DR/ER-MPH on symptoms and temporal at-home functional impairment in children with attention-deficit/hyperactivity disorder (ADHD). Method(s): This 3-week, randomized, double-blind, multicenter, placebo-controlled, parallel-group, forced-dose titration trial evaluated DR/ER-MPH (40-80 mg/day) in children aged 6-12 years with ADHD. Primary efficacy endpoint was the ADHD rating scale-IV (ADHD-RS-IV), and the key secondary endpoints were the Before-School Functioning Questionnaire (BSFQ), and Parent Rating of Evening and Morning Behavior-Revised, morning (PREMB-R AM) and evening (PREMB-R PM). Safety measures included spontaneously reported treatment-emergent adverse events (TEAEs) and two TEAEs of special interest, appetite suppression and insomnia (with direct questioning on sleep disturbance). Result(s): One hundred sixty-one participants were included in the intent-to-treat population (DR/ER-MPH, n = 81; placebo, n = 80). After 3 weeks, DR/ER-MPH achieved significant improvements versus placebo in ADHD symptoms (least-squares [LS] mean ADHD-RS-IV: 24.1 vs. 31.2; p = 0.002), and at-home early morning (LS mean BSFQ: 18.7 vs. 28.4; p < 0.001; LS mean PREMB-R AM: 2.1 vs. 3.6; p < 0.001) and late afternoon/evening (LS mean PREMB-R PM: 9.4 vs. 12.2; p = 0.002) functional impairment. Commonly reported TEAEs (>=10%) were insomnia and decreased appetite. Conclusion(s): DR/ER-MPH was generally well tolerated and demonstrated significant improvements versus placebo in ADHD symptoms and at-home functional impairments in the early morning, late afternoon, and evening in children with ADHD. Copyright © 2017, Mary Ann Liebert, Inc.

Pochechueva, T., et al. (2014). "PEGylation of microbead surfaces reduces unspecific antibody binding in glycan-based suspension array." Journal of Immunological Methods **412**: 42-52.

Glycan-based suspension array (SGA) is an "in-house" developed multi-target immunoassay, employing commercially available fluorescent microbeads as a solid support for unique chemically synthesized glycopolymers which capture naturally occurring human anti-glycan antibodies. SGA is a sensitive and reliable tool for the high-throughput screening of anti-glycan antibody alterations characteristic for a vast number of human diseases including cancer. However, unspecific background binding, for instance binding of non-target antibodies, is a common obstacle in such immunoassays. In an attempt to reduce unspecific background binding of serum (or plasma) antibodies, we prepared glycosylated microbeads modified with linear poly(ethylene glycols) (PEGs) of different lengths. We compared several kinds of PEG modifications: (a) partial side-chain substitution of glycopolymers by PEGs of different lengths, (b) end-point addition of biotin-linked PEGs to glycopolymer-coupled beads, and (c) linking of heterobifunctional PEGs to the bead surface prior to glycopolymer immobilization. Among the various modifications investigated, the direct modification of the bead surface with linear heterobifunctional PEGs, consisting of 23- and 60PEG-units significantly reduced the background binding. The end-point addition of biotin-linked PEGs, especially in the case of PEG consisting from 50PEG-units, helped to repel non-target binding caused by endogenous biotin. We observed unspecific binding predominantly for antibodies of IgG but of IgM class. The novel design of fluorescent microbeads allows the detection of human anti-glycan antibodies with increased specificity and opens new horizons for practical application of SGA as a diagnostic tool.

Poerio, T., et al. (2019). "Membrane Processes for Microplastic Removal." Molecules **24**(22): 15.

Plastic pollution of the aquatic environment is a major concern considering the disastrous impact on the environment and on human beings. The significant and continuous increase in the production of plastics causes an enormous amount of plastic waste on the land entering the aquatic environment. Furthermore, wastewater treatment plants (WWTPs) are reported as the main source of microplastic and nanoplastic in the effluents, since they are not properly designed for this purpose. The application of advanced wastewater treatment technologies is mandatory to avoid effluent contamination by plastics. A concrete solution can be represented by membrane technologies as tertiary treatment of effluents in integrated systems for wastewater treatment, in particular, for the plastic particles with a smaller size (< 100 nm). In this review, a survey of the membrane processes applied in the plastic removal is analyzed and critically discussed. From the literature analysis, it was found that the removal of microplastic by membrane technology is still insufficient, and without the use of specially designed approaches,

with the exception of membrane bioreactors (MBRs).

Poertner, L., et al. (2009). "Activation of T- and NK- cells through CD19xCD3 and CD19xCD16A bispecific TandAb antibodies in patients with B-cell non-Hodgkin's lymphoma." Blood. Conference: 51st Annual Meeting of the American Society of Hematology, ASH. New Orleans, LA United States. Conference Publication: **114**(22).

Purpose: Bispecific, tetravalent.antibodies (TandAbs) directed against the B-cell-surface marker CD19 and activating receptors on T or NK cells (CD19xCD3 or CD19xCD16b) have shown promising effects in vitro and in preclinical studies. The present study examines their effects on the cytotoxic responses of viable T and NK cells isolated from patients with B-cell Non Hodgkin Lymphoma (NHL). Method(s): Peripheral Blood MNCs were obtained from 30 patients with B-NHL (High grade=6, low grade=24) after successful prior therapy and from 17 healthy donors (HD) and were enriched for NK cells by immunomagnetic separation with CD56-microbeads, the other one was enriched for T cells. After overnight stimulation (RPMI-1640 with 10% FCS, 1% Pen/Strep and human recombinant IL-2 (Novartis) (NK: 1000U/ml; T: 100U/ml) cells were stained with CD107a, a surface marker indicating cytotoxicity. Cells were exposed to K562 alone, to Raji cells alone and finally to the TandAbs CD19xCD3 (T cells) or CD19xCD16A (NK cells) (conc. 1mug/ml). Using FACS analysis we determined the percent fraction of activated CD3 or CD56 cells being positive for CD107a. Result(s): To look for functional NK cells and T cells of HD and NHL patients first we exposed the cells to the K562 cell line. Both groups, HD and NHL patients expressed CD107a similarly (NK: 27.7+/-12.0% vs. 28.5+/-14.6%; T: 9.75+/-7.1% vs. 8.1+/-5.7%), indicating functional NK and T cells. To observe if NK or T cells would upregulate CD107a expression when exposed to lymphoma cells alone we performed experiments with Raji cells and measured the CD107a response. NK cells of both, patients and HD responded with similar levels of CD107a expression. T-cells of patients showed more cytotoxic activity towards Raji cells than observed in HD (3.1+/-8.4% vs. 0.1+/-0.2%). Next we added the CD19xCD3 or the CD19xCD16 TandAb to T/NK cells in the presence of Raji cells. In the patients' NK-cell-population the fraction of activated cells increased from 10.7% (Raji cells alone) to 30.7+/-19.2% when TandAb was added. The mean reaction in the group of HD was increased from 9.2% up to 27.7%. CD107a expression of T cells from NHL patients increased from 3.1% when exposed to Raji alone up to 21.3+/-14.3% when TandAb was added which was comparable to the results of HD (19.6%+/-11.4%). Conclusion(s): Patients with NHL have functional intact effector cells which show cytotoxic activity in response to TandAbs in presence of lymphoma cells similar to that of HD. These TandAb antibodies are therefore suitable for patients with B-cell NHL as potential maintenance therapy.

Poggi, E., et al. (2013). "Interpreting the results of luminex-single antigen beads assay." Tissue Antigens **81 (5)**: 327.

Anti-human leukocyte antigen (HLA) antibodies are produced by alloimmunization resulting from transfusions, pregnancies or transplants. The recent introduction of the Luminex-single antigen (LSA) beads (a solid phase assay which consists of microbeads coated with recombinant HLA antigens) greatly enhanced antibody characterization of patients on transplant waiting lists. Using this assay, many authors reported the presence of HLA antibodies in patients who have never been alloimmunized. These findings might be due to denatured HLA molecules coated to some beads that could give rise to positive results of unknown clinical significance. Otherwise, the detected HLA antibodies might be produced to cross-reactive epitopes found in microorganisms or ingested proteins. The aim of the study was to characterize the 'kind' of LSA-detected antibodies, using the new iBeads assay (microbeads with a reduced amount of

denatured HLA class I antigens), in serum samples from 30 HLA class I positive patients: 20 patients were non-alloimmunized and the remaining 10 had received sensitizing events that determined production of antibodies with low fluorescence intensity values. Eight of the 20 non-alloimmunized patients showed iBeads negative results, that is to say that these patients had produced antibodies specific for denatured HLA molecules. Twelve non-alloimmunized patients showed iBeads positive results that might be related to an immune response to epitopes shared between HLA and other proteins. Four of the 10 immunized patients showed iBeads negative results and consequently they could not be considered as 'HLA alloimmunized patients', 6 immunized patients had HLA antibodies that reacted positively with iBeads. In conclusion our findings demonstrated that LSA assay was able to detect not only different 'kinds' of HLA reactive antibodies such as alloantibodies, but also antibodies specific for denatured HLA molecules or for cross-reactive epitopes whose clinical relevance has to be investigated. Finally, it is mandatory to discriminate between these different LSA-detected antibodies to define the real immunologic risk of a potential organ transplant.

Poirier, R., et al. (1976). "Comparison between the use of a scintiscanner and angiography in the exploration of pulmonary circulation during primitive bronchial carcinoma. [French]." Revue Francaise des Maladies Respiratoires **4**(12): 963-968.

This study deals with 60 observations of patients with bronchial carcinoma (59 primitive, the majority of which were hilar, localized on the large bronchi; one was secondary). All patients had a double exploration of their pulmonary vascular network: scanning with macro-aggregates labelled with 131 Iodine or with 99 technetium, or with micro-beads of technetium-labelled albumin and angiography by opacification of the blood stream performed on the right side. A comparison of these two investigation techniques was satisfying enough; however, there was some contradiction and the scanning sometimes leads to an overestimation of the reduction in perfusion. Angiography seems more discriminating with respect to the localization of the circulatory cutoff or of blood reflux (complete amputation of a trunk or arterial branch-incomplete stenosis, reduction of capillary bed, etc.). A comparison of the results with the same patients using a scintiscanner and angiography shows the numerous problems involved in pathogenic interpretation of the observed disturbance, which varied according to the lesion in question and the methods used (for instance with scintiscanner, embolus of macro-aggregates or beads, perfusion of these same products; with angiography, injection of an opaque product by massive embolus at the periphery with one or two sites, injection after catheterization of venous sinus or pulmonary artery or one of its branches, etc.). An attempt to quantitatively evaluate the data is presented in reference to these 60 cases. The authors discuss these differences which are mainly due to the principle of the two methods (capillary embolization by bolus of macro-aggregates in the case of scintiscanning: opacification following the bloodstream in the case of angiography). They insist on the subjective nature of this comparison; the quantification of the results if possible only with the scintiscanner.

Poirier, Y., et al. (1995). "Production of polyhydroxyalkanoates, a family of biodegradable plastics and elastomers, in bacteria and plants." Bio/technology (Nature Publishing Company) **13**(2): 142-150.

In response to problems associated with plastic waste and its effect on the environment, there has been considerable interest in the development and production of biodegradable plastics. Polyhydroxyalkanoates (PHAs) are polyesters that accumulate as inclusions in a wide variety of bacteria. These bacterial polymers have properties ranging from stiff and brittle plastics to rubber-like materials. Because of their inherent biodegradability, PHAs are regarded as an attractive source of nonpolluting plastics and elastomers that can be used for specialty and commodity products. The possibility of producing PHAs in large scale and at a cost comparable to synthetic plastics has arisen from the demonstration of PHA accumulation in transgenic Arabidopsis plants expressing the bacterial PHA biosynthetic genes. Synergism between knowledge of the enzymes and genes contributing to PHA synthesis in bacteria and engineering of plant metabolic pathways will be necessary for the development of crop plants that produce biodegradable plastics.

Pok, K. Y., et al. (2012). "Cytokine changes in adult dengue hemorrhagic fever." International Journal of Infectious Diseases **16 (SUPPL.1)**: e93.

Background: Dengue, which is hyperendemic in tropical and subtropical countries, can cause severe plasma leakage, bleeding, and organ impairment. Cytokines associated with disease severity may serve as useful biomarkers for predicting disease outcome. Method(s): From our primarily dengue virus 1-infected adult cohort, we collected blood from 220 polymerase chain reaction (PCR)-positive patients at clinical presentation in 2004-43 with dengue hemorrhagic fever (DHF by World Health Organization 1997 criteria) and 177 with dengue fever (DF). Samples were tested for dengue antibodies IgG/IgM to differentiate between primary and secondary infection. Viral load was approximated using the threshold cycle of dengue real-time PCR, and the multiplex microbead immunoassay was used to quantify 18 different growth factors and cytokines. Result(s): Interferon alpha (IFNalpha) levels were elevated in DHF versus DF patients (22.61 pg/ml vs. 11.32 pg/ml; p = 0.04). Among those who presented during days 1-4 of illness, interleukin 6 (IL6), IL8, IL10, soluble IL2 receptor, and transforming growth factor alpha were significantly higher in DHF versus DF patients. During days 5-7, IFNalpha was significantly higher while IFN gamma (IFNgamma) was lower in DHF versus DF. When comparing secondary to primary infections, IL10 was increased by a factor of 3.07 (p = 0.001), IFNalpha was decreased by 1.54 (p = 0.02), and viral load decreased by 3.21 (p = 0.03). IFNalpha levels were greater in patients with mucosal bleeding versus those without (18.04 pg/ml vs. 11.29 pg/ml; p = 0.04).Among those with hypotension, IL12 p70 was higher than normotensive patients (1.58 pg/ml vs. 0.15 pg/ml; p = 0.03). Conclusion(s): In our adult cohort in Singapore, IFNalpha was expressed prominently in DHF compared to non-DHF patients. Other interleukins and TGFalpha significantly differed between DHF and non-DHF patients in early illness as well.

Poli, C., et al. (2015). "Plastic ingestion by sea turtles in Paraiba State, Northeast Brazil." Iheringia, Serie Zoologia **105**(3): 265-270.

Currently, plastics are recognized as a major pollutant of the marine environment, representing a serious threat to ocean wildlife. Here, we examined the occurrence and effects of plastic ingestion by sea turtles found stranded along the coast of Paraiba State, Brazil from August 2009 to July 2010. Ninety-eight digestive tracts were examined, with plastic found in 20 (20.4%). Sixty five percent (n=13) of turtles with plastic in the digestive tract were green turtles (Chelonia mydas), 25% (n=5) were hawksbills (Eretmochelys imbricata), and 10% (n=2) were olive ridley (Lepidochelys olivacea). More plastic was found in the intestine (85%) than in other parts of the gastrointestinal tract. We observed complete blockage of the gastrointestinal tract due to the presence of plastic in 13 of the 20 turtles that had ingested plastic. No correlation was found between the curved carapace length (CCL) and the number or mass of the plastic ingested items. Significant differences were found between the intake of hard and soft plastic and the ingestion of white/transparent and colored plastic, with soft and white/transparent plastics being more commonly ingested. This study reveals the serious problem of plastic pollution to sea turtles at the area.

Poli, F., et al. (2009). "Clinical relevance of human leukocyte antigen antibodies in kidney transplantation from deceased donors: The North Italy Transplant program approach." Human Immunology **70**(8): 631-635.

At the North Italy Transplant Program (NITp) Reference Center, which is responsible for pre- and posttransplant immunological evaluation and organ allocation, the sera of patients who enter the kidney waiting list are analyzed with complement dependent cytotoxicity (CDC) and a microbead array technique (Luminex). At present, the NITp waiting list includes 2543 patients. The rate of patients with a percentage panel-reactive antibody (PRA) >=30 with CDC is about 8%; among them, 1% exhibits a %PRA >=85. Furthermore, 14% of patients have antibodies detectable only with Luminex. The overall 5-year graft survival in the period 1997-2008 is 85%, whereas that of individuals with a CDC %PRA >=30 is 80.1% (p = 0.0355). A retrospective analysis on the effect of Luminex-detected anti-human leukocyte antigen (HLA) antibodies has suggested that there is a posttransplant immunological response in Luminex-positive patients that can slowly produce kidney damage. Here we present the NITp current policy for the screening and identification of anti-HLA antibodies in relation to kidney allocation algorithm and the authors' view on some aspects of discussion. © 2009 American Society for Histocompatibility and Immunogenetics.

Polonenko, D. R. and G. A. Maclachlan (1984). "Plasma-membrane sheets from pea protoplasts." Journal of Experimental Botany **35**(158): 1342-1349.

Stable protoplasts isolated from apices of 8-day-old etiolated seedlings of pea cv. Alaska were used to prepare sheets of plasma membrane by the following method: positively-charged silica microbeads were bound to the negatively-charged surfaces of intact protoplasts, exposed surfaces of the microbeads were neutralized and the protoplasts were lysed in a hypotonic buffer. Bead-plasma membrane sheets were pelleted by low speed centrifugation and shown by electron microscopy to be free of contamination from intracellular components.

Poma, A., et al. (2019). "In Vitro Genotoxicity of Polystyrene Nanoparticles on the Human Fibroblast Hs27 Cell Line." Nanomaterials **9**(9): 11.

Several studies have provided information on environmental nanoplastic particles/debris, but the in vitro cyto-genotoxicity is still insufficiently characterized. The aim of this study is to analyze the effects of polystyrene nanoparticles (PNPs) in the Hs27 cell line. The viability of Hs27 cells was determined following exposure at different time windows and PNP concentrations. The genotoxic effects of the PNPs were evaluated by the cytokinesis-block micronucleus (CBMN) assay after exposure to PNPs. We performed ROS analysis on HS27 cells to detect reactive oxygen species at different times and treatments in the presence of PNPs alone and PNPs added to the Crocus sativus L. extract. The different parameters of the CBMN test showed DNA damage, resulting in the increased formation of micronuclei and nuclear buds. We noted a greater increase in ROS production in the short treatment times, in contrast, PNPs added to Crocus sativus showed the ability to extract, thus reducing ROS production. Finally, the SEM-EDX analysis showed a three-dimensional structure of the PNPs with an elemental composition given by C and O. This work defines PNP toxicity resulting in DNA damage and underlines the emerging problem of polystyrene nanoparticles, which extends transversely from the environment to humans; further studies are needed to clarify the internalization process.

Pomponi, D., et al. (2012). "Allergen micro-bead array for IgE detection: a feasibility study using allergenic molecules tested on a flexible multiplex flow cytometric immunoassay." PLoS ONE [Electronic Resource] **7**(4): e35697.

BACKGROUND: Allergies represent the most prevalent non infective diseases worldwide. Approaching IgE-mediated sensitizations improved much by adopting allergenic molecules instead of extracts, and by using the micro-technology for multiplex testing.

OBJECTIVE AND METHODS: To provide a proof-of-concept that a flow cytometric bead array is a feasible mean for the detection of specific IgE reactivity to allergenic molecules in a multiplex-like way. A flow cytometry Allergenic Molecule-based micro-bead Array system (ABA) was set by coupling allergenic molecules with commercially available micro-beads. Allergen specific polyclonal and monoclonal antibodies, as well as samples from 167 allergic patients, characterized by means of the ISAC microarray system, were used as means to show the feasibility of the ABA. Three hundred and thirty-six sera were tested for 1 or more of the 16 selected allergens, for a total number of 1,519 tests on each of the two systems.

RESULTS: Successful coupling was initially verified by detecting the binding of rabbit polyclonal IgG, mouse monoclonal, and pooled human IgE toward three allergens, namely nDer s 1, nPen m 1, and nPru p 3. The ABA assay showed to detect IgE to nAct d 1, nAct d 11, rAln g 1, nAmb a 1, nArt v 3, rBet v 1, rCor a 1, nCup a 1, nDer p 1, nDer s 1, rHev b 5, nOle e 1, rPar j 2, nPen m 1, rPhl p 1, and nPru p 3. Results obtained by ABA IgE testing were highly correlated to ISAC testing ($r = 0.87$, $p<0.0001$). No unspecific binding was recorded because of high total IgE values.

CONCLUSION: The ABA assay represents a useful and flexible method for multiplex IgE detection using allergenic molecules. As also shown by our initial experiments with monoclonals and polyclonals, ABA is suitable for detecting other human and non-human immunoglobulins.

Poncelet, D., et al. (1994). "A parallel plate electrostatic droplet generator: Parameters affecting microbead size." Applied Microbiology and Biotechnology **42**(2-3): 251-255.

Polymer microbead production by parallel plate electrostatic extrusion is presented. Factors affecting microbead size such as needle gauge, electrostatic potential, distance between needle and collecting solution, and polymer solution concentration and flow rate were evaluated. Smaller microbeads resulted from reduced needle diameter, reduced needle to collecting solution distance, increased electrostatic potential, and reduced polymer solution concentration and flow rate. In terms of process scale-up, it was shown that a multi-needle (20) device could continuously produce relatively uniform beads via electrostatics. The technology was demonstrated to be feasible for cell encapsulation or immobilization as there was no detectable effect of applied potential on Spodoptera frugiperda viability.

Ponchel, F., et al. (2015). "Naive and memory CD4⁺T-cell DNA methylation profile in RA." Annals of the Rheumatic Diseases **1)**: A9-A10.

Introduction Several abnormal features of T-cell responses are observed in RA. These range from MHC disease association, repertoire distortion, compromised thymic activity, accelerated ageing, abnormal signalling, formation of secondary ectopic lymphoid structure. More recently the RA genetic predisposition has been shown to reside mostly in T-cell related genes. We investigated DNA methylation profiles in naive and memory T-cells isolated from healthy controls and RA patients to identify additional levels of regulation in T-cell functionalities. Methods 6 HC and 10 RA patients (5 ACPA+) were recruited. 30 ml of EDTA blood was collected and naive and memory Tcells purified using cell sorting. DNA was extracted and treated for bi-sulfite conversion. A 450k micro-bead array (Illumina) was used to investigate genome-wide DNA methylation. QA/QC procedure included inspection of beta-value density plots generated using the "minfi" R package. Results 30/32 samples passed QA/QC procedure. Signal from methylated and un-methylated probes was normalised and converted in to M values using the "minfi" package. M values were analysed using t-tests in the "gene filter" R package.

Multidimentional scaling analysis clearly separated naive from memory cells suggesting that the phenotype of the cells (notably between two CD4⁺ subsets) is essential for the detection of disease specific changes. Memory cell analysis revealed 37050 differentially methylated positions between health and RA and 36750 for naive cells (P <= 0.05). We selected the top 1000 most significant differences for both subsets and compared them. Surprisingly only 180 positions were common to the 2 subsets but importantly included 5 positions for the IL-6 gene, 15 for histone deacethylation-4 (HDAC4), 26 in Wnt3/Frizzle8 and homeobox-1 pathway and 43 in various transcription factors (notably FoxP1) all suggestive of a strong disease effect. Memory cells showed additional differential methylation of positions near genes such SMAD 2/7, p21-CIP-1, FGFR-3, HSP70 and TNFR-member-13. Naive cells showed similar differential methylation but for different members of these gene families (TNFR-I, TGFR-3, FGFR-1, HSP40) in addition to other specific genes such as interferon regulator 1, SUMO-1, several PAX transcription factors, P-selectin and importantly the IL-17R. Conclusion These pilot data demonstrate that there are important differences in the methylation of DNA between RA patients and HC that can be identified in relevant pathways provided cells are separated into the same phenotype (naive vs. memory) even if from the same lineage (both CD4⁺T-cells).

Pongstabodee, S., et al. (2008). "Combination of three-stage sink-float method and selective flotation technique for separation of mixed post-consumer plastic waste." Waste Management **28**(3): 475-483.

The aim of this research was to separate the different plastics of a mixed post-consumer plastic waste by the combination of a three-stage sink-float method and selective flotation. By using the three-stage sink-float method, six mixed-plastic wastes, belonging to the 0.3-0.5 cm size class and including high density polyethylene (HDPE), polypropylene (PP), polyvinylchloride (PVC), polystyrene (PS), polyethylene terephthalate (PET) and acrylonitrile-butadiene-styrene copolymers (ABS) were separated into two groups, i.e., a low density plastic group (HDPE and PP) and a high density plastic group (PET, PVC, PS and ABS) by tap water. Plastic whose density is less than that of the medium solution floats to the surface, while the one whose density is greater than that of the medium solution sinks to the bottom. The experimental results elucidated that complete separation of HDPE from PP was achieved by the three-stage sink-float method with 50% v/v ethyl alcohol. To succeed in the separation of a PS/ABS mixture from a PET/PVC mixture by the three-stage sink-float method, a 30% w/v calcium chloride solution was employed. To further separate post-consumer PET/PVC and PS/ABS based on plastic type, selective flotation was carried out. In order to succeed in selective flotation separation, it is necessary to render hydrophilic the surface of one or more species while the others are kept in a hydrophobic state. In flotation studies, the effects of wetting agent, frother, pH of solution and electrolyte on separation were determined. The selective flotation results showed that when using 500 mg l(-1) calcium lignosulfonate, 0.01 ppm MIBC, and 0.1 mg l(-1) CaCl2 at pH 11, PET could be separated from PVC. To separate ABS from PS, 200 mg l(-1) calcium lignosulfonate and 0.1 mg l(-1) CaCl2 at pH 7 were used as a flotation solution. Wettability of plastic increases when adding CaCl2 and corresponds to a decrease in its contact angles and to a reduction in the recovery of plastic in the floated product.

Poonyakan, A., et al. (2018). "Potential Use of Plastic Wastes for Low Thermal Conductivity Concrete." Materials **11**(10): 11.

The use of plastics has increased over the years, thus resulting in a large volume of plastic waste being generated and accumulated in the environment. Due to its non-biodegradability and persistence, recycling processes have become one of the sustainable solutions for preventing

environmental deterioration. Plastic wastes, including high density polyethylene (HDPE), low density polyethylene (LDPE), polypropylene (PP), and polyethylene terephthalate (PET), were collected from industrial sector and used as additional ingredients to improve concrete properties. Prior to concrete processing, an increase in wettability of plastic fibers using nonionic surfactant, Dehydol LS-12, was investigated. At the optimal concentration of 10 times of the critical micelle concentration (CMC), an interfacial tension and a contact angle were reduced to 31-32 mN/m and 65degree-68degree, respectively. Properties of concrete were determined and compared to those of the mortar samples. Porosity was found to increase with higher volume fraction of plastic fibers, whereas decreases in workability, bulk density, thermal conductivity, splitting tensile strength, and compressive strength were encountered. The lowest thermal conductivity was recorded for concrete samples prepared with 30% by volume of LDPE fibers, and the rest in descending order were HDPE, PP, and PET, respectively. Furthermore, the maximal inclusions of plastic fibers were 5% for HDPE and LDPE, 10% for PP, and 50% for PET so as to satisfy the precast concrete wall requirements.

Porter, A., et al. (2019). "The sea urchin Paracentrotus lividus as a bioeroder of plastic." Science of the Total Environment **693**(133621).

It is increasingly recognised that plastic pollution of the marine environment is highly dynamic in nature. Larger plastic items are fragmented or eroded into smaller and smaller pieces as its moves through marine ecosystems and small particles can be fouled or flocculate into larger aggregates. Whilst physical processes play a major part in photo- and oxidative degradation of plastic debris, biological process may also contribute to the breakdown of larger plastic items into smaller particulates, yet this has not been studied well to date. Here, we demonstrate the potential for the sea urchin Paracentrotus lividus to act as bioeroders of macroplastics. We found that urchins readily graze on a plastic surface, with this grazing activity generating microplastics, when held in experimental systems together. On average each urchin produced 91.7 (+or-33.8 pieces) smaller plastic pieces (118-15,797 micro m) from one macroplastic item over a ten day period. This plastic fragmentation by the urchins grazing activity was strongly influenced by the additional availability of natural food and by the presence of fouling of the macroplastic surface. Fragmentation of macroplastic by urchins dropped by 97% when urchins were exposed to virgin plastic in the presence of natural food (kelp). However, when macroplastic was biofouled urchins acted to fragment this plastic irrespective of the presence of additional food. The majority of fragments produced were negatively buoyant due to both the biofouling process and indeed the fouling by faecal matter, sinking to the bottom of the exposure systems. This smaller size range of plastic would then bioavailable to a much wider suite of species than the original macroplastic item; hence this bioerosion process has the potential to contribute to the transfer plastic fragments through benthic food webs.

Porter, B. and C. Wallerstein (2018). "'SAIL AGAINST PLASTIC' EXPEDITION RETURNS FROM ARCTIC." Resurgence & Ecologist(311): 6-6.

The article reports that group of filmmakers, campaigners and scientists have announced findings of expedition to study plastic pollution in island Svalbard and mentions analysis of discovery of microplastic samples in laboratory at University of Exeter.

Pospiskova, K., et al. (2013). "Magnetic particlesabased biosensor for biogenic amines using an optical oxygen sensor as a transducer." Mikrochimica Acta **180**(3): 311-318.

We have developed a fibre optic biosensor with incorporated magnetic microparticles for the determination of biogenic amines. The enzyme diamine oxidase from Pisum sativum was immobilized either on chitosan-coated magnetic microparticles or on commercial microbeads modified with a ferrofluid. Both the immobilized enzyme and the ruthenium complex were incorporated into a UV-cured inorganicaorganic polymer composite and deposited on a lens that was connected, by optical fibres, to an electro-optical detector. The enzyme catalyzes the oxidation of amines under consumption of oxygen. The latter was determined by measuring the quenched fluorescence lifetime of the ruthenium complex. The limits of detection for the biogenic amines putrescine and cadaverine are 25a30 ?mol?L?1, and responses are linear up to a concentration of 1 mmol L?1.

Possatto, F. E., et al. (2011). "Plastic debris ingestion by marine catfish: an unexpected fisheries impact." Marine Pollution Bulletin **62**(5): 1098-1102.

Plastic marine debris is a pervasive type of pollution. River basins and estuaries are a source of plastics pollution for coastal waters and oceans. Estuarine fauna is therefore exposed to chronic plastic pollution. Three important catfish species [Cathorops spixii (N=60), Cathorops agassizii (N=60) and Sciades herzbergii (N=62)] from South Western Atlantic estuaries were investigated in a tropical estuary of the Brazilian Northeast in relation to their accidental ingestion of plastic marine debris. Individuals from all three species had ingested plastics. In C. spixii and C. agassizii, 18% and 33% of individuals had plastic debris in their stomachs, respectively. S. herzbergii showed 18% of individuals were contaminated. All ontogenetic phases (juveniles, sub-adults and adults) were contaminated. Nylon fragments from cables used in fishery activities (subsistence, artisanal and commercial) played a major role in this contamination. These catfish spend their entire life cycles within the estuary and are an important feeding resource for larger, economically important, species. It is not yet possible to quantify the scale and depth of the consequences of this type of pollution. However, plastics are well known threat to living resources in this and other estuaries. Conservation actions will need to from now onto take plastics pollution into consideration.

Potocka, M., et al. (2019). "Plastic pollution affects American lobsters, Homarus americanus." Marine Pollution Bulletin **138**: 545-548.

This paper provides the first record of ingestion of plastic debris by American lobster, Homarus americanus. Plastics particles, identified as rubber pieces, were found in the stomachs of 3 from 17 individuals of lobsters kept in laboratory conditions. Debris had evidence of cuts, what suggest they were actively consumed.

Potreck, J. and P. B. Luppa (2019). "Influence of different bead sizes on the binding affinity of anti-factor VIII and von Willebrand factor as a new diagnostic tool." Journal of Laboratory Medicine **43 (4)**: eA38.

The motto of this year's DGKL conference is the classic modern motto "form follows function". It is not only the abandonment of ornaments in architecture that is described, but rather a description of an approach to perspective from which new materials and technologies have developed in the workshops of Bauhaus. In particular, interdisciplinary work and higher-level thinking can lead to new findings. Transferred to coagulation, this means that many parameters interact with different influencing factors. Only if a trouble-free expiration of all components takes place, the coagulation can run off and the bleeding is stopped. In hemophilia A, the complex coagulation process is disturbed by a lack of factor VIII. Patients with this disease cannot stop bleeding after injury, as well as spontaneous bleeding, especially in large joints. These circumstances affect the daily lives of patients in a massive way. Similar to classic modern, the focus in diagnostics should be placed on the overall picture. Long time the diagnostic considered only on the interaction of FVIII antibodies with FVIII. But the effect of FVIII, von

Willebrand factor (vWF) and anti-FVIII antibodies was neglected. All these parameters are in a direct interaction with each other. For this reason, we develop a special bead-based fluorescence assay to investigate the competition reaction between anti-FVIII antibody and vWF to FVIII as ligand in patient plasma. In order to visualize both parameter, two monoclonal detection antibodies against vWF and anti-FVIII was additionally added. With this structure we could already discover the first surprising findings. By using different bead sizes, we have seen that the VWF preferably binds to 7 mum beads; the vWF preferably binds to 13,5 mum beads. These findings were found both in the control plasma (Bethesda plasma pool) and in patient samples. We cannot yet explain the results to date, but it is thought that the influence of surface curvature, surface functionalization density, and electrostatic interactions play a role. These findings will be examined more closely in the near future. If the binding affinity of the vWF is shown to be influenced by the bead size, then this would be a new approach for the diagnostics of von Willebrand disease (vWD). Instead of using the elaborate multi-parameter analysis, a simpler and faster flow-cytometric method can be established. We take advantage of the property that the big vWF is bound disparately on microbeads of different sizes (from 7 to 20 mu m).

Potts, J. R., et al. (2013). "Circulating granulocyte survival is reduced in inactive alcohol-related cirrhosis." Nuclear Medicine Communications **34 (4)**: 363-364.

Purpose: Although neutrophil dysfunction is associated with chronic liver disease, peripheral blood granulocyte survival half-time (G-t<inf>1/2</inf>) has never been measured in cirrhosis. We aimed to determine G-t<inf>1/2</inf> in cirrhosis. Method(s): Seven subjects with inactive alcohol-related cirrhosis received ¹¹¹In-labelled mixed leucocytes. Blood was sampled over 24 h following administration and granulocytes isolated using a magnetic microbead technique selecting for the granulocyte marker CD15. CD15- associated activity was expressed as percentage of peak activity. G-t<inf>1/2</inf> was estimated from time points up to 10 h and compared with neutrophil half-time (N-t<inf>1/2</inf>) in 7 normal volunteers from a collaborating centre determined in samples up to 12 h using a similar technique that specifically selects neutrophils. Result(s): G-t<inf>1/2</inf> was 2.7+/-0.5 h compared with N-t<inf>1/2</inf> of 5.5+/-3.0 h (P=0.04). CD15-associated activity in 13/14 samples obtained >20 h were above the exponential fit (rate constant 0.23 h-1) to pooled values up to 10 h but the exponential fit to neutrophil-associated activity (0.13 h-1) passed close to late points. Transient rises were seen at 4-6 h in CD15-associated and neutrophil-associated activities in 4 patients and 4 normals, respectively. Conclusion(s): These data suggest neutrophil lifespan is reduced in cirrhosis. ¹¹¹In-labelled eosinophils are not responsible for the transient rise in CD15-associated activity but probably generate the CD15-associated clearance curve 'tail'.

Potts, J. R., et al. (2014). "In vivo circulating granulocyte lifespan is reduced in compensated cirrhosis." Journal of Hepatology **1)**: S73.

Background and Aims: Although granulocyte dysfunction is well described in cirrhosis, the in vivo lifespan of granulocytes in chronic liver disease has not previously been reported. The normal circulating granulocyte survival half-time (G-t<inf>1/2</inf>), determined using indium-111 (111In)-radiolabelled granulocytes, is approximately 7 h. We aimed to measure in vivo G-t<inf>1/2</inf> in inactive alcohol-related cirrhosis (ARC). Method(s): Sequential venous blood samples were obtained from abstinent subjects with ARC over 24h post injection (PI) of minimally manipulated 111In-radiolabelled autologous mixed leucocytes. Purified granulocytes were isolated from each sample using a magnetic microbead-antibody technique positively selecting for the marker CD15. Granulocyte-associated radioactivity was expressed relative to peak activity, plotted over time and G-t<inf>1/2</inf> estimated from data up to 12h PI. This was compared with normal neutrophil half-time (N-t<inf>1/2</inf>), determined using a similar method specifically selecting neutrophils in healthy controls at a collaborating centre. Result(s): Seven patients with ARC (6 male, aged 57.9+/-9.4yrs, all Child-Pugh class A) and seven normal controls (3 male, aged 64.4+/-5.6yrs) were studied. Peripheral blood neutrophil counts were similar in both groups (4.6+/-1.8x10⁹/l vs 4.0+/-1.6x10⁹/l respectively, p = 0.629). G-t<inf>1/2</inf> in ARC was significantly lower than N-t<inf>1/2</inf> in healthy controls (2.7+/-0.5 h vs 4.4+/-1.0 h, p = 0.002). Granulocyte and neutrophil-associated activities transiently rose in 4 patients from each group, typically earlier in ARC (4-6 h PI) than in controls (5-10 h PI), indicating recirculation of radiolabelled cells released from an unidentified focus. Conclusion(s): Reduced in vivo granulocyte lifespan in cirrhosis is a novel finding and potentially another mechanism for immune dysfunction in chronic liver disease. (Figure Presented).

Potts, J. R., et al. (2016). "Circulating granulocyte lifespan in compensated alcohol-related cirrhosis: a pilot study." Physiological Reports **4**(17): 09.

Although granulocyte dysfunction is known to occur in cirrhosis, in vivo studies of granulocyte lifespan have not previously been performed. The normal circulating granulocyte survival half-time (G - t1/2), determined using indium-111 ((111)In)-radiolabeled granulocytes, is ~7 h. In this pilot study, we aimed to measure the in vivo G - t1/2 in compensated alcohol-related cirrhosis. Sequential venous blood samples were obtained in abstinent subjects with alcohol-related cirrhosis over 24 h post injection (PI) of minimally manipulated (111)In-radiolabeled autologous mixed leukocytes. Purified granulocytes were isolated from each sample using a magnetic microbead-antibody technique positively selecting for the marker CD15. Granulocyte-associated radioactivity was expressed relative to peak activity, plotted over time, and G - t1/2 estimated from data up to 12 h PI This was compared with normal neutrophil half-time (N - t1/2), determined using a similar method specifically selecting neutrophils in healthy controls at a collaborating center. Seven patients with cirrhosis (six male, aged 57.8 +/- 9.4 years, all Child-Pugh class A) and seven normal controls (three male, 64.4 +/- 5.6 years) were studied. Peripheral blood neutrophil counts were similar in both groups (4.6 (3.5 - 5.5) x 10(9)/L vs. 2.8 (2.7 - 4.4) x 10(9)/L, respectively, P = 0.277). G - t1/2 in cirrhosis was significantly lower than N - t1/2 in controls (2.7 +/- 0.5 h vs. 4.4 +/- 1.0 h, P = 0.007). Transient rises in granulocyte and neutrophil-associated activities occurred in four patients from each group, typically earlier in cirrhosis (4-6 h PI) than in controls (8-10 h), suggesting recirculation of radiolabeled cells released from an unidentified focus. Reduced in vivo granulocyte survival in compensated alcohol-related cirrhosis is a novel finding and potentially another mechanism for immune dysfunction in chronic liver disease. Larger studies are needed to corroborate these pilot data and assess intravascular neutrophil residency in other disease etiologies.

Poulain, M., et al. (2019). "Small Microplastics As a Main Contributor to Plastic Mass Balance in the North Atlantic Subtropical Gyre." Environmental Science & Technology **53**(3): 1157-1164.

Estimates of cumulative plastic inputs into the oceans are expressed in hundred million tons, whereas the total mass of microplastics afloat at sea is 3 orders of magnitude below this. This large gap is evidence of our ignorance about the fate of plastics, as well as transformations and sinks in the oceans. One of the current challenges consists of identifying and quantifying plastic particles at the microscale, the small microplastics (SMP, 25-1000 mum). The aim of the present study is to investigate SMP concentration in count and in mass at the sea surface in the North Atlantic subtropical gyre during the sea campaign Expedition 7 th Continent. After

isolation, SMP were characterized by micro-Fourier-transform infrared spectroscopy. Microplastic distribution was modeled by a wind-driven vertical mixing correction model taking into account individual particle properties (dimension, shape and density). We demonstrate that SMP buoyancy is significantly decreased compared to the large microplastics (LMP, 1-5 mm) and consequently more susceptible to vertical transport. The uncorrected LMP concentration in count was between 13000 and 174000 pieces km⁻², and was between 5 and 170 times more abundant for SMP. With a wind-driven vertical mixing correction, we estimated that SMP were 300 to 70000 times more abundant than LMP. When discussing this in terms of weight after correction, LMP concentrations were between 50 and 1000 g km⁻², and SMP concentrations were between 5 and 14000 g km⁻².

Powell, M. K., et al. (1998). "Titration of a CD45-FITC conjugate to determine the linearity and dynamic range of fluorescence intensity measurements on lymphocytes." Cytometry **33**(2): 219-224.

To produce biologic calibrators for relative fluorescence intensity (RFI) measurements, we stained leukocytes with serial dilutions of CD45-FITC conjugate and processed them using our regular whole blood lysis procedure. Cells were stained with conjugate concentrations ranging from twice recommended to a million-fold lower. At the highest concentrations of conjugate, the RFI reached a plateau near the top of the third decade, indicating saturation of CD45 binding sites. As the concentration decreased, the RFI declined in a highly linear relationship between the dilution factor and the histogram channel number. For channel numbers corresponding to the lowest percentiles of the RFI distribution, linearity persisted down to the first half decade. The slope of this relationship revealed a true dynamic range of 4.5 decades, which was comparable to the value obtained with microbead standards calibrated in molecules of equivalent soluble fluorochrome (MESF). Our results suggest that the lower limit of linearity for fluorescence intensity from fluorescein isothiocyanate (FITC)-stained lymphocytes is below 500 MESF and that cellular autofluorescence is the major limiting factor in detecting and quantifying FITC-specific staining. This procedure provides an adroit way of characterizing the linearity and dynamic range of measurements for quantitative fluorescence cytometry using exactly the same matrix, stains, and preparation methods as those used for cellular analytes.

Pozo, K., et al. (2019). "Presence and characterization of microplastics in fish of commercial importance from the Biobio region in central Chile." Marine Pollution Bulletin **140**: 315-319.

In this study we have identified and characterized microplastic particles (MPs) found in six fish species of commercial importance in central Chile. The fish species belong to different trophic levels and were obtained from the oceanic and coastal habitats. To analyze MPs, the fish gastrointestinal content was extracted, analyzed and characterized using a microscopy equipped with Fourier-transform infrared spectroscopy (FT-IR). The MPs found in fish samples were mainly constituted by red microfibers (70-100%) with sizes ranging between 176 and 2842 micro m. Polyester, polyethylene (PE) and polyethylene terephthalate (PET) were identified as the prevalent polymers detected. The coastal species showed the presence of microfibers with a higher size and abundance (71%) compared to oceanic species (29%), suggesting there is a greater exposure risk. These findings are consistent with results found in other investigations worldwide. However, further research is still needed to accurately establish the potential exposure risk for the public consuming these fish and the impact of MPs in the Chilean fishery activities.

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Pozo, K., et al. (2020). "Persistent organic pollutants sorbed in plastic resin pellet - "Nurdles" from coastal areas of Central Chile." Marine Pollution Bulletin **151 (no pagination)**(110786).

Plastic resin pellets were collected from coastal areas (n = 7) of central Chile. Pellets were analyzed using Fourier-transform infrared spectroscopy for polymer identification and gas chromatography-mass spectrometry for Persistent Organic Pollutants (POPs) determination. Screened compounds were PBDEs (n = 10), PCBs (n = 7), and OCPs (n = 13). Pellets were only found at Lenga Beach (San Vicente Bay), which is likely influenced by the presence of industrial activities in the surrounding coastal area. The diameter of the pellets was 4.0 +/- 0.6 cm (n = 370), the color varied from white (32%) to yellowing (68%), and the most prevalent polymer identified was high-density polyethylene (99%). POPs concentrations (ng/g-pellet) ranged from 10 to 133 for 10PBDEs, from 3 to 60 for 7PCBs and between 0.1 and 7 for DDTs. Levels of POPs are consistent with other investigations around the world and highlight the sorbtion capacity of plastics resin pellets, and consequently transport of POPs into coastal environments. Copyright © 2019

Prata, J. C. (2018). "Airborne microplastics: Consequences to human health?" Environmental Pollution **234**: 115-126.

Microplastics have recently been detected in atmospheric fallout in Greater Paris. Due to their small size, they can be inhaled and may induce lesions in the respiratory system dependent on individual susceptibility and particle properties. Even though airborne microplastics are a new topic, several observational studies have reported the inhalation of plastic fibers and particles, especially in exposed workers, often coursing with dyspnea caused by airway and interstitial inflammatory responses. Even though environmental concentrations are low, susceptible individuals may be at risk of developing similar lesions. To better understand airborne microplastics risk to human health, this work summarizes current knowledge with the intention of developing awareness and future research in this area. [ABSTRACT FROM AUTHOR]

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Prata, J. C. (2018). "Microplastics in wastewater: State of the knowledge on sources, fate and solutions."

Marine Pollution Bulletin **129**(1): 262-265.

Microplastics are ubiquitous contaminants that could harm ecosystems. Wastewater contains microplastics and may lead to further contamination of the environment. This focus article presents a summary of current knowledge on microplastics in wastewater and possible solutions, suggesting current research needs.

Prata, J. C., et al. (2020). "An easy method for processing and identification of natural and synthetic microfibers and microplastics in indoor and outdoor air." MethodsX **7**: 1-9.

Microplastics and microfibers can contaminate every matrix, including in the atmosphere, thus leading to incidental inhalation. However, concentrations of airborne synthetic particle in indoor and outdoor environments are not well understood due to the complexities of sampling, sample processing and identification. This work aims at producing a simple protocol to determine the concentrations of airborne microplastics and fibers. This is accomplished by removing organic matter using hydrogen peroxide (H₂O₂), followed by removal of mineral matter by density separation with sodium iodide (NaI). Finally, identification of fibers into synthetic or natural under the stereomicroscope can be achieved following a diagram produced by systematically observing the most common textile fibers. This method produces a recovery rate of 94.4 % for spiked samples and has been proven suitable for environmental samples. *Fibers and microplastics in air are easier to identify after carbonaceous matter removal;*No loss of microfiber is expected from the solutions used;*Recovery rates of spiked samples is 94.4 %.

Prata, J. C., et al. (2019). "Methods for sampling and detection of microplastics in water and sediment: A critical review." TrAC - Trends in Analytical Chemistry **110**: 150-159.

Microplastics are widespread contaminants, virtually present in all environmental compartments. However, knowledge on sources, fate and environmental concentration over time and space still is limited due to the laborious and varied analytical procedures currently used. In this work we critically review the methods currently used for sampling and detection of microplastics, identifying flaws in study design and suggesting promising alternatives. This work provides insights on bulk sample collection, separation, digestion, identification and quantification, and mitigation of cross-contamination. The sampling of microplastics will improve in representativeness and reproducibility through the determination of bulk sample volume, filter's pore size, density separation and digestion solutions, but also through use of novel methods, such as the enhancement of visual identification by staining dyes, and the generalized use of chemical characterization. Copyright © 2018 Elsevier B.V.

Prata, J. C., et al. (2019). "Effects of microplastics on microalgae populations: A critical review." Science of the Total Environment **665**: 400-405.

Microplastics are persistent contaminants accumulating in the environment. Aquatic ecosystems have been studied worldwide, revealing ubiquitous contamination with microplastics. Microalgae, one of the most important primary producers in aquatic ecosystems, could suffer from microplastic contamination, leading to larger impacts on aquatic food webs. Nonetheless, little is known about the toxic effects of microplastics on microalgae populations. Thus, the objective of this review was to identify these effects and the impacts of microplastics on microalgae populations based on currently available literature, also identifying knowledge gaps. Even though microplastics seem to have limited effects on parameters such as growth, chlorophyll content, photosynthesis activity and reactive oxygen species (ROS), current environmental concentrations are not expected to induce toxicity. Even so, microplastics could disrupt population regulation mechanisms, by reducing the availability or absorption of nutrients (bottom-up) or reducing the population of predator species (top-down). Microplastics' properties can also influence the effects on microalgae, with smaller sizes and positive surface charges having higher toxicity. Therefore, more research is needed to better understand the effects of microplastics on microalgae, such as adaptation strategies, effects on population dynamics and microplastics properties influencing toxicity.

Prata, J. C., et al. (2020). "Environmental exposure to microplastics: An overview on possible human health effects." Science of the Total Environment **702**: 134455.

Microplastics are ubiquitous environmental contaminants leading to inevitable human exposure. Even so, little is known about the effects of microplastics in human health. Thus, in this work we review the evidence for potential negative effects of microplastics in the human body, focusing on pathways of exposure and toxicity. Exposure may occur by ingestion, inhalation and dermal contact due to the presence of microplastics in products, foodstuff and air. In all biological systems, microplastic exposure may cause particle toxicity, with oxidative stress, inflammatory lesions and increased uptake or translocation. The inability of the immune system to remove synthetic particles may lead to chronic inflammation and increase risk of neoplasia. Furthermore, microplastics may release their constituents, adsorbed contaminants and pathogenic organisms. Nonetheless, knowledge on microplastic toxicity is still limited and largely influenced by exposure concentration, particle properties, adsorbed contaminants, tissues involved and individual susceptibility, requiring further research.

Prata, J. C., et al. (2018). "Influence of microplastics on the toxicity of the pharmaceuticals procainamide and doxycycline on the marine microalgae Tetraselmis chuii." Aquatic Toxicology **197**: 143-152.

Microplastics and pharmaceuticals are considered ubiquitous and emergent pollutants of high concern but the knowledge on their effects on primary producers is still limited, especially those caused by mixtures. Thus, the goal of the present study was to investigate if the presence of microplastics (1-5mum diameter) influences the toxicity of the pharmaceuticals procainamide and doxycycline to the marine microalga Tetraselmis chuii. Bioassays (96h) to investigate the toxicity of those substances individually and in mixtures (i.e. microplastics-procainamide mixtures and microplastics-doxycycline mixtures) were carried out. Effect criteria were the average specific growth rate (growth rate) and chlorophyll a concentration (chlorophyll). EC₁₀, EC₂₀ and EC₅₀ were determined. Microplastics alone had no significant effects on growth rate up to 41.5mg/l, whereas chlorophyll was significantly reduced at 0.9 and 2.1mg/l of microplastics, but not at higher concentrations. The 96h EC₅₀ (growth rate and chlorophyll, respectively) determined for the other bioassays were: 104 and 143mg/l for procainamide alone; 125 and 31mg/l for procainamide in the presence of microplastics; 22 and 14mg/l for doxycycline alone; 11 and 7mg/l for doxycycline in the presence of microplastics. Significant differences (p<0.001) between the toxicity curves of each pharmaceutical alone and in mixture with microplastics were found for procainamide (chlorophyll), and doxycycline (both parameters). Thus, both pharmaceuticals were toxic to T. chuii in the low ppm range, and microplastics-pharmaceutical mixtures were more toxic than the pharmaceuticals alone. Very high decreases of doxycycline concentrations in test media were found, indicating degradation of the antibiotic. Thus, although the biological results are expressed in relation to doxycycline concentration, the effects were likely caused by a mixture of the parental compound and its degradation products. The concentrations of microplastics and pharmaceuticals tested (low ppm range) are higher than those expected to be found in waters of the most part of marine ecosystems (ppt or ppb ranges). However, considering the widespread contamination by microplastics and pharmaceuticals, the concentrations already found in waters, sediments and/or organism of heavily polluted areas, the long-term exposure (over generations) of wild populations to such substances in polluted ecosystems and the possibilities of bioaccumulation and toxicological interactions, these findings are of concern and further research on microplastics-pharmaceuticals toxicological interactions is needed.

Prata, J. C., et al. (2019). "A new approach for routine quantification of microplastics using Nile Red and automated software (MP-VAT)." Science of the Total Environment **690**: 1277-1283.

Microplastics are widespread contaminants in the environment. However, most identification protocols rely on long and subjective visual counting, which could be improved using staining dyes. Thus, the objective of this work is to identify the best staining dye protocol and create an objective and quick automated counting software for microplastics. Tests were conducted to identify the most appropriate of eight staining dye solutions and of six wavelengths for virgin and weathered synthetic polymers, textile fibers, natural organic matter and filters. Nile Red produced the best results (without interfering in infrared spectra) rendering microplastics fluorescent at 254 nm, but with limited number of fluorescent polymers, and at 470 nm (with orange filter), with fluorescence of plastics as well as natural organic matter (requiring a digestion step). Next, a script was developed in ImageJ for the automatic quantification and characterization in shape (fiber, fragment, particle) and size of fluorescent microplastics, the Microplastics Visual Analysis Tool (MP-VAT). MP-VAT was evaluated, producing recovery rates in the range of 89.0-111.1% in spiked filters under 470 nm. Furthermore, this package is accompanied by a script that sets a scale from a known filter diameter, MP-SCALE, and a script that allows user threshold setting, MP-ACT.

Prata, J. C., et al. (2019). "Effects of spatial and seasonal factors on the characteristics and carbonyl index of (micro)plastics in a sandy beach in Aveiro, Portugal." Science of the Total Environment **709**: 135892.

Coastal environments are highly contaminated with plastics of various sizes. In order to understand the distribution and factors influencing (micro)plastics contamination in the environment, sampling of a sandy beach in Costa Nova, Aveiro, Portugal, was conducted by collecting plastic particles and sediments for density separation in transects from the mean low tide line to the dunes, during wet and dry seasons. For surface collection, microplastics comprised 69.4% of plastics, presenting concentrations of 3-6 items m⁻² in the wet season, mostly polyethylene pellets carried ashore by storms, and <1 item m⁻² for dry season, lower due to less backwashing, were found. Collection of infrared spectra of these particles allowed characterization by polymer type and carbonyl index of all particles. Variations in carbonyl index were found to be related to season, site and particle color. Density separated microplastics, mostly fibers, presented 23 times higher concentrations than surface collection (22 microplastics kg⁻¹, 280 microplastics m⁻²), due to the identification of smaller sizes, and with higher concentrations in dry seasons, likely from accumulation in sediment and bathing season. Overall, different sampling methods allowed identification of different particle types and sizes, which may vary according to seasonal and spatial factors.

Prata, J. C., et al. (2019). "Solutions and Integrated Strategies for the Control and Mitigation of Plastic and Microplastic Pollution." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(13): 07.

Plastic pollution is generated by the unsustainable use and disposal of plastic products in modern society, threatening economies, ecosystems, and human health. Current clean-up strategies have attempted to mitigate the negative effects of plastic pollution but are unable to compete with increasing quantities of plastic entering the environment. Thus, reducing inputs of plastic to the environment must be prioritized through a global multidisciplinary approach. Mismanaged waste is a major land-based source of plastic pollution that can be reduced through improvements in the life-cycle of plastics, especially in production, consumption, and disposal, through an Integrated Waste Management System. In this review paper, we discuss current practices to improve life cycle and waste management of plastics that can be implemented to reduce health and environmental impacts of plastics and reduce plastics pollution. Ten recommendations for stakeholders to reduce plastic pollution include (1) regulation of production and consumption; (2) eco-design; (3) increasing the demand for recycled plastics; (4) reducing the use of plastics; (5) use of renewable energy for recycling; (6) extended producer responsibility over waste; (7) improvements in waste collection systems; (8) prioritization of recycling; (9) use of bio-based and biodegradable plastics; and (10) improvement in recyclability of e-waste.

Pravduk, A. I., et al. (2010). "Control rate slow freezing with ice nucleation preserves viability and capacity to multilineage differentiation of mesenchymal stromal cells encapsulated in alginate microbeads." Cryobiology **61 (3)**: 407.

Mesenchymal stromal cells (MSCs) have a unique capacity to multilineage differentiation that makes them attractive for regenerative medicine and tissue engineering. Encapsulation of MSCs in alginate microbeads is a novel approach of tissue engineering. The response of alginate encapsulated cells on cryopreservation factors can be different then in single cell suspension; therefore the influence of cryopreservation on survival and functions of cells encapsulated in alginate microbeads demands of detailed study. The purpose of this study was to investigate the effect of cryopreservation with dimethyl sulfoxide (ME<inf>2</inf>SO) on viability, metabolic activity and capacity to multilineage differentiation of MSCs encapsulated in alginate microbeads. Human adult bone marrow and fetal mesodermal tissues derived MSCs were isolated and expanded in vitro according to Ethical guidelines. Encapsulation was carried out by spraying MSCs suspended in sodium alginate to solution containing calcium ions. Cryopreservation media contain 5% or 10% of ME<inf>2</inf>SO and 10% fetal calf serum. Samples were frozen using three different protocols: conventional two steps slow cooling at 1 degreeC/min to -80 degreeC following immersion to LN2, one step rapid freezing by immediate immersion to LN2, three steps control rate slow cooling at 1 degreeC/min down to -40 degreeC with ice nucleation at -6.3 degreeC and then at 10 degreeC/min from -40 to -80 degreeC with subsequent immersion to LN2. Before thawing samples were stored in LN2 for 1 week. The viability of encapsulated cells was assessed by using confocal laser microscopy after live/dead staining. Metabolic activity of MSCs was assessed by Alamar blue test. Cell differentiation was carried out by culture in mediums containing appropriate supplements. Markers of differentiation were determined by biochemical and histological methods. In experiments with MSCs isolated from human tissues of mesodermal origin was shown that cryopreservation of alginate encapsulated cells included rapid freezing with 10% Me<inf>2</inf>SO resulted in change of alginate hydrogel optical properties and cell death (Viability mean 6 +/- 2%). Cryopreservation with slow two steps freezing allowed to considerably preserve the viability of alginate encapsulated MSCs (viability mean 79 +/- 3%). The response of alginate encapsulated MSCs on cryopreservation procedure during two steps slow freezing in the presence of 10% ME<inf>2</inf>SO did not considerably differ from single cell suspension (viability mean 84 +/-

2%). However, decline Me<inf>2</inf>SO concentration down to 5% resulted in a significant decrease of metabolic activity and viability of cells in microbeads as compared to single cell suspension. Maximal values of viability and metabolic activity of alginate encapsulated MSCs were obtained after cryopreservation in the presence of 10% of Me<inf>2</inf>SO included control rate slow freezing with ice nucleation. This protocol was applied for cryopreservation of alginate encapsulated bone marrow (BM) derived MSCs. After cryopreservation alginate encapsulated BM MSCs demonstrated high viability, metabolic activity and were able to induced differentiation in osteogenic, chondrogenic and adipogenic lineages similar to non-frozen cells in culture.Thus, control rate slow freezing with ice nucleation allows to preserve viability and capacity to multilineage differentiation of MSC encapsulated in alginate microbeads.

Praveen, R., et al. (2017). "Better management of alcohol liver disease using a 'microstructured synbox' system comprising L. plantarum and EGCG." PLoS ONE **12**(1).

Synergistic combination of probiotics with carbohydrate based prebiotics is widely employed for the treatment of various gut related disorders. However, such carbohydrate based prebiotics encourage the growth of pathogens and probiotics, equally. Aim of the study was (i) to explore the possibility of using epigallocatechin gallate (EGCG) a phenolic compound, as a prebiotic for L. plantarum; (ii) to develop and evaluate a microstructured synbox (microencapsulating both probiotic and EGCG together) in rat model of alcohol liver disease (ALD); and, (iii) to confirm whether the combination can address issues of EGCG bioavailability and probiotic survivability in adverse gut conditions. Growth enhancing effect of EGCG on L. plantarum (12.8+or-0.5 log ₁₀ units) was significantly (p<=0.05) better than inulin (11.4+or-0.38 log ₁₀ units), a natural storage carbohydrate. The formulated synbox significantly modulated the levels of alcohol, endotoxin, hepatic enzymes and restored the hepatoarchitecture in comparison to simultaneous administration of free agents. Additionally, using a battery of techniques, levels of various cellular and molecular markers viz. NF-kB/p50, TNF- alpha , IL12/p40, and signalling molecules TLR4, CD14, MD2, MyD88 and COX-2 were observed to be suppressed. Developed microbead synbox, as a single delivery system for both the agents showed synergism and hence, holds promise as a therapeutic option for ALD management.

Praveena, S. M., et al. (2018). "Exploration of microplastics from personal care and cosmetic products and its estimated emissions to marine environment: An evidence from Malaysia." Marine Pollution Bulletin **136**: 135-140.

This study aims understand microplastics from personal care and cosmetic products in Malaysia via quantification and characterization of microplastics together with emission estimation to marine environment. A total of 214 respondents from all over Malaysia were surveyed with identification of top ten personal care and cosmetic products usage. Particles found in facial cleaner/scrub and toothpaste were colored and colorless with majority of granular shapes. Particles in toothpaste were found between 3 and 145mum while particles in facial cleaner/scrub were found to be between 10 and 178mum, stipulating the presence of microplastics. Plastic polymers (LDPE and polypropylene) were found in all facial cleaner/scrub samples while only plastic polymers (LDPE) were present in toothpaste sample G. A total of 0.199 trillion microplastics are expected to be released annually to marine environment in Malaysia. Personal care and cosmetic products are seen as one of the microplastics sources for Malaysia and worldwide.

Pregibon, D. C. (2008). Enabling technologies for multiplexed biomolecule analysis and cell sorting.

The quantification and manipulation of biological entities from a physiological sample is extremely important for a broad range of applications in medical diagnostics, therapeutics, and basic science research. From a diagnostics standpoint, the cells, proteins, and nucleic acids that compose our bodies contain an enormous amount of information that can indicate the presence of, progression of, or even susceptibility to a given disease. However, extracting this information is often quite challenging. New tools are constantly being developed to make diagnostic testing more accurate, less invasive, faster, and less expensive. To this end, this thesis describes that advent of technologies to (1) precisely pattern biologically- and magnetically-active beads in hydrogel substrates for cell sorting and pattering, (2) synthesize morphologically and chemically-complex microparticles in a high-throughput fashion, and (3) perform rapid and accurate multiplexed biomolecule quantification using such particles. Bead-Patterned Hydrogels are a class of materials developed in this thesis that consist of microbeads precisely patterned in poly(ethylene glycol) (PEG) matrices. Using microfluidics and projection lithography on a standard microscope, magnetically-active or protein-decorated beads were patterned in close-packed or disperse-bead patterns on glass substrates with high resolution over large areas. Using slight alterations to the synthesis protocol, bead patterns could be completely encapsulated in a bio-inert PEG matrix, or exposed from the PEG surface. It was shown that bead-patterned hydrogels could be used for the phenotype-specific sorting or patterning of lymphocytes. As was observed in the synthesis of bead-patterned hydrogels, free-radical polymerization is inhibited near microfluidic channel walls due to oxygen diffusion through the porous poly dimethoxysilane (PDMS) elastomer composing devices. By exploiting this phenomenon using projection lithography in an all-PDMS device, Continuous-Flow Lithography was developed. In stark contrast to traditional methods for anisotropie particle synthesis, this one-phase process provides a simple method to synthesize microparticles with complex morphologies and/or multiple adjacent chemistries in a high-throughput fashion. The processes is broadly applicable to any free-radical reacting monomer. For improved resolution and sharpened interfaces between adjacent chemistries, Stop-Flow Lithography was implemented using a valve system to rapidly start and stop flow in a fluidic system. Flow lithography provided unprecedented control over particle shape, composition, and inclusion of multiple functionalities. Utilizing these attributes, Encoded Hydrogel Particles were synthesized bearing multiple functional regions including a graphical barcode and one or more DNA probe-loaded regions. These particles were used for multiplexed detection of deoxyribonucleic acid (DNA) and ribonucleic acids (RNA), affording virtually unlimited multiplexing capabilities, single-color detection, flow-through scanning in a microfluidic device, and low cost. Mathematical models were developed to understand the kinetics of hybridization depending on particle design and assay conditions. Using these models to direct optimization, the method was shown to give attomole-sensitivity, single-nucleotide specificity, and rapid hybridization kinetics. Overall, this thesis demonstrates the combination of hydrogels, lithography, and microfluidics to generate intricate substrates and particles that provide means for high-performance, low-cost bioseparations and molecular screening. (Copies available exclusively from MIT Libraries, Rm. 14-0551, Cambridge, MA 02139-4307. Ph. 617-253-5668; Fax 617-253-1690.)

Pregibon, D. C., et al. (2006). "Magnetically and biologically active bead-patterned hydrogels." Langmuir **22**(11): 5122-5128.

We present a new approach to the direct patterning of biologically and magnetically active microbeads in nonbiofouling polymer scaffolds for use in microfluidic devices. Briefly, the process involves treatment of a glass substrate, conformal contact bonding of a PDMS microchannel on the substrate, filling of the channel with beads and prepolymer solution, and

UV-initiated photopolymerization of a mask-defined pattern using a standard inverted microscope. This versatile and simple method allows for the rapid fabrication of dispersed or packed bead patterns in poly(ethylene glycol) (PEG) hydrogels that are covalently linked to glass surfaces. By exploiting the relative opacity of the microbeads used, we are able to create both partially exposed and fully encapsulated bead patterns. To demonstrate the utility of this new technology, we separated magnetic bead-bound B lymphocytes from T lymphocytes on a PEG-encapsulated magnetic filtration platform and also captured B cells directly on patterned, protein-decorated beads in a flow-through microfluidic device. Beyond cell sorting, the accurate patterning of industrially standardized, chemically diverse microbeads may have significant implications for microchip-based analyte detection.

Prendergast-Miller, M. T., et al. (2019). "Polyester-derived microfibre impacts on the soil-dwelling earthworm Lumbricus terrestris." Environmental Pollution **251**: 453-459.

Microplastic (MP) pollution is everywhere. In terrestrial environments, microfibres (MFs) generated from textile laundering are believed to form a significant component of MPs entering soils, mainly through sewage sludge and compost applications. The aim of this study was to assess the effect of MFs on a keystone soil organism. We exposed the earthworm Lumbricus terrestris to soil with polyester MFs incorporated at rates of 0, 0.1 and 1.0%w/w MF for a period of 35 days (in the dark at 15 degrees C; n=4 for each treatment). Dried plant litter was applied at the soil surface as a food source for the earthworms. We assessed earthworm vitality through mortality, weight change, depurate production and MF avoidance testing. In addition, we measured stress biomarker responses via the expression of metallothionein-2 (mt-2), heat shock protein (hsp70) and superoxide dismutase (sod-1). Our results showed that exposure and ingestion of MFs (as evidenced by subsequent retrieval of MFs within earthworm depurates) were not lethal to earthworms, nor did earthworms actively avoid MFs. However, earthworms in the MF1.0% treatment showed a 1.5-fold lower cast production, a 24.3-fold increase in expression of mt-2 ($p<0.001$) and a 9.9-fold decline in hsp70 expression ($p<0.001$). Further analysis of soil and MF samples indicated that metal content was not a contributor to the biomarker results. Given that burrowing and feeding behaviour, as well as molecular genetic biomarkers, were modulated in earthworms exposed to MFs, our study highlights potential implications for soil ecosystem processes due to MF contamination.

Prenen, H., et al. (2013). "Peripheral blood monocytes as biomarkers for colorectal cancer." Journal of Clinical Oncology. Conference **31**(15 SUPPL. 1).

Background: Peripheral blood monocytes (PBM) represent a reservoir of inflammatory cells that contribute to cancer progression. When recruited into tumors, monocytes give rise to either macrophages or dendritic cells. Tumor-derived soluble factors can influence the differentiation of tumor-associated macrophages (TAMs) and drive their phenotype to either tumoricidal (M1) or pro-tumorigenic macrophages (M2). We hypothesized that PBM might change their phenotype already when in circulation and can be used as potential markers for early diagnosis of colorectal cancer (CRC) and its progression to metastatic disease. Method(s): Monocytes were isolated by using magnetic microbeads conjugated to antibodies against CD14. In a monocentric training set we included 55 (27 non metastatic (NM), 38 metastatic (M)) untreated CRC patients. The third group included age and gender matched healthy volunteers (HV). Following RNA extraction, gene expression profiles of PBM were investigated by high throughput screening using Illumina. Statistical analysis was done on the microarray expression data to delineate a disease specific signature. A cut off was set to select the genes showing a minimum fold change of 1,5. A validation study was performed in three additional major

oncological centers throughout Europe. Result(s): There was a broad overlap in the gene signature of PBM from NM and M patients, indicating that this signature already exists in an early stage. Then we assessed the performance of the gene signature of cancer versus HV as diagnostic tool, in particular the sensitivity and specificity, which were remarkably high in the ROC analysis. Out of 40 differentially expressed genes, 21 genes were confirmed by qRT-PCR analysis on samples processed independently. In the validation study the number of genes was downsized to a 12 gene signature without loss of specificity and sensitivity. Conclusion(s): This first biomarker study of PBM in CRC suggests an 'imprinting' of PBM by the tumor in CRC patients. Since the imprinting profile might also be reversed, the PBM signature might not only be useful in CRC diagnosis, but also for the follow-up of treated CRC patients. Overall, our data offer new opportunities to develop a non-invasive test for CRC detection and monitoring.

Preobrazhensky, S. N. and D. W. Bahler (2009). "Immunomagnetic bead separation of mononuclear cells from contaminating granulocytes in cryopreserved blood samples." Cryobiology **59**(3): 366-368.

Density gradient centrifugation usually allows efficient separation of mononuclear cells from granulocytes using fresh human blood samples. However, we have found that with cryopreserved blood samples, density gradient centrifugation fails to separate granulocytes from mononuclear cells and have explored using immunomagnetic anti-CD15 microbeads as an alternate method to separate these cell populations. Using cryopreserved blood samples from 10 healthy donors we have shown that granulocytes express a significantly higher level of CD15 antigen than monocytes and lymphocytes, which allows for their efficient separation from mononuclear cells using anti-CD15 microbeads. This procedure is critical for purification of individual cell populations from cryopreserved leukocyte samples and could also potentially be applied to avoid granulocyte contamination of mononuclear cells isolated from stored blood and from patients with sepsis or thermal injury.

Prezioso, L., et al. (2013). "Haploidentical stem cell transplantation after negative depletion of T cells expressing the alfa-beta+ chain of the T-cell receptor (TCR) for adults with hematological malignancies." Haematologica **3)**: 165.

Premise. For many years,T cell depletion (TCD) of hematopoietic stem cells (HSCs) has been based on either positive or negative selection of mobilised peripheral blood cells (PBPCs). Selective elimination of + T cells has been recently performed to achieve a 4,5-5 log TCD and to retain in the graft NK, dendritic cells, monocytes and T lymphocytes.A rapid immunological reconstitution and very promising outcome were observed in pediatric patients.With the aims of confirming these results even in adults, we have recently launched this programme and here we report our preliminar clinical data. Methods. Eight patients, median age 40 yrs (range19-65), with AML(n=6), ALL(n=1)or HL(n=1) entered the study.Conditioning consisted of Treosulfan 12gr/sqm x3 days,Fludarabine 30mg/sqm x5 days,Thiotepa 5mg/Kgx2 days and ATG 1,5mg/kg x4 days. G-CSF was used to mobilize PBPCs from one-haplotype mismatched donors (3 mothers,4 brothers,1 cousin). Mobilized mononuclear cells were incubated with a biotinylated anti-TcR antibody and subsequently with an antibiotin antibody conjugated to magnetic microbeads(Miltenyi Biotec,Germany).Under a strong magnetic field,TcR T lymphocytes were retained,whereas all nonmagnetized cells were recovered. Short sirolimus(1mg/day x3 weeks)was used as GVHD prophylaxis in 3 cases whose grafts contained >2x10⁵/kg +Tcells. Results.Grafts contained a median of 14,4x10⁶/kg (range7- 15,7)CD34+ cells, 6,6x10⁶ CD3+Tcells/kg (range 2,14-13) with 19x10⁴/kg (SD 21,24) +T cells and 7,78x10⁶ Tcells/kg (range2,1-12,6), 0,08x10⁶ B cells/kg (range 0,003-0,32) and 24x10⁸ CD56+NKcells/kg (SD 1,04). All but one patient,who required a second graft from the same donor to boost hematopoietic reconstitution,achieved a full donor sustained engraftment. Median time to reach 500 neutrophils and 50,000 platelets was 13 (range 9-18) and 11 days(range 9-13),respectively. Two patients had skin grade I/II aGVHD. No patients has so far developed cGvHD. 100 CD4+cell/mcL were reached in a median of 60 days.Only 1 CMV reactivation occurred. Overall,3 patients have so far died (2 non-hematologic causes and 1 relapse).All were in relapse at transplant. Five survive event-free at a median follow-up of 92 days (range 30-163). Conclusions. The infusion of /CD19-depleted grafts was safe and effective also in adult setting,resulting into rapid donor engraftment and early expansion of donor-derived T lymphocytes,without life-threatening infectious complication.

Prezioso, L., et al. (2013). "Haploidentical stem cell transplantation after negative depletion of T cells expressing the alphabeta chain of the T-cell receptor (TCR) for adults with hematological malignancies." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Introduction For many years, T cell depletion (TCD) of hematopoietic stem cells (HSCs) has been based on either positive or negative selection of mobilised peripheral blood cells (PBPCs). After CD34+ cell selection, the T cell repertoire is very narrow since the number of T lymphocytes in the graft has to be particularly low to prevent GvHD and ATG in the conditioning exerts an additional in vivo T cell depletion. Thus the immune recovery is slow and patients tend to remain susceptible to opportunistic infections for several months after HSCT. To hasten and improve post-transplant immune reconstitution broad repertoire various strategies of adoptive donor T cell immunotherapy (e.g. engineering with a suicide gene; depleting alloreactivity by means of photodynamic purging or through the use of freshly purified regulatory T cells) have been investigated over the past years. More recently, selective elimination of alphabeta+ T cells has been performed to achieve a 4,5-5 log TCD and to retain in the graft NK, dendritic cells, monocytes and gammadeltaT lymphocytes. Under this approach, a rapid immunological reconstitution and very promising outcome have been reported in pediatric patients. With the aims of confirming these results even in adults, we have recently launched this programme and here we report our preliminar clinical data. Methods Thirteen patients, median age 40 years (range 19-65), with AML (n=9), ALL (n=2), HL (n=1) or Rhabdomyosarcoma (n=1) entered the study. All but two patients, who were in first remission, were in advanced-stage disease at transplant with five patients in chemoresistant relapse. Conditioning consisted of ATG 1,5 mg/kg from day -13 to day -10, Treosulfan 12gr/sqm from -9 to -7, Fludarabine 30mg/sqm from -6 to -2 and Thiotepa 5mg/Kg on days -5 and -4. Ten mug/kg G-CSF was used to mobilize PBPCs from one-haplotype mismatched donors (4 mothers, 4 brothers, 2 sisters, 1 son, 1 daughter and 1 cousin). Mobilized mononuclear cells were incubated with a biotinylated anti-TcRalphabeta antibody and subsequently with an antibiotin antibody conjugated to magnetic microbeads (Miltenyi Biotec, Germany). Under a strong magnetic field, TcRalphabeta T lymphocytes were retained, whereas all nonmagnetized cells were recovered. Short sirolimus (1mg/day x3 weeks) was used as additional GVHD prophylaxis in 3 cases whose grafts contained more than 2x105/kg alphabeta+Tcells. Results Grafts contained a median of 12,3x106/kg CD34+ cells(range7-19), 6 x106 CD3+Tcells/kg (range 2,3-13)with 10,4x104/kg alphabeta+T cells (range 1,38-62) and 5,8x106 gammadelta+Tcells/kg (range2,1-12,6), 6x104B cells/kg (range 0,2-32) and 34x108 CD56+NKcells/kg (range10-91). All but one patient, who required a second graft from the same donor to boost hematopoietic reconstitution, achieved a full donor sustained engraftment. Median time to reach 500 neutrophils and 50,000 platelets was 13 (range 9-18) and 11 days (range 9-13), respectively. Four patients had skin grade I/II aGVHD. No patients has so far developed chronic GvHD. Median CD4+ cell counts at 30, 60, 90 and 120 days since the

transplant were 33, 122, 190 and 251 n/mL, respectively. CMV reactivation occurred in only 2 cases (in one, CMV serology was unfavourable: CMV-negative donor/CMV-positive recipient). Overall, 3 patients have so far died (2 non-hematologic causes and 1 early relapse). Ten survive disease-free at a median follow-up of 104 days (range 30-178). Conclusions The infusion of alphabeta/CD19-depleted grafts was safe and effective also in adult setting, resulting into rapid donor hematopoietic engraftment and early expansion of donor-derived gammadeltaT lymphocytes, without life-threatening infectious complications.

Priesnitz, W. (2017). "Microfibers - How Your Clothes Could be Polluting the Oceans (and damaging your health)." Natural Life: 28-29.

The article offers information on impact of microfibers of the clothing on polluting the oceans. Topics discussed include microfibers are estimated to be responsible for over eighty percent of shoreline pollution around the world; it has been reported that polar fleece from recycled plastic has been found to release the most fiber; and dangers associated with microbeads in beauty products and property of observing the toxins like pesticides or organic pollutants by the microfibers.

Primiano, F. P., Jr., et al. (1984). "Measurement system for respiratory water vapor and temperature dynamics." Journal of Applied Physiology: Respiratory, Environmental & Exercise Physiology **56**(6): 1679-1685.

An instrumentation system has been developed to simultaneously measure water vapor and temperature at the same point within respiratory airways during breathing. A mass spectrometer was used to analyze gas continuously sampled through a modified inlet catheter. At the tip of the catheter, gas temperature is sensed by a microbead thermistor. Adequate water vapor dynamics is achieved by a two-step procedure. First, the tip of the sampling catheter is constricted to reduce the catheter's internal pressure and thereby prevent condensation and evaporation. Second, the water vapor signal from the mass spectrometer is compensated electronically to improve its transient response. As part of the evaluation of the system, water vapor and gas temperature were measured in the oropharynx of human subjects.

Pringle, J. K., et al. (2008). "Time-lapse geophysical investigations over a simulated urban clandestine grave." Journal of Forensic Sciences **53**(6): 1405-1416.

A simulated clandestine shallow grave was created within a heterogeneous, made-ground, urban environment where a clothed, plastic resin, human skeleton, animal products, and physiological saline were placed in anatomically correct positions and re-covered to ground level. A series of repeat (time-lapse), near-surface geophysical surveys were undertaken: (1) prior to burial (to act as control), (2) 1 month, and (3) 3 months post-burial. A range of different geophysical techniques was employed including: bulk ground resistivity and conductivity, fluxgate gradiometry and high-frequency ground penetrating radar (GPR), soil magnetic susceptibility, electrical resistivity tomography (ERT), and self potential (SP). Bulk ground resistivity and SP proved optimal for initial grave location whilst ERT profiles and GPR horizontal "time-slices" showed the best spatial resolutions. Research suggests that in complex urban made-ground environments, initial resistivity surveys be collected before GPR and ERT follow-up surveys are collected over the identified geophysical anomalies. © 2008 American Academy of Forensic Sciences.

Privalova, A., et al. (2015). "Biodegradable polyester-based microcarriers with modified surface tailored for tissue engineering." Journal of Biomedical Materials Research **103**(3): 939-948.

Microcarriers have been proposed in tissue engineering, namely for bone, cartilage, skin, vascular, and central nervous system. Although polyester-based microcarriers have been already used for this purpose, their surface properties should be improved to provide better cell growth. The goal of this study was to prepare microbeads based on poly(d,l-lactide) acid, poly(l-lactide) acid, and to study cell behavior (adhesion, spreading, growth, and proliferation) in function of microbead topography and surface chemistry. To improve L-929 fibroblasts adhesion, microbead surface has been modified with three polycations: chitosan, poly(2-dimethylamino ethylmethacrylate) (PDMAEMA), or chitosan-g-oligolactide copolymer (chit-g-OLA). Although modification of the microbead surface with chitosan and PDMAEMA was performed through physical adsorption on the previously prepared microbeads, chit-g-OLA copolymer was introduced directly during microbead processing. This simple approach (1) bypass the use of an emulsifier (polyvinyl alcohol, PVA); (2) avoid surface "contamination" with PVA molecules limiting a control of the surface characteristics. In vitro study of the growth of mouse fibroblasts on the microbeads showed that both surface topography and chemistry affected cell attachment, spreading, and proliferation. Cultivation of L-929 fibroblasts for 7 days resulted in the formation of a 3D cell-scaffold network. © 2014 Wiley Periodicals, Inc. J Biomed Mater Res Part A: 103A: 939-948, 2015.

Priyanka, M. and S. Dey (2018). "Ruminal impaction due to plastic materials - An increasing threat to ruminants and its impact on human health in developing countries." Veterinary World **11**(9): 1307-1315.

Ruminal impaction due to plastic materials is a condition, in which indigestible plastic foreign bodies accumulate in the rumen of ruminants leading to ruminal impaction, indigestion, recurrent tympany, and many other adverse health effects. It is caused by the indiscriminate feeding of ruminants on indigestible plastic waste materials. The disease is primarily noticed in stray animals residing in urban areas of developing countries. Ingested plastic materials in the rumen slowly release the chemicals in rumen fluid, which intern enter the food chain through milk and meat products. These chemicals have a detrimental effect on human health. At present, exploratory rumenotomy is the only choice for both diagnosis and treatment of ruminal impaction due to plastic materials in ruminants. Control measures include good animal husbandry practices and proper disposal of plastic waste materials. The present review discusses in depth about the epidemiology, pathophysiology, diagnosis, treatment, prevention, and control of ruminal impaction due to plastic materials in ruminants and also highlights its impact on human health.

Procter, J., et al. (2019). "Smells good enough to eat: dimethyl sulfide (DMS) enhances copepod ingestion of microplastics." Marine Pollution Bulletin **138**: 1-6.

Marine copepods have been shown to readily ingest microplastics - a crucial first step in the transfer of plastics into the marine food chain. Copepods have also been shown to elicit a foraging behavioural response to the presence of olfactory stimuli, such as dimethyl sulfide (DMS) - a volatile compound produced by their algal prey. Here, we show that the temperate Calanoid copepod Calanus helgolandicus displays enhanced grazing rates of between 0.7 and 3-fold (72%-292%) on microplastics that have been infused in a DMS solution, compared to DMS-free controls. Environmental exposure of microplastics may result in the development of an olfactory signature that includes algal-derived compounds such as DMS. Our study provides evidence that copepods, which are known to use chemosensory mechanisms to identify and locate dense sources of palatable prey, may be at an increased risk of plastic ingestion if it mimics the scent of their prey.

Prokopijevic, M., et al. (2017). "Tyramine-modified pectins via periodate oxidation for soybean hull peroxidase induced hydrogel formation and immobilization." Applied Microbiology & Biotechnology **101**(6): 2281-2290.

Pectin was modified by oxidation with sodium periodate at molar ratios of 2.5, 5, 10, 15 and 20 mol% and reductive amination with tyramine and sodium cyanoborohydride afterwards. Concentration of tyramine groups within modified pectin ranged from 54.5 to 538 mumol/g of dry pectin while concentration of ionizable groups ranged from 3.0 to 4.0 mmol/g of dry polymer compared to 1.5 mmol/g before modification due to the introduction of amino group. All tyramine-pectins showed exceptional gelling properties and could form hydrogel both by cross-linking of carboxyl groups with calcium or by cross-linking phenol groups with peroxidase in the presence of hydrogen peroxide. These hydrogels were tested as carriers for soybean hull peroxidase (SHP) immobilization within microbeads formed in an emulsion based enzymatic polymerization reaction. SHP immobilized within tyramine-pectin microbeads had an increased thermal and organic solvent stability compared to the soluble enzyme. Immobilized SHP was more active in acidic pH region and had slightly decreased K _m value of 2.61 mM compared to the soluble enzyme. After 7 cycles of repeated use in batch reactor for pyrogallol oxidation microbeads, immobilized SHP retained half of the initial activity.

Provencher, J. F., et al. (2019). "Assessing plastic debris in aquatic food webs: what we know and don't know about uptake and trophic transfer." Environmental Reviews **27**(3): 304-317.

Plastic pollution is now recognized as a global environmental issue that can affect the health of biota and ecosystems. Now that a growing number of species and taxa are known to ingest a diverse range of sizes and types of plastics and retain the plastics in their guts, there are increasing questions relating to the movement of plastics through food webs, and how biota may directly and indirectly ingest plastics. Here, we synthesize what is known from the published, peer-reviewed literature about plastic ingestion by animals and identify critical gaps in our knowledge. We systematically reviewed and examined the literature for studies that reported ingested plastics in marine and freshwater biota at a global scale. Our objective was to inform discussions and future studies regarding what we know about plastic ingestion and fate in food webs. We assessed what regions, ecosystems, and food webs have been studied to date and whether potential information may already be available to assess if trophic transfer of plastics may be occurring. We found 160 relevant publications through 2016. Most studies were concentrated in specific regions and in specific ecosystem types, with freshwater studies being the most limited. Moreover, most studies examined one species at a time with only a handful of regions with multiple taxa examined across multiple studies. Twenty-one percent of the regions have no published data on plastic ingestion to date. Although some studies have measured ingestion in multiple species across trophic levels, few have tested the hypothesis that plastics are transferred across trophic levels. Moreover, none have addressed questions related to biomagnification. While our review suggests that numerous papers have recorded the ingestion of plastics by biota across many trophic levels, habitats, and geographic regions, many questions regarding how or whether biota retain, bioaccumulate, biomagnify, and trophically transfer plastics still need to be addressed.

Provencher, J. F., et al. (2020). "Are phthalate ester contaminants in northern fulmar preen oil higher in birds that have ingested more plastic?" Marine Pollution Bulletin **150**: 110679.

Understanding the impacts of plastic pollution is a global research priority. Previous research has shown that plasticizers such as phthalate esters detected in seabird tissues can be useful non-lethal biochemical markers of plastic ingestion as compared with more standard necropsy techniques. We examined the concentrations of six phthalate esters in the preen oil of Northern Fulmars (Fulmarus glacialis) in relation to their retained plastics. Contrary to a previous study, we found that the phthalates examined were not analytically detectable in fulmar preen oil. Given that the birds we examined had up to 100 pieces of plastics in their stomachs, and all uropygial glands were completely emptied during the necropsies, it does not appear that measuring phthalates in preen oil of Northern Fulmars is a useful, non-lethal technique to determine if individuals ingest plastics, at least not currently given the available commercial analytical detection limits.

Provencher, J. F., et al. (2018). "Are ingested plastics a vector of PCB contamination in northern fulmars from coastal Newfoundland and Labrador?" Environmental Research **167**: 184-190.

While marine animals are exposed to environmental contaminants via their prey, because plastic pollution in the aquatic environment can concentrate some chemicals, ingested plastics are thought to increase the exposure of biota to contaminants. Currently, in the literature there are contradictory results relating to how higher levels of ingested plastics by birds may lead to higher levels of polychlorinated biphenyl (PCBs). To date none of these have incorporated known Toxic Equivalency Factors (TEFs) for non-ortho and mono-ortho congeners of PCB which is critical to assessing the potential effects from PCBs. We examined northern fulmars (Fulmarus glacialis) from the Labrador Sea region Canada, and the ingested plastics from these same birds for comparative PCB concentrations. We found no significant correlations between the PCB concentrations in the birds and the mass or number of retained ingested plastic pieces in the stomach, this held true when PCBs were considered by a number of different ways, including Sigma ₄PCB, Sigma PCB, lower-chlorinated, high-chlorinated, non-ortho PCB, and mono-ortho congeners. PCB concentrations were lower in plastics as compared with livers. We found significant differences in congener profiles between the ingested plastics and seabird livers suggesting that while plastics do not contribute to the PCB concentrations, there may be some interactions between plastics and the chemicals that the birds are exposed to via ingested plastics.

Provencher, J. F., et al. (2015). "Marine birds and plastic debris in Canada: a national synthesis and a way forward." Environmental Reviews **23**(1): 1-13.

Marine plastic ingestion by seabirds was first documented in the 1960s, but over 50 years later our understanding about the prevalence, intensity, and subsequent effect of plastic pollution in the oceans is still developing. In Canada, systematic assessments using recognized standard protocols began only in the mid-2000s. With marine plastic pollution identified by the United Nations Environmental Program (UNEP) as one of the most critical challenges for the environment, a greater understanding of how plastics affect marine birds in Canada, along with a national strategy, is timely and necessary. To better understand which and how many marine birds are affected by marine debris, we reviewed reports of plastic ingestion and nest incorporation in Canada. Of the 91 marine bird species found in Canadian waters, detailed plastic ingestion data from multiple years and locations are available for only six species. Another 33 species have incidental reports, and we lack any data on dozens more. Future efforts should focus on characterizing the risk of plastic ingestion among understudied species and on continued monitoring of species that are known indicators of plastic pollution internationally and found in multiple regions of Canada to facilitate comparisons at the national and international levels.

Provencher, J. F., et al. (2018). "Garbage in guano? Microplastic debris found in faecal precursors of

seabirds known to ingest plastics." Science of the Total Environment **644**: 1477-1484.

Plastic pollution is global environmental contaminant. Plastic particulates break down into smaller fragments in the environment, and these small pieces are now commonly found to be ingested by animals. To date, most plastic ingestion studies have focused on assessing retained plastics or regurgitated plastics, but it is likely that animals also excrete plastic and other debris items. We examined the terminal portion of the gastrointestinal tract of a seabird known to commonly ingest plastics, the Northern Fulmar (Fulmarus glacialis), to determine if seabirds excrete microplastics and other debris via their guano. We also examine how guano collections may be used as an indicator of retained plastics. The frequency of occurrence of microplastics did not correlate between the gut and faecal precursor samples, but there was a positive relationship between the number of pieces of plastics in the gut and the number of microplastics in the guano. Our findings suggest that seabirds are acting as vectors of microplastics and debris in the marine environment where their guano accumulates around their colonies. This transport of microplastics and debris by colonial seabirds needs to be further examined, and considered when designing environmental monitoring for microplastics in regions where seabird colonies are found.

Prunier, J., et al. (2019). "Trace metals in polyethylene debris from the North Atlantic subtropical gyre." Environmental Pollution **245**: 371-379.

Plastic pollution in the marine environment poses threats to wildlife and habitats through varied mechanisms, among which are the transport and transfer to the food web of hazardous substances. Still, very little is known about the metal content of plastic debris and about sorption/desorption processes, especially with respect to weathering. In this study, plastic debris collected from the North Atlantic subtropical gyre was analyzed for trace metals; as a comparison, new packaging materials were also analyzed. Both the new items and plastic debris showed very scattered concentrations. The new items contained significant amounts of trace metals introduced as additives, but globally, metal concentrations were higher in the plastic debris. The results provide evidence that enhanced metal concentrations increase with the plastic state of oxidation for some elements, such as As, Ti, Ni, and Cd. Transmission electron microscopy showed the presence of mineral particles on the surface of the plastic debris. This work demonstrates that marine plastic debris carries complex mixtures of heavy metals. Such materials not only behave as a source of metals resulting from intrinsic plastic additives but also are able to concentrate metals from ocean water as mineral nanoparticles or adsorbed species. Plastic debris collected from the North Atlantic subtropical gyre was analyzed for trace metals. Marine plastic debris carry complex mixtures of heavy metals but it is evidence that plastic oxidation favors their adsorption. Copyright © 2018 Elsevier Ltd

Pruter, A. T. (1987). "Plastics in the marine environment." Fisheries **12**(1): 16-17.

The major sources of plastics in the marine environment were ship-generated litter, rubbish left on beaches, and solid waste dumped at sea or transported via rivers and municipal drainage systems. This plastic debris included various convenience and packaging items (drinking cups, plastic bags, holders for canned drink packs), fishing tackle (rope, lines, nets), and raw plastics (pellets). Birds, fish, seals, sea turtles and other marine wildlife have ingested plastics, or become entangled, with disastrous consequences. Entanglement in fishing net, uncut strapping bands etc., were responsible for approximately 50,000 deaths a year among northern fur seals in the eastern Bering sea. In the absence of international efforts to control this global problem, some suggestions are presented (eg disposing of rubbish on-shore) for minimizing oceanic plastic pollution.

Ptitsyn, K. G., et al. (2018). "[Use of DNA-aptamers for enrichment of low abundant proteins in cellular extracts for quntitative detection by selected reaction monitoring]." Biomeditsinskaia Khimiia **64**(1): 5-9.

The relationship between the amount of a target protein in a complex biological sample and its amount measured by selected reaction monitoring (SRM) mass spectrometry upon the affinity enrichment of target protein with aptamers immobilized on a solid phase was studied. Human thrombin added in known concentrations to cellular extracts derived from bacterial cells was used as model target protein. It has been demonstrated that the affinity enrichment of thrombin in cellular extracts by means of the thrombin-binding aptamer immobilized on the surface of magnetic microbeads results in an approximately 10-fold increase of the concentration of target protein and a 100-fold decrease of the low limit of a target protein concentration range where its quantitative detection by SRM is possible without an interference from other peptides present in a tryptic digest.

Puertas, S., et al. (2011). "Taking advantage of unspecific interactions to produce highly active magnetic nanoparticle-antibody conjugates." Acs Nano **5**(6): 4521-4528.

Several strategies for linking antibodies (Abs) through their Fc region in an oriented manner have been proposed at the present time. By using these strategies, the Fab region of the Ab is available for antigen molecular recognition, leading to a more efficient interaction. Most of these strategies are complex processes optimized mainly for the functionalization of surfaces or microbeads. These methodologies imply though the Ab modification through several steps of purification or the use of expensive immobilized proteins. Besides, the functionalization of magnetic nanoparticles (MNPs) turned out to be much more complex than expected due to the lack of stability of most MNPs at high ionic strength and non-neutral pH values. Therefore, there is still missing an efficient, easy and universal methodology for the immobilization of nonmodified Abs onto MNPs without involving their Fab regions during the immobilization process. Herein, we propose the functionalization of MNPs via a two-steps strategy that takes advantage of the ionic reversible interactions between the Ab and the MNP. These interactions make possible the orientation of the Ab on the MNP surface before being attached in an irreversible way via covalent bonds. Three Abs (Immunoglobulin G class) with very different isoelectric points (against peroxidase, carcinoembryonic antigen, and human chorionic gonadotropin hormone) were used to prove the general applicability of the strategy here proposed and its utility for the development of more bioactive NPs.

Puglisi, E., et al. (2019). "Selective bacterial colonization processes on polyethylene waste samples in an abandoned landfill site." Scientific Reports **9**(1): 14138.

The microbial colonization of plastic wastes has been extensively studied in marine environments, while studies on aged terrestrial wastes are scarce, and mostly limited to the isolation of plastic-degrading microorganisms. Here we have applied a multidisciplinary approach involving culturomics, next-generation sequencing analyses and fine-scale physico-chemical measurements to characterize plastic wastes retrieved in landfill abandoned for more than 35 years, and to assess the composition of bacterial communities thriving as biofilms on the films' surfaces. All samples were characterized by different colors but were all of polyethylene; IR and DSC analyses identified different level of degradation, while FT-Raman spectroscopy and X-ray fluorescence further assessed the degradation level and the presence of pigments. Each plastic type harbored distinct bacterial communities from the others, in agreement with the differences highlighted by the physico-chemical analyses. Furthermore, the most degraded polyethylene films were found to host a bacterial community more similar to the surrounding soil as revealed by both alpha- and beta-diversity NGS analyses. This work confirms the novel hypothesis that different polyethylene terrestrial waste samples select for different bacterial communities, and that structure of these communities can be correlated with physico-chemical properties of the plastics, including the degradation degree.

Puig-De-Morales, M., et al. (2001). "Measurement of cell microrheology by magnetic twisting cytometry with frequency domain demodulation." Journal of Applied Physiology **91**(3): 1152-1159.

Magnetic twisting cytometry (MTC) (Wang N, Butler JP, and Ingber DE, Science 260: 1124-1127, 1993) is a useful technique for probing cell micromechanics. The technique is based on twisting ligand-coated magnetic microbeads bound to membrane receptors and measuring the resulting bead rotation with a magnetometer. Owing to the low signal-to-noise ratio, however, the magnetic signal must be modulated, which is accomplished by spinning the sample at approximately 10 Hz. Present demodulation approaches limit the MTC range to frequencies <0.5 Hz. We propose a novel demodulation algorithm to expand the frequency range of MTC measurements to higher frequencies. The algorithm is based on coherent demodulation in the frequency domain, and its frequency range is limited only by the dynamic response of the magnetometer. Using the new algorithm, we measured the complex modulus of elasticity (G*) of cultured human bronchial epithelial cells (BEAS-2B) from 0.03 to 16 Hz. Cells were cultured in supplemented RPMI medium, and ferromagnetic beads (approximately 5 microm) coated with an RGD peptide were bound to the cell membrane. Both the storage (G', real part of G*) and loss (G", imaginary part of G*) moduli increased with frequency as omega(alpha) (2 pi x frequency) with alpha approximately equal to 1/4. The ratio G"/G' was approximately 0.5 and varied little with frequency. Thus the cells exhibited a predominantly elastic behavior with a weak power law of frequency and a nearly constant proportion of elastic vs. frictional stresses, implying that the mechanical behavior conformed to the so-called structural damping (or constant-phase) law (Maksym GN, Fabry B, Butler JP, Navajas D, Tschumperlin DJ, LaPorte JD, and Fredberg JJ, J Appl Physiol 89: 1619-1632, 2000). We conclude that frequency domain demodulation dramatically increases the frequency range that can be probed with MTC and reveals that the mechanics of these cells conforms to constant-phase behavior over a range of frequencies approaching three decades.

Puig-de-Morales, M., et al. (2004). "Cytoskeletal mechanics in adherent human airway smooth muscle cells: probe specificity and scaling of protein-protein dynamics." American Journal of Physiology - Cell Physiology **287**(3): C643-654.

We probed elastic and loss moduli in the adherent human airway smooth muscle cell through a variety of receptor systems, each serving as a different molecular window on cytoskeletal dynamics. Coated magnetic microbeads were attached to the cell surface via coating-receptor binding. A panel of bead coatings was investigated: a peptide containing the sequence RGD, vitronectin, urokinase, activating antibody against beta(1)-integrin, nonactivating antibody against beta(1)-integrin, blocking antibody against beta(1)-integrin, antibody against beta(1)-integrin, and acetylated low-density lipoprotein. An oscillatory mechanical torque was applied to the bead, and resulting lateral displacements were measured at baseline, after actin disruption by cytochalasin D, or after contractile activation by histamine. As expected, mechanical moduli depended strongly on bead type and bead coating, differing at the extremes by as much as two orders of magnitude. In every case, however, elastic and loss moduli increased with frequency f as a weak power law, f(x-1). Moreover, with few exceptions, data could be scaled such that elastic and frictional responses depended solely on the power law exponent x. Taken together, these data suggest that power law behavior represents a generic feature of underlying protein-protein dynamics.

Puig-de-Morales-Marinkovic, M., et al. (2007). "Viscoelasticity of the human red blood cell." American Journal of Physiology - Cell Physiology **293**(2): C597-605.

We report here the first measurements of the complex modulus of the isolated red blood cell (RBC). Because the RBC is often larger than capillary diameter, important determinants of microcirculatory function are RBC deformability and its changes with pathologies, such as sickle cell disease and malaria. A functionalized ferrimagnetic microbead was attached to the membrane of healthy RBC and then subjected to an oscillatory magnetic field. The resulting torque caused cell deformation. From the oscillatory forcing and resulting bead motions, which were tracked optically, we computed elastic and frictional moduli, g' and g", respectively, from 0.1 to 100 Hz. The g' was nearly frequency independent and dominated the response at all but the highest frequencies measured. Over three frequency decades, g" increased as a power law with an exponent of 0.64, a result not predicted by any simple model. These data suggest that RBC relaxation times that have been reported previously, and any models that rest upon them, are artifactual; the artifact, we suggest, arises from forcing to an exponential fit data of limited temporal duration. A linear range of response was observed, but, as forcing amplitude increased, nonlinearities became clearly apparent. A finite element model suggests that membrane bending was localized to the vicinity of the bead and dominated membrane shear. While the mechanisms accounting for these RBC dynamics remain unclear, methods described here establish new avenues for the exploration of connections among the mechanical, chemical, and biological characteristics of the RBC in health and disease.

Pul, R., et al. (2012). "Glatiramer acetate increases phagocytic activity of human monocytes in vitro and in multiple sclerosis patients." PLoS ONE [Electronic Resource] **7**(12): e51867.

Beside its effects on T cells, a direct influence on cells of the myelo-monocytic lineage by GA becomes evident. Recently, we demonstrated that GA drives microglia to adopt properties of type II antigen presenting cells (APC) and increases their phagocytic activity. In the present work, we focused on human blood monocytes in order to examine whether GA may increase phagocytic activity in vivo and to evaluate the molecular mechanisms explaining this new discovered mode of action. Peripheral blood mononuclear cells (PBMC) were obtained using a Biocoll-Isopaque gradient and monocytes were subsequently isolated by using CD14 MicroBeads. Phagocytic activity was determined by flow cytometric measurement of the ingestion of fluorescent beads. Flow cytometry was also used to assess monocytic differentiation and expression of phagocytic receptors. Monocytes of GA treated MS patients exhibited a significantly higher phagocytic activity than those of healthy controls or non-treated MS patients. In vitro, a significant phagocytic response was already detectable after 1 h of GA treatment at the concentrations of 62.5 and 125 micro g/ml. A significant increase at all concentrations of GA was observed after 3 h and 24 h, respectively. Only monocytes co-expressing CD16, particularly CD14(++)CD16(+) cells, were observed to phagocytose. Treatment of monocytes with IL-10 and supernatants from GA-treated monocytes did not alter phagocytosis. We observed a decrease in CD11c expression by GA while no changes were found in the expression of CD11b, CD36, CD51/61, CD91, TIM-3, and CD206. In our blocking assays, treatment with anti-CD14, anti-CD16, anti-TIM3, anti-CD210, and particularly anti-CD36 antibodies led to a decrease in phagocytosis. Our results demonstrate a new mechanism of action of GA treatment that augments phagocytic activity of human monocytes in vivo and in vitro. This activity seems to arise from the CD14(++)CD16(+) monocyte subset.

Punin, W., et al. (2014). "The feasibility of converting solid waste into refuse-derived fuel 5 via mechanical biological treatment process." Journal of Material Cycles and Waste Management **16**(4): 753-762.

The aim of our study was to investigate the feasibility of utilizing solid waste after mechanical biological treatment (MBT) processing at a landfill site in Phitsanulok, Thailand, as refuse-derived fuel 5 (RDF-5). The waste composition, and physical and chemical characteristics of each waste fraction were determined to evaluate the suitability of the waste for recycling and reuse as RDF-5. Results showed that after MBT processing, the solid waste >40 mm in size was observed to have 33.8 MJ/kg of calorific value. The average concentrations of heavy metals were also found to be within the acceptable limit for plastic waste combustion, thus proving that MBT-processed solid waste >40 mm in size has high potential for use as RDF-5. The optimal weight ratio of MBT-processed solid waste and crude oil sludge for transformation into RDF-5 was found to be 80:20. With this optimum ratio, the average calorific values of the RDF-5 were determined to be 47 MJ/kg, with sulfur and chlorine contents of 0.16 and 0.74 %, respectively. The characteristics of the produced RDF-5 could meet the specified ASTM standards in terms of calorific value (>15 MJ/kg), and sulfur and chlorine contents. In addition, the compressive strength of the produced RDF-5 was also found to be suitable for compact storage and transportation without any damage. Finally, the energy production cost from this RDF-5 process was estimated as USD $0.05/kWh.

Purdy, T. and E. Tarn (2013). Improving plastic wastes recovery from hospitals through innovative environmental management. Proceedings, Annual Conference - Canadian Society for Civil Engineering.

Plastic wastes pose one of the greatest challenges to modern waste management. While much of the focus for recovering and recycling plastics is on industrial, commercial, and residential waste streams, an often overlooked source of waste plastics originates from the healthcare sector, and especially from hospitals. Hospitals could benefit significantly from improved environmental and waste management system practices and techniques to reduce their contribution of waste plastics to the solid waste stream. However, conventional waste management measures do not necessarily work effectively in hospitals. A number of documented challenges are faced by hospitals, particularly in terms of the amount of plastic wastes produced. Because of the focus on patient care, environmental concerns may only be a secondary objective, and modern budget restrictions can limit alternatives for waste management. More critically, issues such as the cross contamination of biohazardous and nonhazardous wastes, inappropriate labeling, and discrepancies in defining infectious wastes, can result in the unnecessary disposal of plastics wastes which could have been otherwise recovered and recycled. This research examines through a case study in progress how an innovative environmental management system can assist a hospital in identifying key issues in handling its plastics wastes by identifying the obvious and hidden sources of plastics wastes in hospital activities, examining how commonly held beliefs can impact plastics handling by hospital personnel, and assessing how handling practices can benefit or disadvantage improved plastics recovery.

Puskic, P. S., et al. (2019). "Uncovering the sub-lethal impacts of plastic ingestion by shearwaters using fatty acid analysis." Conservation Physiology **7**(1): coz017.

Marine plastic pollution is increasing exponentially, impacting an expanding number of taxa each year across all trophic levels. Of all bird groups, seabirds display the highest plastic ingestion rates and are regarded as sentinels of pollution within their foraging regions. The consumption of plastic contributes to sub-lethal impacts (i.e. morbidity, starvation) in a handful of species. Additional data on these sub-lethal effects are needed urgently to better understand the scope and severity of the plastics issue. Here we explore the application of fatty acid (FA) analysis as a novel tool to investigate sub-lethal impacts of plastic ingestion on seabird body condition and health. Using gas chromatography-mass spectrometry, we identified 37 individual FAs within the adipose, breast muscle and liver of flesh-footed (Ardenna carneipes) and short-tailed (Ardenna tenuirostris) shearwaters. We found high amounts of FA 16:0, 18:0, 20:5n3 (eicosapentaenoic acid), 22:6n3 (docosahexaenoic acid) and 18:1n9 in both species; however, the overall FA composition of the two species differed significantly. In flesh-footed shearwaters, high amounts of saturated and mono-unsaturated FAs (needed for fast and slow release energy, respectively) in the adipose and muscle tissues were related to greater bird body mass. While total FAs were not related to the amount of plastic ingested in either species, these data are a valuable contribution to the limited literature on FAs in seabirds. We encourage studies to explore other analytical tools to detect these sub-lethal impacts of plastic.

Putnam, A. L., et al. (2009). "Expansion of human regulatory T-cells from patients with type 1 diabetes." Diabetes **58**(3): 652-662.

OBJECTIVE: Regulatory T-cells (Tregs) have catalyzed the field of immune regulation. However, translating Treg-based therapies from animal models of autoimmunity to human clinical trials requires robust methods for the isolation and expansion of these cells-a need forming the basis for these studies.

RESEARCH DESIGN AND METHODS: Tregs from recent-onset type 1 diabetic patients and healthy control subjects were isolated by fluorescence-activated cell sorting and compared for their capacity to expand in vitro in response to anti-CD3-anti-CD28-coated microbeads and IL-2. Expanded cells were examined for suppressive function, lineage markers and FOXP3, and cytokine production.

RESULTS: Both CD4+CD127(lo/-) and CD4+CD127(lo/-)CD25+ T-cells could be expanded and used as Tregs. However, expansion of CD4+CD127(lo/-) cells required the addition of rapamycin to maintain lineage purity. In contrast, expansion of CD4+CD127(lo/-)CD25+ T-cells, especially the CD45RA+ subset, resulted in high yield, functional Tregs that maintained higher FOXP3 expression in the absence of rapamycin. Tregs from type 1 diabetic patients and control subjects expanded similarly and were equally capable of suppressing T-cell proliferation. Regulatory cytokines were produced by Tregs after culture; however, a portion of FOXP3+ cells were capable of producing interferon (IFN)-gamma after reactivation. IFN-gamma production was observed from both CD45RO+ and CD45RA+ Treg populations.

CONCLUSIONS: The results support the feasibility of isolating Tregs for in vitro expansion. Based on expansion capacity, FOXP3 stability, and functional properties, the CD4+CD127(lo/-)CD25+ T-cells represent a viable cell population for cellular therapy in this autoimmune disease.

Pye, A. (2017). CLEARING OCEANS OF PLASTICS. Environmental Engineering. London, Professional Engineering Publishing Ltd. **30:** 3.

At the annual CEFIC Chemicals Convention 2017 in Vienna in October the special guests included multi-awards winner young entrepreneur Boyan Slat and Ocean Conservancy VP Emily Woglom, who addressed the best approaches to rid the oceans of plastic and the possible role of industry. Michael Gove announced in July that the UK will, from 2018, ban the production and sale of cosmetics containing microbeads -- the small bits of plastic found in cosmetics that end up in the food chain and poison fish and sea mammals. They will join the select group of countries that have bans: USA, Canada, Ireland, New Zealand, Netherlands. Here, Pye discusses clearing oceans of plastic preventing it from breaking down into microplastics.

Qadir, A. and M. Imam (2006). "UTILISATION OF WASTE PLASTIC BAGS IN BITUMINOUS MIX FOR IMPROVED PERFORMANCE OF ROADS." Journal of Solid Waste Technology & Management **32**(3): 185-195.

The quantity and type of waste being generated is growing at enormous rate. The plastic wastes produced particularly in form of bags being non-degradable and with limited recycling options poses disposal problem. The probable solution as mentioned lies in effective recycling of the waste which in fact is restricted by economic and operational constraints hence demanding a sustainable solution for safe and ultimate disposal of waste plastic bags. An academic research aimed at probable use of waste plastic bags in pavement structure so as to come up with an ultimate safe disposal together with improvement in the performance of pavement through better mix design was undertaken. An aggregate material from waste plastic bags referred to as Recycled Plastic Waste Aggregate (RPWA) is developed which would partially replace the conventional material to improve desired mechanical characteristics for a particular road mix. Preliminary investigations have indicated that use of RPWA (1.2 - 3mm in size) in the surface and base mix design, when utilised up to 2.5% by weight substitution has shown improved stability and flow (Marshall test) having unit weight and bulk specific gravity falling within the acceptable limits for light and heavy traffic loads, It is envisaged that use of RPWA in the conventional asphalt hot mix design is likely to improve the pavement performance with a sustainable solution for the disposal of plastic waste. [ABSTRACT FROM AUTHOR]

Qi, R., et al. (2020). "Behavior of microplastics and plastic film residues in the soil environment: A critical review." Science of the Total Environment **703**: 134722.

It is now widely acknowledged that microplastic pollution represents one of the greatest anthropogenically mediated threats to Earth-system functioning. In freshwater and marine ecosystems the presence of large amounts of microplastic appears almost ubiquitous, with frequent reports of negative impacts on aquatic health. In contrast, however, the impact of plastic in terrestrial environments remains poorly understood. In agroecosystems, microplastics (particles<5mm) can enter the soil environment either directly (e.g. from biosolids application, irrigation water, atmospheric deposition), or indirectly through the in situ degradation of large pieces of plastic (e.g. from plastic mulch films). Although we have encouraged the use of plastics over the last 50years in agriculture to promote greater resource use efficiency and food security, the legacy of this is that many soils are now contaminated with large amounts of plastic residue (ca. 50-250kgha⁻¹). Due to difficulties in separating and quantifying plastic particles from soil, our knowledge of their behavior, fate and potential to transfer to other receptors (e.g. surface and groundwater, air) and enter the human food chain remains poor. This information, however, is critical for evaluating the risk of soil-borne microplastic pollution. In this critical review, we systematically summarize (i) the distribution and migration of microplastics in soils, (ii) highlight the separation, extraction, and identification methods for monitoring microplastics in soils, (iii) discuss the ecological effects and pollution mechanisms of soil microplastics, (iv) propose mitigation strategies to help prevent and reduce microplastic pollution, and (v) identify the most important future challenges in soil microplastics research.

Qi, W., et al. (2019). "Growth and survival of microencapsulated probiotics prepared by emulsion and internal gelation." Journal of Food Science and Technology **56**(3): 1398-1404.

Efficient microencapsulation of probiotics by most existing methods is limited by low throughput. In this work, Saccharomyces boulardii and Enterococcus faecium were microencapsulated by a method based on emulsion and internal gelation. The growth and survival of microencapsulated microbes under different stressors were investigated using free non-encapsulated ones as a control. The results showed that the prepared micro-beads by emulsion and internal gelation exhibited a spherical and smooth shape, with sizes between 300 and 500 micro m. Both S. boulardii and E. faecium grew well and survived better when encapsulated in micro-beads. The survival rates were increased 25% and 40% for microencapsulated S. boulardii and E. faecium respectively when compared with non-encapsulated controls under high temperature and high humidity. The increases of survival rates were 60% for microencapsulated S. boulardii and 25% for E. faecium in simulated gastric juice. And the increases were 15% and 20% respectively when the survival rates of the microencapsulated S. boulardii and E. faecium were determined in simulated intestinal juice. The microencapsulation by emulsion and internal gelation offers an effective way to protect microbes in adverse in vitro and in vivo conditions and is promising for the large-scale production of probiotics microencapsulation.

Qi, Y., et al. (2019). "Effects of plastic mulch film residues on wheat rhizosphere and soil properties." Journal of Hazardous Materials: 121711.

Plastic residues could accumulate in soils as a consequence of using plastic mulching, which results in a serious environmental concern for agroecosystems. As an alternative, biodegradable plastic films stand as promising products to minimize plastic debris accumulation and reduce soil pollution. However, the effects of residues from traditional and biodegradable plastic films on the soil-plant system are not well studied. In this study, we used a controlled pot experiment to investigate the effects of macro- and micro- sized residues of low-density polyethylene and biodegradable plastic mulch films on the rhizosphere bacterial communities, rhizosphere volatile profiles and soil chemical properties. Interestingly, we identified significant effects of biodegradable plastic residues on the rhizosphere bacterial communities and on the blend of volatiles emitted in the rhizosphere. For example, in treatments with biodegradable plastics, bacteria genera like Bacillus and Variovorax were present in higher relative abundances and volatile compounds like dodecanal were exclusively produced in treatment with biodegradable microplastics. Furthermore, significant differences in soil pH, electrical conductivity and C:N ratio were observed across treatments. Our study provides evidence for both biotic and abiotic impacts of plastic residues on the soil-plant system, suggesting the urgent need for more research examining their environmental impacts on agroecosystems.

Qi, Y., et al. (2018). "Macro- and micro- plastics in soil-plant system: effects of plastic mulch film residues on wheat (Triticum aestivum) growth." Science of the Total Environment **645**: 1048-1056.

Plastic residues have become a serious environmental problem in the regions with intensive use of plastic mulching. Even though plastic mulch is widely used, the effects of macro- and micro- plastic residues on the soil-plant system and the agroecosystem are largely unknown. In this study, low density polyethylene and one type of starch-based biodegradable plastic mulch film were selected and used as examples of macro- and micro- sized plastic residues. A pot experiment was performed in a climate chamber to determine what effect mixing 1% concentration of residues of these plastics with sandy soil would have on wheat growth in the presence and absence of earthworms. The results showed that macro- and micro- plastic residues affected both above-ground and below-ground parts of the wheat plant during both vegetative and reproductive growth. The type of plastic mulch films used had a strong effect on wheat growth with the biodegradable plastic mulch showing stronger negative effects as compared to polyethylene. The presence of earthworms had an overall positive effect on the wheat growth and chiefly alleviated the impairments made by plastic residues.

Qian, Q., et al. (2014). "Modulating the release of drugs from alginate matrices with the addition of gelatin microbeads." Journal of Bioactive and Compatible Polymers **29**(3): 193-207.

Injectable drug-loaded matrices and controlled release technology offer numerous advantages over conventional dosages. Cross-linkable alginate hydrogels have been proposed for in vivo injection, but their large initial burst release of encapsulated drugs represents a limitation for the transition to the clinical phase. To reduce this effect, a new drug delivery system was prepared by combining uncross-linked, drug-loaded gelatin microbeads with cross-linkable alginate solution. Gelatin microbeads ranging from 5 to 50 mum were obtained depending on gelatin concentration, stirring rate, and emulsifying time. The release behavior of drugloaded gelatin microbeads encapsulated within cross-linked alginate gel was characterized both at room temperature and 37degreeC and compared with the release from gelatin microbeads and cross-linked alginate gel alone. Gelatin microbeads reduced the initial burst release of fluorescein from cross-linked alginate matrix, with a corresponding decrease in the release efficiency. Burst release in the first 2 h was reduced from 30% to about 5%, while cumulative release at 37degreeC declined from about 95% to 50% after 7 days. This system represents a promising approach for the development of novel and versatile injectable drug delivery systems. © The Author(s) 2014.

Qiang, L. and J. Cheng (2019). "Exposure to microplastics decreases swimming competence in larval zebrafish (Danio rerio)." Ecotoxicology and Environmental Safety **176**: 226-233.

Microplastics have been frequently detected in both marine and freshwater ecosystems. Their impact on aquatic organisms has raised much concern. This study investigated the impact of microplastics on zebrafish embryos and larvae, with a special focus on their swimming competence. The zebrafish embryos were exposed to microplastics starting from 4 h post fertilization. Microplastics first adhered to the embryo chorion, then entered the stomach and intestinal tract of the larvae later. In the free swimming test, exposure to 1000 micro g/L (around 1.91x10⁷ particles/L) of microplastics led to a significant decrease in both swimming distance and speed of zebrafish larvae under the dark condition by 3.2% and 3.5% respectively. In the alternating light-to-dark photoperiod stimulation assay, exposure to 100 and 1000 micro g/L (around 1.91x10⁶ and 1.91x10⁷ particles/L) of microplastics caused a 4.6% and 2.6% decrease in swimming distance, and reduced the active speed by 4.9% and 2.8%, possibly as a result of inhibited dark avoidance in treated zebrafish larvae. At the molecular level, exposure to microplastics induced upregulated expression of inflammation (il1b) and oxidative stress (cat) related genes. This study demonstrates that exposure to microplastics significantly decreases larvae swimming competence, which may have significant impacts on its population fitness in the aquatic environment and further ecological consequences.

Qiao, R., et al. (2019). "Accumulation of different shapes of microplastics initiates intestinal injury and gut microbiota dysbiosis in the gut of zebrafish." Chemosphere **236**(124334).

Different shapes of microplastics are widely detected in the environment and organisms and most of them remain in the gut. However, the influences of shapes on the bioaccumulation and toxicity of microplastics in the gut are largely unknown. Three shapes (bead, fragment, and fiber) of microplastics of comparable size in one dimension were prepared to exposure to zebrafish. The accumulation and toxicities of microplastics in the gut were detected. Shape-dependent accumulation in the gut was observed with the order of fibers (8.0 micro g/mg) > fragments (1.7 micro g/mg) > beads (0.5 micro g/mg). The accumulation of microplastics caused multiple toxic effects in fish intestine, including mucosal damage, and increased permeability, inflammation and metabolism disruption. Based on these toxic effects, microplastic fibers resulted in more severe intestinal toxicity than microplastic fragments and beads did. Furthermore, microplastics also induced gut microbiota dysbiosis and specific bacteria alterations, which will provide novel insights into the potential mechanism of microplastics causing intestinal toxicities in fish. Our results also suggested that shape-depended effects should not be ignored in the health risk assessment of microplastics.

Qiao, R., et al. (2019). "Combined effects of polystyrene microplastics and natural organic matter on the accumulation and toxicity of copper in zebrafish." Science of the Total Environment **682**: 128-137.

As emerging contaminants, microplastics (MPs) are predicted to act as vectors for other contaminants and their combined effects are largely unknown. In this study, the combined effects of MPs and natural organic matter (NOM) on the accumulation and toxicity of copper (Cu) in zebrafish (Danio rerio) were investigated. As a result, small-size MPs could absorb more Cu than large-size MPs. The presence of NOM promoted Cu adsorption on MPs in the pH range of 6-8. Our results demonstrate that the combination of MPs and NOM increased Cu accumulation in the livers and guts in a size-depended manner. Correspondingly, the results of biochemical test showed that MPs and NOM could aggravate Cu-toxicity in the livers and guts, which is manifested in the increased levels of malonaldehyde (MDA) and metallothionein (MT) and decreased levels of superoxide dismutase (SOD). Furthermore, the results of transcriptomic analysis suggested that such aggravation of toxicity was mainly attributed to the inhibition of Cu-ion transport and the enhanced oxidative stress. Since the co-existence of MPs and NOM in the environment is inevitable, their enhancement effects on the bioaccumulation and toxicity of other pollutants such as heavy metals deserve more attention. Copyright © 2019 Elsevier B.V.

Qiao, R., et al. (2019). "Microplastics induce intestinal inflammation, oxidative stress, and disorders of metabolome and microbiome in zebrafish." Science of the Total Environment **662**: 246-253.

Microplastics (MPs) can be ingested by a variety of species and mainly accumulate in the gut. However, the consequences of MPs exposure in the gut are largely unknown. Here we evaluated the impacts of MPs exposure in zebrafish gut. Animals were experimentally exposed to polystyrene MPs (5- micro m beads; 50 micro g/L and 500 micro g/L) for 21 days and monitored for alterations in tissue histology, enzymatic biomarkers, gut microbiome and metabolomic responses. Inflammation and oxidative stress were observed in the zebrafish gut after exposed to MPs. Furthermore, significant alterations in the gut microbiome and tissue metabolic profiles were observed, with most of these were associated with oxidative stress, inflammation and lipid metabolism. This study provides evidence that MPs exposure causes gut damage as well as alterations in gut metabolome and microbiome, yielding novel insights into the consequences of MPs exposure.

Qin, M., et al. (2015). "Functional evaluations of ex vivo induced endothelial progenitors for autologous transplantation in non-human primates." Blood **126 (23)**: 4302.

It is possible to treat ischemia and hemophilia A diseases by producing sufficient functional human endothelial progenitor cells (EPCs)/endothelial cells (ECs) in vitro, for use with cell

therapy in the clinic. We have previously reported the ability to produce FVIII-secreting EPCs/ ECs derived from human cord blood CD34⁺ cells. About 1412+/-102 fold expansion over initial EPCs was achieved after culturing for 21 days. An acute liver sinusoidal endothelial cells (LSEC) injury model in NOD/SCID mice was also developed to verify the functional migrating ability of the generated EPCs/ ECs in vivo. Here, we further applied this culturing technique to expand and subsequently differentiate CD34⁺ cells into the EPCs/ ECs derived from mobilized peripheral bloods of both human and cynomolgus monkeys. In brief, the CD34⁺ cells were isolated from human peripheral bloods or from monkeys (n=10) mobilized with human G-CSF/SCF. In the first 6 days, the isolated CD34⁺ cells were expanded in modified IMDM medium supplemented with human cytokine combinations of SCF, Flt-3L, TPO, IL-3, GM-CSF, and VEGF. From days 7 to 36, the adhering EPCs/ ECs were subsequently differentiated in EBM-2 basal medium with 20% FBS and endothelial growth factors of VEGF, IGF, EGF, FGF, and fibronectin. The purities and phenotypes of the induced EPCs/ECs were assessed in vitro by antibodies against human CD31, vWF, and FVIII for the human or Dil- acetylated- low density lipoprotein (ac-LDL) and FITC-lectin double staining for the monkey cells.In addition, the safety and efficacy of the induced monkey EPCs/ECs was determined in vivo by autologous transplantation in monkey LSEC injury model, which was induced by a toxic agent, monocrotaline (MCT), to disrupt the sinusoidal endothelial barrier and stimulate the incorporation of transplanted cells into liver parenchyma. In the transplantation group (n=7), each monkey was injected with double labeled autologous EPCs/ECs preparations (2x10⁸ cells/500mul in saline), whereas in the control group (n=3) was injected with the same volume saline via hepatic portal vein injections. The cross-sections (20mum in depth) of fixed hepatic tissues were analyzed for grafting and functional migration of transplanted EPCs/ECs. The transplanted cells were identified by lenti-viral gene expressed with green fluorescent protein (red) or direct observation using anti-monkey IgG -microbead- FITC conjugates (green). For in vitro induced EPCs/ECs derived from human peripheral blood cell, the expansion of 834.58+/-119.03 fold was achieved from the CD34⁺/VEGFR2⁺ EPCs on day 21. Total more than 2x 10⁸ FVIII-producing EPCs / ECs were produced from one collection of human peripheral blood (250 mL). On the other hand, the CD34⁺/VEGFR2⁺ EPCs (3.6x10⁴ +/-2.1x10³) from one collection of monkey peripheral blood (20ml) were expanded up to 1274+/-166 fold and 7211+/-372 fold on days 24 and 36, respectively (n=4). The EPCs were reached at a logarithmic growth from days 12 to 45. The induced cells can be frozen and resuscitated during any stage of the culturing process. The formation of EC tubes was observed from day 24. Over 80% of expanded cells were EPC/EC-specific and identified by Dil-ac-LDL and FITC-lectin double staining on day 36. All monkeys recoveredfrom the surgeries of portal vein injection and resumed normal diet and behavior after autologous transplantation with cultured EPCs/ECs. Similarly, the routine blood analysis and liver functional enzymes were at the normal level, and no other apparent side effects were observed. About 3.2+/-1.4% and 2.1+/-1.1% of liver cells were observed as Dil-ac-LDL and FITC-lectin double positive in the liver cryosections (25 sections per monkey) on days 7 and 14, respectively, indicating that autologous transplanted EPCs/ECs were capable of repopulating into functional ECs in vivo. Furthermore, the injected EPCs/ECs were scattered in the intercellular spaces of hepatocytes t the hepatic tissues on day 14, suggesting that the transplanted cells could migrate towards injured LSEC sites and reconstitute structurally the sinusoidal endothelial compartment in monkey livers. In summary, the large-scale EPCs/ECs were produced from CD34⁺ cells of both human and monkey peripheral bloods in vitro. The safety and functions of the EPCs/ECs were confirmed in mice and cynomolgus

monkeys, strongly suggesting the potential application of these FVIII-producing EPCs/ECs to future clinical study.

Qin, Y., et al. (2019). "Microplastics in the sediment of Lake Ulansuhai of Yellow River Basin, China." Water Environment Research **02**: 02.

As an emerging organic pollutant, microplastics in the ocean have been the subject of much study. However, there is a lack of research on freshwater environments, notably in sediment, China. Microplastics contamination in sediment of Lake Ulansuhai has been investigated in the study, and its concentration range was from 24 +/- 7 to 14 +/- 3 n/kg. Further, it exhibited a difference in spatial distribution with high content in the north zone of the lake far from the entrance of the drainage canal and it has a decreasing tendency with the flow from north to south in lake. Colored plastic particles acted as the dominated pollution type, and more than 79.69% of microplastics were smaller than 2 mm in size, existed as the form of fibers. FTIR results mirrored that the main types of microplastics were polyethylene, polyethylene terephthalate, polypropylene, and polyvinyl chloride.

Qiu, J., et al. (2015). "Characterization and isolation of splenic littoral cells, a possible cellular niche for extramedullary hematopoiesis in myelofibrosis." Blood **126 (23)**: 3594.

Splenic littoral cells (LC) line the venous sinusoids of the human spleen and have been thought to act as blood cells filters. Little is known about SLCs beyond their preliminary characterization using immunochemistry and electron microscopy by others. Since SLCs comprise a significant portion of spleen, we hypothesized that SLC might be an important component of the splenic microenvironment that contributes to the development of extramedullary hematopoiesis in myelofibrosis (MF) patients. To further phenotypically characterize viable SLCs, surgically removed fresh spleens were treated with collagenase B and the hematopoietic cells were depleted using anti-CD45 micro-beads. The enriched CD45- cells were then stained and analyzed on a FACS analyzer. The SLCs were i, CD3-, CD45-, CD34-, CD8a+, CD31+ (Figure 1), ii, CD206+, CD21-, CD14-, FHOD1+, SIRP1a+, a phenotype identical to that previously reported based on IHC. SLCs and SECs were then identified by IHC in the red pulp of healthy individuals and MF patients using anti- CD8a and CD34 antibodies. SLCs were much more abundant than ECs in normal spleens. MF SLCs were however, much less condensed due to the expansion of hematopoietic cells than normal SLCs and the sinusoids encircled by SLCs were more elongated and had a more irregular shape as compared to normal spleen (Figure 2). To isolate the viable SLC and EC, fresh or cryopreserved spleen single cell suspensions were prepared as above and were FACS sorted for CD3-, CD45-, CD34-, CD8a+, CD31+ SLCs and CD3-, CD45-, CD34+, CD8a-, CD31+ SECs. The SSC/FSC profiles revealed two cell populations which could be distinguished by size and complexity, SLC being bigger and less uniform in size and shape. The CD31 signal intensity was greater in SEC than in SLC. The gene expression profiles of FACS sorted SLC, SEC and mononuclear cells (MNCs) were analyzed using human genome U133 Plus 2.0 arrays. DAVID Functional Annotation Clustering was applied to identify enriched gene clusters in selected lists. MNCs were significantly different from both SLC and EC, which expressed several clusters of genes involved in cell morphology, adhesion, and blood vessel formation. This indicated that SLCs were not closely related to myeloid cells but share features with SEC. SLC could however be differentiated from SEC by expression of genes involved in chromatin modification and regulation of RAS protein signaling, as well as intravesicle transportation genes, which may be related to their assumed capacity for phagocytosis. In addition SLC expressed many cytokines and adhesion molecules known to support hematopoiesis. Transcripts for various cytokines expressed by SEC and SLC were, however, distinct suggesting that they might serve as niches for

different subpopulations of HSC/HPC. Preliminary microarray analysis of SLCs from an MF patient was also performed. Genes associated with apoptosis, intracellular lumens were upregulated as well as a cluster of genes in the cancer pathway. Cell cycle genes, genes of transcription regulation, and proteolysis were down-regulated in MF SLCs. Sorted SLC were also cultured in EC medium (ECM). The cultured SLCs were able to be repeatedly passaged. These cells were wide and spindle shaped. At a lower density, the cells tended to connect and organize into rings with a hollow space in the middle which resembled a splenic sinusoid. Immunostaining for CD8a and FHOD1 were conducted on these cultured cells, revealing that they continued to express these two markers. Interestingly, the expression of FHOD1, a stress fiber inducing protein was strongly polarized. To determine the relationship between SLC and the MF malignant clone SLCs from MF patients were isolated and assayed for JAK2V617F using allele specific NESTED PCR. Samples from three MF patients, were analyzed and no JAK2V617F was detected. In conclusion, we have isolated, cultured and characterized SLCs from normal and MF spleens for the first time. This will allow for further analysis of their function in normal individuals and individuals with blood disea es. (Figure Presented).

Qiu, Q., et al. (2015). "Occurrence of microplastics in the coastal marine environment: First observation on sediment of China." Marine Pollution Bulletin **98**(1-2): 274-280.

Microplastics in sediments from the Beibu Gulf and the coastline of China Sea were investigated to evaluate the occurrence and abundance of microplastics in China for the first time. Microplastics (<5. mm) were taken from sediments by a flotation method. The number of microplastics was counted by a fluorescence microscope, an instrument that is rarely used in the detection of microplastics in sediments. This instrument led to results that were satisfactory. Compared with other sampled areas, microplastics were found in massive concentrations in China. Four types of microplastics, HDPE, PET, PE and PS, were identified. The results will provide useful background information for further investigations. Copyright © 2015 Elsevier Ltd.

Qiu, Q., et al. (2016). "Extraction, enumeration and identification methods for monitoring microplastics in the environment." Estuarine, Coastal and Shelf Science **176**: 102-109.

There is much research on the occurrence, pollution characteristics and impacts of microplastics in the marine environment but this omits factors which play important roles in the analysis of microplastics. This review summarizes the methods and techniques in the extraction from sediment, seawater and organisms, and assesses their advantages and limitations according to different experimental conditions, such as salt solution and reagents added to remove organic matter. Similarly, this overview includes the enumeration methods of microplastics by many kinds of microscopes (e.g. stereomicroscope, fluorescent microscope, scanning electron microscope). Advantages and challenges of using micro-FTIR, ART-FTIR, FPA-FTIR, Pry-GC/MS, and Raman spectroscopy in the identification methods are also discussed. This review suggests that monitoring microplastics needs standardized protocols for extraction, identification and quantification and that further research on the effects of microplastics to human health is needed.

Qiu, Y., et al. (2019). "Potential toxicity of nanopolystyrene on lifespan and aging process of nematode Caenorhabditis elegans." Science of the Total Environment: 135918.

In the environment, nanoplastic particles, such as nanopolystyrene, potentially cause toxicity on organisms at various aspects. We here employed endpoints of lifespan and aging-related phenotypes to further investigate the possible long-term effects of nanopolystyrene (100 nm) in Caenorhabditis elegans. After exposure from L1-larvae to adult day-3, nanopolystyrene at high concentrations (100 and 1000 mug/L) reduced the lifespan. Although nanopolystyrene (1 or 10 mug/L) did not affect the lifespan, nanopolystyrene (1 or 10 mug/L) could induce the more severe intestinal reactive oxygen species (ROS) production and decrease in locomotion behavior during the aging process compared with control. Moreover, nanopolystyrene exposure could cause the severe decrease in expressions of some immune response genes, hsp-6 gene, and genes encoding manganese-superoxide dismutases (Mn-SODs) during aging process, suggesting the severe suppression in innate immune response, inhibition in antioxidation defense system, and suppression in mitochondrial unfolded protein response (mt UPR) by nanopolystyrene. Our results highlight the potential of long-term nanopolystyrene exposure in reducing longevity and in affecting health state during the aging process in environmental organisms.

Qiu, Y., et al. (2019). "Sorption of polyhalogenated carbazoles (PHCs) to microplastics." Marine Pollution Bulletin **146**: 718-728.

The sorption of 5 Polyhalogenated carbazoles (PHCs) [3,6-dibromocarbazole (3,6-BCZ), 3,6-dichlorocarbazole (3,6-CCZ), 3,6-diiodocarbazole (3,6-ICZ), 2,7-dibromocarbazole (2,7-BCZ) and 3-bromocarbazole (3-BCZ)] on to three microplastics [polyethylene (PE), polypropylene (PP), and polyvinyl chloride (PVC)] in a simulated seawater system are studied. Sorption isotherms demonstrated that PVC had the maximum sorption capacity, which can be attributed to polar-polar interaction. The sorption kinetics model showed that the sorption process was controlled by both intraparticle and film diffusion. The sorption of PHCs to microplastics was significantly influenced by temperature, the sorption capacity first increased gradually and then decreased with the increasing temperature. Increasing the salinity decreased the sorption of PHCs onto PP, PE, PVC microplastics. Our results indicated that all three kinds of microplastics can serve as carriers for PHCs in the aquatic environment, which put marine ecosystems at higher risks. Copyright © 2019 Elsevier Ltd

Qu, H., et al. (2019). "Enantiospecific toxicity, distribution and bioaccumulation of chiral antidepressant venlafaxine and its metabolite in loach (Misgurnus anguillicaudatus) co-exposed to microplastic and the drugs." Journal of Hazardous Materials **370**: 203-211.

In present study, we investigated the enantioselective behaviors of the chiral antidepressant venlafaxine and its metabolite O-desmethylvenlafaxine in loach Misgurnus anguillicaudatus (M. anguillicaudatus), as well as effects of microplastic on toxicity, distribution and metabolism through a 40-day co-exposure. The contents of SOD and MDA in loach liver elevated when the loach was exposed to venlafaxine and O-desmethylvenlafaxine. Moreover, co-exposure with microplastic might lead to more adverse effect against loach. The distribution of venlafaxine and O-desmethylvenlafaxine were both detected in loach tissues and liver subcellular. The concentrations of venlafaxine and O-desmethylvenlafaxine were lower in water in microplastic-present treatment. Whilst, more contaminants were accumulated in liver through the "vehicle" (microplastic). Enantioselective behavior of venlafaxine and O-desmethylvenlafaxine occurred with R-enantiomers being preferentially degraded. With microplastic present, the bioaccumulation factor (BAF) of venlafaxine and O-desmethylvenlafaxine in loach tissue amplified more than 10 times. In liver subcellular structure, microplastic may help to transport more compounds into subtle areas and postpone the contaminants metabolism in organisms. The present study for the first time gained an insight into the potential ecological effects and environmental behaviors of combined pollutions of chiral pharmaceuticals and microplastic, which could supply important information for environment risk assessment of concurrent organic pollutants and microplastic.

Qu, H., et al. (2018). "Effects of microplastics on the uptake, distribution and biotransformation of chiral antidepressant venlafaxine in aquatic ecosystem." Journal of Hazardous Materials **359**: 104-112.

In this study, we investigated the enantioselective environmental behaviors of the chiral antidepressant venlafaxine (VFX) in lab-scale aquatic ecosystems in the presence of microplastics (MPs). To determine the bioaccumulation, distribution, and metabolism as well as the effects of MPs on aquatic ecosystems, water-sediment, water-Lemna.minor (L.minor), water-Misgurnus.anguillicaudatus (M.anguillicaudatus), and water-sediment-L.minor-M.anguillicaudatus ecosystems were set up and exposed to venlafaxine and two levels of microplastics over a 90-day period. The removal efficiencies of VFX ranged from 58 to 96% in different ecosystems, and VFX degraded significantly faster in the complex water-sediment-L.minor-M.anguillicaudatus ecosystem with S-enantiomer preferentially enriched. The main metabolite O-desmethylvenlafaxine (O-DVFX) was also observed in ecosystems, displaying similar enantioselectivity. When exposed to 50 mg L⁻¹ of microplastics, the amount of venlafaxine in sediment and loach (M.anguillicaudatus) were significantly higher than that in the 1 mg L⁻¹ microplastics treatments, and enhanced accumulation of O-DVFX was observed in loach. The present study for the first time assessed the combined effects of venlafaxine and microplastics in simulated aquatic microcosms, which could help gain an insight into the potential ecological impacts of chiral pollutants and microplastic, and evaluate their environment risks more accurately in future. Copyright © 2018 Elsevier B.V.

Qu, M., et al. (2019). "Neuronal damage induced by nanopolystyrene particles in nematode <i>Caenorhabditis elegans</i> (Electronic supplementary information (ESI) available. See DOI: 10.1039/c9en00473d)." Environmental Science: Nano **6**(8): 2591-2601.

The potential adverse effects of nanoplastics have gradually gained significant attention. Herein, we employed Caenorhabditis elegans to investigate the possible neurotoxic effects of nanopolystyrene particles on the development and function of D-type GABAergic motor neurons. Nanopolystyrene (1000 μg L−1) induced the neurodegeneration of D-type motor neurons in wild-type nematodes, and nanopolystyrene (≥100 μg L−1) further induced the neurodegeneration phenotype in nematodes with a mutation in sod-3, encoding a Mn-SOD or acs-22, which governs the functional state of the intestinal barrier. Meanwhile, nanopolystyrene (≥10 μg L−1) decreased head thrash and body bend, and nanopolystyrene (≥100 μg L−1) altered forward and backward movements in wild-type nematodes. Moreover, nanopolystyrene (≥1 μg L−1) decreased head thrash and body bend and nanopolystyrene (≥10 μg L−1) affected forward and backward movements in sod-3 or acs-22 mutant nematodes. Along with the neurotoxicity observed in nanopolystyrene-exposed nematodes, nanopolystyrene exposure induced a dynamic autophagy induction. RNAi knockdown of lgg-1 encoding a key regulator of autophagy induced susceptibility to the neurotoxic effects of nanopolystyrene particles on the development and function of D-type motor neurons, implying the association of dynamic autophagy induction with the neurotoxicity induced by nanopolystyrene particles. Our results highlight the potential neurotoxicity of long-term nanoplastic exposure in organisms.

Qu, M., et al. (2019). "Nanopolystyrene-induced microRNAs response in Caenorhabditis elegans after long-term and lose-dose exposure." Science of the Total Environment **697**: N.PAG-N.PAG.

microRNAs (miRNAs) usually act post-transcriptionally to suppress the expression of many targeted genes. However, the response of miRNAs to nanoplastics is still unclear. We here employed Caenorhabditis elegans to investigate the response of miRNAs to 100 nm nanopolystyrene at a predicted environmental concentration (1 μg/L). After exposure from

L1-larvae to adult day-3, we found that 7 miRNAs (4 down-regulated (mir-39 , mir-76 , mir-794 , and mir-1830) and 3 up-regulated (mir-35 , mir-38 , and mir-354)) were dysregulated by nanopolystyrene. Expressions of these 7 miRNAs were dose-dependent in nematodes exposed to 1–100 µg/L nanopolystyrene. Among these 7 miRNAs, we found that only mir-35 , mir-38 , mir-76 , mir-354 , and mir-794 were involved in the regulation of response to nanopolystyrene based on phenotypic analysis of both transgenic strains and mutant nematodes. Overexpression of mir-35 , mir-38 , or mir-354 induced a resistance to nanopolystyrene toxicity, and overexpression of mir-76 or mir-794 induced a susceptibility to nanopolystyrene toxicity, which suggested that these 5 miRNAs mediated a protective response to nanopolystyrene. Gene ontology and KEGG analysis further implied that mir-35 , mir-38 , mir-76 , mir-354 , and mir-794 were associated with various biological processes and signaling pathways. Our results suggest the crucial role of a certain number of miRNAs in response to nanopolystyrene after long-term and low-dose exposure in organisms. In nematodes, long-term and low-dose exposure to nanopolystyrene caused the response of limited number of miRNAs. Unlabelled Image • miRNAs responses to nanopolystyrene were investigated in nematode C. elegans. • We identified only 7 miRNAs in response to nanopolystyrene (1 µg/L). • We confirmed functions of 5 miRNAs in regulating the nanopolystyrene toxicity. [ABSTRACT FROM AUTHOR]

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Qu, M., et al. (2018). "Using acs-22 mutant Caenorhabditis elegans to detect the toxicity of nanopolystyrene particles." Science of the Total Environment **643**: 119-126.

In this study, we employed Caenorhabditis elegans with acs-22 mutation to examine the in vivo effect of functional deficit in intestinal barrier on toxicity and translocation of nanopolystyrene particles. Mutation of acs-22 leads to deficit in intestinal barrier. After prolonged exposure, nanopolystyrene particles at concentrations >=1? micro g/L could cause toxicity on acs-22 mutant nematodes. acs-22 mutation resulted in translocation of nanopolystyrene particles into targeted organs through intestinal barrier in nanopolystyrene particles (1 micro g/L) exposed nematodes. After prolonged exposure, nanopolystyrene particles (1 micro g/L) dysregulated expressions of some genes required for the control of oxidative stress and activated expression of Nrf signaling pathway. Therefore, under certain pathological conditions, our results suggest the potential toxicity of nanoplastic particles at predicted environmental concentration on organisms after long-term exposure.

Qu, M., et al. (2019). "Identification of long non-coding RNAs in response to nanopolystyrene in Caenorhabditis elegans after long-term and low-dose exposure." Environmental Pollution **255**(Pt 1): 113137.

The potential adverse effects of nanoplastics, such as nanopolystyrene, have received the great attention recently. However, the molecular response of organisms to nanoplastics is still largely unknown. In this study, we employed Caenorhabditis elegans as an animal model to investigate the long non-coding RNAs (lncRNAs) in response to long-term exposure to low-dose nanopolystyrene (100nm). Based on Hiseq 2000 sequencing and qRT-PCR confirmation, we identified 36 lncRNAs (21 down-regulated lncRNAs and 15 up-regulated lncRNAs) in response to nanopolystyrene (1mug/L). Using intestinal reactive oxygen species (ROS) production and locomotion behavior as endpoints, we found that RNAi knockdown of linc-2, linc-9, or linc-61 induced a susceptibility to nanopolystyrene toxicity, and RNAi knockdown of linc-18 or linc-50 induced a resistance to nanopolystyrene toxicity. Meanwhile, nanopolystyrene (1mug/L) increased expressions of linc-2, linc-9, linc-18, and linc-61 and decreased linc-50 expression, suggesting that these 5 lncRNAs mediated two different responses to nanopolystyrene exposure. Bioinformatical analysis implied that these 5 lncRNAs were associated with multiple biological processes and signaling pathways. Our results demonstrated the crucial roles of lncRNAs in response to long-term exposure to low-dose nanopolystyrene in organisms.

Qu, S., et al. (2019). "Implications of China's foreign waste ban on the global circular economy." Resources, Conservation & Recycling **144**: 252-255.

As a main destination for recycling, reuse and disposal of solid waste in the global circular economy, China has recently issued a new regulation on its imports, banning 24 types of solid waste in 4 categories, including waste plastics, unsorted scrap papers, discarded textile materials, and vanadium slags. Bans on additional types of solid waste will take effect soon. Here we discuss the possible profound effects of such policy changes on the global circular economy of solid waste. Recycling industries in developed countries will face challenges in the short run, due to their limited capacity and past reliance on exporting, but also opportunities in the long run. Furthermore, developing countries currently without stringent environmental regulations will likely become the new "pollution haven" of solid waste from developed countries and even emerging economies such as China itself. To truly reap the benefits from China's new policies which are originally designed for environmental sustainability and social justice, the global community needs to develop appropriate policy framework to prevent the unintended consequences. [ABSTRACT FROM AUTHOR]

Qu, S., et al. (2017). "[Isolation of polyethylene microbeads in cosmetics by double-density separation]." Wei Sheng Yen Chiu/Journal of Hygiene Research **46**(6): 986-990.

OBJECTIVE: To develop a stable method for isolation and quantitation of polyethylene microbeads in cosmetics and to observe its morphology and size.

METHODS: Polyethylene microbeads were isolated by using the difference of relative density between polyethylene and two kinds of separation solutions(sodium chloride solution and acetonitrile). The contents of polyethylene microbeads in cosmetics were determined by gravimetric method. The morphology and particle size were observed by microscope.

RESULTS: A stable method was developed by optimizing experimental method. The recoveries were from 93. 2% to 98. 2%, and the relative standard deviations varied in the range from 0. 16% to 2. 81%. Samples labeled containing microbeads could be isolated polyethylene microbeads, and the contents were from 0. 11% to 7. 76%, and size ranged from 100 mum to 200 mum. The morphology of isolated polyethylene microbeads were mostly regular, and color were mainly blue and white.

CONCLUSION: The developed method is simple, repeatable and reliable that can be used for isolation and quantitation of polyethylene microbeads with a density lower than 1 g/cm in cosmetics.

Qu, S.-Y., et al. (2017). "Transcription factor RBP-J-mediated signalling regulates basophil immunoregulatory function in mouse asthma model." Immunology **152**(1): 115-124.

Summary Basophils (BA) play an important role in the promotion of aberrant T helper type 2 (Th2) immune responses in asthma. It is not only the effective cell, but also modulates the initiation of Th2 immune responses. We earlier demonstrated that Notch signalling regulates the biological function of BAin vitro. However, whether this pathway plays the same role in vivo is not clear. The purpose of the present study was to investigate the effect of Notch signalling on BA function in the regulation of allergic airway inflammation in a murine model of asthma. Bone marrow BA were prepared by bone marrow cell culture in the presence of recombinant interleukin-3 (rIL-3; 300 pg/ml) for 7 days, followed by isolation of the CD49b+ microbeads. The recombination signal binding protein J (RBP-J-/-) BA were co-cultured with T cells, and the supernatant and the T-cell subtypes were examined. The results indicated disruption of the capacity of BA for antigen presentation alongside an up-regulation of the immunoregulatory function. This was possibly due to the low expression of OX40L in the RBP-J-/- BA. Basophils were adoptively transferred to ovalbumin-sensitized recipient mice, to establish an asthma model. Lung pathology, cytokine profiles of brobchoalveolar fluid, airway hyperactivity and the absolute number of Th1/Th2 cells in lungs were determined. Overall, our results indicate that the RBP-J-mediated Notch signalling is critical for BA-dependent immunoregulation. Deficiency of RBP-J influences the immunoregulatory functions of BA, which include activation of T cells and their differentiation into T helper cell subtypes. The Notch signalling pathway is a potential therapeutic target for BA-based immunotherapy against asthma.

Qu, X., et al. (2018). "Assessing the relationship between the abundance and properties of microplastics in water and in mussels." Science of the Total Environment **621**: 679-686.

Microplastic pollution is increasingly becoming a great environmental concern worldwide. Microplastics have been found in many marine organisms as a result of increasing plastic pollution within marine environments. However, the relationship between micoplastics in organisms and their living environment is still relatively poorly understood. In the present study, we investigated microplastic pollution in the water and the mussels (Mytilus edulis, Perna viridis) at 25 sites along the coastal waters of China. We also, for the first time, conducted an exposure experiment in parallel on the same site using M. edulis in the laboratory. A strong positive linear relationship was found between microplastic levels in the water and in the mussels. Fibers were the dominant microplastics. The sizes of microplastics in the mussels were smaller than those in the water. During exposure experiments, the abundance of microbeads was significantly higher than that of fibers, even though the nominal abundance of fibers was eight times that of microbeads. In general, our results supported positive and quantitative correlations of microplastics in mussels and in their surrounding waters and that mussels were more likely to ingest smaller microplastics. Laboratory exposure experiment is a good way to understand the relative impacts of microplastics ingested by marine organisms. However, significant differences in the results between exposure experiments and field investigations indicated that further efforts are needed to simulate the diverse environmentally relevant properties of microplastics.

Quan, X., et al. (2018). "Three-dimensional stimulation and imaging-based functional optical microscopy of biological cells." Optics Letters **43**(21): 5447-5450.

A new type of functional optical microscope system called three-dimensional (3D) stimulation and imaging-based functional optical microscopy (SIFOM) is proposed, to the best of our knowledge. SIFOM can precisely stimulate user-defined targeted biological cells and can simultaneously record the volumetric fluorescence distribution in a single acquisition. Precise and simultaneous stimulation of fluorescent-labeled biological cells is achieved by multiple 3D spots generated by digital holograms displayed on a phase-mode spatial light modulator. Single-shot 3D acquisition of the fluorescence distribution is accomplished by common-path off-axis incoherent digital holographic microscopy in which a diffraction grating with a focusing lens is displayed on another phase-mode spatial light modulator. The effectiveness of the proposed functional microscope system was verified in experiments using fluorescent microbeads and human lung cancer cells located at various defocused positions. The system can be used for manipulating the states of cells in optogenetics.

Quang, D. V., et al. (2011). "Preparation of amino functionalized silica micro beads by dry method for supporting silver nanoparticles with antibacterial properties." Colloids and Surfaces A: Physicochemical and Engineering Aspects **389**(1-3): 118-126.

The development of resistance to antibiotics and disinfectants as well as the occurrence of many adverse effects caused by using conventional antibacterial agents like chlorine compounds have prompted scientists to search for new antibacterial agents. Among the many nanomaterials, silver nanoparticles have proven to be a good alternative for its antibacterial properties. In this study, silver nanoparticle-supported silica micro beads (Ag-NPBs) with sizes ranging from 180 to 500 mum have been prepared. Silica gel was synthesized by a sol-gel route and crushed into micro beads, which were modified with 3-aminopropyltriethoxysilane by so-called dry method. Silver nanoparticles were directly created on the surface and in the pores of the modified silica by chemical reduction. The prepared materials were characterized with FT-IR, BET, XRD, FE-SEM, FE-STEM, UV-vis spectrophotometer, and optical microscope. Silver nanoparticles mostly distributed at the outer layer of amino functionalized silica beads. Ag-NPBs samples were examined for their antibacterial properties against Escherichia coli (E. coli) and Bacillus subtilis (B. subtilis). The excellent antibacterial properties of Ag-NPBs were confirmed with zone inhibition and test tube test. Zone inhibitory tests proved that Ag-NPBs were effective against both gram negative and gram positive bacteria while test tube tests indicated that no E. coli was detected after 1. min contact. © 2011 Elsevier B.V.

Quartey, E. T., et al. (2015). "Theoretical Framework for Plastic Waste Management in Ghana through Extended Producer Responsibility: Case of Sachet Water Waste." International Journal of Environmental Research & Public Health [Electronic Resource] **12**(8): 9907-9919.

Currently, use and disposal of plastic by consumers through waste management activities in Ghana not only creates environmental problems, but also reinforces the notion of a wasteful society. The magnitude of this problem has led to increasing pressure from the public for efficient and practical measures to solve the waste problem. This paper analyses the impact of plastic use and disposal in Ghana. It emphasizes the need for commitment to proper management of the impacts of plastic waste and effective environmental management in the country. Sustainable Solid Waste Management (SSWM) is a critical problem for developing countries with regards to climate change and greenhouse gas emission, and also the general wellbeing of the populace. Key themes of this paper are producer responsibility and management of products at end of life. The paper proposes two theatrical recovery models that can be used to address the issue of sachet waste in Ghana.

Que, Z., et al. (2019). "Establishment and characterization of a patient-derived circulating lung tumor cell line in vitro and in vivo." Cancer Cell International **19**: 21.

Background: Circulating tumor cells (CTCs) have been described as a population of cells that may

seed metastasis, which is a reliable target for the prevention of metastases in lung cancer patients at the early stage. The culturing of CTCs in vitro can be used to study the mechanism of lung cancer metastasis and to screen antimetastasis drugs. This study aims to establish CTC cell line in vitro and explore the potential mechanism of its metastasis.

Methods: A mixture of EpCAM- and EGFR-coated immunomagnetic microbeads in microfluidic Herringbone-Chip was used to capture CTCs. The CTCs, 95-D and A549 cells was evaluated by cell proliferation assays, clonal formation assays, migration assays and drug resistance. Flow cytometry and cytokine protein chip were used to detect the difference in phenotype and cytokine secretion between CTCs, 95-D and A549 cells. The NOD/SCID mice were used to study tumorigenicity, lung organ colonization and metastasis of CTCs. The H&E staining, immunohistochemistry and immunofluorescence assay were used to detect the pathological status of CTCs.

Results: The number of EpCAM(+)/EGFR(+)/CK(+)/CD45(-) lung CTCs showed a weak negative correlation with clinical stages in patients with non-small cell lung cancer (NSCLC). In a phase IIa lung cancer patient, we successfully establish a permanent CTC cell line, named CTC-TJH-01. In vitro studies showed the CTC-TJH-01 cells were in the intermediate stage of epithelial to mesenchymal transition (EMT), had stem cell characteristics and were drug resistant. In vivo studies showed that CTC-TJH-01 cells can induce tumorigenesis, lung organ colonization and metastasis after xenografting in immunodeficient mice. In addition, the low expression level of CX3CL1 and high expression level of CXCL5 in the CTC-TJH-01 cells may be an important mechanism for their metastasis.

Conclusions: We successfully established a permanent CTC cell line with metastatic ability, which can be used to screen antimetastatic drugs and study the mechanism of lung cancer metastasis.

Quecholac-Pina, X., et al. (2017). "Biodegradation of compostable and oxodegradable plastic films by backyard composting and bioaugmentation." Environmental Science and Pollution Research **24**(33): 25725-25730.

Plastics are widely used in the production of short-life products, which are discarded producing an accumulation of these materials and problems due to their persistence in the environment and waste management systems. Degradable plastics (compostable, oxodegradable) have been presented as an alternative to decrease the negative effect of plastic waste. In this research, the feasibility of degrading a commercially available compostable film and oxodegradable polyethylene, with and without previous abiotic oxidation, is assessed in a home composting system. Reactors (200 L) were used to degrade the plastic films along with a mixture of organic food waste (50%), mulch (25%), and dry leaves (25%), amended with yeast and a solution of brown sugar to increase the speed of the process. The presence of the plastic film did not affect the composting process, which showed an initial increase in temperature and typical profiles for moisture content, pH, with a final C/N of 17.4. After 57 days, the compostable plastic has decreased its mechanical properties in more than 90%, while the oxodegradable film did not show significant degradation if it was not previously degraded by UV radiation. The use of these plastics should be assessed against the prevailing waste management system in each city or country. In the case of Mexico, which lacks the infrastructure for industrial composting, home composting could be an option to degrade compostable plastics along organic waste. However, more testing is needed in order to set the optimal parameters of the process.

Quillen, K., et al. (2011). "Screening plateletpheresis donors for HLA antibodies on two high-throughput platforms and correlation with recipient outcome." Transfusion **51**(3): 504-510.

BACKGROUND: To determine the prevalence and impact of transfusing plasma containing white blood cell antibodies, we compared two high-throughput HLA antibody screening assays and prospectively examined the medical records of all platelet (PLT) recipients to detect subtle manifestations of transfusion-related acute lung injury and other transfusion reactions.

STUDY DESIGN AND METHODS: Serum samples from 136 plateletpheresis donors were tested for HLA Class I and II antibodies using microbead (LABScreen PRA, One Lambda) and microchip (Dynachip, Invitrogen) assays. Electronic medical records of all recipients were reviewed for vital signs and nursing documentation before and after transfusion.

RESULTS: In the microchip assay with a cutoff value of 0.25, 2.9% of samples were positive for Class I and 8.9% for Class II antibodies; with a cutoff value of 0.1, the results were 14.9 and 21.6%, respectively. In the microbead assay (normalized background ratio, 1.5), 15% were positive for Class I and 21% for Class II antibodies. The prevalence of HLA antibodies was 17% in donors without pregnancy or transfusion history and 47% in donors with such history. The PLTs were transfused in 265 episodes to 67 patients. There were no reported reactions; however, symptoms or vital sign changes were noted in seven transfusion episodes. The incidence of reactions was 2.7% (2/75) for antibody-positive units and 2.6% (5/190) for antibody-negative units.

CONCLUSIONS: Microbead and microchip assays yielded similar results. The prevalence of HLA antibodies was greater in donors with a history of pregnancy or transfusion, but no increase in the incidence of transfusion reactions was noted in recipients of components from donors with HLA antibodies.

Quinn, B., et al. (2017). "Validation of density separation for the rapid recovery of microplastics from sediment. (Special Issue: Microplastics in the environment.)." Analytical Methods **9**(9): 1491-1498.

Several density separation techniques using numerous brine solutions have been developed for the separation of microplastics from sediment. The aim of this study was to validate the use of various brine solutions in a relatively rapid, reproducible, low cost single stage method that can deliver consistently high recoveries for different microplastic polymers <1 mm appropriate for monitoring programmes. The recovery of environmentally relevant microplastics (200-400 micro m and 800-1000 micro m) from post-consumer products was tested against tap water and brine solutions of varying density including sodium chloride (NaCl), sodium bromide (NaBr), sodium iodide (NaI) and zinc bromide (ZnBr₂). As expected a general trend of increasing microplastic recovery with increasing solution density was observed, with NaI and ZnBr₂ having significantly (p<=0.001) higher rates of microplastic recovery. Microplastic size was found to influence recovery rates and needs to be taken into consideration when choosing a brine solution. From this work it is evident that density separation recovery tests are needed to validate the use of brine solutions for microplastic recovery and that ZnBr₂ is a novel and appropriate brine solution for microplastic extraction. This study represents the most in depth validation of brine solutions for the density separation of microplastic from sediments undertaken to date.

Raamanathan, A., et al. (2012). "Integrated microfluidic bead-based immunosensor for multiplexed determinations of ovarian cancer biomarkers at the point-of-care." Cancer Research. Conference: 103rd Annual Meeting of the American Association for Cancer Research, AACR **72**(8 SUPPL. 1).

Early detection of ovarian cancer could significantly impact clinical outcome and hence patient survival. Given the biological heterogeneity of ovarian cancer, multi-marker panels will be required. Validation of such panels must utilize pre-clinical serum samples that are available only in small quantities. Diagnostic platforms that are capable of rapid, precise and multiplexed analysis of biomarkers in small quantities of serum should facilitate validation of optimal biomarker panels. Once validated, these platforms could permit rapid screening with finger-stick quantities of blood at point-of-care. The Programmable Bio-Nano-Chip (p-BNC) microfluidic immunosensor provides such a platform. In the p-BNC, serum biomarkers are sequestered and assessed with a fluorescence-based sandwich immunoassay, completed in nano-nets of sensitized agarose microbeads localized in individually addressable wells, housed in a microfluidic module, capable of integrating multiple sample, reagent and biowaste processing and handling steps. Previously, we adapted the p-BNC for the quantification of the CA125 biomarker with low LODs, high precision and a short analysis time of 43 minutes. Here, we adapt the p-BNC to simultaneously assess CA125 and HE4, a promising biomarker panel implicated in early detection. The HE4 immunoassay was developed to perform optimally with the previously established CA125 assay as the rate determining step. Extensive cross reactivity analysis ruled out non-ideal interactions between HE4 and CA125 reagents at the level of capturing antibody, detecting antibody and individual analytes. Wash times were optimized to maximize p-BNC performance. The dose-response curves obtained for the individual analytes (singleplex) were similar to those obtained with multiplex assays. Identical LOD values were noted for the singleplex and multiplex immunoassays with 1.5-fold decrease in precision for the multiplexed assays, demonstrating negligible loss of analytical performance upon multiplexing. For clinical validation, 8 surgically confirmed advanced stage patient sera and 8 age-matched healthy controls were assessed on the multiplexed p-BNC. ROC curve analysis for the CA125-HE4 biomarker combination, interpreted with a Risk of Ovarian Malignancy Algorithm was able to discriminate diseased samples from healthy controls with an AUC of 1.00. The p-BNC indicates strong promise for robust, multiplexed, quantitative measurements of ovarian cancer biomarkers, with high precision and sensitivity to yield clinically pertinent information under 45 minutes. Incorporation of additional biomarkers is underway to establish and validate an optimal panel for early detection of ovarian cancer.

Raamanathan, A., et al. (2012). "Programmable bio-nano-chip systems for serum CA125 quantification: toward ovarian cancer diagnostics at the point-of-care." Cancer Prevention Research **5**(5): 706-716.

Point-of-care (POC) implementation of early detection and screening methodologies for ovarian cancer may enable improved survival rates through early intervention. Current laboratory-confined immunoanalyzers have long turnaround times and are often incompatible with multiplexing and POC implementation. Rapid, sensitive, and multiplexable POC diagnostic platforms compatible with promising early detection approaches for ovarian cancer are needed. To this end, we report the adaptation of the programmable bio-nano-chip (p-BNC), an integrated, microfluidic, and modular (programmable) platform for CA125 serum quantitation, a biomarker prominently implicated in multimodal and multimarker screening approaches. In the p-BNCs, CA125 from diseased sera (Bio) is sequestered and assessed with a fluorescence-based sandwich immunoassay, completed in the nano-nets (Nano) of sensitized agarose microbeads localized in individually addressable wells (Chip), housed in a microfluidic module, capable of integrating multiple sample, reagent and biowaste processing, and handling steps. Antibody pairs that bind to distinct epitopes on CA125 were screened. To permit efficient biomarker sequestration in a three-dimensional microfluidic environment, the p-BNC operating variables (incubation times, flow rates, and reagent concentrations) were tuned to deliver optimal analytical performance under 45 minutes. With short analysis times, competitive analytical performance (inter- and intra-assay precision of 1.2% and 1.9% and limit of detection of 1.0 U/mL) was achieved on this minisensor ensemble. Furthermore, validation with sera of patients with ovarian cancer (n = 20) showed excellent correlation ($R(2) = 0.97$) with gold-standard ELISA. Building on the integration capabilities of novel microfluidic systems programmed for ovarian

cancer, the rapid, precise, and sensitive miniaturized p-BNC system shows strong promise for ovarian cancer diagnostics.

Rack, R., et al. (2011). "Sustainable supply chains: Lessons learned from a long lasting insecticidal net recycling pilot project in Madagascar." American Journal of Tropical Medicine and Hygiene **1)**: 371.

Distribution, use and timely replacement of long-lasting insecticide treated nets (LLINs) are part of a key malaria prevention strategy in Madagascar, where 5.2 million LNs were distributed from 2005-2007. There is a growing awareness of the potential environmental impact of insecticide-embedded plastic waste from the increased number of LNs, if not disposed of or recycled in an environmentally sound manner. We conducted a pilot project to collect and recycle existing old, expired LNs (oLNs) in conjunction with a mass free LN distribution campaign in November, 2010. Six health districts with an estimated population of 1.6 million were targeted for the pilot where 279,000 bed nets had been distributed in 2007. Health volunteers were trained to educate their communities, using a pre-tested job-aid, to voluntarily bring unwanted oLNs for disposal to the closest campaign community distribution point at the time of collecting their new free LNs. oLNs were collected, transported, sorted, compacted, baled and shipped to a plastics recycling company for processing. Over 22,500 oLNs were collected from 394 out of 489 (81%) community collection points. Of these, 90% were collected post-campaign. Community members were more willing to give up oLNs once the new LNs were installed in homes after the campaign distribution. Families with an insuffcient number of new nets, and those using oLNs for other purposes, were reluctant to give up their oLNs. Sites with the most complex transport logistics were less likely to successfully collect oLNs. Post hoc radio messaging was found to be a useful tool to reinforce messages. The cost was $2.72/oLN collected. Costs could be substantially reduced by combining training with other LN distribution campaign preparation activities. LLINs have been successfully recycled and the material is being analyzed and tested for the most appropriate recycling use. In conclusion, collection and recycling of oLNs was found to be acceptable and feasible. Malaria programs and international donors should further explore and implement cost-effective recycling and re-use options.

Racolta, A., et al. (2016). THE ANALYSIS OF PET BOTTLE REUSE AS A ROOF THERMAL INSULATION COMPONENT. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **2:** 731-738.

The sustainability of the built environment is an intensely debated topic and, nowadays, there is a predilection to focus on innovation through new building materials. The process tends to divert attention from the oportunities offered by existing objects. In this respect, rethinking the concept of sustainability becomes an imperative. The object of analysis in this case is the functional reinterpretation of available products that can be exploited in the field of construction systems. The purpose of this study is to highlight an alternative method - the reuse of PET bottles by avoiding recycling which assumes additional processing expense. Although today there are technologies that, in compliance with environmental standards, are capable of recycle and reprocess plastic waste, we highly believe that the reuse of PET bottles is "greener" than recycling which involves considerable energy consumption. This approach concentrates on the analysis of the feasibility of creating an insulating layer on the roof of single-family houses located in disadvantaged areas in relation to existing insulation materials currently on the market. The research is considering ways of grouping items and anchor means for the case of pitched roofs that characterize most single-family houses located in rural areas or less urbanized ones. Thermal and economical performances are analyzed in comparison with the behavior of materials dedicated to the same functionality of insulating the upper level of the houses. The conclusions consider multi-criterial aspects to reveal the feasibility of the option of introducing residual objects - namely, the waste PET bottles - into insulating systems. Furthermore, the paper tries to anticipate several threats that may occur over time together with the changing perception about the potential of easily accessible objects following the adoption of the possible legal regulations.

Radziwon, P., et al. (2016). "Ozone induces generation of microparticles from erythrocytes, leukocytes, platelets and endothelial cells." Vox Sanguinis **111 (Supplement 1)**: 301-302.

Background: Ozone for therapeutic purposes has been applicated in a number of pathologies, such as vascular diseases, ulcers, and acute and chronic viral diseases. Ozone performance arises from generation of highly reactive oxygen species and subsequent activation of antioxidant enzymes. Despite long experience of ozonized autohaemotherapy the putative molecular mechanisms underlying some reported clinical effects of this gas as well adverse effects included myocardial infarction remain mainly unknown. Aim(s): We studied the effect of blood ozonation on the generation of microparticles derived from blood cells and endothelium which may be responsible for some clinical effects of ozone. Method(s): Sixty ml of venous blood was taken from 20 healthy volunteers and anticoagulated with citrate phosphate dextrose solution (0.12% final concentration). Each sample of blood was divided into 4 equal volumes and transferred to separate containers. The first part was not further processed, the second part was aerated, the third and the fourth parts were subjected to ozone in a dose of 15 mug/ml and 30 mug/ ml respectively. The oxygen-ozone gas mixture was freshly prepared from medicalgrade oxygen using ATO-3 MINI ozone generator (CryoFlex, Poland). Blood samples were taken from the blood bag before and after ozonation/aeration. Microparticles derived from erythrocytes (RMP), leukocytes (LMP), platelets (PMP) and endothelial cells (EMP) were quantitatively measured using flow cytometry (FACSCalibur, Becton Dickinson) and murine monoclonal antibodies: anti-CD235 for RMP, anti-CD42 for PMP, CD45 for LMP, anti-CD105 for EMP. For quantitative measurement of microparticles the flow cytometer was calibrated using microspheres size from 1 lm to 1.5 mum (Microbead NIST Traceable Particle Size Standard, Polysciences) and microbeds (TruCount, Becton Dickinson). Result(s): We observed statistically significant larger amounts of microparticles derived from erythrocytes, leukocytes, platelets as well as endothelial cells generated in either aerated or ozonized blood compare to control (blood untreated with any gas). Moreover in ozonized blood were statistically significant more microparticles generated compare to blood subjected to air. The generation of microparticles induced by ozone was dose dependent. Conclusion(s): Aeration or ozonizing of blood induce generation of microparticles from erythrocytes, leukocytes, platelets and endothelial cells. Microparticles may be involved in mechanism of some adverse effects observed after ozonized autohaemotherapy.

Rafiee, M., et al. (2018). "Neurobehavioral assessment of rats exposed to pristine polystyrene nanoplastics upon oral exposure." Chemosphere **193**: 745-753.

The increasing use of plastics has raised concerns about pollution of freshwater by these polymeric materials. Knowledge about their potential effects on environmental and public health is limited. Recent publications have suggested that the degradation of plastics will result in the release of nano-sized plastic particles to the environment. Therefore, it is of utmost importance to gain knowledge about whether and how nanoplastics affect living organisms. The present study aimed to analyse potential neurobehavioral effects of polystyrene nanoparticles (PS-NPs) after long-term exposure on rat. Potential effects of PS-NPs were investigated using four test dosages (1, 3, 6, and 10 mg PS-NPs/kg of body weight/day) administrated orally with adult Wistar male rats for five weeks. Neurobehavioral tests were chosen to assess a variety of behavioral domains. Particle diameters in test suspensions were determined through dynamic light scattering and showed an average hydrodynamic diameter of approximately 38.92 nm. No statistically significant behavioral effects were observed in all tests performed ($p > 0.05$). In the elevated plus maze, PS-NPs-exposed rats showed greater number of entries into open arms compared to controls. Also, PS-NPs had no significant influence on body weight of animals. Taking into account the subtle and transient nature of neurobehavioral consequences, however, these results underline the possibility of even pristine plastic nanoparticles to induce behavioral alteration in the rest of the food web, including for marine biota and humans. Indeed even though studied neurobehavioral effects in our study was not statistically significant, the observed subtle effects may be clinically considerable.

Ragaert, K., et al. (2017). "Mechanical and chemical recycling of solid plastic waste." Waste Management **69**: 24-58.

This review presents a comprehensive description of the current pathways for recycling of polymers, via both mechanical and chemical recycling. The principles of these recycling pathways are framed against current-day industrial reality, by discussing predominant industrial technologies, design strategies and recycling examples of specific waste streams. Starting with an overview on types of solid plastic waste (SPW) and their origins, the manuscript continues with a discussion on the different valorisation options for SPW. The section on mechanical recycling contains an overview of current sorting technologies, specific challenges for mechanical recycling such as thermo-mechanical or lifetime degradation and the immiscibility of polymer blends. It also includes some industrial examples such as polyethylene terephthalate (PET) recycling, and SPW from post-consumer packaging, end-of-life vehicles or electr(on)ic devices. A separate section is dedicated to the relationship between design and recycling, emphasizing the role of concepts such as Design from Recycling. The section on chemical recycling collects a state-of-the-art on techniques such as chemolysis, pyrolysis, fluid catalytic cracking, hydrogen techniques and gasification. Additionally, this review discusses the main challenges (and some potential remedies) to these recycling strategies and ground them in the relevant polymer science, thus providing an academic angle as well as an applied one.

Ragaert, K., et al. (2020). "Design from recycling: A complex mixed plastic waste case study." Resources, Conservation and Recycling **155 (no pagination)**(104646).

With today's continued drive to increase recycling rates of plastics, the low-hanging fruit of clean mono-streams of plastic waste has long since been picked. If Europe's ambitious recycling targets are to be met, plastics waste streams that have until now been labeled 'problematic' and have consistently been sent to incineration, must be considered as well. One such stream is the sink fraction obtained from float-sink sorting of mixed post-consumer packaging waste. It is a very complex stream in terms of composition. Moreover, it contains a sizeable amount of PVC, which is considered detrimental to further mechanical recycling of any mixed plastic waste. Within the current research, the sink fraction was extensively analyzed for composition and mechanical properties, as well as treated for removal of PVC and non-ferrous metals. Subsequently, the Design from Recycling strategy was applied to successfully develop a new product with this material, called the Greentile. The Greentile was effectively manufactured and found to be a useful construction element for slanted green roofs. Copyright © 2019 Elsevier B.V.

Raghu, P. V., et al. (2014). "Upgradation of geotechnical parameters by waste plastic admixture in soil." Journal of Environmental Research and Development **8**(3): 759-765.

Waste plastics impart huge environmental problems. Apparently they are not serious harmful materials but they require huge amount of space in land fills and also consume high amount of energy for its production. Scavenge plastic also poses clogging of drainage conduits and as such often observed rainwater detention in cities and towns. Ministry of Environment and Forest (MoEF) and Central Pollution Control Board (CPCB) inducted rules for plastic waste management and recommended also possible recycling of waste as far as possible. For a sustainable resource management practice, plastic waste are being recycled in many ways. Plastic waste management institute reported about 55% of waste plastic are effectively being utilized in energy recovery and feed stock recycling. All the plastics are not recyclable. A common problem with recycling plastics is that they are often made up of more than one kind of polymer or some sort of fibers added to the plastics (a composite) to give added strength. The above characteristics are helpful for using the waste materials in poor grade soil to enhance the geotechnical properties of soil. Plastic fibers are similar to the roots of trees and vegetation which provide an excellent ingredient to improve the soils and the stability of natural slopes. One of the main advantages of using plastic fibers is the maintenance of strength isotropy and the absence of potential places of weakness that can develop parallel to oriented reinforcement. Polyethylene Terephthalate (PET) materials are used in bottles, food packaging and carpets. Some investigation showed that the PET fiber reinforcement enhances the peak and ultimate strength of both cemented uncemented soil and does not change the initial stiffness of the soil. PET bottle fibers mixed soil behaves as reinforced soil similar to fiber reinforced soil. The introduction of waste plastic as strips or fibers improve the soil texture and strength in terms of compressibility, energy absorption, shear strength, CBR since their addition also helps favorably. The present paper describes the status on uses of various waste plastic fibers for also for the parameters improvement of soil in terms of its geotechnical parameters.

Raghu, P. V., et al. (2015). "Improvement of shear strength of clayey soil using randomly distributed pet bottle strips." Journal of Environmental Research and Development **10**(1): 65-72.

Waste plastics impart adverse environmental problems like clogging in drainage system and need of large space required for solid waste disposal in the metropolitan and over crowded cities. Recycling of plastic waste from water bottles is becoming one of the challenges worldwide. The bottled water is the fastest growing beverage industry in the world. Plastic bottle recycling has not kept pace with the dramatic increase in sale of virgin resin Poly Ethylene Terephthalate (PET) and the same are to reduce/reuse/recycle that has emerged as one of the important need for sustainable development. The introduction of randomly distributed plastic fibers in reinforcing soil has enabled geotechnical engineers to effectively use unsuitable soils as reliable construction material and foundation medium in a wide range of civil engineering applications for ground improvement, sub bases and sub grade preparation in building and road construction. In order to use waste plastic material as means of waste management an experimental work has been undertaken with one type of locally collected clayey soil and two types of amended soil (clayey soil with 10% sand and 20% sand) reinforced with randomly mixed PET bottle strips of different percentages (varying from 0.5% to 2% by weight) with different values of aspect ratio (length/width) with constant width of 5 mm. The work has been done with the objective of examining the improvement of shear strength parameters of a clayey soil by mixing PET bottle strips. A series of triaxial compression tests were carried out adopting standard procedures on those three types of soil with different percentages of plastic strips with varying aspect ratio as mentioned. It is observed that angle of internal friction (phi) enhances with the elevated percentage of sand up to addition of 1% of plastic strips by weight for values of aspect ratio (length/width) 1, 2 and 3. However beyond this value the angle of internal

friction descends gradually, when other parameters do not vary. The present study provides an approach in improvement of strength of weak soil as well as in recycling plastic waste and also brings out change in shear strength parameters of soil with mixing of PET bottle strips in different proportions for its use in geotechnical engineering.

Ragossnig, A. M. and D. R. Schneider (2017). "What is the right level of recycling of plastic waste?" Waste Management and Research **35**(2): 129-131.

Rahman, A. T., et al. (2015). "Evaluation of Time-Temperature Integrators (TTIs) with Microorganism-Entrapped Microbeads Produced Using Homogenization and SPG Membrane Emulsification Techniques." Journal of Microbiology & Biotechnology **25**(12): 2058-2071.

A comparative study was conducted to evaluate precision and accuracy in controlling the temperature dependence of encapsulated microbial time-temperature integrators (TTIs) developed using two different emulsification techniques. Weissela cibaria CIFP 009 cells, immobilized within 2% Na-alginate gel microbeads using homogenization (5,000, 7,000, and 10,000 rpm) and Shirasu porous glass (SPG) membrane technologies (10 mum), were applied to microbial TTIs. The prepared micobeads were characterized with respect to their size, size distribution, shape and morphology, entrapment efficiency, and bead production yield. Additionally, fermentation process parameters including growth rate were investigated. The TTI responses (changes in pH and titratable acidity (TA)) were evaluated as a function of temperature (20degreeC, 25degreeC, and 30degreeC). In comparison with conventional methods, SPG membrane technology was able not only to produce highly uniform, small-sized beads with the narrowest size distribution, but also the bead production yield was found to be nearly 3.0 to 4.5 times higher. However, among the TTIs produced using the homogenization technique, poor linearity (R(2)) in terms of TA was observed for the 5,000 and 7,000 rpm treatments. Consequently, microbeads produced by the SPG membrane and by homogenization at 10,000 rpm were selected for adjusting the temperature dependence. The Ea values of TTIs containing 0.5, 1.0, and 1.5 g microbeads, prepared by SPG membrane and conventional methods, were estimated to be 86.0, 83.5, and 76.6 kJ/mol, and 85.5, 73.5, and 62.2 kJ/mol, respectively. Therefore, microbial TTIs developed using SPG membrane technology are much more efficient in controlling temperature dependence.

Rainieri, S. and A. Barranco (2019). "Microplastics, a food safety issue? (Special Issue: Keeping food safety on the agenda for 15 years - the SAFE consortium.)." Trends in Food Science & Technology **84**: 55-57.

The risk posed by microplastics for human and environment, has become a hot topic. The concern is focused not only on the effect of microplastics as such but also on additives and chemical contaminants absorbed by microplastics that may be released and affect negatively animals and environmental health. Despite several works have been written on this topic, a number of knowledge gaps still should be filled to enable a correct risk assessment of this important issue. For example, the relevance of microplastics for food safety has not yet been fully established and scientific results aimed at establishing a possible health risk for contaminants associated with microplastics are rather controversial. The risk assessment of microplastics in foodstuff is still at a very early stage and very few studies on the monitoring of microplastics in foodstuff and their effects on human health are available. Additionally, it is difficult to compare results from different studies as methodologies and study designs are not uniform. For this reason, it is not always possible to reach some definitive conclusion. This work sets out to complement the reviews and statements already existing, by updating the

information and identifying if any of the knowledge gaps have been covered and if further ones have been detected with the final aim of properly assessing and managing this emerging risk.

Rainieri, S., et al. (2018). "Combined effects of microplastics and chemical contaminants on the organ toxicity of zebrafish (Danio rerio)." Environmental Research **162**: 135-143.

Microplastics contamination of the aquatic environment is considered a growing problem. The ingestion of microplastics has been documented for a variety of aquatic animals. Studies have shown the potential of microplastics to affect the bioavailability and uptake route of sorbed co-contaminants of different nature in living organisms. Persistent organic pollutants and metals have been the co-contaminants majorly investigated in this field. The combined effect of microplastics and sorbed co-contaminants in aquatic organisms still needs to be properly understood. To address this, we have subjected zebrafish to four different feeds: A) untreated feed; B) feed supplemented with microplastics (LD-PE 125–250 µm of diameter); C) feed supplemented with 2% microplastics to which a mixture of PCBs, BFRs, PFCs and methylmercury were sorbed; and D) feed supplemented with the mixture of contaminants only. After 3 weeks of exposure fish were dissected and liver, intestine, muscular tissue and brain were extracted. After visual observation, evaluation of differential gene expression of some selected biomarker genes in liver, intestine and brain were carried out. Additionally, quantification of perfluorinated compounds in liver, brain, muscular tissue and intestine of some selected samples were performed. The feed supplemented with microplastics with sorbed contaminants produced the most evident effects especially on the liver. The results indicate that microplastics alone does not produce relevant effects on zebrafish in the experimental conditions tested; on the contrary, the combined effect of microplastics and sorbed contaminants altered significantly their organs homeostasis in a greater manner than the contaminants alone. [ABSTRACT FROM AUTHOR]

Rainieri, S., et al. (2018). "Combined effects of microplastics and chemical contaminants on the organ toxicity of zebrafish (Danio rerio). (Special Section: Environmental contaminants in seafood: new findings & innovation challenges.)." Environmental Research **162**: 135-143.

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Raj, G., et al. (2009). "Probing cellulose/polylactic acid interactions in model biocomposite by colloidal force microscopy." Colloids and Surfaces A: Physicochemical and Engineering Aspects **352**(1-3): 47-55.
Over the last few years, intensive research has been devoted to the exploitation of "green products" based on natural resources for both matrices and as reinforcements in composite systems. The mechanical properties of reinforced biocomposites, such as flax/polylactic acid (PLA), are largely governed by interfacial properties between the two constituents apart from their intrinsic properties. Although many papers indirectly demonstrate the importance of optimising the interface between these two polymers, the exact nature of the interaction between the natural fibre and the polymeric matrix has not been clearly investigated on a fundamental level and is presently a major technological limitation of these materials. This work presents the first direct study of adhesion forces, by colloidal force microscopy, between smooth PLA films representing the polymer matrix, and a microbead of cellulose that mimic the cellulose material in flax fibres. Normalised adhesion force measurements have shown the importance of capillary forces when experiments were carried out under ambient conditions. Experiments, conducted under dry air, allowed for the deduction of the contribution of pure van der Waals forces, and our results, through the calculation of the Hamaker constant, show that these forces, for the PLA/cellulose/air system, were lower than those obtained for the cellulose/cellulose/air system and hence underlined the importance of optimising the interface among these materials. This study demonstrates the capacity of AFM to probe direct interactions in complex systems by adjusting the nature of the surface and the probe to mimic the materials in contact. Furthermore, the technique can be operated in a variety of environments, consistent with composite making and provides particular opportunity for testing and improving the properties of these new classes of composite materials. © 2009 Elsevier B.V. All rights reserved.

Raj, M. M., et al. (2015). "Preparation and characterization of alginate/methyl cellulose microbeads of losartan potassium." International Journal of Pharma and Bio Sciences **6**(4): P1-P11.
Losartan Potassium microbeads were formulated by ionotropic gelation technique using a combination of sodium alginate and methyl cellulose. The influence of different concentrations of polymer was studied. Microbeads were assessed for their physicochemical properties and In-vitro drug release studies. FT-IR study confirmed that there was no drug excipient interaction. The prepared microbeads are within specifications for all the physicochemical properties.SEM shows all the beads are spherical and smooth surface. In-vitro release data shows the individual concentration of sodium alginate sustains the drug release up to 8hrs but combinations with methyl cellulose sustain the drug release more than 12 hrs. Methyl cellulose in higher proportion increased the mean diameter of bead and increased encapsulation efficiency up to 93.94 % and drug release was extended up to 13hrs.

Rajak, A., et al. (2020). "Electrospun nanofiber from various source of expanded polystyrene (EPS) waste and their characterization as potential air filter media." Waste Management **103**: 76-86.
This paper reported on the fabrication of nanofibrous membranes from various sources of expanded polystyrene (EPS) waste using electrospinning technique and their application as air

filter media. The filter membranes were made from four EPS waste sources, i.e. food packaging, EPS craft, instant noodle cup, and electronic packaging. The properties of the membranes fabricated from those sources were compared to obtain the best EPS waste source for air filter application. To make the precursor solutions, those samples were dissolved in d-limonene:DMF with the concentration of 15, 20, and 25 wt%. The solid EPS density, solution viscosity, and surface tension were measured. The fiber diameter and morphology of nanofibers were characterized by scanning electron microscopy (SEM) for each EPS variation. The fabricated membrane properties (crystallinity, wettability, and mechanical strength) and filtration properties (pressure drop, PM<inf>2.5</inf> filtration efficiency, and quality factor) were fully characterized and analyzed. Homogeneous fiber diameter with various morphologies (beaded, wrinkled, and smooth fiber) were obtained from all samples with hydrophobic to super-hydrophobic surface (water contact angle ranging from 106 to 153degree). Also, the EPS solid density affected the solution viscosity with the expression of eta = 0.132 rho^{0.29}, which then affected the fabricated membrane packing density, porosity, and mechanical properties. Overall, the experimental results showed that all EPS nanofiber filters had great potential as an air filter media. The EPS filter made from food packaging waste with the solution concentration of 15 wt% exhibited the highest efficiency and quality factor of 99.99% and 0.15 Pa⁻¹, respectively. Copyright © 2019 Elsevier Ltd

Rajathurai, T., et al. (2010). "Periadventitial rapamycin-eluting microbeads promote vein graft disease in long-term pig vein-into-artery interposition grafts." Circulation: Cardiovascular Interventions **3**(2): 157-165.

BACKGROUND: Neointima formation and atherosclerosis compromise long-term graft patency in aortocoronary and peripheral vein bypass grafts. We investigated the short- and long-term effects of periadventitial application of a sustained-release formulation of rapamycin on experimental pig vein grafts with similar dimensions and kinetics to human saphenous vein bypass grafts.

METHODS AND RESULTS: Periadventitial application of rapamycin-eluting polyvinyl alcohol microspheres (60 microg . cm(-2)) to porcine saphenous vein-to-carotid artery interposition grafts inhibited vein graft positive and vascular smooth muscle cell proliferation in 1-week grafts. It also decreased neointima formation and wall thickening in 4-week vein grafts compared with controls. The inhibition of vein graft thickening was not sustained; however, a catch-up phenomenon was observed, and there was no therapeutic benefit evident in 12-week grafts. Increasing the dose of rapamycin to 120 microg . cm(-2) was associated with significant local toxicity manifest by high rates of graft rupture (25%), inhibition of adventitial neoangiogenesis, and a paradoxical acceleration of vein graft disease as evidenced by increased vascular smooth muscle cell proliferation.

CONCLUSIONS: Local toxicity and poor long-term efficacy limits the clinical applicability of locally applied, sustained rapamycin release in vein graft disease.

Rajendran, S., et al. (2013). "Plastics recycling: insights into life cycle impact assessment methods." Plastics, Rubber & Composites: Macromolecular Engineering **42**(1): 1-10.

The increased consumption of plastics in day to day life has a significant impact on the environment. Life cycle assessment (LCA) is widely used to select a sustainable alternative in plastic waste management. The LCA studies on mechanical recycling and energy recovery scenarios showed that recycling resulted in lower emissions and provided benefits to the environment. These results are valid only if the performance of the recycled plastic is equivalent to those of the virgin materials. Many LCA studies have been focused on individual impact

categories rather than aggregated single score. The decision making process becomes complex if individual impact categories are used. This research is focused on the comparison of LCA results between individual and aggregated impacts and integration of performance of recycled plastics in LCA. The results indicated that recycling was the preferred option if it could replace a minimum of 70-80% of virgin plastics.

RajeshKumar, A., et al. (2016). "Recycling and reusing of plastic." International Journal of Pharmacy and Technology **8**(4): 20774-20782.

Plastic of things deals with the ways of improving the reuse of plastic waste which harms the environment in many different ways. Plastic, sure is very useful substance and could me made cheaply but the problem in using it is that it cannot be disintegrated both naturally and artificially so, to overcome the problems through plastic wastes the only way possible is reusing it. Plastic when heated under certain pressures could mould into many useful substances. Some methods of changing plastic would be using a centrifuge and some methods include using only heat. In this paper we briefly discuss about methods of synthesizing plastic about the amount of plastic going waste and methods to reuse it and also we discuss about the reactions plastic undergoes with different types of chemicals. Copyright © 2016, International Journal of Pharmacy and Technology. All rights reserved.

Ram, C. (2015). "Advances in biodegradation and bioremediation of industrial waste." Advances in biodegradation and bioremediation of industrial waste **479**.

Advances in Biodegradation and Bioremediation of Industrial Waste examines and compiles the latest information on the industrial waste biodegradation process and provides a comprehensive review. Dedicated to reducing pollutants generated by agriculturally contaminated soil, and plastic waste from various industries, this text is a book that begs the question: Is a pollution-free environment possible? The book combines with current available data with the expert knowledge of specialists from around the world to evaluate various aspects of environmental microbiology and biotechnology. It emphasizes the role of different bioreactors for the treatment of complex industrial waste and provides specific chapters on bioreactors and membrane process integrated with biodegradation process. It also places special emphasis on phytoremediation and the role of wetland plant rhizosphere bacterial ecology and the bioremediation of complex industrial wastewater. The authors address the microbiological, biochemical, and molecular aspects of biodegradation and bioremediation which cover numerous topics, including microbial genomics and proteomics for the bioremediation of industrial waste.

Ramadan, Q., et al. (2006). "An integrated microfluidic platform for magnetic microbeads separation and confinement." Biosensors & Bioelectronics **21**(9): 1693-1702.

An innovative microfluidic platform for magnetic beads manipulation is introduced, consisting of novel microfabricated 3D magnetic devices positioned in a microfluidic chamber. Each magnetic device comprises of an embedded actuation micro-coil in various design versions, a ferromagnetic pillar, a magnetic backside plate and a sensing micro-coil. The various designs of the micro-coils enable efficient magnetic beads trapping and concentration in different patterns. The finite element analysis (FEA) results show a significant increase of the developed force on suspended magnetic beads when the magnetic pillar and backside plate were integrated into the device structure. These simulation results were confirmed experimentally by measuring the magnetic beads trapping ratios for the different designs and structures of the devices under continuous flow conditions. The trapping ratios and profiles were studied using beads counting, measuring the change of inductance with the sensing micro-coil and by image processing. The devices have efficiently demonstrated a controlled and localized magnetic beads trapping and concentration at small spatial locations for the first time. The new results shown in this study demonstrate the feasibility of efficiently using these original devices as key elements in complex bio-analysis systems.

Raman, B., et al. (2007). "Neuromorphic Processing for Optical Microbead Arrays: Dimensionality Reduction and Contrast Enhancement." IEEE Sensors Journal **7**(4): 506-514.

This paper presents a neuromorphic approach for sensor-based machine olfaction that combines a portable chemical detection system based on microbead array technology with a biologically inspired model of signal processing in the olfactory bulb. The sensor array contains hundreds of microbeads coated with solvatochromic dyes adsorbed in, or covalently attached on, the matrix of various microspheres. When exposed to odors, each bead sensor responds with corresponding intensity changes, spectral shifts, and time-dependent variations associated with the fluorescent sensors. The bead array responses are subsequently processed using a model of olfactory circuits that capture the following two functions: chemotopic convergence of receptor neurons and center on-off surround lateral interactions. The first circuit performs dimensionality reduction, transforming the high-dimensional microbead array response into an organized spatial pattern (i.e., an odor image). The second circuit enhances the contrast of these spatial patterns, improving the separability of odors. The model is validated on an experimental dataset containing the responses of a large array of microbead sensors to five different analytes. Our results indicate that the model is able to significantly improve the separability between odor patterns, compared to that available from the raw sensor response.

Ramana Reddy, K. V. and M. V. Nagabhushanam (2017). "Process and parameters affecting drug release performance of prepared cross-linked alginate hydrogel beads for ezetimibe." International Journal of Pharmacy and Pharmaceutical Sciences **9**(2): 254-262.

Objective: The objective of this study was to formulate an oral sustained release delivery system of ezetimibe mucoadhesive beads by ionic gelation technique based on sodium alginate used as a hydrophilic carrier in combination with carbopol 934P which acts as a rate modifier. Method(s): Microbeads of ezetimibe were prepared using an easy method of ionotropic gelation by little modification while in addition of drug. The prepared beads were characterised for mean particle size, entrapment efficiency, swelling capacity, and in vitro release. They were also subjected to various studies such as Fourier Transform Infrared Spectrophotometer (FTIR) Spectroscopy for drug polymer reaction, Scanning Electron Microscopy for surface morphology, and Differential Scanning Calorimetric Analysis to determine the physical state of the drug in the beads. Result(s): The microspheres of ezetimibe were formulated successfully. The addition of drug concentration gives higher drug loading and higher conc. of Alcl<inf>+3</inf> yields small diameter beads and lower drug entrapment. Analysis of the release profiles showed that the data corresponds to zero order release and the diffusion-controlled mechanism as suggested by Higuchi concept. Conclusion(s): It can be concluded that beads produced by the sequential method had higher drug entrapment. Beads produced by simultaneous yields larger beads in diameter. The concept was cleared that drug release was dependent upon the quantity of polymer and increase in conc. of. aluminium chloride retarded the drug release in the sequential method. Prepared beads enhance the dissolution of ezetimibe and the oral bioavailability and also reduce the fluctuations in the oral bioavailability. Copyright © 2016 The Authors.

Ramasamy, R., et al. (2008). "The immunosuppressive effects of human bone marrow-derived mesenchymal stem cells target T cell proliferation but not its effector function." Cellular Immunology **251**(2): 131-136.

Mesenchymal stem cells (MSC) are non-haematopoietic stem cells that are capable of differentiating into tissues of mesodermal origin. MSC play an important role in supporting the development of fetal and adult haematopoiesis. More recently, MSC have also been found to exhibit inhibitory effect on T cell responses. However, there is little information on the mechanism of this immunosuppression and our study addresses this issue by targeting T cell functions at various level of immune responses. We have generated MSC from human adult bone marrow (BM) and investigated their immunoregulatory function at different phases of T cell responses. MSC showed the ability to inhibit mitogen (CD3/CD28 microbeads)-activated T cell proliferation in a dose-dependent manner. In order to evaluate the specificity of this immunosuppression, the proliferation of CD4(+) and CD8(+) cells were measured. MSC equally inhibit CD4(+) and CD8(+) subpopulations of T cells in response to PHA stimulation. However, the antiproliferative effect of MSC is not due to the inhibition of T cell activation. The expression of early activation markers of T cells, namely CD25 and CD69 were not significantly altered by MSC at 24, 48 and 72h. Furthermore, the immunosuppressive effect of MSC mainly targets T cell proliferation rather than their effector function since cytotoxicity of T cells is not affected. This work demonstrates that the immunosuppressive effect of MSC is exclusively a consequence of an anti-proliferative activity, which targets T cells of different subpopulations. For this reason, they have the potential to be exploited in the control of unwanted immune responses such as graft versus host disease (GVHD) and autoimmunity.

Rambaldi, A., et al. (1998). "Innovative two-step negative selection of granulocyte colony-stimulating factor-mobilized circulating progenitor cells: adequacy for autologous and allogeneic transplantation." Blood **91**(6): 2189-2196.

A major obstacle in purifying either autologous or allogeneic hematopoietic stem cells from granulocyte colony-stimulating factor (G-CSF) mobilized circulating progenitor cells (CPC) is represented by the huge cellularity present in each apheretic product. To obtain a significant debulking of unwanted cells from the leukapheresis, we developed a modified protocol of immune rosetting whereby human ABO-Rh- compatible red blood cells (RBCs) are treated with chromium chloride and then coated with murine monoclonal antibodies (MoAbs) against leukocyte antigens. When experiments were performed with leukaphereses obtained from normal donors or from T-cell acute lymphoblastic leukemia (T-ALL) patients, RBCs were coated with murine MoAbs against human mature myeloid cells (CD11b) and T cells (CD6); whereas, in the case of patients with B-precursor ALL, B-cell non-Hodgkin's lymphoma (B-NHL), or multiple myeloma (MM), RBCs were coated with anti-CD11b only. After incubation with CPC, rosetting cells (myeloid precursor cells, granulocytes, monocytes, and T cells) were removed by Ficoll-Hypaque density gradient centrifugation with a blood cell processor apparatus, COBE (Lakewood, CO) 2991. After this step, a significant reduction of the initial cellularity was consistently obtained (range, 72% to 97%), whereas the median absolute recovery of the CD34+ cells was above 85% (range, 64 to 100), with a 10-fold relative enrichment ranging from 3% to 41%. In a second step, CPC can be further purged of contaminating T or B cells by incubation with lymphoid-specific magnetic microbeads (anti-CD2 and -CD7 to remove T cells; anti-CD19 to remove B cells) and elution through a type-D depletion column (composed of ferromagnetic fiber) inserted within a SuperMACS separator device (Miltenyi Biotech, Bergisch-Gladbach, Germany). By this approach, a highly effective (three to four logs) T-cell depletion was achieved in all experiments performed with normal donors or T-ALL patients (median loss of CD3+ cells: 99.8% [range 99.2 to 100]) and an equally efficient B-cell depletion was obtained from

B-precursor ALL, B-NHL, or MM patients. At the end of the procedure the T- or B-cell depleted fraction retained a high proportion of the initial hematopoietic CD34+ stem cells, with a median recovery above 70% (range 48% to 100%) and an unmodified clonogenic potential. In five patients (two follicular NHL and three ALL) the purified fraction of stem cells was found disease free at the molecular level as assessed by polymerase chain reaction (PCR) analysis of the t(14;18) chromosome translocation or clono-specific DNA sequences of IgH or T-cell receptor gamma and delta chain genes. Purified autologous and allogeneic CPCs were transplanted in three and six patients, respectively, who showed a prompt and sustained hematologic engraftment. In conclusion, this method represents a simple and reproducible two-step procedure to obtain a highly efficient purging of T or B cells from G-CSF expanded and mobilized CPCs. This approach might lead to the eradication of the neoplastic clone in the autologous stem cell inoculum as well as for T-cell depletion during allogeneic transplantation.

Ramesha, V., et al. (2017). "Polycyclic hydrocarbon degradation by bacteria: a review." Trends in Biosciences **10**(14): 2465-2473.

Polycyclic hydrocarbons are compounds containing carbon and hydrogen, these are important pollutants found in air, soil and sediments. Polycyclic hydrocarbons and their derivatives are products of incomplete combustion of organic materials arising, in part, from natural combustion such as forest fires and volcanic eruptions, but for the most part by human activities. In recent decades the major source of PAH (polycyclic aromatic hydrocarbons) pollution is industrial production, transportation, refuse burning, gasification and plastic waste incineration. Hydrocarbons usually degraded by aerobic and anaerobic bacteria, compare to anaerobic bacteria aerobic bacteria shows efficient degradation of hydrocarbons. Hydrocarbons contains two groups of compounds which are aromatic and aliphatic, where aromatic hydrocarbons shows much importance because their utilization in manufacturing of different substances and later accumulation in the environment.

Ramirez, L., et al. (2019). "Behavior of TiO₂ and CeO₂ nanoparticles and polystyrene nanoplastics in bottled mineral, drinking and Lake Geneva waters. Impact of water hardness and natural organic matter on nanoparticle surface properties and aggregation." Water **11**(4).

Intensive use of engineered nanoparticles (NPs) in daily products ineluctably results in their release into aquatic systems and consequently into drinking water resources. Therefore, understanding NPs behavior in various waters from naturel to mineral waters is crucial for risk assessment evaluation and the efficient removal of NPs during the drinking water treatment process. In this study, the impact of relevant physicochemical parameters, such as pH, water hardness, and presence of natural organic matter (NOM) on the surface charge properties and aggregation abilities of both NPs and nanoplastic particles is investigated. TiO₂, CeO₂, and Polystyrene (PS) nanoplastics are selected, owing to their large number applications and contrasting characteristics at environmental pH. Experiments are performed in different water samples, including, ultrapure water, three bottled mineral waters, Lake Geneva, and drinking water produced from Lake Geneva. Our findings demonstrate that both water hardness and negatively charged natural organic matter concentrations, which were measured via dissolved organic carbon determination, are playing important roles. At environmental pH, when negatively charged nanoparticles are considered, specific cation adsorption is promoting aggregation so long as NOM concentration is limited. On the other hand, NOM adsorption is expected to be a key process in NPs destabilization when positively charged PS nanoplastics are considered.

Ramirez-Alvarez, N., et al. (2020). "Microplastics: Sources and distribution in surface waters and sediments of Todos Santos Bay, Mexico." <u>Science of the Total Environment</u> **703 (no pagination)**(134838).

Microplastics (MPs) are ubiquitous and a threat to marine and freshwater environments. Effluent waters from secondary wastewater treatment plants (WWTPs) into Todos Santos Bay (TSB) were investigated as sources of MPs. MPs were detected in all analyzed matrices and presented variable morphologies. MPs from surface water samples (n = 18) varied from 0.01 to 0.70 plastic particles/m³ (pp/m³). Fragments (47 +/- 23%) and fibers (47 +/- 23%) were the most abundant particles found in the surface water samples. In sediment samples (n = 11), MPs varied from 85 to 2494 pp/0.1 m². Sediment samples showed fragments of 70 +/- 19%, fibers 28 +/- 18% in mean. The range of MP values from WWTP effluents (n = 24) was 81 to 1556 pp/m³, and fibers (65 +/- 28%) were the most abundant MP particles. Several synthetic polymers (polypropylene, polyethylene, polyethylene-propylene, polyvinyl chloride, cellophane), and natural fibers (cotton and wood) were identified. The surface currents and the parameters that modulate them, are the main factors that dominate the distribution of MPs in surface waters. While in the sediments the parameters such as bathymetry and grain size distribution have more influence on their distribution in the marine environment, where the effluent waters from WWTPs only contributes MPs to the TSB. Copyright © 2019 Elsevier B.V.

Ramos, II, et al. (2019). "Automated lab-on-valve sequential injection ELISA for determination of carbamazepine." <u>Analytica Chimica Acta</u> **1076**: 91-99.

The development of an automated miniaturized analytical system that allows for the rapid monitoring of carbamazepine (CBZ) levels in serum and wastewater is proposed. Molecular recognition of CBZ was achieved through its selective interaction with microbeads carrying anti-CBZ antibodies. The proposed method combines the advantages of the micro-bead injection spectroscopy and of the flow-based platform lab-on-valve for implementation of automatic immunosorbent renewal, rendering a new recognition surface for each sample. The sequential (or simultaneous) perfusion of CBZ and the horseradish peroxidase-labelled CBZ through the microbeads is followed by real-time on-column monitoring of substrate (3,3',5,5'-tetramethylbenzidine) oxidation by colorimetry. The evaluation of the initial oxidation rate and also the absorbance value at a fixed time point provided a linear response versus the logarithm of the CBZ concentration. Under the selected assay conditions, a single analysis was completed after only 11min, with a quantification range between 1.0 and 50mugL⁻¹. Detection of CBZ levels in undiluted wastewater samples was feasible after a simple filtration step while good recoveries were attained for spiked certified human serum, analyzed without sample clean-up.

Ramos, II, et al. (2018). "Micro-bead injection spectroscopy for label-free automated determination of immunoglobulin G in human serum." <u>Analytical & Bioanalytical Chemistry</u> **410**(3): 981-988.

Immunoglobulin G (IgG) represents the major fraction of antibodies in healthy adult human serum, and deviations from physiological levels are a generic marker of disease corresponding to different pathologies. Therefore, screening methods for IgG evaluation are a valuable aid to diagnostics. The present work proposes a rapid, automatic, and miniaturized method based on UV-vis micro-bead injection spectroscopy (mu-BIS) for the real-time determination of human serum IgG with label-free detection. Relying on attachment of IgG in rec-protein G immobilized in Sepharose 4B, a bioaffinity column is automatically assembled, where IgG is selectively retained and determined by on-column optical density measurement. A "dilution-and-shoot"

approach (50 to 200 times) was implemented without further sample treatment because interferences were flushed out of the column upon sample loading, with minimization of carryover and cross-contamination by automatically discarding the sorbent (0.2 mg) after each determination. No interference from human serum albumin at 60 mg mL⁻¹ in undiluted sample was found. The method allowed IgG determination in the range 100-300 mug mL⁻¹ (corresponding to 5.0-60 mg mL⁻¹ in undiluted samples), with a detection limit of 33 mug mL⁻¹ (1.7 mg mL⁻¹ for samples, dilution factor of 50). RSD values were < 9.4 and < 11.7%, for intra and inter-assay precision, respectively, while recovery values for human serum spiked with IgG at high pathological levels were 97.8-101.4%. Comparison to commercial ELISA kit showed no significant difference for tested samples (n = 8). Moreover, time-to-result decreased from several hours to < 5 min and analysis cost decreased 10 times, showing the potential of the proposed approach as a point-of-care method. Graphical abstract Micro-Bead Injection Spectroscopy method for real time, automated and label-free determination of total serum human Immunoglobulin G (IgG). The method was designed for Lab-on-Valve (LOV) platforms using a miniaturised protein G bioaffinity separative approach. IgG are separated from serum matrix components upon quantification with low non-specific binding in less than 5 min.

Ramos, J., et al. (2012). "Quantification and Recommended Management of Man-Made Debris Along the Sea Turtle Nesting Beach at Playa Caletas, Guanacaste, Costa Rica." Marine Turtle Newsletter(134): 12.

The predation of sea turtles and nests by coyotes, skunks, raccoons, and crabs is one of the greatest threats at Playa Caletas in Guanacaste, Costa Rica. Another threat to turtles at Caletas is garbage. From causing entanglement, severe lesions, digestive tract obstruction through ingestion, and interference with nesting and hatchling emergence, marine plastic pollution is causing deleterious effects to populations of endangered sea turtles worldwide. Due to the heightened concern of the effects of man-made marine debris pollution on turtle nesting at Playa Caletas, Ramos et al investigate the characteristics of the garbage in terms of size and type and offer recommendations on how to improve sea turtle habitat.

Randall, I. (2013). "Paying with plastic." Green Futures(90): 9-9.

The article describes the Plastic Bank scheme, which is being pilot-tested in Lima, Peru as of October 2013, that aims to encourage people living in poverty to help tackle the problem of plastic pollution and profit from it by collecting plastic and exchanging it at a Plastic Bank for goods.

Rani, M., et al. (2019). "Miniaturized Near-Infrared (MicroNIR) Spectrometer in Plastic Waste Sorting." Materials **12**(17): 27.

Valorisation of the urban plastic waste in high-quality recyclates is an imperative challenge in the new paradigm of the circular economy. In this scenario, a key role in the improvement of the recycling process is exerted by the optimization of waste sorting. In spite of the enormous developments achieved in the field of automated sorting systems, the quest for the reduction of cross-contamination of incompatible polymers as well as a rapid and punctual sorting of the unmatched polymers has not been sufficiently developed. In this paper, we demonstrate that a miniaturized handheld near-infrared (NIR) spectrometer can be used to successfully fingerprint and classify different plastic polymers. The investigated urban plastic waste comprised polyethylene (PE), polypropylene (PP), poly(vinyl chloride) (PVC), poly(ethylene terephthalate) (PET), and poly(styrene) (PS), collected directly in a recycling plastic waste plant, without any kind of sample washing or treatment. The application of unsupervised and supervised chemometric tools such as principal component analysis (PCA) and partial least squares-discriminant analysis (PLS-DA) on the NIR dataset resulted in a complete classification of the polymer classes. In addition, several kinds of PET (clear, blue, coloured, opaque, and boxes) were correctly classified as PET class, and PE samples with different branching degrees were properly separated.

Rani, M., et al. (2015). "Qualitative Analysis of Additives in Plastic Marine Debris and Its New Products." Archives of Environmental Contamination & Toxicology **69**(3): 352-366.

Due to their formulation and/or processing, plastics contain additives and impurities that may leach out under conditions of use and accumulate in the environment. To evaluate their role as vectors of chemical contaminants in marine environment, plastic debris (n = 19) collected from coastal beaches along with new plastics (n = 25; same or same brand) bought from local markets were screened by gas chromatography-mass spectrometry in full scan mode. Detected peaks were identified using NIST library in different polymers (polypropylene (PP) > polyethylene (PE) > PP + PE > polyethyl terephthalate > poly(acylene:styrene) with different use (food, fishery, and general use). A database on the presence of 231 different chemicals were grouped into hydrocarbons, ultra-violet (UV)-stabilizers, antioxidants, plasticizers, lubricants, intermediates, compounds for dyes and inks, flame retardants, etc. The UV326, UV327, UV328, UV320, UvinualMC80, irganox 1076, DEHP, antioxidant no 33, di- n-octylisophthalate, diisooctyl phthalate, hexanoic acid 2-ethyl-hexadecyl ester, and hydrocarbons were most frequently detected. Finding of toxic phthalates and UV stabilizers in those products having moisture contact (like bottles with short use) raised concern to humans and indicated their irregular use. The comparison between new and debris plastics clearly indicated the leaching and absorption of chemicals and supports our assumption of plastic as media for transferring these additives in marine environment. [ABSTRACT FROM AUTHOR]

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Rani, M., et al. (2017). "Benzotriazole-type ultraviolet stabilizers and antioxidants in plastic marine debris and their new products." Science of the Total Environment **579**: 745-754.

Ultraviolet stabilizers (UVSs) and antioxidants are the most widely used additives in plastics to enhance the lifetime of polymeric materials. There is growing interest in the roles of plastic marine debris and microplastics as source or vector of toxic substances to marine environment and organisms. However, there is limited information available on plastic associated chemicals, particularly additive chemicals. Therefore, to evaluate their extent of exposure from plastics to the marine environment, we determined UVSs and antioxidants in plastic debris (n=29) collected from beaches along with their corresponding new plastic products in markets (n=27) belonging to food, fisheries, and general use. Antioxidants were present at higher concentrations than UVSs in both plastic debris and new plastics, indicative of their high use over UVSs. Irganox 1076 and Irganox 1010 were more commonly used than other chemicals investigated. The irregular use with high concentration of additive chemicals was observed in short-term use plastic products. Except for Irganox 1076 and UV 326, most antioxidants and UVSs were relatively high in new plastics compared to corresponding plastic marine debris, implying their potential leaching or degradation during use or after disposal. The present study provides quantitative information about additive chemicals contained in plastic marine debris and their new products. These results could be useful for better understanding of environmental exposure to hazardous chemicals through plastic pollution.

Rani, M., et al. (2017). "Releasing of hexabromocyclododecanes from expanded polystyrenes in seawater -field and laboratory experiments." Chemosphere **185**: 798-805.

Expanded polystyrene (EPS) is a major component of marine debris globally. Recently, hazardous hexabromocyclododecanes (HBCDDs) were detected in EPS buoys used for aquaculture farming. Subsequently, enrichment of HBCDDs was found in nearby marine sediments and mussels growing on EPS buoys. It was suspected that EPS buoys and their debris might be sources of HBCDDs. To confirm this, the release of HBCDDs from EPS spherules detached from a buoy to seawater was investigated under field (open sea surface and closed outdoor chambers with sun exposure and in the dark) and laboratory (particle-size) conditions. In all exposure groups, initial rapid leaching of HBCDDs was followed by slow desorption over time. Abundant release of HBCDDs was observed from EPS spherules exposed to the open sea surface (natural) and on exposure to sunlight irradiation or in the dark in controlled saline water. Water leaching and UV-light/temperature along with possibly biodegradation were responsible for about 37% and 12% of HBCDDs flux, respectively. Crumbled EPS particles (<=1 mm) in samples deployed on the sea surface for 6 months showed a high degree of weathering. This implies that surface erosion and further fragmentation of EPS via environmental weathering could enhance the leaching of HBCDDs from the surface of EPS. Overall, in the marine environment, HBCDDs could be released to a great extent from EPS products and their debris due to the cumulative effects of the movement of large volumes of water (dilution), biodegradation, UV-light/temperature, wave action (shaking), salinity and further fragmentation of EPS spherules.

Rao, B. B. (2010). "Larval habitats of Aedes albopictus (Skuse) in rural areas of Calicut, Kerala, India." Journal of Vector Borne Diseases **47**(3): 175-177.

During 2006-09, a descriptive observational study was performed to evaluate major larval habitats of A. albopictus in rural areas around Calicut City, in Kerala State, India. A total of 100 houses was covered during house-to-house larval surveys for potential container breeding sources during June and July. Larvae collected were identified for Aedes and A. albopictus larval indices, i.e., container index, house index and breteau index. Container habitats were enumerated and classified according to type, such as coconut shells, plastic objects, tyres, flower pots and glass waste. Overall, container, house and breteau indices were found to be higher than normally acceptable limits. Major breeding sites for Aedes mosquitoes were coconut shells and plastic materials. Tyres, flower pots, earthenware and glass waste were also detected, though in smaller numbers. A similar trend was observed in cases of containers positive for A. albopictus breeding. These results suggest that source reduction programmes should specifically be directed at proper disposal of these objects with special attention to coconut shells, plastic waste and tyres in order to effectively control A. albopictus.

Rao, B. B. and B. George (2010). "Breeding patterns of Aedes stegomyia albopictus in periurban areas of Calicut, Kerala, India." Southeast Asian Journal of Tropical Medicine & Public Health **41**(3): 536-540.

Aedes albopictus has been shown to be a vector for diseases which have been on the increase, such as dengue fever and chikungunya infection. We conducted a study of 100 homes from 2006-2009 to determine the breeding sites for Ae. albopictus mosquitoes in Calicut, Kerala, India. We found the larvae of Ae. albopictus mosquitoes most often in coconut shells and plastic

waste, followed by tires, flower pots, glass products, egg shells and dumped grinding stones. Ae. albopictus control programs in Calicut, Kerala, India should target these objects as part of a control program.

Rao, B. M. (2019). "Microplastics in the aquatic environment: implications for post-harvest fish quality." Indian Journal of Fisheries **66**(1): 142-152.

Though fish meat is good for health, its consumption is determined by post-harvest quality parameters. The "use and dispose" attitude of the public towards plastics coupled with inadequate waste management has led to extensive accumulation of plastic debris in the aquatic environment. Microplastics (plastic particles of <5 mm in their longest dimension) in the aquatic environment and fish gut is an emerging concern that has been reported from different regions of the world. The degradation of plastic polymers to micro- and even to nano sized particles smaller than 100 nm size is of recent major concern. Micro- and nanoplastics are basically inert but they tend to sorb toxic pollutants and harmful microorganisms. Moreover, chemicals added to plastic to impart functional properties pose threat to human health. Fish, either by passive ingestion or active foraging accumulate microplastics in their guts. However, there is paucity of documented evidence on the adverse effect of microplastics on human health due to consumption of such fish. Protocol for the determination of quantity of microplastics in fish flesh needs to be standardised and quality standard to be fixed for the quantity of microplastics that would be considered as a food hazard. There exists an imminent need to perform risk analysis in order to categorise microplastic as a food hazard in fish meant for human consumption. Until then there is no justification to reduce the consumption of fish and fishery products due to apprehension of presence of microplastics.

Rao, J., et al. (2017). "BH3 mimetic ABT-737 induces apoptosis in CD34⁺ acute myeloid leukemia cells and shows synergistic effect with conventional chemotherapeutic drugs." Asia-Pacific Journal of Clinical Oncology **13**(2): e144-e152.

AIMS: Acute myeloid leukemia (AML) is an immunophenotypically heterogenous malignant disease. The early immature CD34⁺ AML cell subpopulation is frequently impervious to intensive chemotherapy, making them largely responsible for relapse of AML. CD34⁺ AML cells have higher level of Bcl-2 protein expression than the CD34⁻ subpopulation. As such, development of drugs that specifically target the Bcl-2 may have the potential to eliminate immature CD34⁺ AML progenitor cells and provide therapeutic benefit. In this work, we made an attempt to investigate the cytotoxic effect of a novel Bcl-2 family inhibitor, ABT-737, on CD34⁺ AML cell lines (KG1a and Kasumi-1) as well as CD34⁺ primary AML cells.

METHODS: Primary human CD34⁺ cells were isolated from bone marrow mononuclear cells using CD34 MicroBead kit. The growth inhibitory effect was measured by cell counting kit-8. Apoptosis was analyzed by annexin V/PI assays. Protein expression was determined by Western blotting analysis.

RESULTS: Inhibition of Bcl-2 by ABT-737 effectively inhibited growth and induced apoptosis in CD34⁺ AML cell lines and CD34⁺ primary AML cells without affecting CD34⁺ normal hematopoietic cells. Furthermore, Western blot analysis showed that ABT-737 induced apoptosis associated with caspase-3 activation and poly ADP-ribose polymerase (PARP) degradation. Finally, ABT-737 synergistically enhanced the cytotoxic effect of cytarabine and daunorubicin in CD34⁺ AML cells.

CONCLUSION: Taken together, these findings indicate that ABT-737 may offer as a promising molecular targeting agent in CD34⁺ AML.

Rao, J., et al. (2011). "Curcumin reduces expression of Bcl-2, leading to apoptosis in daunorubicin-insensitive CD34+ acute myeloid leukemia cell lines and primary sorted CD34+ acute myeloid leukemia cells." Journal of Translational Medicine **9**: 71.

BACKGROUND: Acute myeloid leukemia (AML) is an immunophenotypically heterogeneous malignant disease, in which CD34 positivity is associated with poor prognosis. CD34+ AML cells are 10-15-fold more resistant to daunorubicin (DNR) than CD34- AML cells. Curcumin is a major component of turmeric that has shown cytotoxic activity in multiple cancers; however, its anti-cancer activity has not been well studied in DNR-insensitive CD34+ AML cells. The aim of this study was to therefore to explore curcumin-induced cytotoxicity in DNR-insensitive CD34+ AML cell lines (KG1a, Kasumi-1), DNR-sensitive U937 AML cells, and primary CD34+ AML bone-marrow-derived cells.

METHODS: Primary human CD34+ cells were isolated from peripheral blood mononuclear cells or bone marrow mononuclear cells using a CD34 MicroBead kit. The growth inhibitory effects of curcumin were evaluated by MTT and colony-formation assays. Cell cycle distribution was examined by propidium iodide (PI) assay. Apoptosis was analyzed by Wright-Giemsa, Hoechst 33342 and Annexin-V/PI staining assays. The change in mitochondrial membrane potential (MMP) was examined by JC-1 staining and flow cytometry. Expression of apoptosis-related proteins was determined by reverse transcription-polymerase chain reaction and Western blotting. Short interfering RNA (siRNA) against Bcl-2 was used in CD34+ KG1a and Kasumi-1 cells incubated with/without DNR.

RESULTS: Curcumin inhibited proliferation and induced apoptosis and G1/S arrest in both DNR-insensitive KG1a, Kasumi-1 and DNR-sensitive U937 cells. Curcumin-induced apoptosis was associated with reduced expression of both Bcl-2 mRNA and protein, subsequent loss of MMP, and activation of caspase-3 followed by PARP degradation. Curcumin synergistically enhanced the cytotoxic effect of DNR in DNR-insensitive KG1a and Kasumi-1 cells, consistent with decreased Bcl-2 expression. Accordingly, siRNA against Bcl-2 increased the susceptibility of KG1a and Kasumi-1 cells to DNR-induced apoptosis. More importantly, curcumin suppressed Bcl-2 expression, selectively inhibited proliferation and synergistically enhanced the cytotoxicity of DNR in primary CD34+ AML cells, while showing limited lethality in normal CD34+ hematopoietic progenitors.

CONCLUSION: Curcumin down-regulates Bcl-2 and induces apoptosis in DNR-insensitive CD34+ AML cell lines and primary CD34+ AML cells.

Rao, J., et al. (2017). "A preliminary study of SP70 as a marker to enrich tumor cells from body fluid samples." Journal of the American Society of Cytopathology **6 (5)**: S83-S84.

Introduction: Cytological diagnosis of body fluid samples plays an important role in managing cancer. However, the sensitivity of detecting malignant cells by cytology is low. SP70 is a newly identified marker for adenocarcinoma of lung, breast and colon. A reagent kit with the antibody against SP70 conjugated to microbeads was developed. The goal of this project was to preliminarily test the efficacy of SP70 as a marker to detect metastatic adenocarcinoma in body fluid samples. Material(s) and Method(s): In this study, remnants of 30 body fluid samples (including 15 pleural fluid samples and 15 ascetic fluid samples) were obtained from cytology laboratory after routine cytological evaluation. For each sample, 50 ml samples were processed by centrifuging at 1500 rpm for 10 minutes. The pellet was re-suspended with 2mL NaCl solution mixed with 10mL working bead solution, inverted 5 times, and incubated for an hour. The mixture was washed multiple times with PBST, fixed with 95% ethanol, smeared on the slide, and then stained with DiffQuick. The slides were reviewed independently without the knowledge of cytological diagnosis. Result(s): Total 30 cases, consisting of 7 males and 23 females with an average age of 70 years old, were analyzed. Among which 18 were positive by SP70 test, and 12 were negative. All 10 cases with positive cytological diagnosis were positive by SP70 test. In 20 cytology negative samples, 8 (Figure Presented) had positive SP70 test. Interestingly, 7 of the 8 samples were from patients with history of cancer, and only 1 of 7 samples had positive SP70 in patients with no cancer history. Figure 1 showed a positive sample with a beads-coated cell. Conclusion(s): SP70-based test is feasible in body fluid samples, and the test may have higher sensitivity for detecting malignant cells. Larger studies are warranted to confirm the findings.

Rao, R. R., et al. (2013). "Winner for outstanding research in the Ph.D. category for the 2013 Society for Biomaterials meeting and exposition, April 10-13, 2013, Boston, Massachusetts: Osteogenic differentiation of adipose-derived and marrow-derived mesenchymal stem cells in modular protein/ceramic microbeads." Journal of Biomedical Materials Research. Part A **101**(6): 1531-1538.

Modular tissue engineering applies biomaterials-based approaches to create discrete cell-seeded microenvironments, which can be further assembled into larger constructs for the repair of injured tissues. In the current study, we embedded human bone marrow-derived mesenchymal stem cells (MSC) and human adipose-derived stem cells (ASC) in collagen/fibrin (COL/FIB) and collagen/fibrin/hydroxyapatite (COL/FIB/HA) microbeads, and evaluated their suitability for bone tissue engineering applications. Microbeads were fabricated using a water-in-oil emulsification process, resulting in an average microbead diameter of approximately 130 +/- 25 mum. Microbeads supported both cell viability and cell spreading of MSC and ASC over 7 days in culture. The embedded cells also began to remodel and compact the microbead matrix as demonstrated by confocal reflectance microscopy imaging. After two weeks of culture in media containing osteogenic supplements, both MSC and ASC deposited calcium mineral in COL/FIB microbeads, but not in COL/FIB/HA microbeads. There were no significant differences between MSC and ASC in any of the assays examined, suggesting that either cell type may be an appropriate cell source for orthopedic applications. This study has implications in the creation of defined microenvironments for bone repair, and in developing a modular approach for delivery of pre-differentiated cells.

Rapoport, A., et al. (2015). "NY-ESO T cells administered post ASCT for MM exhibit extended functionality without exhaustion in a natural pattern of effector and memory programming." Cancer Research. Conference: 106th Annual Meeting of the American Association for Cancer Research, AACR **75**(15 SUPPL. 1).

Adoptive immunotherapy for cancer has been limited by a lack of antigen specificity, low levels of target expression, and failure to break self-tolerance. We hypothesized that infusion of genetically modified tumor-specific T cells following autologous stem cell transplant (ASCT) may overcome these barriers for multiple myeloma (MM). To test this, we conducted a phase I/II clinical trial (NCT01352286) in which T cells engineered with an HLA-A*0201 restricted, affinity-enhanced TCR recognizing NY-ESO-1 / LAGE-1 peptides (NY-ESO^{c259}-T), were infused in the setting of profound lymphodepletion that accompanies high-dose chemotherapy given with ASCT. HLA-A*0201 MM patients eligible for ASCT, with antigen positive tumor were enrolled. NY-ESO^{c259}-T was manufactured in a 10 day process using anti-CD3/CD28 microbeads and lentiviral vector, and was administered two days following ASCT. IMWG criteria were used to assess response at day 100 with the addition of a near complete response category (nCR) due to the common occurrence of oligoclonal banding observed following rapid post-ASCT immune reconstitution. Blood and marrow samples were taken at multiple timepoints for serum cytokine analysis, NY-ESO^{c259}-T persistence and trafficking, multiparameter flow analysis to examine the phenotype and function of NY-ESO^{c259}-T, and tumor biomarker analysis. 25 of 29 enrolled patients were infused. A mean of 2.8 x 10⁹ engineered cells were administered (range 8.3 x 10⁸-4.2 x 10⁹), and the average transduction efficiency was 33% (range 30%-45%). Patients tended to have advanced disease (64% chromosomal abnormalities, and 24% prior ASCT). At 3 months, 67% (16/24) and 58% (14/24) of patients were in VGPR and nCR or better, respectively. Infusions were well-tolerated and no cytokine release syndrome was reported. NY-ESO^{c259}-T persisted at 6 months in all but one patient, and in a subset of patients at 2 years; marrow infiltration was consistently observed from day 7 through day 180. NY-ESO^{c259}-T initially displayed a dominant activated effector phenotype which converted towards a dominant effector memory phenotype by 1 year post infusion, in a pattern that mirrored clinical responses. Persisting cells demonstrated a polyfunctional response (IFN-gamma and TNF-alpha) with a cytotoxic (CD107a and granzyme B) signature without overexpression of exhaustion markers (PD-1, LAG-3, and TIM-3). Tumor biomarker analysis is ongoing. MM relapse occurred in 13/25 patients. This data show that NY-ESO^{c259}-T cells exhibit robust trafficking and expansion, durable persistence without exhaustion, and follow a natural immune expansion and contraction pattern consistent with an antigen-driven mechanism of action. Relapse correlated with a loss of persistence or tumor antigen escape, suggesting that targeting multiple antigens and maintenance infusions may increase durable remissions.

Rapoport, A. P., et al. (2013). "Correlates of clinical response following autologous stem cell transplant and adoptive immunotherapy with engineered T cells expressing an affinity-enhanced T cell receptor in patients with mutliple myeloma." Cancer Research. Conference: 104th Annual Meeting of the American Association for Cancer Research, AACR **73**(8 SUPPL. 1).

Background: Adoptive immunotherapy for cancer has been limited by lack of antigen specificity, low levels of target expression, and failure to break self-tolerance. We are conducting an early phase clinical trial (NCT01352286) attempting to overcome these barriers using T cells engineered with an HLA-A0201 restricted, affinity-enhanced TCR that recognizes an epitope expressed by the NY-ESO-1 and LAGE-1 cancer testis antigens; these cells are infused in the setting of profound lymphodepletion that accompanies high-dose chemotherapy with autologous stem cell transplant (aSCT) for patients with high risk or relapsed multiple myeloma (MM). Method(s): Inclusion criteria include: 1) eligibility for aSCT, 2) PS of 0-2, 3) high risk MM or relapse after prior therapy, 4) HLA-A0201 positive, and 5) NY-ESO-1 and/or LAGE-1 positive tumor by PCR. CD25 depleted T cells are activated and expanded using anti-CD3/28 antibody conjugated microbeads, and genetically modified with a lentiviral vector. T cells are administered four days after high dose melphalan and two days following auto-SCT. Patients are evaluated for MM responses in accordance with the IMWG criteria at 6 weeks, and 3 and 6 months. At 3 months, patients with adequate marrow function start lenalidomide maintenance. Blood and marrow are monitored for persistence of engineered cells by qPCR and by surface expression of the NY-ESO-1 / LAGE-1 TCR using dextramerTM reagents. NY-ESO-1 and LAGE-1 antigen expression in marrow was assessed by qRT-PCR at baseline and post infusion. Result(s): As of November 2012, 21 patients have been enrolled, 15 have been infused; 4 were taken off study prior to infusion due to disease progression. An average of 2.7 x 10⁹engineered T cells were administered per patient (range 8.3 x 10⁸-4.2 x 10⁹), and the average transduction efficiency was 33% (range 30%-45%). More than 50% (8/15) of patients have high risk chromosomal abnormalities, and 3 (20%) have

received prior aSCT. At 3 months post aSCT, 73% of patients were in a very good partial response (VGPR) or better. Gastrointestinal toxicity resulting from autologous GVHD (aGVHD) occurred in a subset of patients at a higher rate than reported following aSCT alone or aSCT and T cell infusion, and was resolved in all cases. Infused T cells typically showed peak expansion in blood at day 14, followed by durable persistence in blood and marrow at 6-12 months in all but one patient. Disease progression is typically accompanied by very low levels or loss of engineered T cell persistence or loss of target antigen on tumor. Conclusion(s): We report for the first time that possible correlates of clinical response in this study include persistence of engineered T cells and loss of antigen, suggesting specific activity of the infused cells. Infusions are well tolerated with a possible risk of manageable aGVHD.

Raposo, M. F. d. J. and R. M. S. C. d. Morais (2011). "Chlorella vulgaris as soil amendment: influence of encapsulation and enrichment with rhizobacteria." International Journal of Agriculture and Biology **13**(5): 719-724.

Several trials with five plant growth-promoting rhizobacteria (PGPR) and the chlorophyte Chlorella vulgaris were carried out in order to look for the consortia that could show the best interactions, giving rise to improved growth of mixed cultures. Pseudomonas putida, Serratia proteomaculans and Stenotrophomonas maltophilia were the chosen bacteria for the consortia with Chlorella, while the proportions of microalgae/bacteria tested were 2:1, 3:1 and 3:1, respectively. Three replicates of 20 treatments were performed and studied, after sowing 20 seeds per replicate, for each of the consortia. Plantlets were left to grow for a two-week period. Maltodextrin (MD) and arabic gum (GA) or gelatine (G) were used as coats for the freeze-dried biomass microbeads. Longest roots were obtained with the consortium Chlorella:Serratia but encapsulates of Chlorella:Stenotrophomonas gave rise to meadow clover plantlets with the highest root and shoot system dried biomass, especially with coating proportions of 1:1 MD:G and MD:GA. Results obtained with this last consortium suggested some interactions with the plant metabolism, as well as some synergistic effects between Chlorella and bacteria.

Rasmussen, L. T. and R. Seljelid (1989). "The modulatory effect of lipoproteins on the release of interleukin 1 by human peritoneal macrophages stimulated with beta-1,3-D-polyglucose derivatives." Scandinavian Journal of Immunology **29**(4): 477-484.

Human peritoneal macrophages were stimulated in vitro with beta-1,3-D-polyglucose-derivatized microbeads (GDM) or soluble aminated beta-1,3-D-polyglucose (AG) in combination with lipoproteins. The release of interleukin 1 (IL-1) was analysed in cell supernatants in a thymocyte proliferation assay. We report that the release of IL-1 is markedly enhanced in macrophages stimulated with polyglucose in either form in combination with native low-density lipoprotein (LDL) or acetyl LDL at a concentration of 100 micrograms/ml. By increasing the amount of lipoproteins up to 10-fold, the IL-1 release decreased sharply. There was only a slight increase in activity when high-density lipoprotein (HDL) or very low-density lipoprotein (VLDL) were added. Other stimulatory agents, such as gamma interferon (IFN-gamma) and lipopolysaccharide (LPS) showed about half the activity of polyglucose. There was no significant difference between native LDL and acetyl LDL in potentiating effect. Our observations also suggest that the potentiating effect of LDL or acetyl LDL is not dependent on binding to their specific receptors. These findings provide a connection between macrophages, lipoproteins, and cytokines with regard to their role in the inflammatory response.

Rassam, S. M., et al. (2013). "T-cell and monocyte profiling shows marked differences in fresh tissue

gene expression between positively selected tumour infiltrating and peripheral blood cells in follicular non-hodgkin's lymphoma (FL): Possible role of heat shock protein 70 (HSP70) and B-cell receptor activating genes in disease progression and transformation." Hematological Oncology **1)**: 149.

Introduction: T-cells and macrophages/monocytes (MM) have an important role in the biology of follicular lymphoma (FL). There is conflicting data on the number role of tumour-infiltrating T-cells (TIL) and MM in predicting outcome. A National Cancer Institute study showed prediction of survival in FL based on the gene expression profiling of TIL. Other studies have shown multiple TIL functional defects. However, these studies used non-trizol frozen material, and the selected cells were stimulated with CD3 and grown in culture that could have changed the signatures. In the National Cancer Institute study, T-cells were negatively selected and mixed with other non-B-cells, and the study did not look at peripheral blood (PB) T-cell or MM profiles. No studies have looked specifically at fresh MM signatures, although there are reports implicating their number in transformation to diffuse large B-cell lymphoma. Aims and Methods: In the first stage reported here, we looked at positively selected TIL and MM gene expression profile signatures in fresh diagnostic samples of histologically confirmed grades 1-3a FL in 14 patients and compared the profiles with similarly selected cells from PB samples taken at the same time. The analysis was controlled with four histologically proven reactive hyperplasia lymph nodes. Tissue samples were digested with a cocktail of enzymes, Ficol separated and then positively selected for CD2, CD14 and CD19 in that order using microbead technology. CD2 selection and no expansion in culture were used to minimize T-cell receptor stimulation and change of expression. Some isolated T-cells were expanded in culture for purity assessment by flow cytometry. T-cells and MM were liquidized in Trizol prior to liquid nitrogen freezing. RNA was extracted at the same time and analysed using affymetrix microarray chips. Statistical analysis used three parameters to define significant change in expression: fold change of >1.5, pvalue of >1x10,³and FDR of <0.05. Samples were analysed as paired and pooled with a fold (over or under expressed) cut off threshold of 10. Results were validated with qPCR for 10 of the most under or overexpressed genes. Result(s): T-cells: paired samples (10) showed 97 over-expressed (41) or underexpressed (56) genes in TIL compared with peripheral blood T-cell, whereas pooled samples (14) showed 778 over-expressed (380) or under-expressed (398) genes. The top over-expressed genes using both methods of analysis are CXCL13, a B-cell chemotactic gene, IGJ, which helps in Ig assembly, CTLA4, a regulatory molecule, and CD200, which delivers an inhibitory signal to macrophages. These define a T-helper phenotype. Several heat shock protein (HSP) genes are over expressed relating to HSP70 pathway. The top underexpressed genes include genes that regulate T-cell adhesion, migration and cytotoxicity such as a number of flow cytometry receptor genes needed for antibody dependant cell cytotoxicity, genes involved in adhesion and migration, and granzyme, granulosin, lysosyme and other genes involved in T-cell cytotoxocity. MMs: Only pooled analysis was performed as the cell numbers were too small to have paired analysis. Many more (3239) genes were overexpressed (1494) or under-expressed (1745) in lymph node compared with PB MM. The top over-expressed genes include genes that stimulate B-cell receptor, growth and transformation such as IGJ, BLNK, PAX5, PTTG1 and C4orf7, CXCL13, signal transduction inhibitors and again HSP70. The top under-expressed genes include those that regulate cell adhesion, proliferation, migration and survival, and flow cytometry receptors, IL-1 and complement genes necessary for cell cytotoxicity. Conclusion(s): We believe this is the first study of this design with novel data suggesting that TIL and tissue MM support B-cell growth and transformation in FL whilst inheriting several defects in direct and indirect cell cytotoxicity. Over-expression of the HSP70 pathway supporting tumour growth and metastasis is a novel finding which could potentially lead to new treatment options. MMs appear to play a role in diffuse large Bcell lymphoma transformation of FL and their regulation may reduce the rate of progression and transformation.

Rassam, S. M. B., et al. (2012). "T-cell profiling shows marked differences in gene expression between tumour infiltrating (TIL) and peripheral blood (PB) antibody-bead selected T-cells from fresh lymph node and PB samples in follicular non-hodgkin's lymphoma (FL): Possible implications for immunomodulatory therapy." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Introduction: FL is one of the commonest B-cell lymphomas accounting for 25-30% of all newcases of non-Hodgkin's lymphoma. Median survival ranges from 6-10 years with a constant annual rate of relapse and death. The cellular immune system through T-cells and macrophages/monocytes (MMs) has an important role in the response to therapy and long term remissions. Evidence for this stemmed from increased incidence and the poor response rates and survival in patients with inherited or acquired T-cell defects, and the graft-versus-leukaemia effect of allogeneic stem cell transplants. The number of tumour infiltrating lymphocytes (TILs) and MMs appear to predict clinical response and outcome in FL. A recent National Cancer Institute study looked at the prediction of survival in FL based on the molecular features of TILs with positive findings. However, this study used frozen material which could have changed the signatures, T-cells were not positively selected and would have been mixed with other non B-cells, negatively selected cells were stimulated with CD3 which could have changed the gene expression profile, the study looked only at the predictive value in relation to prognosis and did not look at PB T-cell (PBT)profile. Aims and methods: In the first stage reported here, we looked at positively selected TILs, PBT and MMs gene expression profile signatures in fresh lymph node samples (LNs) of histologically confirmed grades 1-3 FL in 14 patients and compared the profile results with similar cells positively selected from PB samples taken at the same time. The analysis was controlled with 4 histologically proven reactive hyperplasia LNs. Tissue samples were digested with a cocktail of enzymes, ficol separated and then positively selected for CD2, CD19, CD14 in that order using Dynabeads (Dynall) initially then Microbeads (Miltenyl Biotech) subsequently. CD2 was used to avoid T-cell receptor stimulation and change of expression with CD3. Some isolated T-cells were initially expanded in culture for purity assessment only by flow cytometry. T-cells and MMs were liquid nitrogen frozen in trisol whilst B-cells were stored in DMSO. RNA was extracted at the same time and analysed using Affymetrix Microarray Chips. Statistical analysis used 3 parameters to define significant change in expression: fold change of >1.5, p value of > 1x10-3and FDR of >0.5. Samples were analysed as paired and pooled as some cases did not yield adequate paired samples. Result(s): T-cell paired (10) samples showed 97 over (41) or under (56) expressed genes in TILs compared to PBT whilst pooled samples (14) showed 778 over (380) or under (398) expressed genes. The top over expressed genes (10 fold plus) using both methods of analysis were CXCL13 a B-cell chemotactic gene, IGJ which helps in assembling IgG and IgM, CTLA4 a regulatory molecule, CD200 which delivers an inhibitory signal for the macrophage lineage and several heat shock protein (HSP) genes. The top under-expressed genes (10 fold plus) include genes that regulate T-cell adhesion, migration and direct and indirect cytotoxicity such as a number of FC receptor genes needed for antibody dependant cell cytotoxicity, killer cell lectin-like receptor genes, fractalkine genes involved in the adhesion and migration of leukocytes, and granzyme, granulosin, lysosyme and other genes involved in T-cell cytotoxocity. MMs: Only pooled samples were analysed as the extracted cell numbers were too small to have paired analysis. Many more (3239) genes were over (1494) or under (1745) expressed in LN MMs compared to PB MMs. The top over expressed genes include genes that support B cell growth such as IGJ, BLNK and C4orf7, the B cell chemotactic gene CXCL13, signal transduction inhibitors and HSPs. The top underexpressed genes include those that regulate cell adhesion and survival, cell proliferation and migration and extracellular matrix assembly. Others include FC receptor, IL-1 and compliment genes necessary for cell cytotoxicity, and thrombomodulin genes. Conclusion(s): We believe this is novel data suggesting that TILs and tissue MMs appear to support B-cell growth in FL whilst inheriting several defects in direct and indirect cell cytotoxicity. Downregulating the significantly overexpressed and upregulating the under expressed genes through targeted therapy may provide the basis of non-chemotherapy immunomodulatory treatment of B-cell lymphomas.

Rassam, S. M. B., et al. (2015). "Novel findings for the role of microenvironment and Heat Shock Proteins (HSP) in B-Cell Recptor (BCR) activation, disease progression and transformation of follicular non-hodgkin lymphoma (FL): Gene Expression Profiling (GEP) and Immuno-Histochemical (IH) studies reveal new pathways for potential targeted therapies." Blood **126 (23)**: 3897.

Introduction: Tumour infiltrating lymphocytes (TIL), tissue macrophages/monocytes (TMM) and follicular dendritic cells (FDC) have an important role in the biology of FL. Previous GEP studies used stored material, non-trizol freezing, negative T cell selection and CD3 stimulation and culture which could change signatures. None looked at peripheral blood (PB) T-cell (PBT) or MM (PBMM) profiles concurrently or specifically at fresh MM signatures though numbers are implicated in the disease's biology. Aims and methods: In the first stage we looked at positively selected TIL and TMM gene expression profile signatures in fresh diagnostic samples of histologically confirmed grades 1-3a FL in 14 patients and compared the profiles with similarly selected cells from controls and PB samples taken at the same time. We positively selected for CD2, CD14 and CD19 in that order with microbead technology. CD2 selection with no expansion in culture were used to minimise T-cell receptor stimulation. Cells were liquidised in Trizol prior to freezing. RNA was extracted and analysed using Affymetrix Microarray Chips. Statistical analysis used 3 parameters to define significant change in expression: fold change of >1.5, p value of > 1x10⁻³ and FDR of <0.05. Samples were analysed as paired and pooled with a fold (over or under expression) cut off threshold of 10. Results were validated with q-PCR for 10 of the most under or overexpressed genes. In the second stage we performed immunohistochemistry on paraffin embedded tissue from the same sample population looking at expression of HSP70, TLR2 & 4, CD21, CD22, CD200, PAX 5, p-AKT, and NF-kappaB p50 and p65. Co-expression by double staining was tested in 4 samples for CD3/HSP70, CD68/200, CD21/CD200 and CD68/PAX5. Result(s): GEP: T-cells paired samples (10) showed 97 over (41) or under (56) expressed genes in TIL compared to PBT whilst pooled samples (14) showed 778 over (380) or under (398) expressed genes. Several HSP genes are over expressed relating to HSP70 pathway. MM: Only pooled analysis was performed as the cell numbers were small. More (3239) genes were over (1494) or under (1745) expressed in LN compared to PBMM. The top over expressed genes include those that stimulate B cell receptor (BCR) growth and transformation and HSP70. Immunohistochemistry: FL cells lack nuclear HSP70 expression though TIL, TMM and FDC universally express it. Cytoplasmic NF-kappaB p50 and p65 and p-AKT are uniformly expressed in FL whilst TIL and TMM are weak or negative. FL cells strongly express TLR4 and to lesser extent TLR2 and are much weaker in TIL and TMM. CD200 is strongly expressed by FDC which show co-localisation with HSP70 and PAX5 double staining. TMM have granular cytoplasmic CD22 expression. Discussion(s): HSP suppress the apoptotic signalling at the premitochondrial stage through regulation of the pro-survival signalling and can be actively released extracellularly from inflammatory cells through the Golgi complex and passively from necrotic cells. HSP70 as a TLR4 and 2 ligand has a potent cytokine activity rapidly activates the MyD88/IRAK/NF-kappaB and TRIF pathways through MAPK/AP-1 and AKT increasing cell proliferation, adhesion and migration and resistance to apoptosis. Entry of the activated

NF-kappaB into nuclei is the final step of signalling cascades and contributes to enhanced BCL-2 expression in FL. Our immunohistochemical and GEP findings are complimentary and show for the first time that in FL, HSP70 expressed and probably released by TIL and TMM for self-preservation could act as a ligand for TLR2 & 4, activating the NF-kappaB and p-AKT pathways leading to tumour growth and metastasis. We also show novel data that TMM and FDC appear to play a major role in disease proliferation and transformation through expression and secretion of BCR activating ligands. Targeting the HSP70/TLR pathway could induce apoptosis of both FL and TIL cells inhibiting tumour growth and spread whilst targeting HSP70, TMM and FDC could in addition abrogate histological transformation.

Rastogi, N., et al. (1992). "A rapid microbead method for breaking pathogenic mycobacteria: Application in SDS-PAGE and Western blot analysis." Current Microbiology **24**(6): 311-317.

Ravindran, R., et al. (2010). "Validation of multiplex microbead immunoassay for simultaneous serodetection of multiple infectious agents in laboratory mouse." Journal of Immunological Methods **363**(1): 51-59.

Multiplex methodologies enable simultaneous detection of antibodies against several infectious agents allowing sample conservation, cost effectiveness, and amenability to high-throughput/automation. We have previously described a multiplex microbead immunoassay for serodetection of ten, high-priority mouse infectious pathogens. Here, we present a validation of this multiplex diagnostic system using approximately four hundred serum samples from different groups of mice. Computer assisted multivariate analysis of the resulting high volume data (8000 data points) was performed. This computational approach enabled presentation of data in a variety of easily interpretable formats (e.g., correlation tables and heat maps). Importantly, this computer aided approach was instrumental for the evaluation of assay accuracy, sensitivity, specificity, and robustness during the study. Crucial pieces of information were obtained to make timely adjustments for assay refinement. This progressive approach to developing an implementation-ready clinical assay, facilitated by computational analysis, produced a highly efficient, accurate and dependable serodiagnostics system. This system has effectively replaced the current state-of-the-art methodology (ELISA) used in mouse colony health management at the University of California and the Jackson Laboratory. A pathway to develop multiplex serology tests for infectious disease diagnosis described here serves as a model for multiplex immunoassay design, clinical validation, refinement and implementation.

Ravindran, R., et al. (2013). "Exploratory study on plasma immunomodulator and antibody profiles in tuberculosis patients." Clinical & Vaccine Immunology: CVI **20**(8): 1283-1290.

Host immune responses to Mycobacterium tuberculosis are generally able to contain infection and maintain a delicate balance between protection and immunopathology. A shift in this balance appears to underlie active disease observed in about 10% of infected individuals. Effects of local inflammation, combined with anti-M. tuberculosis systemic immune responses, are directly detectable in peripheral circulation, without ex vivo stimulation of blood cells or biopsy of the affected organs. We studied plasma immunomodulator and antibody biomarkers in patients with active pulmonary tuberculosis (TB) by a combination of multiplex microbead immunoassays and computational tools for data analysis. Plasma profiles of 10 immunomodulators and antibodies against eight M. tuberculosis antigens (previously reported by us) were examined in active pulmonary TB patients in a country where TB is endemic, Pakistan. Multiplex analyses were performed on samples from apparently healthy individuals without active TB from the same community as the TB patients to establish the assay baselines

for all analytes. Over 3,000 data points were collected from patients (n = 135) and controls (n = 37). The data were analyzed by multivariate and computer-assisted cluster analyses to reveal patterns of plasma immunomodulators and antibodies. This study shows plasma profiles that in most patients represented either strong antibody or strong immunomodulator biomarkers. Profiling of a combination of both immunomodulators and antibodies described here may be valuable for the analysis of host immune responses in active TB in countries where the disease is endemic.

Ravindranath, M. and P. Terasaki (2013). "A monoclonal antibody which possibly may replace the therapeutic intravenous immunoglobulin." American Journal of Transplantation **5)**: 477.

The value of intravenous immunoglobulin (IVIg) in lowering HLA antibodies (Abs) has recently come into question. High variability in different therapeutic preparations may account for the variable outcomes. We have produced a monoclonal Ab (mAb) which mimic immunoreactivity and immunosuppressive capabilities of IVIg and provide a stable reliable replacement for current IVIg.Four IVIg preparations were tested for their reactivity of HLA class-Ia and Ib alleles, and shown to have high reactivity to HLA class-I alleles (high mean fluorescent intensity and titers up to 1/512, by Luminex microbead testing) and to HLA-E. The numbers of HLA class-Ia allelic reactivities of IVIg preparations are shown in A. Since the blood of healthy individuals was shown to have HLA-Ia IgG Abs, the concentration of IgG from the plasma pooled from of donors accounts for the high levels of anti-HLA-Ia reactivities. Importantly, depleting anti-HLA-E Abs from IVIg totally eliminated the HLA-Ia reactivity of IVIg. We accordingly developed mAbs against recombinant HLA-E, which had reactivity to HLA class-I alleles identical to the different preparations of IVIg (A). Inhibition of the antibody reactivities with synthetic peptides showed that HLA-E shares epitopes with HLA-Ia alleles.The immunosuppressive functions of IVIg were then compared among different preparations by suppression of PHA-activated proliferation of CD4+ T cells with that of the two anti-HLA-E mAbs. Carboxyfluorescein succinimidyl ester (CFSE) staining was used to monitor proliferation of T cells after different treatments. A striking similarity was noted between different preparations of IVIg (Figure B) and the anti HLA E mAbs (Figures C and D) in the dose dependent inhibition of PHA-stimulated blastogenesis of CD4+ T cells.Since CD4+ T cells are involved in donor specific antigen presentation in allograft recipients for production of plasma B cells, inhibition of their proliferation and blastogenesis may account for their ability to reduce antibodies. We conclude that our unique anti-HLA-E mAb have the potential to replace the current IVIg, pooled and purified from the plasma of thousands donors. (Figure Presented).

Ravindranath, M. H., et al. (2010). "Antibodies to HLA-E in nonalloimmunized males: pattern of HLA-Ia reactivity of anti-HLA-E-positive sera." Journal of Immunology **185**(3): 1935-1948.

Natural anti-HLA Abs found in sera of healthy nonalloimmunized males recognize HLA-Ia alleles parallel to those recognized by anti-HLA-E mAbs (MEM-E/02/06/07). Therefore, some of the HLA-Ia Abs seen in healthy males could be due to anti-HLA-E Abs cross-reacting with HLA-Ia. If anti-HLA-E Abs occur in healthy nonalloimmunized males, it can be assessed whether they evoke HLA-Ia reactivity as do mouse HLA-E mAbs. IgG and IgM Abs to HLA-E and HLA-Ia alleles are identified in sera of healthy males using microbeads coated with recombinant denatured HLA-E or a panel of rHLA-Ia alleles. The pattern of allelic recognition is comparable to that of anti-HLA-E mAbs. Sixty-six percent of the sera with HLA-E IgG have a high level of HLA-Ia IgG, whereas 70% of those with no anti-HLA-E Abs have no HLA-Ia Abs. HLA-E IgM/IgG ratios of sera are divided into four groups: IgM(Low)/IgG(Low), IgM(High)/IgG(Low), IgM(High)/IgG(High), and IgM(Low)/IgG(High). These groups correspond to anti-HLA-Ia IgM/IgG ratio groups. When HLA-E

IgM and IgG are absent or present in males, the IgM or IgG of HLA-Ia are similarly absent or present. The mean fluorescent intensity of HLA-Ia Abs correlates with that of anti-HLA-E Abs. Most importantly, HLA-E and HLA-Ia reactivities of the sera are inhibited by the shared, but cryptic, peptide sequences (117)AYDGKDY(123) and (137)DTAAQIS(143). Therefore, Abs to the H chain of HLA-E may be responsible for some of the HLA-Ia allele reactivity of the natural HLA-Ia Ab in human sera. Absence of any anti-HLA-Ia Abs in 112 nonvegans and the presence of the same in vegans suggest that dietary meat proteins might not have induced the natural allo-HLA Abs.

Ravindranath, M. H., et al. (2013). "Therapeutic preparations of IVIg contain naturally occurring anti-HLA-E antibodies that react with HLA-Ia (HLA-A/-B/-Cw) alleles." Blood **121**(11): 2013-2028.

The US Food and Drug Administration approved intravenous immunoglobulin (IVIg), extracted from the plasma of thousands of blood donors, for removing HLA antibodies (Abs) in highly sensitized patients awaiting organ transplants. Since the blood of healthy individuals has HLA Abs, we tested different IVIg preparations for reactivity to HLA single antigen Luminex beads. All preparations showed high levels of HLA-Ia and -Ib reactivity. Since normal nonalloimmunized males have natural antibodies to the heavy chains (HCs) of HLA antigens, the preparations were then tested against iBeads coated only with intact HLA antigens. All IVIg preparations varied in level of antibody reactivity to intact HLA antigens. We raised monoclonal Abs against HLA-E that mimicked IVIg's HLA-Ia and HLA-Ib reactivity but reacted only to HLA-I HCs. Inhibition experiments with synthetic peptides showed that HLA-E shares epitopes with HLA-Ia alleles. Importantly, depleting anti-HLA-E Abs from IVIg totally eliminated the HLA-Ia reactivity of IVIg. Since anti-HLA-E mAbs react with HLA-Ia, they might be useful in suppressing HLA antibody production, similar to the way anti-RhD Abs suppress production. At the same time, anti-HLA-E mAb, which reacts only to HLA-I HCs, is unlikely to produce transfusion-related acute lung injury, in contrast to antibodies reacting to intact-HLA. Copyright © 2013 by The American Society of Hematology.

Rawluk, J., et al. (2013). "Striking, aggressive synchronous non-small cell lung cancer (NSCLC) in a multiple myeloma (MM) patient (PT) and circulating tumor cell (CTC) detection." Onkologie **7)**: 255.

Introduction: Different neoplasms (DN), apart from the MM itself, synchronously detected or after 1.-line- and maintenance-treatment have recently been reported, questioning whether specific risk factors for MM exist. Moreover 2. tumors have gained more attention, since MM pts live longer and randomized data show associations between newer drugs and excess risk of DNs. Large population-based databases offer powerful sample sizes, but bear the limitation of focusing on primary tumors, therefore well-documented registry analyses are of value. Methods & Results: We report on a 62-year old pt, who was diagnosed with (w) IgM lambda (l) MM w diffuse osteolyses in conventional and CT-radiographs. Via histopathology Waldenstrom's macroglobulinaemia was excluded. The hemoglobin at initial diagnosis (ID) was 13 g/dl, l-SFLC 32.5 g/l, BM infiltration 15% w del13q14 and ISS I. Due to symptomatic MM, he was included in the DSMM XII trial which applies 4 cycles of RAD (Knop S, Blood 2009) followed by SCT. Neither the initial conventional lung-x-ray nor bone-CT-scans described thoracic abnormalities. After ASCT, the pt reported about haemoptysis; extensive diagnostics revealed central squamous cell NSCLC. Retrospectively, this NSCLC was already detectable w ID of the MM, suspecting that both neoplasms had occurred simultaneously. He underwent R0-resection, the tumor stage was pT2pN2cM0,L2,G2. Since biopsy of the osteolytic lesions was unfeasible, a bilateral BM-re-evaluation was done, that revealed no epithelial tumor cells. Re-staging diagnostics determined no metastases, albeit CTCs were detected by image cytometry and immunofluorescence. CTCs were enriched using CD326 (EpCAM)-microbeads and magnet-assisted cell sorting: w the former 59 EpCAM+ cells were captured from 1.2e5 cells (0.05%), w the latter 8 EpCAM+/CD45- cells from 800 cells detected in the EpCAM+ fraction (1%). These CTCs were substantially higher than in 5 other NSCLC pts (range 0-4). VGPR of the MM was obtained after the 1. ASCT, but due to the NSCLC, no 2. ASCT or maintenance were performed. Instead, the pt received mediastinal irradiation, but refrained from adjuvant CTx. 6 months after NSCLC-resection, he showed liver metastases. Despite palliative multi-agent CTx, he died of progressing NSCLC 5 months later and 20 months after ID of his NSCLC. Conclusion(s): CTCs in this pt preceded detection of aggressive NSCLC- metastases by conventional imaging and may prompt adjuvant CTx application in the future.

Ray, A., et al. (2018). "Targeting tryptophan catabolic kynurenine pathway enhances anti-tumor immunity and cytotoxicity in multiple myeloma." Blood. Conference: 60th Annual Meeting of the American Society of Hematology, ASH **132**(Suppl. 1).

Introduction. Plasmacytoid dendritic cells (pDCs) play an integral role in MM pathogenesis (Chauhan et al, Cancer Cell 2009, 16:309-323). pDCs interactions with tumor cells and T/NK effector cells in the MM-BM milieu induce immune suppression and MM cell proliferation (Chauhan et al, Cancer Cell 2009, 16:309-323; Ray et al, Leukemia 2015, 29:1441-1444). A direct interruption of pDC-MM and pDC-T cells interactions with novel agents will enhance cytotoxicity and anti-tumor immunity. In this context, our DNA microarray analysis identified upregulation of tryptophan catabolic kynurenine (Kyn) pathway during pDC-MM interactions. To date, the role of Kyn pathway in MM is unclear, but two rate-limiting enzymes of Kyn pathway, kynurenine 3-monooxygenase (KMO) and indoleamine 2,3-dioxygenase 1 (IDO1), have been implicated in various cancers. Overexpression of these enzymes causes hyper-accumulation of terminal metabolites, thereby triggering immune suppression via disruption of bidirectional signaling axes between antigen-presenting cells and T cells. In our study, we found that KMO and IDO1 are increased in both pDCs and MM cells during pDC-MM interactions. To assess the functional significance of these findings, we used our pDC/MM or pDC/T cells co-culture models, and show that targeting Kyn pathway generates MM-specific CTL activity. Moreover, the combination of KMO/IDO1 inhibitors with anti-PD-L1 Ab enhances anti-tumor immunity and cytotoxicity in MM. Methods MicroArray: MM cells were cocultured with pDCs for 72h; separated using CD138 Microbeads; poly RNA was subjected to microarray analysis using HG-U133 plus 2.0 plus Affymetrix chip. Gene expression patterns for MM cells cultured in the presence vs absence of pDCs were compared (>1.5-fold change was considered significant, CI > 95%). pDC-induced overexpression of target proteins: MM cells were cocultured with pDCs for 24h; analyzed by flow to detect KMO/IDO1 expression. CTL or NK activity assays: Minimally cytotoxic concentrations of inhibitors were used to assess immune functions. MM-BM CD8+ T or NK- cells were cultured with autologous pDCs (pDC:T/NK; 1:10 ratio) in the presence or absence of KMO (Ro 61-8048: 100 nM) or IDO1 (INCB 024360: 0.1 muM) inhibitors (Selleck Chemicals) for 5 days; drug washed, prestained MM cells were added for 24-48h (E/T ratio 10:1, T/NK:MM), followed by quantification of viable MM cells by FACS. Degranulation assay was quantified using cell surface CD107a. Osteoclast and osteoblast formations were assessed from TRAP and Alizarin Red staining, respectively. Results. 1) Normalized microarray expression profile showed pDC-induced upregulation of KMO in MM cells (2.153 fold vs MM alone; n=3; CI > 95%). 2) Both pDCs and MM cells expressed KMO and IDO1; pDC-MM coculture further increased KMO expression in MM cells (2-3-fold vs MM; p = 0.006); KMO MM cell populations also increased after coculture (~1.2 fold; p <0.05). Importantly, IDO1 expression in MM cells is also enhanced after co-culture; validating the importance of Kyn pathway in the context of pDC-MM interactions (MFI: 1.5-2 fold; p=0.006); IDO1 MM cell populations increased by ~1.5 fold after coculture (p <0.05). 3) KMOi directly activates pDCs and upregulates functional markers on pDCs (CD80: 1.19 fold; CD83: 1.4 fold; p <0.05). 4) KMOi activates patient BM-CD8 T cells in autologous pDCs/T cell coculture; triggers robust allogeneic and autologous MM-specific CD8 CTL activity (~2.0 fold vs control; p = 0.009). 5) In agreement with above findings, KMOi also increased surface CD107a expression on NK and CD8+T cells (CD56+NK: 1.41 fold; p = 0.004; CD8+T: 1.6 fold; p= 0.001). 6) Importantly, the combination of KMOi or IDO1i and anti-PD-L1 Ab (5 mug/ml) triggers a more robust MM-specific CD8⁺CTL activity than single agent (%MM viability: KMOi: 72%; KMOi + anti-PD-L1 Ab: 57%; IDOi: 82%; IDOi + anti- PD-L1 Ab: 70%; n=7; p = 0.01). Finally, 7) Both KMOi and IDO1i blocked monocyte-derived osteoclast formation, as well as restored MM patient BM-derived osteoblast formation. Conclusio s pDC-MM interactions upregulate immunosuppressive enzymes in Kyn pathway; and importantly, blockade of Kyn pathway enzymes induces MM-specific CD8 CTL activity. Our preclinical data therefore provides provides the basis for novel immune-based therapeutic approaches targeting kynurenine (Kyn) pathway enzymes KMO and IDO1 to enhance MM cytotoxicity and restore anti-MM immunity.

Raz, O., et al. (2018). "Chronic lymphocyte leukemia cells share a unique circular RNA expression pattern." HemaSphere **2 (Supplement 2)**: 114.

Background: MicroRNAs are known to be dysregulated in CLL and have been shown to be involved in the initiation and progression of the disease. The role of other non-coding RNAs in the pathobiology of CLL is less clear. Circular RNAs (circRNAs) are endogenous noncoding RNAs that represent approximately 10% of the human transcriptome. They result from noncanonical alternative splicing which generates a stable circular form through a covalent bond between their 3' and 5' ends. The expression profile of circRNAs has been shown to have a unique pattern in various pathological conditions. Yet, their expression has not been tested in CLL. Although the exact mechanism of action of circRNAs remains to be clarified, one suggested mode of action is regulation of gene expression via an interaction with miRNAs thus functioning as miRNA sponges. Other alternative modes of action include protein binding or regulation of transcription and post-transcriptional modifications. Through these functions, circRNAs may act as tumor suppressors or as oncogenes and contribute to the pathogenesis and/or progression of CLL Aims: To decipher the circRNA expression profile in CLL cells and compare it to that of normal B-lymphocytes and to evaluate the potential impact of the CLL specific circRNA profile on the pathogenesis and/or progression of CLL. Method(s): Lymphocytes from 6 CLL patient and 3 healthy volunteers were separated on a ficoll gradient and B cells were sorted with the aid of magnetic anti-CD19+ microbeads. circRNA expression in CLL lymphocytes was identified and quantified using a microarray based platform, provided by Arraystar Inc. Real-time PCR was used to validate the microarray results. Extensive bioinformatics analysis was performed in order to construct circRNA- miRNA-mRNA-protein networks and to identify pathways that may be influenced by these differently expressed circRNAs. Result(s): Of the 13,438 circRNAs transcripts that are represented in the array, 13,195 (98%) were present in at least 3 of 9 sample tested, indicating that circRNAs are abundant in both normal and neoplastic lymphocytes. Overall, 397 circRNAs were upregulated in CLL cells compared to normal B cells and 688 were downregulated. This downregulation of circRNA expression is 2 folds more than is expected by chance (P<0.01), suggesting a possible global downregulation of cirRNA transcription activity in CLL cells. Next, in an attempt to model a possible sponge effect, we constructed four circRNA-miRNA-mRNA networks. Two networks represent up regulated circRNAs (hsa-circRNA-104424, hsa-circRNA-100251) and two represent downregulated circRNAs

(hsa-circRNA-102680, hsa-circRNA- 001430). Each network consists of one circRNA, five miRNAs and over 1000 target genes. Deregulated expression of all of the circRNAs was verified by real-time PCR. Multiple fundamental biological processes that may be associated with the deregulated circRNAs including; apoptosis, cell cycle regulation, B cell activation and RNA transcription and processing were revealed by the DAVID and WebGestalt database resource and by GO enrichment analysis. Summary and Conclusion(s):Our study demonstrates that the circRNA profiling of CLL cells is significantly different from that of normal B-cells and revealed that the deregulated circRNAs may have profound impact on the pathogenesis of CLL. This is the first study publishing circRNA profiling in CLL thus paving the way towards an understanding of whether a specific expression pattern is associated with prognosis and whether targeting circRNAs may have therapeutic benefit in CLL.

Razanajatovo, R. M., et al. (2018). "Sorption and desorption of selected pharmaceuticals by polyethylene microplastics." Marine Pollution Bulletin **136**: 516-523.

The aim of the present study was to evaluate the sorption and desorption of sulfamethoxazole (SMX), propranolol (PRP) and sertraline (SER) by polyethylene (PE) microplastics in water. After the 96h mixture, the sorption percentages of pharmaceuticals on PE microplastics decreased according to the following order: SER (28.61%)>PRP (21.61%)>SMX (15.31%). The sorption kinetics were fitted well with the pseudo-second-order model. Both linear and Freundlich models were able to describe the sorption isotherm. The results suggest that the sorption process of the pharmaceuticals may be adequately described by their hydrophobicity and electrostatic interactions. The desorption results showed that 8% and 4% of PRP and SER, respectively, were released from the microplastics within 48h, but the sorption of SMX was irreversible. The results indicate the potential risks of PRP and SER for bioaccumulation in aquatic organisms via ingestion of the microplastics in aquatic environments.

Razza, F., et al. (2009). "Compostable cutlery and waste management: An LCA approach." Waste Management **29**(4): 1424-1433.

The use of disposable cutlery in fast food restaurants and canteens in the current management scenario generates mixed heterogeneous waste (containing food waste and non-compostable plastic cutlery). The waste is not recyclable and is disposed of in landfills or incinerated with or without energy recovery. Using biodegradable and compostable (B&C) plastic cutlery, an alternative management scenario is possible. The resulting mixed homogeneous waste (containing food waste and compostable plastic cutlery) can be recycled through organic recovery, i.e., composting. This LCA study, whose functional unit is “serving 1000 meals”, shows that remarkable improvements can be obtained by shifting from the current scenario to the alternative scenario (based on B&C cutlery and final organic recovery of the total waste). The non-renewable energy consumption changes from 1490 to 128MJ (an overall 10-fold energy savings) and the CO2 equivalents emission changes from 64 to 22 CO2 eq. (an overall 3-fold GHG savings). [Copyright &y& Elsevier]

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Re, F., et al. (1994). "Inhibition of anchorage-dependent cell spreading triggers apoptosis in cultured

human endothelial cells." Journal of Cell Biology **127**(2): 537-546.
When cultivated on substrates that prevent cell adhesion (the polymer polyhydroxyethylmethacrylate, bovine serum albumin, and Teflon), human endothelial cells (EC) rapidly lost viability with a half-life of approximately 10 h. Dying EC showed the morphological and biochemical characteristics of apoptosis. The apoptotic process of suspended EC was delayed by the protein synthesis inhibitor cycloheximide. To obtain information as to the mechanism involved in the apoptosis of suspended EC, we investigated whether adhesion to matrix proteins or integrin occupancy in EC retaining a round shape may affect EC suicide. EC bound to low coating concentration of either fibronectin or vitronectin, retaining a round shape and failing to organize actin microfilaments, underwent to rapid cell death; by contrast, cells on high substrate concentrations became flattened, showed actin microfilament organization, and retained viability. Addition of saturating amounts of soluble vitronectin to suspended round-shaped EC did not reduce the process of apoptosis. Finally, when suspended EC bound Gly-Arg-Gly-Asp-Ser-coated microbeads (approximately 10 microbeads/cell), yet retaining a round shape, the apoptotic process was not affected. Oncogene-transformed EC in suspension were less susceptible to cell death and apoptosis than normal EC. Overall, these data indicate that cell attachment to matrix or integrin binding per se is not sufficient for maintaining cell viability, and that cells need to undergo some minimal degree of shape change to survive. Modulation of interaction with the extracellular matrix can, therefore, be an important target for the control of angiogenesis.

Re, V. (2019). "Shedding light on the invisible: addressing the potential for groundwater contamination by plastic microfibers." Hydrogeology Journal **27**(7): 2719-2727.
The processes of microplastic fiber pollution in groundwater are unknown. The recent research on this contaminant threat is generally focused on surface waters (mainly oceans and rivers), while aquifer contamination is only marginally mentioned as an issue needing further investigation. Synthetic microfibers can be introduced into soils in different ways (e.g. wastewater treatment plants or greywater discharge, septic tank outflows, direct injection of contaminated water in cases of managed aquifer recharge, losing streams, etc.), and can thus reach aquifer systems due to leaching or infiltration in soil pores. Microfibers can then adsorb persistent bioaccumulative and toxic chemicals, which include persistent organic pollutants and metals, and become a carrier of harmful substances in the aquifer system, hence contributing to the overall contamination in both urban and rural areas. For this reason, it is of paramount importance, not only to assess the occurrence and fate of microplastic fibers in groundwater, but also to study the role of microplastics as carriers of contaminants within the aquifer and to advance standardization and organization of monitoring campaigns. Only by addressing these key challenges can hydrogeologists contribute to the state of the art on microplastic pollution and ensure that groundwater is not neglected in the environmental assessments tackling this contaminant of emerging concern.Alternate abstract:Les processus de pollution par les fibres micro-plastiques dans les eaux souterraines sont inconnus. Les recherches récentes sur cette menace de contaminants sont généralement axées sur les eaux de surface (principalement les océans et les rivières), tandis que la contamination des aquifères n’est que marginalement mentionnée comme une question nécessitant des recherches plus approfondies. Les microfibres synthétiques peuvent être introduites dans les sols de différentes manières (par ex. rejets de stations de traitement d’eaux usées ou rejets d’eaux grises, sorties de fosses septiques, injection directe d’eau contaminée dans les cas de gestion de la recharge d’aquifère, perte de cours d’eau, etc.) et peuvent ainsi atteindre les systèmes aquifères en raison de lessivage ou d’infiltration dans les pores du sol. Les microfibres peuvent ensuite adsorber des produits

chimiques persistants, bio-accumulatifs et toxiques, qui comprennent les polluants organiques persistants et les métaux, et deviennent porteuses de substances nocives dans les systèmes aquifères, contribuant ainsi à la contamination générale aussi bien dans les zones urbaines que dans les zones rurales. Pour cette raison, il est d'une importance primordiale, non seulement d'évaluer l'occurrence et le devenir des fibres micro-plastiques dans les eaux souterraines, mais aussi d'étudier le rôle des micro-plastiques en tant que porteurs de contaminants dans l'aquifère et de faire progresser la normalisation et l'organisation de campagnes de suivi. Ce n'est qu'en abordant ces principaux défis que les hydrogéologues contribuent à l'état de l'art sur la pollution par les micro-plastiques et veillent à ce que les eaux souterraines ne soient pas négligées dans les évaluations environnementales qui s'attaquent à ce contaminant de préoccupation émergente.Alternate abstract:Se desconocen los procesos de contaminación por fibras microplásticas en el agua subterránea. La investigación reciente sobre esta amenaza de contaminantes se centra generalmente en las aguas superficiales (principalmente los océanos y los ríos), mientras que la contaminación de los acuíferos se menciona sólo marginalmente como un tema que requiere mayor investigación. Las microfibras sintéticas pueden introducirse en los suelos de diferentes maneras (por ejemplo, en plantas de tratamiento de aguas residuales o descarga de aguas grises, desagües de fosas sépticas, inyección directa de agua contaminada en casos de recarga de acuíferos gestionados, pérdida de corrientes, etc.) y, por l tanto, pueden llegar a los sistemas acuíferos debido a la lixiviación o infiltración en los poros del suelo. Las microfibras pueden entonces adsorber productos químicos bioacumulativos y tóxicos persistentes, que incluyen contaminantes orgánicos persistentes y metales, y convertirse en portadores de sustancias nocivas en el sistema acuífero, contribuyendo así a la contaminación general tanto en zonas urbanas como rurales. Por esta razón, es de suma importancia, no sólo evaluar la ocurrencia y el destino de las fibras microplásticas en las aguas subterráneas, sino también estudiar el papel de los microplásticos como portadores de contaminantes dentro del acuífero y avanzar en la estandarización y organización de campañas de monitoreo. Sólo abordando estos desafíos clave pueden los hidrogeólogos contribuir al estado del arte de la contaminación microplástica y asegurar que las aguas subterráneas no sean descuidadas en las evaluaciones ambientales que abordan este contaminante de interés emergente.Alternate abstract:摘要地下水中微塑性纤维污染的过程尚不清楚。最近关于该污染物威胁的研究通常集中在地表水(主要是海洋和河流),而含水层污染仅略微被提到是需要进一步调查的问题。合成微纤维可以不同方式进入土壤(例如废水处理厂或灰水排放,化粪池出流,管理的含水层补给或河流补给地下水等情况下直接补给污染水),因此由于土壤孔隙中浸出或**渗透作用**污染水可以进入含水层系统。而且微纤维可以吸附包括持久性有机污染物和金属之类的持久性生物蓄积性和有毒的化学物质,并成为含水层系统中有害物质的载体,从而导致城市和农村地区的整体污染。因此至关重要的是,不仅要评估地下水中微塑料纤维的产生和归趋,还要研究微塑料作为含水层内污染载体的作用,并推进监测项目的标准化和组织。只有解决了这些关键问题,水文地质学家才能对微塑性污染的现有技术做出贡献,并**确保在解决新出**现污染的环境评估中地下水不会被忽视。Alternate abstract:Os processos de poluição de fibra de microplástico em águas subterrâneas são desconhecidos. A pesquisa recente sobre essa ameaça de contaminantes é geralmente focada em águas superficiais (principalmente oceanos e rios), enquanto a contaminação de aquíferos é apenas marginalmente mencionada como uma questão que necessita de investigação adicional. As microfibras sintéticas podem ser introduzidas nos solos de diferentes maneiras (por exemplo, estações de tratamento de águas residuais, vazamentos de tanques sépticos, injeção direta de água contaminada em casos de recarga gerenciada de aquíferos, influência de córregos, etc.) e podem atingir sistemas aquíferos devido à lixiviação ou infiltração nos poros do solo. As microfibras podem, então, adsorver

substâncias químicas bioacumulativas e tóxicas persistentes, que incluem poluentes orgânicos persistentes e metais, e se tornarem portadoras de substâncias nocivas no sistema aquífero, contribuindo assim para a contaminação geral em áreas urbanas e rurais. Por essa razão, é de suma importância não apenas avaliar a ocorrência e o destino das fibras de microplásticos nas águas subterrâneas, mas também estudar o papel dos microplásticos como portadores de contaminantes no aquífero e avançar na padronização e organização das campanhas de monitoramento. Somente abordando esses desafios chave, os hidrogeólogos podem contribuir para o estado da arte sobre a poluição por microplásticos e garantir que as águas subterrâneas não sejam negligenciadas nas avaliações ambientais que tratam desse contaminante de preocupação emergente.

Rebeiz, K. S. and A. P. Craft (1995). "Plastic waste management in construction: Technological and institutional issues." Resources, Conservation and Recycling **15**(3-4): 245-257.

The main objective of a solid waste management system is to effectively safeguard the public health, safety, and welfare. The various options involved in a waste management process are land-filling, incineration, and recycling wastes into useful products. Plastics recycling, in particular, would not be successful unless the proper infrastructure to collect the waste is being set, the technology to economically reprocess the waste into new products is available, and the establishment of markets for the cost-effective use of recycled products are developed. The development of new construction materials using recycled plastics is important to both the construction and the plastics recycling industries. Extensive research investigated the use of resins based on recycled poly(ethylene terephthalate) (PET) plastic waste for the production of a high performance composite material, namely polyester concrete (PC). Resins using recycled PET offer the possibility of a lower source cost of materials for forming good quality PC. PC products also allow the long-term disposal of PET waste, an important advantage in recycling applications.

Rebibou, J. M., et al. (2002). "Flow cytometric evaluation of pregnancy-induced anti-HLA immunization and blood transfusion-induced reactivation." Transplantation **74**(4): 537-540.

Background. Pregnancy-induced alloimmunization (PIA) may decrease to a level that becomes undetectable by complement-dependent cytotoxicity (CDC). Nevertheless, such alloimmunization may provoke acute rejections after kidney transplantation and lead to broad-spectrum immunizations after transfusion. Flow-cytometry (FC) was used to estimate the frequency of low-level PIA and to evaluate its influence on posttransfusion alloimmunization profiles. Methods. To evaluate the frequency of low-level PIA, the sera of 36 women, free of CDC-detectable anti-HLA IgG (CDC-IgG-negative), were cross-matched by FC against their husband's or offspring's lymphocytes and further analyzed with human leukocyte antigen (HLA) Ag-coated microbeads (Flow-PRA One-Lambda, Canoga Park, CA). To evaluate the influence of low-level alloimmunization on posttransfusion appearance of CDC-IgG, pretransfusion sera of a second cohort of 43 women, also CDC-IgG-negative and included in a transfusion protocol, were analyzed by Flow-PRA. Posttransfusion sera were analyzed for the development of cytotoxic IgG. Results. Ten of the first cohort of 36 (27.8%) CDC-IgG-negative women showed a positive FC cross-match against the husband or offspring lymphocytes. Flow-PRA analysis confirmed that 9 of 10 positive cross-matched sera contained anti-HLA IgG. Among the 43 transfused patients, 11 of 16 (68.7%) of the women who were CDC-IgG-positive after blood transfusion showed FC-detectable IgG before transfusion; although 2 of 27 (7.4%) of the patients who remained CDC-IgG-negative after transfusion showed FC-detectable IgG before transfusion ($P<0.001$). Conclusion. Most of the de novo anti-HLA immunizations detected by CDC after transfusion in previously pregnant women can be detected by Flow-PRA before transfusion.

Rech, S., et al. (2015). "Sampling of riverine litter with citizen scientists - findings and recommendations." Environmental Monitoring & Assessment **187**(6): 1-18.
The quantity and composition of litter at riversides and in the surface waters, as well as the occurrence of illegal dumping sites, were studied along four rivers in Chile. Data generated by volunteers were compared to the results from a professional survey, using an identical protocol. Litter was found in considerable quantities at the riversides and in the surface waters at all the sites investigated. A generalized linear mixed model analysis showed that the recorded litter densities did not differ between volunteers and professionals, even after controlling for river, site, or distance between sampling locations, demonstrating that the volunteers successfully applied the sampling protocol. Differences occurred with respect to litter composition, which is most likely due to difficulties in the classification of litter items and particles and to the underestimation of litter present in surface water samples. Even though this study was only conducted at a small number of rivers and sites, a comparatively consistent pattern of direct and intentional litter deposition at riversides was recorded, highlighting that river basins require more protection. The results also show that the citizen science approach can be a suitable means for more extensive litter surveys at riversides and in other natural environments. [ABSTRACT FROM AUTHOR]
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Reddy, T. and S. Tammishetti (2002). "Gastric resistant microbeads of metal ion cross-linked carboxymethyl guar gum for oral drug delivery." Journal of Microencapsulation **19**(3): 311-318.
Ionic cross-linking of sodium carboxymethyl guar gum as a mild method for microencapsulation of sensitive drugs, like proteins, is presented. When a solution of sodium salt of carboxymethyl guar gum, containing BSA as a model drug, is added, as droplets, to different multivalent metal ion solutions, they get cross-linked to form insoluble microbeads. The amount of protein retained, morphology of the resulting beads and the subsequent release of the retained protein is simulated intestinal fluids varied with the type of metal ion as well as it's concentration. Trivalent metal ions like Al+++ and Fe+++ were found to be superior to divalent metal ions like Ba+ +, Ca++, Cu++ and Cd++. The optimum concentration around which these ions provide maximum drug retention was found to be much lower for trivalent ions. Beads cross-linked with them released the protein over a longer duration in enzyme free simulated intestinal fluid, than those cross-linked with divalent ions. Mg++, Sr++, Co++ and Zn++ failed to form isolable beads.

Redondo-Hasselerharm, P. E., et al. (2018). "Microplastic Effect Thresholds for Freshwater Benthic Macroinvertebrates." Environmental Science & Technology **52**(4): 2278-2286.
Now that microplastics have been detected in lakes, rivers, and estuaries all over the globe, evaluating their effects on biota has become an urgent research priority. This is the first study that aims at determining the effect thresholds for a battery of six freshwater benthic macroinvertebrates with different species traits, using a wide range of microplastic concentrations. Standardized 28 days single species bioassays were performed under environmentally relevant exposure conditions using polystyrene microplastics (20-500 µm)

mixed with sediment at concentrations ranging from 0 to 40% sediment dry weight (dw). Microplastics caused no effects on the survival of Gammarus pulex, Hyalella azteca, Asellus aquaticus, Sphaerium corneum, and Tubifex spp. and no effects were found on the reproduction of Lumbriculus variegatus. No significant differences in growth were found for H. azteca, A. aquaticus, S. corneum, L. variegatus, and Tubifex spp. However, G. pulex showed a significant reduction in growth (EC10 - 1.07% sediment dw) and microplastic uptake was proportional with microplastic concentrations in sediment. These results indicate that although the risks of environmentally realistic concentrations of microplastics may be low, they still may affect the biodiversity and the functioning of aquatic communities which after all also depend on the sensitive species. [ABSTRACT FROM AUTHOR]

Redondo-Hasselerharm, P. E., et al. (2018). "Ingestion and chronic effects of car tire tread particles on freshwater benthic macroinvertebrates." Environmental Science & Technology **52**(23): 13986-13994.

Micronized particles released from car tires have been found to contribute substantially to microplastic pollution, triggering the need to evaluate their effects on biota. In the present study, four freshwater benthic macroinvertebrates were exposed for 28 days to tread particles (TP; 10-586 micro m) made from used car tires at concentrations of 0, 0.1, 0.3, 1, 3, and 10% sediment dry weight. No adverse effects were found on the survival, growth, and feeding rate of Gammarus pulex and Asellus aquaticus, the survival and growth of Tubifex spp., and the number of worms and growth of Lumbriculus variegatus. A method to quantify TP numbers inside biota was developed and here applied to G. pulex. In bodies and faces of G. pulex exposed to 10% car tire TP, averages of 2.5 and 4 tread particles per organism were found, respectively. Chemical analysis showed that, although car tire TP had a high intrinsic zinc content, only small fractions of the heavy metals present were bioavailable. PAHs in the TP-sediment mixtures also remained below existing toxicity thresholds. This combination of results suggests that real in situ effects of TP and TP-associated contaminants when dispersed in sediments are probably lower than those reported after forced leaching of contaminants from car tire particles.

Reed, C. (2011). "Better drug delivery by design." Machine Design **83**(15): 54-56,58.

Pharmaceutical companies are continually developing new drugs and delivery methods, and liquid-drug formulations are no exception. Packaging for these drugs also continue to be updated and refined, and plastics are at the forefront. The blow-fill-seal (B/F/S) method of packaging liquids in thermoplastics creates aseptic containers that keep contents sterile. B/F/S packaging also replaces glass bottles -- which can break in transit or while drugs are being dispensed and are often shipped in paper and cardboard that can harbor mold and bacteria. Aseptic B/F/S combines blow molding, sterile filling, and hermetic sealing in a continuous, automated operation that takes place in a clean room. The B/F/S process starts with melted granules of thermoplastics like polyethylene and polypropylene. Sterile, HEPA-filtered air blows the melt into a cavity to create a molten parison, an extruded tube of hot plastic resin.

Reed, C. (2018). "The other plastic plague." New Scientist **239**(3186): 37-39.

The article focuses on research examining the role of plastic waste in spreading disease through

the oceans. It states that researcher Joleah Lamb and colleagues detected a connection between the presence of plastic waste and diseased coral, including white syndrome. It mentions concerns that microbe ecosystems living on plastic waste may concentrate pathogens that infect coral after contact. It comments on concerns plastic waste could also encourage diseases including gastroenteritis in humans.

Reed, S., et al. (2018). "Microplastics in marine sediments near Rothera Research Station, Antarctica." Marine Pollution Bulletin **133**: 460-463.

Antarctica and surrounding waters are often considered pristine, but may be subject to local pollution from tourism, fishing and governmental research programme activities. In particular, the quantification of microplastic pollution within the Antarctic Treaty area (south of latitude 60degreeS) has received little attention. We examined microplastic particle concentrations in sediment samples from 20 locations up to 7 km from Rothera Research Station. The highest concentrations of microplastic (<5 particles 10 ml⁻¹) were recorded in sediment collected near the station sewage treatment plant outfall. The concentrations were similar to levels recorded in shallow and deep sea marine sediments outside Antarctica. The detected microplastics had characteristics similar to those commonly produced by clothes washing. We recommend further research on microplastics around Antarctic stations to inform policy discussions and the development of appropriate management responses. Copyright © 2018 Elsevier Ltd

Rees, R. W., et al. (2012). "Ganoderma boninense basidiospores in oil palm plantations: evaluation of their possible role in stem rots of Elaeis guineensis." Plant Pathology **61**(3): 567-578.

Basidiospores are implicated in the distribution and genetic diversity of Ganoderma boninense, cause of basal stem rot (BSR) and upper stem rot (USR) of oil palm (Elaeis guineensis). Measurement of aerial basidiospores within plantations in Sumatra showed continuous and high production over 24 h (range c. 2-11 000 spores m⁻³) with maximum release during early evening. Basidiospores applied to cut surfaces of fronds, peduncles and stems germinated in situ. Equivalent, extensive wounds are created during plantation harvesting and management and represent potential sites for formation of infective heterokaryons following mating of haploid basidiospore germlings. Use of spore-sized micro-beads showed that basidiospores could be pulled up to 10 cm into severed xylem vessels, where they are relatively protected from dehydration, UV irradiation and competing microflora. Diversity of isolates from five locations on two plantations was assessed by RAMS fingerprinting. Isolates from within individual palms with USR were identical and represent single infections, but different USR infections had unique band patterns and revealed separate infections. Some BSR-affected trees contained more than one isolate, and thus had multiple infections. There was one example of adjacent BSR palms with the same isolate, indicating vegetative spread, but there were no identical genets from BSR infections and adjacent fallen palms. Isolate diversity was as great within a plantation as between plantations. It is evident that basidiospores play a major role in spread and genetic variability of G. boninense. Evidence for direct basidiospore infection via cut fronds, indirectly through roots via colonized debris and less frequently, infection by vegetative, clonal spread is considered.

Rego, B. J. (2018). "ASSESSING THE OCCURRENCE OF MICROPLASTIC UPTAKE BY LAKE ERIE PERCH AND WALLEYE AND UNIONID FRESHWATER MUSSELS." The Ohio Journal of Science **118**(1).

Microplastics are defined as plastics under 5 mm in diameter, and can be divided into five groups: fragments, microfibers, beads, foams, and films. Microplastics have been documented

to have harmful effects on aquatic organisms as they can emit toxins and cause blockage in the digestive tracts resulting in irritation and malnutrition. In an ongoing study, 3 different freshwater taxa (Yellow Perch, Perca flavescens, n = 4; Walleye, Sander vitreus, n=4; and Unionid mussels-genus: Anodonta, n = 8) were evaluated to assess the prevalence of microplastics accumulation in digestive tracts or surrounding tissue. Fish were collected from Lake Erie (Fairport Harbor) and mussels were purchased commercially and placed in a mesocosm. The mesocosm consisted of two 25 gallon tanks; one contained microplastics proportional to the composition of microplastics found in the tributaries of the Great Lakes and one did not. The digestive tracts of all species were removed and dissolved using 4N KOH and 30% H2O2. Contents were extracted using a Büchner funnel and dissected for microplastics under a dissection scope. The gill tissue was analyzed separately using the same method for the mussels. 100% of sampled Perch and 50% of Walleye contained microfibers in their digestive tracts. 12% of mussels sampled contained plastic fragments; found in the gill tissue. These data suggest that both fish and mussels are capable of ingesting or accumulating microplastics.

Regtmeier, A., et al. (2012). "Uniform growth of clusters of magnetic nanoparticles in a rotating magnetic field." Journal of Nanoparticle Research **14 (8) (no pagination)**(1061).

It was recently shown that the exposure of magnetic microbeads to a homogeneous magnetic field, which rotates around the axis perpendicular to the field direction, generates highly ordered two-dimensional particle arrays. In this work, the impact of downscaling such systems is analyzed. Dilutions of cobalt nanoparticles with an average diameter of 6 nm were brought into a rotating homogeneous magnetic field. A strong localization of the number of particles within a certain cluster size can be observed if the rotation frequency is adjusted to a specific particle concentration. In particular, we obtain an increase of 85 % of the maximum of the cluster size distribution, when changing the rotation frequency of the magnetic field from 300 to 750 rpm for a cobalt concentration of 35.95 mmol/l. We propose a heuristic model to explain the observed frequency dependence. © 2012 Springer Science+Business Media B.V.

Reguera, P., et al. (2019). "Microplastics in wild mussels (Mytilus spp.) from the north coast of Spain." Scientia Marina **83**(4): 337-347.

Microplastic content (MPs) in mussels (Mytilus spp.) from two areas of the north coast of Spain was measured for the first time. Additionally, a comparison of microplastic levels observed in mussels digested with nitric acid and with potassium hydroxide was carried out. The average microplastic concentration in mussels digested with nitric acid was significantly lower than that observed in mussels digested with potassium hydroxide ($p<0.05$). The average concentration of microplastics in mussels from the Cantabrian Sea (2.55±2.80 MPs g–1 WW) was slightly higher than that in mussels from the Ria of Vigo (1.59±1.28 MPs g–1 WW). Both in the Ria of Vigo and in the Cantabrian Sea the observed pattern of pollution was fitted to the one expected. Consequently, mussels have been confirmed as suitable sentinel organisms for microplastic pollution.

Rehan, M., et al. (2016). "Pyrolytic liquid fuel: a source of renewable electricity generation in Makkah." Energy Sources A: Recovery, Utilization and Environmental Effects **38**(17): 2598-2603.

Millions of Muslims from all over the world visit the Holy Cities of Saudi Arabia: Makkah and Madinah every year to worship in form of Pilgrimage (Hajj) and Umrah. The rapid growth in local population, urbanization, and living standards in Makkah city along with continually increasing number of visitors result in huge municipal solid waste generation every year. Most of this waste is disposed to landfills or dumpsites without material or energy recovery, thus posing

substantial environmental and health risks. The municipal plastic waste is the second largest waste stream (up to 23% of total municipal waste) that is comprised of plastic bottles, water cups, food plates, and shopping bags. The sustainable disposal of plastic waste is challenging task due to its clogging effects, very slow biodegradation rates, and presence of toxic additives and dyes. Pyrolysis is one of the promising waste-to-energy technology for converting municipal plastic waste into energy (liquid fuel) and value-added products like char. The produced liquid fuel has the potential to be used in several energy-related applications such as electricity generation, transportation fuel, and heating purposes. It has been estimated that the plastic waste in Makkah city in 2016 can produce around 87.91 MW of electricity. This is projected to increase up to around 172.80 MW of electricity by 2040. A global warming potential of 199.7 thousand Mt.CO₂ eq. will be achieved with savings of 7.9 thousand tons emission of CH₄, if pyrolysis technology is developed in Makkah city. Furthermore, a total savings of 297.52 million SAR from landfill diversion, electricity generation, and carbon credits would be possible to achieve in 2016 from pyrolysis. These economic benefits will increase every year and will reach up to 584.83 million SAR in 2040.

Rehmert, N., et al. (1992). "A new central supply system as alternative source for bicarbonate dialysate." International Journal of Artificial Organs **15**(6): 339-342.

Bicarbonate dialysis is mandatory for high efficiency treatment. In most cases bicarbonate is delivered either as prepacked powder or as a stable liquid concentrate in 6-10 I plastic containers. With a newly designed central supply system (CSS) using 800 I tanks of custom-made sterile and pyrogen free concentrates, we investigated the risk of bacterial contamination of dialysate in a 30-bed dialysis unit. During three months, samples of reverse osmosis (RO) water, concentrates and dialysate were taken every two weeks. Colony forming units (CFU) were counted after 48 h incubation. Further samples were taken during nine months of continuous use of the CSS without further intermittent disinfection. None of the samples had greater than 10/ml CFU. Pseudomonas, corynebacteria and enterobacter were the predominant species. In summary, this CSS proved reliable in providing bacteriologically safe bicarbonate dialysate as defined by international standards (CFU less than 200/ml). It significantly reduces costs, workload and environmental pollution by plastic waste.

Rehse, S., et al. (2016). "Short-term exposure with high concentrations of pristine microplastic particles leads to immobilisation of Daphnia magna." Chemosphere **153**: 91-99.

Recent studies revealed that freshwaters are not only polluted by chemicals, but also by persistent synthetic material like microplastics (plastic particles <1 mm). Microplastics include a diverse range of characteristics, e.g. polymer type, size or shape, but also their tendency to sorb pollutants or release additives. Although there is rising concern about the pollution of freshwaters by microplastics, knowledge about their potential effects on organisms is limited. For a better understanding of their risks, it is crucial to unravel which characteristics influence their effects on organisms. Analysing effects by the mere particles is the first step before including more complex interactions e.g. with associated chemicals. The aim of this study was to analyse potential physical effects of microplastics on one representative organism for limnic zooplankton (Daphnia magna). We investigated whether microplastics can be ingested and whether their presence causes adverse effects after short-term exposure. Daphnids were exposed for up to 96 h to 1- micro m and 100- micro m polyethylene particles at concentrations between 12.5 and 400 mg L⁻¹. Ingestion of 1- micro m particles led to immobilisation increasing with dose and time with an EC₅₀ of 57.43 mg L⁻¹ after 96 h. 100- micro m particles that could not be ingested by the daphnids

had no observable effects. These results underline that, considering high concentrations, microplastic particles can already induce adverse effects in limnic zooplankton. Although it needs to be clarified if these concentrations can be found in the environment these results are a basis for future impact analysis, especially in combination with associated chemicals.

Rehse, S., et al. (2018). "Microplastics reduce short-term effects of environmental contaminants. Part I: Effects of bisphenol A on freshwater zooplankton are lower in presence of polyamide particles." International Journal of Environmental Research and Public Health **15**(2).

Microplastics can have direct physical effects on organisms in freshwater systems, and are considered as vectors for absorbed environmental pollutants. It is still under discussion if microplastics are relevant pollutant vectors for uptake into aquatic organisms in comparison to further uptake pathways, e.g., via water or sediment particles. We analyzed how the presence of microplastics (polyamide particles, PA) modifies acute effects of the environmental pollutant bisphenol A (BPA) on freshwater zooplankton (Daphnia magna). Daphnids were exposed to PA particles and BPA alone, before combining them in the next step with one concentration of PA and varying concentrations of BPA. The PA particles themselves did not induce negative effects, while the effects of BPA alone followed a typical dose-dependent manner. Sorption of BPA to PA particles prior to exposure led to a reduction of BPA in the aqueous phase. The combination of BPA and PA led to decreased immobilization, although PA particles loaded with BPA were ingested by the daphnids. Calculations based on physiochemistry and equilibrium assumptions indicated lower BPA body burden of daphnids in the presence of PA particles. These results confirm model-based studies, and show that investigated microplastic concentrations are negligible for the overall pollutant uptake of daphnids with water as additional uptake pathway.

Reichert, J., et al. (2019). "Impacts of microplastics on growth and health of hermatypic corals are species-specific." Environmental Pollution **254**(Part B).

Coral reefs are increasingly affected by the consequences of global change such as increasing temperatures or pollution. Lately, microplastics (i.e., fragments <5 mm) have been identified as another potential threat. While previous studies have assessed short-term effects caused by high concentrations of microplastics, nothing is known about the long-term effects of microplastics under realistic concentrations. Therefore, a microcosm study was conducted and corals of the genera Acropora, Pocillopora, Porites, and Heliopora were exposed to microplastics in a concentration of 200 particles L⁻¹, relating to predicted pollution levels. Coral growth and health, as well as symbiont properties were studied over a period of six months. The exposure caused species-specific effects on coral growth and photosynthetic performance. Signs of compromised health were observed for Acropora and Pocillopora, those taxa that frequently interact with the particles. The results indicate elevated energy demands in the affected species, likely due to physical contact of the corals to the microplastics. The study shows that microplastic pollution can have negative impacts on hermatypic corals. These effects might amplify corals' susceptibility to other stressors, further contributing to community shifts in coral reef assemblages.

Reichert, J., et al. (2018). "Responses of reef building corals to microplastic exposure." Environmental Pollution **237**: 955-960.

Pollution of marine environments with microplastic particles (i.e. plastic fragments <5 mm) has increased rapidly during the last decades. As these particles are mainly of terrestrial origin, coastal ecosystems such as coral reefs are particularly threatened. Recent studies revealed that microplastic ingestion can have adverse effects on marine invertebrates. However, little is known about its effects on small-polyp stony corals that are the main framework builders in coral reefs. The goal of this study is to characterise how different coral species (I) respond to microplastic particles and whether the exposure might (II) lead to health effects. Therefore, six small-polyp stony coral species belonging to the genera Acropora, Pocillopora, and Porites were exposed to microplastics (polyethylene, size 37-163 micro m, concentration ca. 4000 particles L⁻¹) over four weeks, and responses and effects on health were documented. The study showed that the corals responded differentially to microplastics. Cleaning mechanisms (direct interaction, mucus production) but also feeding interactions (i.e. interaction with mesenterial filaments, ingestion, and egestion) were observed. Additionally, passive contact through overgrowth was documented. In five of the six studied species, negative effects on health (i.e. bleaching and tissue necrosis) were reported. We here provide preliminary knowledge about coral-microplastic-interactions. The results call for further investigations of the effects of realistic microplastic concentrations on growth, reproduction, and survival of stony corals. This might lead to a better understanding of resilience capacities in coral reef ecosystems.

Reid, A. J., et al. (2019). "Emerging threats and persistent conservation challenges for freshwater biodiversity." Biological Reviews of the Cambridge Philosophical Society **94**(3): 849-873.

In the 12 years since Dudgeon et al. (2006) reviewed major pressures on freshwater ecosystems, the biodiversity crisis in the world's lakes, reservoirs, rivers, streams and wetlands has deepened. While lakes, reservoirs and rivers cover only 2.3% of the Earth's surface, these ecosystems host at least 9.5% of the Earth's described animal species. Furthermore, using the World Wide Fund for Nature's Living Planet Index, freshwater population declines (83% between 1970 and 2014) continue to outpace contemporaneous declines in marine or terrestrial systems. The Anthropocene has brought multiple new and varied threats that disproportionately impact freshwater systems. We document 12 emerging threats to freshwater biodiversity that are either entirely new since 2006 or have since intensified: (i) changing climates; (ii) e-commerce and invasions; (iii) infectious diseases; (iv) harmful algal blooms; (v) expanding hydropower; (vi) emerging contaminants; (vii) engineered nanomaterials; (viii) microplastic pollution; (ix) light and noise; (x) freshwater salinisation; (xi) declining calcium; and (xii) cumulative stressors. Effects are evidenced for amphibians, fishes, invertebrates, microbes, plants, turtles and waterbirds, with potential for ecosystem-level changes through bottom-up and top-down processes. In our highly uncertain future, the net effects of these threats raise serious concerns for freshwater ecosystems. However, we also highlight opportunities for conservation gains as a result of novel management tools (e.g. environmental flows, environmental DNA) and specific conservation-oriented actions (e.g. dam removal, habitat protection policies, managed relocation of species) that have been met with varying levels of success. Moving forward, we advocate hybrid approaches that manage fresh waters as crucial ecosystems for human life support as well as essential hotspots of biodiversity and ecological function. Efforts to reverse global trends in freshwater degradation now depend on bridging an immense gap between the aspirations of conservation biologists and the accelerating rate of species endangerment.

Reihill, J. A., et al. (2016). "Inhibition of Protease-Epithelial Sodium Channel Signaling Improves Mucociliary Function in Cystic Fibrosis Airways." American Journal of Respiratory & Critical Care Medicine **194**(6): 701-710.

RATIONALE: In cystic fibrosis (CF) a reduction in airway surface liquid (ASL) height compromises mucociliary clearance, favoring mucus plugging and chronic bacterial infection. Inhibitors of the epithelial sodium channel (ENaC) have therapeutic potential in CF airways to reduce

hyperstimulated sodium and fluid absorption to levels that can restore airway hydration.

OBJECTIVES: To determine whether a novel compound (QUB-TL1) designed to inhibit protease/ENaC signaling in CF airways restores ASL volume and mucociliary function.

METHODS: Protease activity was measured using fluorogenic activity assays. Differentiated primary airway epithelial cell cultures (F508del homozygotes) were used to determined ENaC activity (Ussing chamber recordings), ASL height (confocal microscopy), and mucociliary function (by tracking the surface flow of apically applied microbeads). Cell toxicity was measured using a lactate dehydrogenase assay.

MEASUREMENTS AND MAIN RESULTS: QUB-TL1 inhibits extracellularly located channel activating proteases (CAPs), including prostasin, matriptase, and furin, the activities of which are observed at excessive levels at the apical surface of CF airway epithelial cells. QUB-TL1-mediated CAP inhibition results in diminished ENaC-mediated Na(+) absorption in CF airway epithelial cells caused by internalization of a prominent pool of cleaved (active) ENaCgamma from the cell surface. Importantly, diminished ENaC activity correlates with improved airway hydration status and mucociliary clearance. We further demonstrate QUB-TL1-mediated furin inhibition, which is in contrast to other serine protease inhibitors (camostat mesylate and aprotinin), affords protection against neutrophil elastase-mediated ENaC activation and Pseudomonas aeruginosa exotoxin A-induced cell death.

CONCLUSIONS: QUB-TL1 corrects aberrant CAP activities, providing a mechanism to delay or prevent the development of CF lung disease in a manner independent of CF transmembrane conductance regulator mutation.

Reimers, D., et al. (2017). "Autoreactive T cell responses in Membranous Nephropathy." European Journal of Immunology **47 (Supplement 2)**: 127.

Membranous Nephropathy (MN) is an immune-mediated glomerular disease. Even with immunosuppressive treatment, MN leads to complete loss of kidney function in about 15 to 20% of patients. MN is caused by binding of autoantibodies against peptide epitopes on glomerular podoctyes. Recently, two podocyte antigens were identified that are recognized by autoantibodies in MN. 70 to 80% of MN patients have antibodies against M-type phospholipase A2 receptor 1 (PLA2R1) and 2 to 3% against the thrombospondin type-1 domain-containing 7A (THSD7A). These autoantibodies are considered central for renal pathology. The detection of anti-PLA2R1 and anti-THSD7A antibodies in serum of patients allows diagnosis for MN. Genome wide association studies demonstrate a correlation of MN with the HLA-DQA1 gene loci, coding for the alpha-chain of HLA-DQ, which implies a role for CD4 T cells in disease development and/or progression. In our current project, we apply a sensitive method for the identification of PLA2R1-specific CD4 T cells to analyze the potential role of autoreactive T cells in patients with MN. Therefore, we isolate Peripheral Blood Mononuclear Cells (PBMCs) from the blood of patients and healthy donors. Isolated cells are stimulated with pools of overlapping peptides covering the sequences of the PLA2R1. Because of the low frequencies of responding cells, CD154+ CD4 T cell are enriched by MACS using biotinylated anti-CD154 mAb and anti-biotin microbeads. The enriched cells are analyzed by multicolor flow cytometry. First results indicate the existence of PLA2R1-reactive CD4 T cells in MN patients. The identified cells produced IFN-gamma, TNF-alpha and IL-17A in an antigen-specific manner. At a lower level, PLA2R1-specific IL-4 and IL-5 producing cells were also detected. The majority of the analyzed CD4 T cells were CD45RA-negative, which implies a memory or effector phenotype of these autoreactive cells. In summary, our results provide the first evidence for a potential role of PLA2R1-specific autoreactive T cells in membranous nephropathy.

Reinholz, J., et al. (2018). "Protein machineries defining pathways of nanocarrier exocytosis and transcytosis." Acta Biomaterialia **71**: 432.

The transport of nanocarriers through barriers like the gut in a living organism involves the transcytosis of these nanocarriers through the cell layer dividing two compartments. Understanding how this process works is not only essential to further developing strategies for a more effective nanocarrier transport system but also for providing fundamental insights into the barrier function as a means of protection against micro- and nanoplastics in the food chain. We therefore set out to investigate the different uptake mechanisms, intracellular trafficking and the routes for exocytosis for small polystyrene nanoparticles (PS-NPs ca. 100 nm) as mimicking nanocarriers in a Caco-2 cell model for gut-blood transition. We used label-free, quantitative mass spectrometry (MS) for determining the proteome that adhered to transversed nanoparticles. From this rich proteomics dataset, as well as previous studies, we generated stable-transfected Caco-2 cell lines carrying the green fluorescent protein (GFP) coupled to proteins of interest for uptake, early, late and exocytotic endosomes. We detected the spatial and temporal overlap of such marked endosomes with the nanocarrier signal in confocal laser scanning and super-resolution microscopy. There was a clear distinction in the time course of nanoparticle trafficking between groups of proteins for endocytosis, intracellular storage and putatively transcytosis and we identified several key transcytotic markers like Rab3 and Copine1. Moreover, we postulate the necessity of a certain protein composition on endosomes for successful transcytosis of nanocarriers. Finally, we define the two-sided impasse of the lysosome as a dead end for nano-plastic and the limit of nanocarriers in the 100 nm range. Statement of Significance Here we focus on mechanisms of transcytosis and how we can follow these with methods not used before. First, we use mass spectrometry of transcytosed nanoparticles to pick proteins of the transcytosis machinery describing key proteins involved. We can detect the complex mixtures of proteins. As this is a dynamic process involving whole families of proteins interacting with each other and as this is an orchestrated process we coined the term protein machineries for this active interplay. By genetically modifying the proteins attaching GFP we are able to follow the transcytosis pathway. We evaluate the process in a quantitative manner over time. This reveals that the most obvious obstacle to transcytosis is a routing of the nanocarriers to the lysosomes.

Reintjes, M. Open-air show 'like the real thing'.

The article discusses the highlights of the biannual Recycling Aktiv open-air show, held at Baden Airpark southwest Germany in September 2013. Figures show the volume of steel scrap, plastics, paper, demolition waste and wood used at the exhibition. Exhibitors like Doppstadt confirmed the improvement in business opportunities by participating in the event. More than 10,000 visitors from various countries attended the open-air show. INSETS: World premiere for Arjes' Tristar;German law 'killing' commercial recyclers;Greemman's versatile cable stripper.

Reintjes, M. (2019). "'No way you can find every lithium battery'." Recycling International: 28-29.

Reis, S. R., et al. (2007). "An in vitro model for dengue virus infection that exhibits human monocyte infection, multiple cytokine production and dexamethasone immunomodulation." Memorias do Instituto Oswaldo Cruz **102**(8): 983-990.

An important cytokine role in dengue fever pathogenesis has been described. These molecules can be associated with haemorrhagic manifestations, coagulation disorders, hypotension and shock, all symptoms implicated in vascular permeability and disease worsening conditions. Several immunological diseases have been treated by cytokine modulation and dexamethasone is utilized clinically to treat pathologies with inflammatory and autoimmune etiologies. We established an in vitro model with human monocytes infected by dengue virus-2 for evaluating immunomodulatory and antiviral activities of potential pharmaceutical products. Flow cytometry analysis demonstrated significant dengue antigen detection in target cells two days after infection. TNF-alpha, IFN-alpha, IL-6 and IL-10 are produced by in vitro infected monocytes and are significantly detected in cell culture supernatants by multiplex microbead immunoassay. Dexamethasone action was tested for the first time for its modulation in dengue infection, presenting optimistic results in both decreasing cell infection rates and inhibiting TNF-alpha, IFN-alpha and IL-10 production. This model is proposed for novel drug trials yet to be applied for dengue fever.

Reisser, J., et al. (2013). "Marine plastic pollution in waters around Australia: characteristics, concentrations, and pathways." PLoS ONE [Electronic Resource] **8**(11): e80466.

Plastics represent the vast majority of human-made debris present in the oceans. However, their characteristics, accumulation zones, and transport pathways remain poorly assessed. We characterised and estimated the concentration of marine plastics in waters around Australia using surface net tows, and inferred their potential pathways using particle-tracking models and real drifter trajectories. The 839 marine plastics recorded were predominantly small fragments ("microplastics", median length = 2.8 mm, mean length = 4.9 mm) resulting from the breakdown of larger objects made of polyethylene and polypropylene (e.g. packaging and fishing items). Mean sea surface plastic concentration was 4256.4 pieces km(-2), and after incorporating the effect of vertical wind mixing, this value increased to 8966.3 pieces km(-2). These plastics appear to be associated with a wide range of ocean currents that connect the sampled sites to their international and domestic sources, including populated areas of Australia's east coast. This study shows that plastic contamination levels in surface waters of Australia are similar to those in the Caribbean Sea and Gulf of Maine, but considerably lower than those found in the subtropical gyres and Mediterranean Sea. Microplastics such as the ones described here have the potential to affect organisms ranging from megafauna to small fish and zooplankton.

Rekha, D., et al. (2014). "Studies on medicinal plants of A.V.V.M. Sri Pushpam College Campus Thanjavur District of Tamil Nadu, Southern India." World Journal of Pharmaceutical Research **3**(5 Suppl): 785-820.

In the present investigation an attempt has been made survey on medicinal plants of Poondi Campus of Thanjavur District of Tamilnadu. The exploration revealed some unknown medical uses of medicinal parts. The scientific name, family, vernacular name (Tamil), parts used, and mode of drug preparation, dosage and duration was also reported and traditional usage of 190 species belonging to 167 genera and 67 Families of angiosperms and gymnosperms were discussed here for the treatment of different ailments viz., snake bite, skin ulcers, urinary bladder, fever, rheumatism, indigestion, cough, cold, acezema, asthma, bone fractures, ear ache, wounds, elephantiasis, vomiting, diarrhoea, hair loss, digestive, stomachic, high blood pressure, diabetes, jaundice, leprosy, toothaches, dysuria, liver, kidney problem and eye infection. The dicotyledons were represented by 177 species of 160 genera and 59 families while monocotyledons were represented by 12 species of 6 genera and 7 Families. Gymnosperms were representing in 1 species of 1 genus 1 families. Poondi campus is in good vegetation status and conservationists should take necessary action to protect this college and plastic pollution. For this, an environmental awareness programmes should be conducted to the local people to safeguard this college from pollution. Conservation and management plan to attain the sustainable biological wealth.

Relja, B., et al. (2014). "Suppressed gene expression of NLRP1 and NLRP3 in monocytes is responsible for their impaired functionality after trauma." Shock **2)**: 28.

Objectives: The IL-1beta-producing activity of monocytes is suppressed after major trauma. The generation of IL-1beta requires its synthesis, the transcription of inflammasome components and their activation. Deregulated NLRP1 and/or NLRP3 inflammasome assembly is associated with several inflammatory diseases, resulting from altered processing of the pro-inflammatory IL-1beta. The present study was designed to determine which NLRP1 and/or NLRP3 inflammasome components are responsible for depressed monocyte function after trauma. Method(s): From ten healthy volunteers and twenty severely injured trauma patients [ISS>= 16] CD14+-monocytes were isolated by microbeads daily up to day 10. Functional analysis of monocytes was performed daily by their ex vivo in vitro LPS-stimulation (10mug/ml, 24h) and subsequent evaluation of the IL-1beta-release by ELISA. Inflammasome activation was verified by protein analysis of cleaved IL-1beta and caspase-1. Gene expression of inflammasome components was analyzed daily before and after LPS-stimulation. Subsequently, isolated monocytes after admission were transfected with expression plasmids encoding for the lacking components identified by gene analyses. Result(s): LPS-induced IL-1beta-release in monocytes from healthy volunteers was significantly suppressed after trauma, with lowest levels at the day of admission (p<0.05). The protein expression of processed IL-1beta and caspase-1 correlated with the IL-1beta-release. IL-1beta, caspase-1 and asc gene expressions were comparable in both, trauma patients and controls after LPS-stimulation during the 10-days course. In contrast, gene expression of nlrp1 and nlrp3 was reduced in trauma patients compared to controls after LPS-stimulation. Transfecting monocytes that were isolated from trauma patients after admission with nlrp1 or nlrp3 recovered the expression of these components as well as the LPS-induced IL-1beta-release to comparable levels of monocytes from healthy volunteers. Conclusion(s): These results indicate that nlrp1 and/or nlrp3 may represent the lacking components in monocytes that are responsible for their suppressed activity after trauma. Regaining all components of NLRP1 and/or NLRP3 inflammasomes in monocytes recovers the monocyte activity after trauma, suggesting new mechanistic targets for balanced immune reaction after trauma.

Relja, B., et al. (2012). "Inflammasome mRNA expression in human monocytes after major trauma." Shock **1)**: 104.

Objectives: Monocytes play a key role in the development of posttraumatic complications due to their central role in the initiation of the inflammatory response by inflammasome activation. Functional capacity of monocytes after trauma is reduced and delayed recovery critically influences the clinical course. We investigated whether the monocytes from patients early after trauma demonstrate alterations in mRNAs for inflammasome compounds in parallel to the reduced monocyte function. Method(s): Severely injured trauma patients [ISSQ16, n=10] and healthy volunteers [n=10] were enrolled. Buffy coats were used for the method verification [n=10]. After isolation of monocytes by CD14+ microbeads, the cells were assayed for ex vivo interleukin-1beta (IL-1beta) production after LPS-stimulation (10 mug/ml, 24 h) by ELISA measurements. Fresh monocyte mRNA was analyzed by qRT-PCR for caspase-1, NALP-1, NALP-3 and IPAF. Result(s): LPS-stimulation increased significantly the IL-1beta release in isolated monocytes from healthy volunteers and buffy coats compared to unstimulated controls (p<0.05). The LPS-response was markedly reduced after trauma compared to healthy volunteers after stimulation. Relative copy numbers for the inflammasome mRNAs for caspase-1 were not markedly enhanced in LPS-stimulated samples. NALP-1 mRNA was significantly enhanced in LPS-stimulated samples from healthy volunteers (p<0.05) and buffy coats (p<0.05), whereas the

NALP-1 mRNA expression remained nearly undetectable in LPS-stimulated monocytes isolated after trauma. NALP-3 and IPAF mRNAs showed no significant changes either after LPS-stimulation or after trauma. Conclusion(s): Monocyte deactivation occurs early after trauma. Reduced monocytic function is paralleled with profound changes in NALP-1 inflammasome mRNA expression, maybe as part of this process.

Rem, P., et al. (2009). "HIGH-PURITY PRODUCTS FROM PLASTIC WASTE: THE W2PLASTICS PROJECT." Environmental Engineering & Management Journal (EEMJ) **8**(4): 963-966.

The European annual consumption of plastic materials has increased from 24.6 Mtons in 1993 to 39.7 M tons in 2003 and it is likely to keep growing. Europe is faced with the challenge of managing millions of tons of waste plastics. At the same time, polymer recyclers and manufacturing industries do not find enough secondary polymers of consistent quality. Plastics production and use has a range of environmental impacts because of the considerable quantity of resources needed as raw materials and process energy. W2Plastics aims to develop a number of novel concepts, in particular Magnetic Density Separation (MDS) and Ultrasound process and quality control, into a new technology to recover high-purity polyolefin's from complex wastes at low cost. The unique promise of this new concept derives from its ability to accurately separate many different materials in a single process step, resulting in an environmentally friendly and cheap process. [ABSTRACT FROM AUTHOR]

Remy, F., et al. (2015). "When Microplastic Is Not Plastic: The Ingestion of Artificial Cellulose Fibers by Macrofauna Living in Seagrass Macrophytodetritus." Environmental Science and Technology **49**(18): 11158-11166.

Dead leaves of the Neptune grass, Posidonia oceanica (L.) Delile, in the Mediterranean coastal zone, are colonized by an abundant detritivorous invertebrate community that is heavily predated by fishes. This community was sampled in August 2011, November 2011, and March 2012 at two different sites in the Calvi Bay (Corsica). Ingested artificial fibers (AFs) of various sizes and colors were found in 27.6% of the digestive tracts of the nine dominant species regardless of their trophic level or taxon. No seasonal, spatial, size, or species-specific significant differences were revealed; suggesting that invertebrates ingest AFs at constant rates. Results showed that, in the gut contents of invertebrates, varying by trophic level, and across trophic levels, the overall ingestion of AFs was low (approximately 1 fiber per organism). Raman spectroscopy revealed that the ingested AFs were composed of viscose, an artificial, cellulose-based polymer. Most of these AFs also appeared to have been colored by industrial dyes. Two dyes were identified: Direct Blue 22 and Direct Red 28. The latter is known for being carcinogenic for vertebrates, potentially causing environmental problems for the P. oceanica litter community. Techniques such as Raman spectroscopy are necessary to investigate the particles composition, instead of relying on fragment size or color to identify the particles ingested by animals. Copyright © 2015 American Chemical Society.

Ren, J., et al. (2019). "Elasticity-Modulated Microbeads for Classification of Floating Normal and Cancer Cells Using Confining Microchannels." ACS Biomaterials Science and Engineering **5**(8): 3889-3898.

Engineered microbeads have a wide range of applications in cancer research including identification, characterization, and sorting of cancer cells. In particular, the microbead-based cancer identification techniques are mainly based on the known genetic or biochemical biomarkers; and detection specificity is yet to be improved. On the other hand, it has been discovered that biomechanical properties of cancer cells such as cell-body elasticity can be considered as cancer biomarkers. Here, we report a straightforward microfluidic classification scheme for floating/dissociated normal and cancer epithelial cells using a confining microchannel device together with calcium-alginate hydrogel microbeads. The hydrogel microbeads are generated based on the microfluidic emulsion process, with characterization on the process parameters (e.g., liquid driving pressure and cross-linking duration) in order to specify the resultant bead diameter and elasticity. These engineered microbeads are first mixed with a cell mixture of dissociated human nasopharyngeal epithelial cells (NP460) and nasopharyngeal carcinoma cells (NPC43). The cell elasticity can then be reflected from the locations of captured cells in the device. Experiments further demonstrate that the cell classification has a success rate of >95%. Furthermore, we performed the microbead-based cell classification on a whole blood sample containing floating human breast epithelial cells (MCF-10A) and breast cancer epithelial cells (MDA-MB-231) with a success rate of >75%, revealing its directly applicability to identification of circulating tumor cells in human blood. Together, this research demonstrates a new application of engineered hydrogel microbeads for classification of cells based on their mechanical properties. © 2019 American Chemical Society.

Ren, L. P., et al. (2012). "Isolation and characteristics of cancer stemness and epithelial-mesenchymal transition of CD133⁺A549 lung cancer cells. [Chinese]." Journal of Shanghai Jiaotong University (Medical Science) **32**(6): 736-740.

Objective: To isolate CD133⁺A549 cells, and investigate the characteristics of cancer stemness and epithelial-mesenchymal transition (EMT). Method(s): A549 cells were isolated by immunomagnetic beads method, and were identified by Real-Time PCR and Western blotting. The expression of cancer stem cell markers (CXCR4, Oct4, CD44, Bmi1 and EpCam) and EMT markers (E-Cadherin and Zeb1) mRNA in CD133⁺A549 cells and CD133⁻A549 cells was detected by Real-Time PC R. The isolated CD133⁺A549 cells and CD133⁻A549 cells were treated with different concentrations (0, 0.25, 0.5 and 1.0 mug/mL) of adriamycin for 72 h, and the relative survival rates of cells were determined by cell viability assay. Result(s): After isolation through CD133 antibody conjugated microbeads, CD133⁺ A549 cells and CD133⁻A549 cells were successfully obtained, and the expression of CD133 in CD133⁺A549 cells was significantly higher than that in CD133⁻A549 cells. Real-Time PCR revealed that the relative expression of Oct 4, CD44, Bmi1 and EpCam mRNA in CD133⁺A549 cells was significantly higher than that in CD133⁻A549 cells [(1+/-0.16) vs(0.66+/-0.12), (1+/-0.07) vs (0.48+/-0.04), (1+/-0.03) vs (0.49+/-0.06), and (1+/-0.14) vs (0.38+/-0.12) ; P<0.05], while there was no significant difference in the relative expression of CXCR4 mRNA between them [(1+/-0.13) vs (0.73+/-0.14), P>0.05]. The relative expression of Zeb1 mRNA in CD133⁺A549 cells was significantly higher than that in CD133⁻A549 cells [(1+/-0.09) vs (0.39+/-0.05), P<0.05], while the relative expression of E-Cadherin mRNA in CD133⁺A549 cells was significantly lower than that in CD133⁻A549 cells [(1+/-0.02) vs (4.98+/-0.04), P<0.05]. Cell viability assay indicated that the relative survival rate of CD133⁺A549 cells was significantly higher than that in CD133⁻A549 cells after treatment with 0.5 and 1.0 mug/mL adriamycin [(85+/-9.4)% vs (67+/-13.1)%, P<0.05; (80+/-14.9)% vs (56+/-6.3)%, P<0.01]. Conclusion(s):

CD133⁺ A549 cells and CD133⁻A549 cells can be successfully isolated by immunomagnetic beads method. There is expression of other cancer stem cell markers in CD133⁺A549 cells, which exhibit characteristics of EMT. CD133 may be a potential biomarker of cancer stemness and EMT in lung cancer.

Ren, S. Y., et al. (2020). "A minimalist approach to quantify emission factor of microplastic by mechanical abrasion." Chemosphere **245 (no pagination)**(125630).

Plastic film has allowed manufacturers to meet varied marketplace demands. Typically, its usage can be divided into two general categories-packaging (food, nonfood and other) and nonpackaging. The microplastics emission resulting from wearing of plastic film is unavoidable in the process of production and use. Currently, no reliable method exists for measure emission factor (EF) of microplastics by mechanical abrasion (MA). In the present study, a simple but effective approach to quantify EF of microplastic by MA was developed. Specifically, the relative light transmittance (RLT) of the plastic film is decreased with increase of MA degree. This quantitative relationship between the two factors can be applied to determine EFs of microplastics induced by MA. The method developed in this study is easy and feasible, but it still has limitations in the standpoint and range, the direction of worthiness of theory. Copyright © 2019 Elsevier Ltd

Ren, W. and W. Zimmermann (2017). "Biocatalysis as a green route for recycling the recalcitrant plastic polyethylene terephthalate." Microbial Biotechnology **10**(6): 1302-1307.

[...]innovative technologies to improve the recycling of plastics and to reduce the consumption of non-renewable fossil feed stocks are required. [...]enzymatic degradation of PET in composite materials such as PET-polyethylene blends, metallized PET-based packaging films or in textiles containing PET could open up further opportunities to recover value from plastic waste using a biocatalytic approach (Gallagher,). [...]PET exhibits a glass transition temperature (Tg) of above 70°C and a melting point (Tm) of over 230°C (Alves et al.,). [...]the microbial biodiversity in environmental samples may allow the identification of further promising polyester hydrolases by metagenomic approaches. [...]protein engineering focusing on key amino acid residues involved in the thermostabilization of polyester hydrolases can be expected to provide further biocatalysts as candidates for industrial PET recycling processes.

Ren, X., et al. (2020). "Effects of microplastics on greenhouse gas emissions and the microbial community in fertilized soil." Environmental Pollution **256**: 113347.

Microplastics (MPs) are characterized by small particle sizes (<5mm) and are widely distributed in the soil environment. To date, little research has been conducted on investigating the effects of MPs on the soil microbial community, which plays a vital role in biogeochemical cycling. In the present study, we investigate the influence of two particle sizes of MPs on dissolved organic carbon (DOC) and its relative functional groups, fluxes of greenhouse gases (GHGs), and the bacterial and fungal communities in fertilized soil. The results showed that a 5% concentration of MPs had no significant effect on soil DOC, whereas the formation of aromatic functional groups was accelerated. In fertilized soil, the existence of MPs decreased the global warming potential (GWP) as a result of a reduction in N₂O emissions during the first three days. A potential mechanism for this reduction in N₂O emissions might be that MPs inhibited the phylum Chloroflexi, Rhodoplanes genera, and increased the abundance of Thermoleophilia on day 3. An increase in N₂O emissions was observed on day 30, mainly due to the acceleration of the NO₃⁻ reduction and a decrease in the abundance of Gemmatimonadacea. The CH₄ uptake was significantly correlated with Hyphomicrobiaceae on day 3 and Rhodomicrobium on day 30. In soil with MPs, Actinobacteria replaced Proteobacteria as the dominant phylum. Larger MPs increased the richness (Chao1) and abundance-based coverage estimators (ACE) and diversity (Shannon) of the bacterial community on day 3, whereas these decreased on day 30. The richness and diversity of the fungal community were also reduced on days 3 and 30. Smaller MPs increased the community richness and diversity of both bacterial and fungal communities in fertilized soil. Our findings suggest that MPs have selective effects on microbes and can potentially have a serious impact on terrestrial biogeochemical cycles.

Ren, X., et al. (2018). "Advances in research on the ecological effects of microplastic pollution on soil ecosystems." Journal of Agro Environment Science **37**(6): 1045-1058.

Microplastics are a new type of environmental pollutants characterized by their small particle size (<5 mm), wide distribution, and resistance to recovery. Owing to their long residue time in soil, microplastics can be accidentally ingested by soil fauna and, thereby, enter the food chain, which can subsequently influence the growth, development, and reproduction of soil fauna by damaging the organisms' organs and DNA. The toxins released during microplastic degradation and the absorption of environmental pollutants by microplastics also threaten soil ecosystems. Primary microplastics are derived from the raw material used for plastic production, whereas secondary microplastics result from the environmental degradation of large plastic products. As microplastics come from many sources, exist in many types, and are found in complex environments, they are difficult to be separated or detected. Recent studies have mainly focused on aquatic ecosystems and have rarely investigated the effects of microplastics on soil ecosystems. However, the plastic materials used in production and manufacturing are abundant, in both quantity and form, and some of these are released into soil systems. This review summarizes the classification, sources, sampling, and detection of microplastics, as well as related environmental problems, such as soil pollution, pollutant absorption, and effects on soil fauna, microbial ecology, and carbon and nitrogen circulation. The discussion of the ecological effects of microplastics could stimulate new ideas for future research.

Renner, G., et al. (2019). "Data preprocessing & evaluation used in the microplastics identification process: A critical review & practical guide." TrAC - Trends in Analytical Chemistry **111**: 229-238.

Characterising microplastics based on spectroscopic measurements is one key step of many studies that analyse the fate of microplastics in the environment. Over the years, many potential sources of error were identified, which can be seen by the implementation of anti-contamination protocols, measuring laboratory blanks or using less aggressive chemicals for sample purification. However, the identification process itself in the meaning of a traceable and transparent documentation is hard to find in many research studies. Unfortunately, this can make it difficult to estimate if the presented results are representative and reproducible, as the evaluation process during microplastics identification depends dramatically on the performed data treatment. To increase the awareness of this often neglected topic, this article reviews suitable data preprocessing and evaluation methods for microplastics identification based on spectroscopic measurements and will recommend a practical workflow or check list that can easily be used for further research studies. Copyright © 2018 Elsevier B.V.

Renner, G., et al. (2019). "Robust Automatic Identification of Microplastics in Environmental Samples Using FTIR Microscopy." Analytical Chemistry **91**(15): 9656-9664.

The analysis of microplastics is mainly performed using Fourier transformation infrared spectroscopy/microscopy (FTIR/ muFTIR). However, in contrast to most aspects of the analysis process, for example, sampling, sample preparation, and measurement, there is less known about data evaluation. This particularly critical step becomes more and more important if a large number of samples has to be handled. In this context, it is concerning that the commonly used library searching is not suitable to identify microplastics from real environmental samples automatically. Therefore, many spectra have to be rechecked by the operator manually, which is very time-consuming. In this study, a new fully automated robust microplastics identification method is presented that assigns over 98% of microplastics correctly. The main concept of this new method is to detect and numerically describe the individual vibrational bands within an FTIR absorbance spectrum by curve fitting, which leads to a very compact and highly characteristic peak list. This list allows very accurate and robust library searching. The developed approach is based on the already published microplastics identification algorithm (muIDENT) and extends and improves the field of application to muFTIR data with a special focus on relevant broad, overlapped, or complex vibrational bands.

Renner, G., et al. (2017). "A New Chemometric Approach for Automatic Identification of Microplastics from Environmental Compartments Based on FT-IR Spectroscopy." Analytical Chemistry **89**(22): 12045-12053.

One key step studying interactions of microplastics with our ecological system is to identify plastics within environmental samples. Aging processes and surface contamination especially with biofilms impede this characterization. A complex and time-consuming cleaning procedure is a common solution for this problem. However, it implies an artificial change of sample composition with a risk of losing important information or even damaging microplastic particles. In the present work, we introduce a new chemometric approach to identify heavily weathered and contaminated microplastics without any cleaning. The main idea of this concept is based on an automated curve fitting of most relevant vibrational bands to calculate a highly characteristic fingerprint that contains all vibrational band area ratios. This new data set will be used to estimate the similarity of samples and reference standards for identification. A total of 300 individual naturally weathered plastic particles were measured with Fourier transformation infrared spectroscopy in attenuated total reflection mode (FT-IR ATR) and identified successfully with the new method. To that end, all samples were compared with a selection of common reference plastics and bio polymers. As it turns out, the accuracy of identification rises significantly from 76% by means of conventional library searching algorithms to 96% by identifying microplastics with our new method. Therefore, the new approach can be a useful tool to compare and describe similarities of FT-IR spectra of microplastics, which may improve further research studies on this topic.

Renzi, M. and A. Blaskovic (2018). "Litter & microplastics features in table salts from marine origin: Italian versus Croatian brands." Marine Pollution Bulletin **135**: 62-68.

This study estimates litter content, including microplastics, mesoplastic, and macroplastic in marine table salts coming from Italy and Croatia. Both high (HC) and low (LC) costs commercial brands easily found at the supermarket were analysed. Any macroplastic or mesoplastic were recovered while microplastics and other litter impurities significantly affect table salts of all tested brands. Average microplastic values ranged within 1.57 (HC) - 8.23 (LC) (Italy) and 27.13 (HC) - 31.68 (LC) items/g (Croatia). Microplastics sizes (min-max) ranged within 4-2100mum (Italy) and 15-4628mum (Croatia). In samples from both Nations, a significant general positive correlation between the average number of items/g recorded and the total amount of general impurities was recorded. Concerning microplastic shapes, in Italy, fragments dominated even if fibres, granules, films, and foams are frequently recorded. On the contrary, clear PP fibres dominated in Croatian brands even if also other shape classes were recorded.

Renzi, M., et al. (2018). "Plastic litter transfer from sediments towards marine trophic webs: a case study on holothurians." Marine Pollution Bulletin **135**: 376-385.

This study estimates for the very first time plastic litter levels in sea cucumbers (Echinodermata, Holothuroidea) sampled in situ and their intakes from sediments in three different rocky bottom habitats (slides, cliff, banks) settled in Salina Island (Aeolian Archipelago). Macroplastic were never recorded while meso- and microplastics were identified in all sediment (81-438 items/kg d.w.) and animal samples (1.8-22 items/ind.). Plastic intakes by sea cucumbers resulted frequently associated to the size range included within 100-2000 micro m. Over than 70% of ingested plastic litter is represented by the size fraction >500 micro m. Sediment/animals ratios% are included 2.7+or-2.0% in studied habitats with a selective intake of fragments occurring in slides. Furthermore, results support the occurrence of selective ingestion of plastic litter by holothurians in natural environments underlining the role of these species in microplastic transfer from abiotic towards biotic compartments of the marine trophic web.

Renzi, M., et al. (2019). "Effects of different microplastic types and surfactant-microplastic mixtures under fasting and feeding conditions: a case study on Daphnia magna." Bulletin of environmental contamination and toxicology **103**(3): 367-373.

This study evaluates the mortality and immobilization on Daphnia magna after 24-96 h of exposure to microplastic dispersions (PP, PE, PVC, PVC/PE), and to microplastic + surfactant solutions both under fasting and feeding conditions. The tested microplastics were analysed with micro FT-IR to determine their chemical composition, purity, and dimensions. The results show that: (i) exposure under fasting conditions produces acceptable results on negative controls no later than 24 h; (ii) the dispersion of microplastics forms homo-agglomerates that are able to affect animals' motility and cause mortality and immobilization; (iii) different types of tested microplastic produce different effects on endpoints (the most toxic is PVC+surfactant); (iv) in all cases, the effects were reduced under feeding conditions (i.e. 4 times reduction of PE toxicity); (v) effects of surfactant on observed toxicity are microplastic-type dependent; (vi) the age of the animal affected the mortality and immobilization responses after exposure under both fasting and feeding conditions.

Renzi, M., et al. (2019). "Effects of Different Microplastic Types and Surfactant-Microplastic Mixtures Under Fasting and Feeding Conditions: A Case Study on <i>Daphnia magna</i>." Bulletin of environmental contamination and toxicology **103**(3): 367-373.

This study evaluates the mortality and immobilization on Daphnia magna after 24–96 h of exposure to microplastic dispersions (PP, PE, PVC, PVC/PE), and to microplastic + surfactant solutions both under fasting and feeding conditions. The tested microplastics were analysed with µFT-IR to determine their chemical composition, purity, and dimensions. The results show that: (i) exposure under fasting conditions produces acceptable results on negative controls no later than 24 h; (ii) the dispersion of microplastics forms homo-agglomerates that are able to affect animals’ motility and cause mortality and immobilization; (iii) different types of tested microplastic produce different effects on endpoints (the most toxic is PVC + surfactant); (iv) in all cases, the effects were reduced under feeding conditions (i.e. 4 times reduction of PE toxicity); (v) effects of surfactant on observed toxicity are microplastic-type dependent; (vi) the age of the animal affected the mortality and immobilization responses after exposure under both fasting and feeding conditions.

Renzi, M., et al. (2018). "Microplastic contents from maricultured and natural mussels." Marine Pollution Bulletin **131**(Pt A): 248-251.

Results of this research focuses on microplastic contents (levels, type, size, colour) in maricultured and natural mussels (Mytilus galloprovincialis) from different Italian stocks. No significant differences were found among maricultured and natural stocks. All recovered MPs are filaments ranging within 750-6000mum of maximum length (average values 1150-2290mum). Feeding raw mussel could produce median MP intakes of 6.2-7.2 items/g w.w. Concerning human exposure by diet, both raw and cooked values are important. Some preliminary tests performed in this study evidenced that the cooking process determined lower MPs levels (-14%) in cooked tissues compared to raw ones, MPs were recorded in cooking water and were characterized by a lower size than in raw mussels.

Renzi, M., et al. (2019). "Marine litter in stomach content of small pelagic fishes from the Adriatic Sea: sardines (<i>Sardina pilchardus</i>) and anchovies (<i>Engraulis encrasicolus</i>)." Environmental science and pollution research international **26**(3): 2771-2781.

Marine litter impacts oceans and affects marine organisms, representing a potential threat for natural stocks of pelagic fish species located at the first levels of the marine food webs. In 2013–2014, on a seasonal basis, marine litter and microplastics in stomach contents from Sardinia pilchardus and Engraulis encrasicolus were evaluated. Selected species are plankitivores of great ecological and commercial importance in the Adriatic Sea. Collected data were correlated to possible factors able to affect ingested levels as well as species, season of sampling, biometry and sex of animals. Almost all tested samples (80 organisms for each species) contained marine litter (over 90% of samples from both species) and also microplastics; while any meso- or macroplastics were recorded. On average, recorded items were as follows: 4.63 (S. plichardus) and 1.25 (E. encrasicolus) per individual. Sardines evidenced a higher number of microplastics characterised by a smaller size than those recorded in anchovies. For sardines, sex, Gastro Somatic Index and sampling season showed negligible effects on the number of ingested litter; conversely, anchovies showed differences related with both sex of animals and dominant colour of ingested materials with prevalence for black and blue colours.

Resaz, R., et al. (2015). "A glycogen storage disease type 1a mouse model to study long term liver pathogenesis and cell therapy approaches." Regenerative Medicine **1)**: 208.

Objectives Animal models are powerful tools to study hereditary diseases and guide the development of new therapeutic approaches to correct single gene defects. This is especially valid for genetic syndromes caused by single gene mutations, as is in the case of glycogen storage disease type 1a (GSD-1a), caused by a deficiency in glucose-6-phosphatase (G6Pase, encoded by G6pc) and characterized by impaired glucose homeostasis and long-term complications including hepatic adenomas (that might undergo malignant transformation) and renal disease. A G6pc-null mouse (G6pc-/-) model for GSD-1a has been generated. We have used these mice to analyze the efficacy of cell therapy to treat GSD-1a. We showed that transplantation of normal bone-marrow-derived myelomonocytes (BMMs) into G6pc-/- mice partially reconstitutes the diseased liver and prolongs lifespan. However, the short life span, extreme fragility, and limited number of G6pc- /- offspring represent an obstacle to evaluate long-term effects of BMMs engraftment. To overcome this problem we generated a mouse line (LS-G6pc-/-) carrying liver-specific deletion of G6Pase-alpha as an alternative animal model to study the age-related disease progression and the long-term consequences of BMMs transplant. Material and methods LS-G6pc-/- were generated by crossing mice harboring a conditional null allele for G6pc with transgenic mice expressing Cre under the control of murine albumin enhancer/promoter. Tissue sections were stained with hematoxylin/eosin (H&E), periodic acid-Schiff (PAS), PAS diastase, reticulin stain and Congo red, or treated for G6Pase histochemical assay and Western Blot analysis. Glucose, cholesterol and triglycerides serum levels were measured by commercially available kits. For cell therapy BMMs have been isolated from the femurs of adult C57Bl/6-Tg(ACTB-EGFP)1 Osb/J mice and purified by positive selection on CD11b MicroBeads. Mice have been injected in the temporal vein at two days of age, and then re-injected at thirty days of age directly into the liver, after partial hepatectomy, and in the heart or in the tail vein. Results LS-G6pc-/- mice are viable but exhibit significantly lower blood glucose levels than their control littermates after 6 hours of fasting, hypercholesterolemia and hypertriglyceridemia until they reached the age of 2-4 months. LS-G6pc-/- mice develop hepatomegaly with glycogen accumulation and hepatic steatosis, progressive hepatic degeneration, amyloidosis, multiple hepatocellular adenomas and occasional late development of hepatocellular carcinoma. We are now utilizing this new GSD-1a animal model to evaluate the correction of liver abnormalities by cell therapy and the long-term consequences of BMMs engraftment. Results obtained from this first set of experiments will be presented and discussed. Conclusion LS-G6pc-/- mice manifest hepatic symptoms similar to those of the human GSD-1a and may, therefore, represent a valid model to study long-term liver pathogenesis of GSD-1a and potentially to discover biomarkers and new treatment interventions. In particular, this model might be useful to evaluate the long-term efficacy of cellular therapies in preclinical studies, such as hematopoietic stem cell approaches to regenerate the liver of diseased animals.

Revel, M., et al. (2020). "Realistic environmental exposure to microplastics does not induce biological effects in the Pacific oyster Crassostrea gigas." Marine Pollution Bulletin **150**: 110627.

The aim of the present study was to evaluate the presence and potential toxic effects of plastic fragments (<400mum) of polyethylene and polypropylene on the Pacific oyster Crassostrea gigas. Oysters were exposed to environmentally relevant concentrations (0, 0.008, 10, 100mug of particles/L) during 10 days, followed by a depuration period of 10 days in clean seawater. Effects of microplastics were evaluated on the clearance rate of organisms, tissue alteration, antioxidant defense, immune alteration and DNA damage. Detection and quantification of microplastics in oyster's tissues (digestive gland, gills and other tissues) and biodeposits using infrared microscopy were also conducted. Microplastics were detected in oyster's biodeposits following exposure to all tested concentrations: 0.003, 0.006 and 0.05 particles/mg of biodeposits in oysters exposed to 0.008, 10 and 100mug of particles/L, respectively. No significant modulation of biological markers was measured in organisms exposed to microplastics in environmentally relevant conditions.

Revel, M., et al. (2019). "Tissue-Specific Biomarker Responses in the Blue Mussel Mytilus spp. Exposed to a Mixture of Microplastics at Environmentally Relevant Concentrations." Frontiers in Environmental Science.

The impact of a microplastic (MPs) mixture composed of polyethylene (PE) and polypropylene (PP) plastic particles, prepared from commercially available products, was evaluated in blue mussels Mytilus spp. exposed to three environmentally relevant concentrations: 0.008µg L^{-1} (low), 10 µg L^{-1} (medium) and 100 µg L^{-1} (high). Organisms were exposed for 10 days followed by 10 days of depuration in clean seawater under controlled laboratory conditions. The evaluation of MP effects on mussel clearance rate, tissue structure, antioxidant defences, immune and digestive parameters, and DNA integrity were investigated while the identification of plastic particles in mussel tissues (gills, digestive gland, and remaining tissues), and biodeposits (faeces and pseudofaeces) was performed using infrared microscopy (µFT-IR).

Results showed the presence of MPs only in the digestive gland of mussels exposed to the highest tested concentration of MPs with a mean of 0,75 particle/mussel (after the 10 days of exposure). In biodeposits, PE and PP particles were detected following exposure to all tested concentrations confirming the ingestion of MPs by the organisms. A differential response of antioxidant enzyme activities between digestive gland and gills was observed. Significant increases in superoxide dismutase (SOD) and catalase (CAT) activities were measured in the digestive gland of mussels exposed to the low (0.008µg L^{-1}) and medium (10 µg L^{-1}) concentrations of MPs and in the gills from mussels exposed to the highest concentration (100 µg L^{-1}) of MPs that could be indicative of a change in the redox balance. Moreover, an increase in acid phosphatase activity was measured in hemolymph of mussels exposed to 0.008 and 10 µg L^{-1} concentrations. No significant difference was observed in the clearance rate, and histopathological parameters between control and exposed mussels. This study brings new insights on the potential sublethal impacts of MPs at environmentally relevant concentrations in marine bivalves.

Revel, M., et al. (2018). "Accumulation and immunotoxicity of microplastics in the estuarine worm Hediste diversicolor in environmentally relevant conditions of exposure." Environmental Science & Pollution Research **23**: 23.

The presence of plastic debris < 5 mm called microplastics (MPs) which results mainly from macroplastic's fragmentation has been reported in aquatic ecosystems. Several studies have shown that MPs are persistent and their accumulation was observed in various aquatic species. However, the majority of studies focused on marine species, and much less on continental and estuarine biota. The goal of the present study was to investigate the effects of a mixture of two types of MPs (polyethylene and polypropylene), frequently found in natural environments, towards the ragworm Hediste diversicolor to determine their accumulation in organisms exposed through the water phase or sediment. Two concentrations of exposure were selected for medium and heavily contaminated areas reported for water phase (10 and 100 mug/L) and sediment (10 and 50 mg of MPs/kg). To study the potential toxic effect of MPs, immune parameters were selected since they are involved in many defense mechanisms against xenobiotics or infectious agents. An average number of MP items/worm ranging from 0 to 2.5 and from 1 to 36 were identified in animals exposed to the lowest and the highest concentration of MPs through water exposure. In worms exposed through sediment, less than 1 MP/worm was found and a greater number of particles were identified in depurated sediment. For immunotoxic impact, MP exposure induced a decrease in coelomocytes viability, but no alteration of phagocytosis activity, phenoloxydase, and acid phosphatase was measured. This study brings new results on the potential accumulation and immunotoxicity of MPs for the ragworm H. diversicolor who plays a key role in the structure and functioning of estuarine ecosystem.

Revel, M., et al. (2018). "Accumulation and immunotoxicity of microplastics in the estuarine worm <i>Hediste diversicolor</i> in environmentally relevant conditions of exposure." Environmental science and pollution research international: 1-10.

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Reynolds, A., et al. (2019). "Evaluation of non-invasive toxicological analysis of nano-polystyrene in relative <i>in vivo</i> conditions to <i>D. magna</i>." Environmental Science: Nano **6**(9): 2832-2849.

Nano-plastic (NP) usage is increasing across many industries; however, the risks posed from waste production or their accidental release into the environment have not been well investigated. Additionally, the resulting effects on the organisms within various environments based on NP exposure have not been thoroughly investigated. To contribute to this information, our current study focused on using an OECD test with additional validation tests to replicate the effects of a specific NP entering the freshwater environment. The current research analysed the potential toxicological, developmental and reproductive effects caused by fluorescent nano-polystyrene spheres (NPS) in juvenile (neonate) freshwater planktonic crustaceans, Daphnia magna. D. magna neonates were exposed for 24 h to a concentration range of 0–100 μg mL−1 of 100 nm diameter NPS as a mortality/immobility (MI) test. MI testing showed that the D. magna exhibited significant NPS consumption at all concentrations; however, adverse effects only occurred after exposure to 30 μg mL−1. The resulting EC50 for the NPS MI testing was 86.3 1 μg mL−1. Florescence imaging showed that the NPS were isolated to the D. magna intestines, even with exposure to a low concentration, producing a distinct emission, with no distinguishable NPS present in the other organs. UV-vis fluorimetry displayed an indirect relation between the initial consumption of NPS and increase in NPS exposure. The fluorimetry results showed an increase in NPS uptake up to 30 μg mL−1, and then a decrease since D. magna slowed consumption, and further increase after 100 μg mL−1. This indicated a change in the ratio of NPS within the intestines of Daphnia, which is independent to the exposure concentration. Raman spectroscopy analysis of the control D. magna produced a consistent emission spectrum, but with large FWHM peaks from its organic structures. The NPS-exposed D. magna clearly produced a clear and sharp peak attributed to a pure polystyrene signal following careful Z-mapping, which was not detected in the control samples. The results clearly present the successful Raman detection of the styrene signal from the NPS-exposed D. magna without significant pre-processing of the neonates.

Reynolds, C. and P. G. Ryan (2018). "Micro-plastic ingestion by waterbirds from contaminated wetlands in South Africa." Marine Pollution Bulletin **126**: 330-333.

Despite a large literature on the impacts of micro-plastic pollution in marine ecosystems, very little research has focused on these pollutants in freshwater ecosystems. Recently, however, a few studies have demonstrated that micro-plastic pollutants are ingested by freshwater taxa,

including birds. To explore this potential environmental threat in African freshwater systems we quantified micro-plastic pollutants in the faeces and feather brushings of seven southern African duck species. We analysed 283 faecal samples and 408 feather brushings, and found that 5% of faecal samples and 10% of feather samples contained micro-plastic fibres. The presence and abundance of micro-fibres differed between sampling sites, with significantly higher amounts recorded for the site that received effluent from a sewage treatment facility. Additionally, micro-fibre presence differed across duck species, indicating that foraging behaviour affects plastic ingestion. Our study confirms that African freshwater ecosystems and the biodiversity they support are under threat from micro-plastic contamination.

Reynolds, M., et al. (2012). "Advanced nitric oxide delivery platforms for therapeutic applications." Nitric Oxide - Biology and Chemistry **1)**: S33.

Nitric oxide (NO) has been identified as a crucial biological signaling molecule in the cardiovascular, nervous, and immune systems. As a result, NO storage and delivery vehicles have been extensively developed to target a range of diseases and to control material-cell interactions. In this presentation, new approaches to store and deliver NO from materials used in therapeutic devices will be discussed. This includes the development of biodegradable and biostable polymers as well as methods to produce NO catalytically from bioavailable sources. The advantages of these systems is that they can tuned to control the NO-loading capacity and then triggered to release NO under various conditions, thereby extending the useful lifetime of currently available NO materials. Further, the delivery platforms have been engineering into a variety of forms including coatings, encapsulated microbeads, and nanofibers. These platforms allow for further tuning of the material properties to maximize control of the bio-interface. Finally, these materials have been extensively characterized for their NO release rates in real-time and under cell culture conditions. These pharmacokinetic profiles have been used to evaluate the physiological effective dosages of NO in cancer, angiogenic, platelet, and infection models.

Rezaei, M., et al. (2019). "Wind erosion as a driver for transport of light density microplastics." Science of the Total Environment **669**: 273-281.

Microplastic pollution in the environment is a growing concern in today's world. Wind-eroded sediment, as an environmental transport pathway of microplastics, can result in environmental and human exposure far beyond its sources. For the first time, this study investigates the presence of microplastics in wind-eroded sediments from different land uses in the Fars Province, Iran. Eleven test plots were selected based on land use and wind erosion risk. On each plot, wind erosion was simulated using a portable wind tunnel and the eroded sediment was collected for further analysis aimed at measuring light density microplastics (LDMP). The LDMPs were extracted in both soil and wind-eroded sediment using a floatation method and then further examined using microscopy. Annual LDMP transport by wind erosion was estimated using wind data from the study areas. LDMPs were detected in six study areas in the Fars Province which are highly prone to wind erosion. Although LDMPs were found mostly in agricultural land, it was also detected in the soils and sediments from two natural areas. The total concentrations of LDMPs in polluted areas were 6.91 and 20.27mgkg⁻¹ of microplastics in soil and wind-eroded sediments, respectively. The enrichment ratio for LDMP ranged from 2.83 to 7.63 in different areas. The erosion rate of LDMP ranged from 0.08 to 1.48mgm⁻²min⁻¹. The results of this study confirmed the key role of wind erosion in the spread of microplastics in terrestrial environments which could form an exposure risk to humans via direct inhalation of the particles transported with the dust.

Rezania, S., et al. (2018). "Microplastics pollution in different aquatic environments and biota: A review of recent studies." Marine Pollution Bulletin **133**: 191-208.

Microplastics (MPs) are generated from plastic and have negative impact to our environment due to high level of fragmentation. They can be originated from various sources in different forms such as fragment, fiber, foam and so on. For detection of MPs, many techniques have been developed with different functions such as microscopic observation, density separation, Raman and FTIR analysis. Besides, due to ingestion of MPs by wide range of marine species, research on the effect of this pollution on biota as well as human is vital. Therefore, we comprehensively reviewed the occurrence and distribution of MPs pollution in both marine and freshwater environments, including rivers, lakes and wastewater treatment plants (WWTPs). For future studies, we propose the development of new techniques for sampling MPs in aquatic environments and biota and recommend more research regarding MPs release by WWTPs. Copyright © 2018 Elsevier Ltd

Rhodes, C. J. (2018). "Plastic pollution and potential solutions." Science Progress **101**(3): 207-260.

A review is presented of the manufacture and use of different types of plastic, and the effects of pollution by these materials on animal, human and environmental health, insofar as this is known. Since 2004, the world has made as much plastic as it did in the previous half century, and it has been reckoned that the total mass of virgin plastics ever made amounts to 8.3 billion tonnes, mainly derived from natural gas and crude oil, used as chemical feedstocks and fuel sources. Between 1950 and 2015, a total of 6.3 billion tonnes of primary and secondary (recycled) plastic waste was generated, of which around 9% has been recycled, and 12% incinerated, with the remaining 79% either being stored in landfills or having been released directly into the natural environment. In 2015, 407 million tonnes (Mt) of plastic was produced, of which 164 Mt was consumed by packaging (36% of the total). Although quoted values vary, packaging probably accounts for around one third of all plastics used, of which approximately 40% goes to landfill, while 32% escapes the collection system. It has been deduced that around 9 Mt of plastic entered the oceans in 2010, as a result of mismanaged waste, along with up to 0.5 Mt each of microplastics from washing synthetic textiles, and from the abrasion of tyres on road surfaces. However, the amount of plastics actually measured in the oceans represents less than 1% of the (at least) 150 Mt reckoned to have been released into the oceans over time. Plastic accounts for around 10% by mass of municipal waste, but up to 85% of marine debris items - most of which arrive from land-based sources. Geographically, the five heaviest plastic polluters are P. R. China, Indonesia, Philippines, Vietnam and Sri Lanka, which between them contribute 56% of global plastic waste. Larger, primary plastic items can undergo progressive fragmentation to yield a greater number of increasingly smaller 'secondary' microplastic particles, thus increasing the overall surface area of the plastic material, which enhances its ability to absorb, and concentrate, persistent organic pollutants (POPs) such as dichlorodiphenyltrichloroethane (DDT) and polychlorinated biphenyls (PCBs), with the potential to transfer them to the tissues of animals that ingest the microplastic particles, particularly in marine environments. Although fears that such microparticles and their toxins may be passed via food webs to humans are not as yet substantiated, the direct ingestion of microplastics by humans via drinking water is a distinct possibility - since 92% of samples taken in the USA and 72% in Europe showed their presence - although any consequent health effects are as yet unclear. Foodstuffs may also become contaminated by microplastics from the air, although any consequent health effects are also unknown. In regard to such airborne sources, it is noteworthy that small plastic particles have been found in human lung tissue, which might prove an adverse

health issue under given circumstances. It is also very striking that microplastics have been detected in mountain soils in Switzerland, which are most likely windborne in origin. Arctic ice core samples too have revealed the presence of microplastics, which were most likely carried on ocean currents from the Pacific garbage patch, and from local pollution from shipping and fishing. Thus, sea ice traps large amounts of microplastics and transports them across the Arctic Ocean, but these particles will be released into the global environment when the ice melts, particularly under the influence of a rising mean global temperature. While there is a growing emphasis toward the substitution of petrochemically derived plastics by bioplastics, controversy has arisen in regard to how biodegradable the latter actually are in the open environment, and they presently only account for 0.5% of the total mass of plastics manufactured globally. Since the majority of bioplastics are made from sugar and starch materials, to expand their use significantly raises the prospect of competition between growing cr

Rhodes, C. J. (2019). "Solving the plastic problem: From cradle to grave, to reincarnation." Science Progress **102**(3): 218-248.

Plastic packaging accounts for 36% of all plastics made, but amounts to 47% of all plastic waste; 90% of all plastic items are used once and then discarded, which corresponds to around 50% of the total mass of plastics manufactured. Evidence for the ubiquity of microplastic pollution is accumulating rapidly, and wherever such material is sought, it seems to be found. Thus, microplastics have been identified in Arctic ice, the air, food and drinking water, soils, rivers, aquifers, remote maintain regions, glaciers, the oceans and ocean sediments, including waters and deep sea sediments around Antarctica, and within the deepest marine trenches of the Earth. They have also been detected in the bodies of animals, including humans, and as being passed along the hierarchy of food chains, up to marine top predators. Evidence has also been presented that microplastics are able to cross different life stages of mosquito that use different habitats - larva (feeding) to pupa (non-feeding) to adult terrestrial (flying) - and therefore can be spread from aquatic systems by flying insects. The so-called 'missing plastic problem' appears to be, in part, due to limitations in sampling methods, that is, many of the very small microplastic particles may simply escape capture in the trawl nets that are typically employed to collect them, but have been evidenced in grab-sampling experiments. Moreover, it is simply not possible to measure entirely through the vast, oceanic volumes of the oceans. It can, however, be concluded with some confidence that the majority of the plastic is not located at the sea surface, and indeed, several different sinks have been proposed for microplastics, including the sea floor and sediments, the ocean column itself, ice sheets, glaciers and soils. The treatment of land with sewage sludge is also thought to make a significant contribution of microplastics to soil. A substantial amount of airborne microparticulate pollution is created by the abrasion of tyres on road surfaces (and other 'non-exhaust' sources), meaning that even electric vehicles are not 'clean' in this regard, despite their elimination of tailpipe PM_{2.5} and PM₁₀ emissions. The emergence of nanoplastics in the environment poses a new set of potential threats, although any impacts on human health are not yet known, save, as indicated from model studies. While improved design, manufacture, collection, reuse, repurposing and reprocessing/recycling of plastic items are necessary, overwhelmingly, a curbing in the use of plastic materials in the first place is demanded, particularly from single-use packaging. However, plastic pollution is just one element in the overall matrix of a changing climate ('the world's woes') and must be addressed as part of an integrated consideration of how we use all resources, fossil and otherwise, and the need to change our expectations, goals and lifestyles. In this effort, the role of deglobalisation/relocalisation may prove critical: thus, food and other necessities might be produced more on the local than the global scale, with

smaller inputs of fossil fuels for transportation and other purposes, water and fertilisers, along with a marked reduction in the need for plastic packaging.

Riaz, Q. U. and T. Masud (2013). "Recent trends and applications of encapsulating materials for probiotic stability." Critical Reviews in Food Science & Nutrition **53**(3): 231-244.

The importance of probiotics and their live delivery in the gastrointestinal tract has gained much importance in the recent past. Many reports have indicated that there is poor viability of probiotic bacteria in dairy based products, both fermented and non-fermented, and also in the human gastro-intestinal system is questionable. In this case, microencapsulation is the most significant emerging and efficient technology that is being used for the preservation of probiotics against adverse environmental conditions. Apart from different techniques of microencapsulation, various types of encapsulating materials are also used for the process, namely, alginate, chitosan, carrageenan, gums (locust bean, gellan gum, xanthan gum, etc.), gelatin, whey protein, starch, and compression coating. Each one of the encapsulating materials has its own unique characteristics of capsule formation and provision of shape, appearance, and strength to microbeads. The type of encapsulating material also influences the viability of probiotics during storage, processing, and in the gastrointestinal tract. The effectiveness of any material depends not upon its capsule forming capability, strength, and enhancing viability but also on its cheapness, availability, and biocompatibility. So, added convenience and reduced packaging costs may also be used to offset the cost of encapsulating one or more ingredients. Encapsulated forms of ingredients provide a longer shelf life for the product.

Riaz, T., et al. (2019). "In vitro survival of Bifidobacterium bifidum microencapsulated in zein-coated alginate hydrogel microbeads." Journal of Microencapsulation **36**(2): 192-203.

The Bifidobacterium bifidum susceptibility in gastrointestinal conditions and storage stability limit its use as potential probiotics. The current study was design to encapsulate B. bifidum using sodium alginate (SA, 1.4% w/v) and different concentration of zein as coating material, that is, Z₁ (1% w/v), Z₂ (3% w/v), Z₃ (5% w/v), Z₄ (7% w/v), Z₅ (9% w/v). The resultant microbeads were further investigated for encapsulation efficiency, survival in gastrointestinal conditions, release profile in intestinal fluid, storage stability and morphological characteristics. The highest encapsulation efficiency (94.56%) and viable count (>10⁷ log CFU/g) was observed in Z₄ (7% w/v). Viable cell count of B. bifidum was >10⁶ log CFU/g in all the zein-coated microbeads as compare to free cells (10³ log CFU/g) and SA (10⁵ log CFU/g) at 4 degreeC after 32 days of storage. Therefore, B. bifidum encapsulated in zein-coated alginate microbeads present improved survival during gastric transit and storage.

Ribeiro, F., et al. (2017). "Microplastics effects in Scrobicularia plana." Marine Pollution Bulletin **122**(1/2): 379-391.

One of the most common plastics in the marine environment is polystyrene (PS) that can be broken down to micro sized particles. Marine organisms are vulnerable to the exposure to microplastics. This study assesses the effects of PS microplastics in tissues of the clam Scrobicularia plana. Clams were exposed to 1 mg L⁻¹ (20 micro m) for 14 days, followed by 7 days of depuration. A qualitative analysis by infrared spectroscopy in diffuse reflectance mode period detected the presence of microplastics in clam tissues upon exposure, which were not eliminated after depuration. The effects of microplastics were assessed by a battery of biomarkers and results revealed that microplastics induce effects on antioxidant capacity, DNA damage, neurotoxicity and oxidative damage. S. plana is a significant target to

assess the environmental risk of PS microplastics.

Ribeiro, F., et al. (2019). "Accumulation and fate of nano- and micro-plastics and associated contaminants in organisms." TrAC - Trends in Analytical Chemistry **111**: 139-147.

Following a decade of research on the environmental impacts of microplastics, a knowledge gap remains on the processes by which micro and nanoplastics pass across biological barriers, enter cells and are subject to biological mechanisms. Here we summarize available literature on the accumulation of microplastics and their associated contaminants in a variety of organisms including humans. Most data on the accumulation of microplastics in both field and lab studies are for marine invertebrates. Microplastics accumulation data for insects, birds, marine mammals and sea turtles are scarce due to methodological issues. There is no conclusive evidence for the mode of accumulation of microplastics in either mammals or humans. The mechanism of chemical partitioning, role of contaminants associated with plastics, and mode of action of both nano- and micro-plastics and associated chemicals in a range of organisms and associated compartments/tissues also requires further research. © 2018 Elsevier B.V.

Richard, H., et al. (2019). "Biofilm facilitates metal accumulation onto microplastics in estuarine waters." Science of the Total Environment **683**: 600-608.

In aquatic environments, plastic debris accumulates chemical pollutants from the surrounding water, potentially altering the fate of xenobiotics in these ecosystems. The effects of biofouling on the potential for plastic to sorb environmental pollutants remain poorly understood. In this study, we test the hypothesis that concentrations of metals are directly related to biofilm accumulation on microplastics submerged in natural estuarine waters. Two types of pre-production plastic pellets (polylactic acid (PLA) and low-density polyethylene (LDPE)) and glass pellets, were suspended for up to 28 days in an urbanized estuary (San Francisco Bay, California) to investigate how biofilm affects the accumulation of metals on these materials. During the initial weeks of the experiment, biofilm growth differed between locations, but after 28 days, PLA and LDPE had similar amounts of biofilm at the two field sites. Biofilm was the only significant predictor variable for Ba, Cs, Fe, Ga, Ni and Rb, and simple regressions of these metals after one month of submersion predicted much of the variability in the data (respective adjusted R² values: 0.46, 0.90, 0.86, 0.81, 0.87, 0.90; p < 0.001). For other metals influenced by location or substrate material, multivariate analysis showed that increases in metal concentrations were predicted by increases in biofilm for Cu, Pb, Al, K, U, Co, Mg (p < 0.001) and Mn (p < 0.01). This work highlights the role of biofilm in facilitating metal accumulation on plastic debris and contributes to current understanding of the underlying processes that influence the behavior of microplastics as aquatic contaminants. Copyright © 2019 Elsevier B.V.

Richards, G. and I. E. Agranovski (2015). "Air emission from the co-combustion of alternative derived fuels within cement plants: Gaseous pollutants." Journal of the Air & Waste Management Association **65**(2): 186-196.

Cement manufacturing is a resource- and energy-intensive industry, utilizing 9% of global industrial energy use while releasing more than 5% of global carbon dioxide (CO2) emissions. With an increasing demand of production set to double by 2050, so too will be its carbon footprint. However, Australian cement plants have great potential for energy savings and emission reductions through the substitution of combustion fuels with a proportion of alternative derived fuels (ADFs), namely, fuels derived from wastes. This paper presents the environmental emissions monitoring of 10 cement batching plants while under baseline and

ADF operating conditions, and an assessment of parameters influencing combustion. The experiential runs included the varied substitution rates of seven waste streams and the monitoring of seven target pollutants. The co-combustion tests of waste oil, wood chips, wood chips and plastic, waste solvents, and shredded tires were shown to have the minimal influence when compared to baseline runs, or had significantly reduced the unit mass emission factor of pollutants. With an increasing ADF% substitution, monitoring identified there to be no subsequent emission effects and that key process parameters contributing to contaminant suppression include (1) precalciner and kiln fuel firing rate and residence time; (2) preheater and precalciner gas and material temperature; (3) rotary kiln flame temperature; (4) fuel-air ratio and percentage of excess oxygen; and (5) the rate of meal feed and rate of clinker produced.

Rickard, D. L., et al. (2010). "Hydration potential of lysozyme: protein dehydration using a single microparticle technique." Biophysical Journal **98**(6): 1075-1084.

For biological molecules in aqueous solution, the hydration pressure as a function of distance from the molecular surface represents a very short-range repulsive pressure that limits atom-atom contact, opposing the attractive van der Waals pressure. Whereas the separation distance for molecules that easily arrange into ordered arrays (e.g., lipids, DNA, collagen fibers) can be determined from x-ray diffraction, many globular proteins are not as easily structured. Using a new micropipette technique, spherical, glassified protein microbeads can be made that allow determination of protein hydration as a function of the water activity (a(w)) in a surrounding medium (decanol). By adjusting a(w) of the dehydration medium, the final protein concentration of the solid microbead is controlled, and ranges from 700 to 1150 mg/mL. By controlling a(w) (and thus the osmotic pressure) around lysozyme, the repulsive pressure was determined as a function of distance between each globular, ellipsoid protein. For separation distances, d, between 2.5 and 9 A, the repulsive decay length was 1.7 A and the pressure extrapolated to d = 0 was 2.2 x 10(8) N/m(2), indicating that the hydration pressure for lysozyme is similar to other biological interfaces such as phospholipid bilayers.

Rico, F., et al. "Nanomechanics of lung epithelial cells." International Journal of Nanotechnology **2**(1/2): 180-194.

Nanobiotechnology provides powerful tools for manipulating cells with nanometric resolution and with simultaneous measurement of force with pN resolution. We review the application of atomic force microscopy (AFM) and magnetic tweezers for probing cell nanomechanics. AFM measures the mechanical properties of the cell by indenting its surface by means of a flexible cantilever with a sharp tip at its end. Magnetic tweezers probe cell mechanics by twisting or pulling a magnetic microbead bound to the cell surface. The stress-strain relationship allows us to compute the complex shear modulus of the cell. Lung epithelial cells probed with AFM and magnetic tweezers exhibit a power-law dynamics with a weak exponent. This dynamics conforms to the rheology of soft glassy materials, suggesting that cytoskeleton internal disorder and matrix agitation could govern the mechanical behaviour of the cell.

Rider, A., et al. (2013). "Induction of T regulatory cells by streptococcus pneumonia." Immunology **1)**: 151.

Background: Streptococcus pneumonia (pneumococcus) is an important human pathogen that causes a number of serious diseases including pneumonia and septicaemia. According to the World Health Organisation, pneumococcal diseases cause around 1.6 million deaths every year worldwide. Th17 and Treg cells have been suggested to play an important role in modulating pneumococcal clearance and carriage in nasopharynx. Th17 cells may mediate the clearance of pneumococcus by the recruitment of phagocytes and Treg cells may act to inhibit the inflammatory response mediated by other effector cells including Th17 cell response. Studies have shown that Foxp3+ Treg cells present in the nasopharynx may have a potent inhibitory effect on effector CD4+ T cell proliferation and could contribute to the persistence of carriage seen in young children. It has been shown in a murine study that a polysaccharide with pneumolysin induces Treg. Aim(s): To study what pneumococcal component(s) induce Foxp3+ Treg cells in humans. Material(s) and Method(s): Mononuclear cells (MNC) from adenotonsillar tissues and peripheral blood mononuclear cells (PBMC) were isolated from children undergoing adenotonsilectomy. Depletion of memory and effector T cells from MNC was performed using CD45RO and CD25 microbeads and MACS cell sorting. Numbers of Treg and Th17 cells were analysed by intracellular staining of Foxp3 and IL-17 following stimulation by concentrated pneumococcal culture supernatant (CCS) derived from a wild type D39 strain, its isogenic mutant lacking pneumolysin (Ply ^{-/-}) or by type 3 pneumococcal polysaccharide plus a pneumolysin toxoid (W433F). Induction of Treg cells and cytokine responses were measured using flowcytometry analysis and immunoassay. Result(s): Stimulation of memory T cell-depleted adenotonsillar MNC or PBMC with pneumococcal CCS induced an increase in numbers of Foxp3+ Treg compared to unstimulated controls, and Ply ^{-/-} CCS appeared to induce less Treg compared to wild-type CCS. Stimulation with type 3 polysaccharide (T3P) and pneumolysin toxoid (W433F) induced a more marked increase in numbers of Foxp3+ Tregs than the control samples. Discussion(s): Stimulation of adeontonsillar MNC and PBMC by a combination of T3P + W433F induced a significant increase in Foxp3+ Treg cells. Further work is ongoing to study whether different types of polysaccharide in combination with pneumolysin or other proteins could also induce Treg cells.

Rieger, B., et al. (2004). "Diffusion of microspheres in sealed and open microarrays." Microscopy Research and Technique **65**(4-5): 218-225.

In several experiments, we study the diffusion of microspheres with different radii in microarrays filled with a variety of aqueous solutions of ethylene glycol. We study diffusion in open and closed (sealed) microarrays. In sealed nanoliter wells, the tracers show pure diffusion, whereas in open reactors, a radial outward-directed evaporation-induced liquid flow is superimposed onto the diffusion. In general, one of the following quantities can be calculated if the others are known: the temperature, the viscosity of the medium, the radius of the microbeads, or the diffusion constant. The estimated diffusion constants in closed microarrays are in good agreement with theoretical predictions based on the Brownian motion. We monitor the motion of the microbeads under a microscope and extract their paths in time from the digital recordings. Ambiguous paths due to the crossing of two trajectories can be detected. We show that low microsphere concentrations or high viscosities do not hamper a robust estimation of the diffusion parameters. Microsc. Res. Tech. 65:218-225, 2004.

Rigamonti, L., et al. (2014). "Environmental evaluation of plastic waste management scenarios." Resources, Conservation and Recycling **85**: 42-53.

The management of the plastic fraction is one of the most debated issues in the discussion on integrated municipal solid waste systems. Both material and energy recovery can be performed on such a waste stream, and different separate collection schemes can be implemented. The aim of the paper is to contribute to the debate, based on the analysis of different plastic waste recovery routes. Five scenarios were defined and modelled with a life cycle assessment approach using the EASEWASTE model. In the baseline scenario (P0) the plastic is treated as residual waste and routed partly to incineration with energy recovery and partly to mechanical

biological treatment. A range of potential improvements in plastic management is introduced in the other four scenarios (P1-P4). P1 includes a source separation of clean plastic fractions for material recycling, whereas P2 a source separation of mixed plastic fraction for mechanical upgrading and separation into specific polymer types, with the residual plastic fraction being down-cycled and used for "wood items". In P3 a mixed plastic fraction is source separated together with metals in a "dry bin". In P4 plastic is mechanically separated from residual waste prior to incineration. A sensitivity analysis on the marginal energy was carried out. Scenarios were modelled as a first step assuming that marginal electricity and heat were based on coal and on a mix of fuels and then, in the sensitivity analysis, the marginal energy was based on natural gas. The study confirmed the difficulty to clearly identify an optimal strategy for plastic waste management. In fact none of the examined scenarios emerged univocally as the best option for all impact categories. When moving from the P0 treatment strategy to the other scenarios, substantial improvements can be obtained for "Global Warming". For the other impact categories, results are affected by the assumption about the substituted marginal energy. Nevertheless, irrespective of the assumptions on marginal energy, scenario P4, which implies the highest quantities of specific polymer types sent to recycling, resulted the best option in most impact categories. © 2014 Elsevier B.V.

Rillig, M. C. (2012). "Microplastic in terrestrial ecosystems and the soil?" Environmental Science & Technology **46**(12): 6453-6454.

Rillig, M. C. (2018). "Microplastic Disguising As Soil Carbon Storage." Environmental Science & Technology **52**(11): 6079-6080.

Rillig, M. C. and M. Bonkowski (2018). "Microplastic and soil protists: A call for research." Environmental Pollution **241**: 1128-1131.

Microplastic is an emerging contaminant of concern in soils globally, probably gradually increasing in soil due to slow degradation. Few studies on microplastic effects on soil biota are available, and no study in a microplastic contamination context has specifically addressed soil protists. Soil protists, a phylogenetically and functionally diverse group of eukaryotic, unicellular soil organisms, are major consumers of bacteria in soils and are potentially important vehicles for the delivery of microplastics into the soil food chain. Here we build a case for focusing research on soil protists by drawing on data from previous, older studies of phagocytosis in protist taxa, which have long made use of polystyrene latex beads (microspheres). Various soil-borne taxa, including ciliates, flagellates and amoebae take up microplastic beads in the size range of a few micrometers. This included filter feeders as well as amoebae which engulf their prey. Discrimination in microplastic particle uptake depended on species, physiological state as well as particle size. Based on the results of the studies we review here, there is now a need to study microplastic effects in a pollution ecology context: this means considering a broad range of particle types under realistic conditions in the soil, and exploring longer-term effects on soil protist communities and functions.

Rillig, M. C., et al. (2019). "Evolutionary implications of microplastics for soil biota." Environmental Chemistry **16**(1): 3-7.

Microplastic pollution is increasingly considered to be a factor of global change: in addition to aquatic ecosystems, this persistent contaminant is also found in terrestrial systems and soils. Microplastics have been chiefly examined in soils in terms of the presence and potential effects on soil biota. Given the persistence and widespread distribution of microplastics, it is also important to consider potential evolutionary implications of the presence of microplastics in soil; we offer such a perspective for soil microbiota. We discuss the range of selection pressures likely to act upon soil microbes, highlight approaches for the study of evolutionary responses to microplastics, and present the obstacles to be overcome. Pondering the evolutionary consequences of microplastics in soils can yield new insights into the effects of this group of pollutants, including establishing 'true' baselines in soil ecology, and understanding future responses of soil microbial populations and communities.

Rillig, M. C., et al. (2017). "Microplastic Incorporation into Soil in Agroecosystems." Frontiers of Plant Science **8**: 1805.

Rillig, M. C., et al. (2019). "Microplastic effects on plants." New Phytologist **223**(3): 1066-1070.
Microplastic effects in terrestrial ecosystems have recently moved into focus, after about a decade of research being limited to aquatic systems. While effects on soil physical properties and soil biota are starting to become apparent, there is not much information on the consequences for plant performance. We here propose and discuss mechanistic pathways through which microplastics could impact plant growth, either positively or negatively. These effects will vary as a function of plant species, and plastic type, and thus are likely to translate to changes in plant community composition and perhaps primary production. Our mechanistic framework serves to guide ongoing and future research on this important topic.

Rioja, A., et al. (2014). "Directing vascularization using modular microtissues." Tissue Engineering - Part A **1)**: S69-S70.
Critical limb ischemia (CLI) is the reduction of blood flow to the extremities due to an arterial blockage, and can cause pain, disrupted wound healing, and tissue necrosis. Pre-vascularized tissues capable of inosculating with existing host vasculature upon implantation have shown promise in tissue engineering applications, but this approach requires open surgery and has not been tested in CLI models. We are developing pre-vascularized collagen-fibrin microtissues that can be delivered in a minimally invasive manner and are designed to inosculate with one another and with existing host vasculature upon implantation to quickly restore blood flow to ischemic tissue. Studies of these microtissues containing human umbilical vein endothelial cells and normal human lung fibroblasts suggest that a developmental program resembling vasculogenesis can be recapitulated, with evidence of vessel-like networks formed within the microtissues. An 11.5 fold increase in cell incorporation was achieved by augmenting the initial cell density by a factor of 5 without altering the average microbead size (approx. 200 mum in diameter) or aggregation. After the cell encapsulation process, cell viability was 76%. When microtissues were embedded within fibrin hydrogels (a simple model tissue), sprouts emerged and showed evidence of inosculation with those from adjacent microtissues. Current studies are focused on the identification of culture methods (static vs. dynamic) to augment cell proliferation, increase network formation within the microtissues, and enhance sprout inosculation within model tissue constructs. Overall, this strategy may yield new insights into vasculogenesis and lead to a new revascularization therapy to treat CLI.

Rioja, A. Y., et al. (2017). "Distributed vasculogenesis from modular agarose-hydroxyapatite-fibrinogen microbeads." Acta Biomaterialia **55**: 144-152.
Critical limb ischemia impairs circulation to the extremities, causing pain, disrupted wound healing, and potential tissue necrosis. Therapeutic angiogenesis seeks to repair the damaged microvasculature directly to restore blood flow. In this study, we developed modular,

micro-scale constructs designed to possess robust handling qualities, allow in vitro pre-culture, and promote microvasculature formation. The microbead matrix consisted of an agarose (AG) base to prevent aggregation, combined with cell-adhesive components of fibrinogen (FGN) and/or hydroxyapatite (HA). Microbeads encapsulating a co-culture of human umbilical vein endothelial cells (HUVEC) and fibroblasts were prepared and characterized. Microbeads were generally 80-100micro m in diameter, and the size increased with the addition of FGN and HA. Addition of HA increased the yield of microbeads, as well as the homogeneity of distribution of FGN within the matrix. Cell viability was high in all microbead types. When cell-seeded microbeads were embedded in fibrin hydrogels, HUVEC sprouting and inosculation between neighboring microbeads were observed over seven days. Pre-culture of microbeads for an additional seven days prior to embedding in fibrin resulted in significantly greater HUVEC network length in AG+HA+FGN microbeads, as compared to AG, AG+HA or AG+FGN microbeads. Importantly, composite microbeads resulted in more even and widespread endothelial network formation, relative to control microbeads consisting of pure fibrin. These results demonstrate that AG+HA+FGN microbeads support HUVEC sprouting both within and between adjacent microbeads, and can promote distributed vascularization of an external matrix. Such modular microtissues may have utility in treating ischemic tissue by rapidly re-establishing a microvascular network.

STATEMENT OF SIGNIFICANCE: Critical limb ischemia (CLI) is a chronic disease that can lead to tissue necrosis, amputation, and death. Cell-based therapies are being explored to restore blood flow and prevent the complications of CLI. In this study, we developed small, non-aggregating agarose-hydroxyapatite-fibrinogen microbeads that contained endothelial cells and fibroblasts. Microbeads were easy to handle and culture, and endothelial sprouts formed within and between microbeads. Our data demonstrates that the composition of the microbead matrix altered the degree of endothelial sprouting, and that the addition of hydroxyapatite and fibrinogen resulted in more distributed sprouting compared to pure fibrin microbeads. The microbead format and control of the matrix formulation may therefore be useful in developing revascularization strategies for the treatment of ischemic disease.

Rios, L. M., et al. (2010). "Quantitation of persistent organic pollutants adsorbed on plastic debris from the Northern Pacific Gyre's “eastern garbage patch”." Journal of Environmental Monitoring **12**(12): 2226-2236.

Floating marine plastic debris was found to function as solid-phase extraction media, adsorbing and concentrating pollutants out of the water column. Plastic debris was collected in the North Pacific Gyre, extracted, and analyzed for 36 individual PCB congeners, 17 organochlorine pesticides, and 16 EPA priority PAHs. Over 50% contained PCBs, 40% contained pesticides, and nearly 80% contained PAHs. The PAHs included 2, 3 and 4 ring congeners. The PCBs were primarily CB-11, 28, 44, 52, 66, and 101. The pesticides detected were primarily p,p-DDTs and its metabolite, o,p-DDD, as well as BHC (a,b,g and d). The concentrations of pollutants found ranged from a few ppb to thousands of ppb. The types of PCBs and PAHs found were similar to those found in marine sediments. However, these plastic particles were mostly polyethylene which is resistant to degradation and although functioning similarly to sediments in accumulating pollutants, these had remained on or near the ocean surface. Particles collected included intact plastic items as well as many pieces less than 5 mm in size. [ABSTRACT FROM AUTHOR]

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Rios Mendoza, L. M. and M. Balcer (2019). "Microplastics in freshwater environments: A review of quantification assessment." TrAC - Trends in Analytical Chemistry **113**: 402-408.

Microplastic (MP) studies in freshwater environments are gaining attention due to the huge quantities of plastic particles reported from lakes and rivers and the potential for negative impacts in these environments. Different units have been used to report MP densities, which makes it difficult to compare data and can result in reports of extremely high concentrations that do not reflect the original sample size. We recommended that the density of MPs from bulk samples be reported as number L⁻¹, while density from net samples should be reported as number m⁻³. If the density of MPs from net samples is expressed on an areal basis, values should be reported as number/1000 m², and not as number km⁻². Spectroscopy (ATR-muFT-IR and muRAMAN) and Pyrolysis-Gas Chromatography coupled to Mass Spectrometry are techniques that could be used for quantitative identification of the various types of polymers in MP particles. Copyright © 2018 Elsevier B.V.

Rios, P., et al. (2003). "Plastics disassembly versus bulk recycling: engineering design for end-of-life electronics resource recovery." Environmental Science & Technology **37**(23): 5463-5470.

Annual plastic flows through the business and consumer electronics manufacturing supply chain include nearly 3 billion lb of high-value engineering plastics derived from petroleum. The recovery of resource value from this stream presents critical challenges in areas of materials identification and recycling process design that demand new green engineering technologies applied together with life cycle assessment and ecological supply chain analysis to create viable plastics-to-plastics supply cycles. The sustainable recovery of potentially high-value engineering plastics streams requires that recyclers either avoid mixing plastic parts or purify later by separating smaller plastic pieces created in volume reduction (shredding) steps. Identification and separation constitute significant barriers in the plastics-to-plastics recycling value proposition. In the present work, we develop a model that accepts randomly arriving electronic products to study scenarios by which a recycler might identify and separate high-value engineering plastics as well as metals. Using discrete eventsimulation,we compare current mixed plastics recovery with spectrochemical plastic resin identification and subsequent sorting. Our results show that limited disassembly with whole-part identification can produce substantial yields in separated streams of recovered engineering thermoplastics. We find that disassembly with identification does not constitute a bottleneck, but rather, with relatively few workers, can be configured to pull the process and thus decrease maximum staging space requirements. [References: 61]

Ripley, K. (2018). "The OEWG Prepares the Table for COP-14." Environmental Policy and Law **48**(5): 289-295.

OEWG-11 had before it a draft update of the general technical guidelines, new technical guidelines regarding short-chain chlorinated paraffins (SCCP), plus updates of existing technical guidelines on wastes consisting of, containing or contaminated with hexachlorobutadiene (HCBD); hexabromodiphenyl ether and heptabromodiphenyl ether, and tetrabromodiphenyl ether and pentabromodiphenyl ether, to include decabromodiphenyl ether; unintentionally produced polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans, hexachlorobenzene, polychlorinated biphenyls, pentachlorobenzene or polychlorinated naphthalenes, to include HCBD.8 The draft update of the general technical guidelines included proposals for provisional definitions of "low POP content" for all POPs regulated by the Stockholm Convention that would provide guidance for situations in which, under that convention, disposal need not destroy or irreversibly transform the POP content of the waste.9 In general this guidance uses values based on European Union (EU) legislation, since most non-EU nations have not adopted the low-POP-content concept in their waste disposal legislation or regulations. The resulting OEWG recommendation adopted the text suggested by the contact group without amendment.23 It sets out draft elements for a COP-14 decision on marine plastic litter, including, * encouraging governments, industry and consumers to make efforts to prevent and minimise the generation of plastic waste and improve the ESM of plastic waste, in particular in order to prevent plastics from entering the marine environment from land-based sources; * considering whether any additional constituents or characteristics should be added to Annex I or Annex III respectively, through the on-going work by the expert working group on review of annexes; * deciding to update the 2002 technical guidelines; * requesting the Household Waste Partnership to coordinate closely with the new partnership on plastic waste to be established; * considering what data should be gathered, and by whom, related to the generation, disposal of, and transboundary movement of plastic wastes in different waste streams; the environmental, economic and social impact of plastic wastes; and national policies and progress towards the ESM of plastic wastes.24 Proposals to Amend Convention Annexes Regarding Plastic Waste Under a procedure adopted by COP-8, Parties can apply for review or adjustment of the lists contained in Convention Annexes VIII (hazardous waste) and IX (waste not normally considered hazardous) by submitting a special form to the Secretariat at least three months prior to an OEWG meeting, which must review the application before making a recommendation to the COP. [...]OEWG-11 accepted an amended version of this proposal as a guide for further work. [...]OEWG-11 adopted the decision drafted by the EU that requests the Secretariat to finish and circulate its report for comment by 15 November 2018, and to include recommendations on opportunities to further develop partnerships under the Basel Convention, taking into account the experience of relevant UN bodies, such as the Economic and Social Council, UN Environment Programme, and the Food and Agriculture Organization, as well as other MEAs such as the Stockholm and Rotterdam Conventions.

Risner, M. L., et al. (2020). "Elevated ocular pressure reduces voltage-gated sodium channel NaV1.2 protein expression in retinal ganglion cell axons." Experimental Eye Research **190**: 107873.

Glaucoma is an age-related neurodegenerative disease that is commonly associated with sensitivity to intraocular pressure. The disease selectively targets retinal ganglion cells (RGCs) and constituent axons. RGC axons are rich in voltage-gated sodium channels, which are essential for action potential initiation and regeneration. Here, we identified voltage-dependent sodium channel, NaV1.2, in the retina, examined how this channel contributes to RGC light responses, and monitored NaV1.2 mRNA and protein expression in the retina during progression of modeled glaucoma. We found NaV1.2 is predominately localized in ganglion cell intraretinal axons with dispersed expression in the outer and inner plexiform layers. We showed Phrixotoxin-3, a potent NaV1.2 channel blocker, significantly decreased RGC electrical activity in a dose-dependent manner with an I_C50 of 40 nM. Finally, we found four weeks of raised intraocular pressure (30% above baseline) significantly increased NaV1.2 mRNA expression but reduced NaV1.2 protein level in the retina up to 57% ($p < 0.001$). Following prolonged intraocular pressure elevation, NaV1.2 protein expression particularly diminished at distal sections of ganglion cell intraretinal axons ($p <= 0.01$). Our results suggest NaV1.2 might

be a therapeutic target during disease progression to maintain RGC excitability, preserving presynaptic connections through action potential backpropagation.

Rist, S., et al. (2019). "Ingestion and effects of micro- and nanoplastics in blue mussel (Mytilus edulis) larvae." Marine Pollution Bulletin **140**: 423-430.

It is well known that mussels are exposed to microplastics but ingestion and potential effects on mussel larvae are not well understood. We quantified ingestion and egestion of 100 nm and 2 micro m polystyrene beads in blue mussel larvae after 4 h exposure and 16 h depuration using different plastic-to-microalgae ratios. Effects on growth and development of mussel larvae were investigated at 0.42, 28.2 and 282 micro gL⁻¹ within 15 days of exposure. We found that, on a mass basis, larvae ingested a higher amount of 2 micro m than 100 nm beads, while egestion was independent of particle size and the plastics-to-algae ratio. Although particle egestion occurred readily, microplastics remained inside the larvae. Larval growth was not affected but abnormally developed larvae increased after exposure to polystyrene beads. Malformations were more pronounced for 100 nm beads, at higher concentration and after longer exposure time.

Rist, S., et al. (2017). "Ingestion of micro- and nanoplastics in Daphnia magna - quantification of body burdens and assessment of feeding rates and reproduction." Environmental Pollution **228**: 398-407.

Evidence is increasing that micro- and nanoplastic particles can have adverse effects on aquatic organisms. Exposure studies have so far mainly been qualitative since quantitative measurements of particle ingestion are analytically challenging. The aim of this study was therefore to use a quantitative approach for determining ingestion and egestion of micro- and nanoplastics in Daphnia magna and to analyze the influence of particle size, exposure duration and the presence of food. One week old animals were exposed to 2 micro m and 100 nm fluorescent polystyrene beads (1 mg/l) for 24 h, followed by a 24 h egestion period in clean medium. During both phases body burdens of particles were determined by measuring the fluorescence intensity in dissolved tissues. Ingestion and egestion were investigated in the absence and presence of food (6.7.10⁵ cells of Raphidocelis subcapitata per ml). Furthermore, feeding rates of daphnids in response to particle exposure were measured as well as effects on reproduction during a 21 days exposure (at 1 mg/l, 0.5 mg/l and 0.1 mg/l) to investigate potential impairments of physiology. Both particle sizes were readily ingested, but the ingested mass of particles was five times higher for the 2 micro m particles than for the 100 nm particles. Complete egestion did not occur within 24 h but generally higher amounts of the 2 micro m particles were egested. Animal body burdens of particles were strongly reduced in the presence of food. Daphnid feeding rates decreased by 21% in the presence of 100 nm particles, but no effect on reproduction was found despite high body burdens of particles at the end of 21 days exposure. The lower egestion and decreased feeding rates, caused by the 100 nm particles, could indicate that particles in the nanometer size range are potentially more hazardous to D. magna compared to larger particle sizes.

Rist, S., et al. (2018). "A critical perspective on early communications concerning human health aspects of microplastics." Science of the Total Environment **626**: 720-726.

Microplastic research in recent years has shown that small plastic particles are found almost everywhere we look. Besides aquatic and terrestrial environments, this also includes aquatic species intended for human consumption and several studies have reported their prevalence in other food products and beverages. The scientific as well as public debate has therefore increasingly focused on human health implications of microplastic exposure. However, there is a big discrepancy between the magnitude of this debate and actual scientific findings, which have merely shown the presence of microplastics in certain products. While plastics can undoubtedly be hazardous to human health due to toxicity of associated chemicals or as a consequence of particle toxicity, the extent to which microplastics in individual food products and beverages contribute to this is debatable. Considering the enormous use of plastic materials in our everyday lives, microplastics from food products and beverages likely only constitute a minor exposure pathway for plastic particles and associated chemicals to humans. But as this is rarely put into perspective, the recent debate has created a skewed picture of human plastic exposure. We risk pulling the focus away from the root of the problem: the way in which we consume, use and dispose of plastics leading to their widespread presence in our everyday life and in the environment. Therefore we urge for a more careful and balanced discussion which includes these aspects.

Rist, S., et al. (2019). "The fate of microplastics during uptake and depuration phases in a blue mussel exposure system." Environmental Toxicology & Chemistry **38**(1): 99-105.

We present a blue mussel exposure system where the fate of microplastics (polystyrene beads) is tracked during exposure and depuration phases. This enabled the establishment of a complete mass balance. Quantification of beads in mussels was done with a novel enzymatic digestion protocol. We found a similar relative distribution of beads for 2 environmentally realistic concentrations (5 and 100 beads L^{-1}) and no substantial egestion of particles within 2 h of depuration. Environ Toxicol Chem 2019;38:99–105. © 2018 SETAC A complete mass balance of microplastic beads in a blue mussel exposure system was established by quantifying beads in 4 compartments: the exposure water, the mussel after exposure, the depuration water, and the mussel after depuration. MP = microplastic. [ABSTRACT FROM AUTHOR]

Rist, S. E., et al. (2016). "Suspended micro-sized PVC particles impair the performance and decrease survival in the Asian green mussel Perna viridis." Marine Pollution Bulletin **111**(1/2): 213-220.

Marine bivalves are known to ingest microplastics, but information on the consequences for their physiological performance is limited. To investigate a potential exposure pathway that has not yet been addressed, we mimicked the resuspension of microplastics from the sediment in a laboratory exposure experiment. For this, we exposed the Asian green mussel Perna viridis to 4 concentrations (0 mg/l, 21.6 mg/l, 216 mg/l, 2160 mg/l) of suspended polyvinylchloride (PVC) particles (1-50 micro m) for two 2-hour-time-periods per day. After 44 days, mussel filtration and respiration rates as well as byssus production were found to be a negative function of particle concentration. Furthermore, within 91 days of exposure, mussel survival declined with increasing PVC abundance. These negative effects presumably go back to prolonged periods of valve closure as a reaction to particle presence. We suggest that microplastics constitute a new seston component that exerts a stress comparable to natural suspended solids.

Rivera-Hernandez, J. R., et al. (2019). "Biodynamics of mercury in mussel tissues as a function of exposure pathway: natural vs microplastic routes." Science of the Total Environment **674**: 412-423.

In the marine environment, metals can be present dissolved or adsorbed to suspended particles.

In the last decades a new type of particle has been introduced, microplastics (MPs). The exposure route of pollutants influences their accumulation and distribution into tissues. A pulse-chase experiment was conducted in which mussels were exposed to Hg: adsorbed onto MPs and microalgae (MA) and dissolved (WB). Mussels accumulated the same amount of Hg independently of particle, due to the Hg loading in both particles and their acceptability were similar. The highest Hg accumulation occurred in gill when the Hg exposure was through water and in digestive gland when Hg was adsorbed to particles. More than 70% of the Hg uptake through MPs was quickly eliminated due to: (i) part of the cleared MPs might not really be ingested but adhered to body surfaces of mussels, (ii) MPs ingested were eliminated through faeces as they are non-nutritive particles which may be rejected in stomach preventing their entry into digestive gland and (iii) high affinity of Hg on surface of MPs which meant that Hg was mainly eliminated jointly to MPs. The organic nature of MA facilitates the entry of Hg into digestive gland where MA are intracellularly digested releasing the Hg adsorbed onto their surfaces. In this case, Hg may reach deeper levels by translocation of the Hg incorporated into gland towards foot and remaining tissues, a process that might occur through haemolymph. All of the Hg accumulated in WB during the exposure was internally absorbed into tissues, and later translocated from gill to gland. Although Hg elimination rate in MPs mussels was greater than in the other exposure pathways, an important amount of Hg was maintained through the depuration period, thus we cannot and should not neglect the risk of MPs as vectors for mercury.

Rivera-Utrilla, J., et al. (2013). "Pharmaceuticals as emerging contaminants and their removal from water. A review." Chemosphere **93**(7): 1268-1287.

The main objective of this study was to conduct an exhaustive review of the literature on the presence of pharmaceutical-derived compounds in water and on their removal. The most representative pharmaceutical families found in water were described and related water pollution issues were analyzed. The performances of different water treatment systems in the removal of pharmaceuticals were also summarized. The water treatment technologies were those based on conventional systems (chlorine, chlorine dioxide, wastewater treatment plants), adsorption/bioadsorption on activated carbon (from lotus stalks, olive-waste cake, coal, wood, plastic waste, cork powder waste, peach stones, coconut shell, rice husk), and advanced oxidation processes by means of ozonation (O<inf>3</inf>, O<inf>3</inf>/H<inf>2</inf>O<inf>2</inf>, O<inf>3</inf>/activated carbon, O<inf>3</inf>/biological treatment), photooxidation (UV, UV/H<inf>2</inf>O<inf>2</inf>, UV/K<inf>2</inf>S<inf>2</inf>O<inf>8</inf>, UV/TiO<inf>2</inf>, UV/H<inf>2</inf>O<inf>2</inf>/TiO<inf>2</inf>, UV/TiO<inf>2</inf>/activated carbon, photo-Fenton), radiolysis (e-Beam, ⁶⁰Co, ¹³⁷Cs. Additives used: H<inf>2</inf>O<inf>2</inf>, SO32-, HCO3-, CH<inf>3</inf>OH, CO32-, or NO3-), and electrochemical processes (Electrooxidation without and with active chlorine generation). The effect of these treatments on pharmaceutical compounds and the advantages and disadvantages of different methodologies used were described. The most important parameters of the above water treatment systems (experimental conditions, removal yield, pharmaceutical compound mineralization, TOC removal, toxicity evolution) were indicated. The key publications on pharmaceutical removal from water were summarized. © 2013 Elsevier Ltd.

Rivers, M. L., et al. (2019). "Quantification is more than counting: Actions required to accurately quantify and report isolated marine microplastics." Marine Pollution Bulletin **139**: 100-104.

Research on marine microplastics continues to increase in popularity, with a large number of studies being published every year. However, with this plethora of research comes the need for a standardised approach to quantification and analysis procedures in order to produce comparative assessments. Using data collected from neuston nets in 2016, parameters for quantifying microplastics were compared. Surface area was the most accurate parameter to describe plastic size and should be used to describe plastic quantity (per km² or m³), alongside abundance. Of the two most commonly used methods for calculating plastic concentration (flowmeter and ship's log), ship's log provided consistently smaller abundances, with the exception of one sample, calling for a standardisation in the techniques and measurements used to quantify floating microplastics.

Ro, K. S., et al. (2014). "Co-pyrolysis of swine manure with agricultural plastic waste: Laboratory-scale study." Waste Management **34**(8): 1520-1528.

Manure-derived biochar is the solid product resulting from pyrolysis of animal manures. It has considerable potential both to improve soil quality with high levels of nutrients and to reduce contaminants in water and soil. However, the combustible gas produced from manure pyrolysis generally does not provide enough energy to sustain the pyrolysis process. Supplementing this process may be achieved with spent agricultural plastic films; these feedstocks have large amounts of available energy. Plastic films are often used in soil fumigation. They are usually disposed in landfills, which is wasteful, expensive, and environmentally unsustainable. The objective of this work was to investigate both the energetics of co-pyrolyzing swine solids with spent plastic mulch films (SPM) and the characteristics of its gas, liquid, and solid byproducts. The heating value of the product gas from co-pyrolysis was found to be much higher than that of natural gas; furthermore, the gas had no detectable toxic fumigants. Energetically, sustaining pyrolysis of the swine solids through the energy of the product gas could be achieved by co-pyrolyzing dewatered swine solids (25%m/m) with just 10% SPM. If more than 10% SPM is used, the co-pyrolysis would generate surplus energy which could be used for power generation. Biochars produced from co-pyrolyzing SPM and swine solid were similar to swine solid alone based on the surface area and the ¹H NMR spectra. The results of this study demonstrated the potential of using pyrolysis technology to manage two prominent agricultural waste streams (SPM and swine solids) while producing value-added biochar and a power source that could be used for local farm operations. © 2014.

Robards, M. D., et al. (1995). "Increasing Frequency of Plastic Particles Ingested by Seabirds in the Subarctic North Pacific." Marine Pollution Bulletin **30**(2): 151.

Stomach samples of 1799 seabirds comprising 24 species were collected over the period 198890 at seven sites in Alaska ranging from Agattu to Prince William Sound. The plastic particles were counted, weighed, and classified according to color, size, shape, and type. Of the 24 species, 15 were found to contain plastic particles. Compared to similar data compiled in 196977, there was an increase in the number of species from 12 to 15, respectively. The number of plastic particles ingested by seabirds in 198890 varied widely among species and areas. However, the number of particles per bird increased significantly between studies. Of the particles examined in the 198890 study, the majority were of two types- pellets and user plastics-and ranged in size from 0.5 to 28 mm.

Roberto, M., et al. (2013). "Can we predict time to tumor progression in early colorectal cancer patients using ctcs count?" Annals of Oncology **4)**: iv25.

Background: Colorectal cancer is the second most common cause of cancer-related death in Europe. Although significant improvements in the primary surgical and chemotherapeutic treatment, it has been estimated that approximately 30% of colorectal cancer patients develop metastases and die. Haematogenous spreading of tumor cells is a pivotal step in the metastatic process. Circulating tumor cells (CTCs) have potential ability to enter the circulation, invade the target organs and subsequently form metastases. Data suggest that the CTCs count before treatment is an independent predictor of progression free survival (PFS) and overall survival (OS) in patients with metastatic colorectal cancer, meanwhile their prognostic role in patients with early disease is uncertain. Method(s): 76 patients with histological diagnosis of colorectal cancer were included in this study. Disease stage was classified according to modified Astler and Coller as follows: 24/76 (31.6%) stages A + B, 30/76 (39.5%) stage C and 22/76 (28.9%) stage D. 7.5 ml of peripheral blood was collected for CTCs evaluation before the start of treatment or follow up. Mononuclear cells were isolated using Ficoll-Paque density centrifugation. CTCs were isolated from mononuclear cells by immunomagnetic enrichment using anti- CD326/EpCAM microbeads (Miltenyi Biotec) according to the manufacturer's instructions. After, they were labeled for an epithelial marker such as CD326, for a nucleic acid dye such as DAPI, and for the leukocyte cell surface marker CD45 and then identified by immunofluorescence method as CD326 + DAPI + CD45- cells. A cut-off of >= 2 CTCs/7.5ml of blood was chosen for the definition of a positive test. Fisher exact test was used to compare frequency distribution of clinicopathologic findings according to CTCs count. A Kaplan-Meier method was applied for time to progression (TTP) curve. Result(s): Twenty-one out of 76 (38%) patients were CTCs + : 4/24 (16.7%), 6/30 (20%), 11/22 (50%) stage A + B, C and stage D respectively. 16/57 (28%) colon and 5/19 (26.3%) rectal cancers were CTCs+. The CTCs positivity showed a correlation with the disease stage (p = 0.01; Table1). At a median follow up of 46.5 months 31 (41%) patients experienced a tumor progression. 62% of the patients with CTCs+ showed tumor progression compared to 33% of those CTCs - (p = 0.03). Tumor progression was significantly correlated with several clinicopathologic features including CTCs (Table2). Time to progression got worse in CTCs positive patients (Figure1) Conclusion(s): This study confirms previous reports on negative prognostic role of the detection of CTCs in colorectal cancer. This was demonstrated in cases including both early and advanced stages of disease. The analysis of predictive role of CTCs treated patients is underway. (Figure Presented).

Roberts, P. A., et al. (2019). "Mathematical model predicts anti-adhesion-antibiotic-debridement combination therapies can clear an antibiotic resistant infection." PLoS Computational Biology **15 (7) (no pagination)**(e1007211).

As antimicrobial resistance increases, it is crucial to develop new treatment strategies to counter the emerging threat. In this paper, we consider combination therapies involving conventional antibiotics and debridement, coupled with a novel anti-adhesion therapy, and their use in the treatment of antimicrobial resistant burn wound infections. Our models predict that anti-adhesion-antibiotic-debridement combination therapies can eliminate a bacterial infection in cases where each treatment in isolation would fail. Antibiotics are assumed to have a bactericidal mode of action, killing bacteria, while debridement involves physically cleaning a wound (e.g. with a cloth); removing free bacteria. Anti-adhesion therapy can take a number of forms. Here we consider adhesion inhibitors consisting of polystyrene microbeads chemically coupled to a protein known as multivalent adhesion molecule 7, an adhesin which mediates the initial stages of attachment of many bacterial species to host cells. Adhesion inhibitors competitively inhibit bacteria from binding to host cells, thus rendering them susceptible to removal through debridement. An ordinary differential equation model is developed and the antibiotic-related parameters are fitted against new in vitro data gathered for the present study. The model is used to predict treatment outcomes and to suggest optimal treatment strategies.

Our model predicts that anti-adhesion and antibiotic therapies will combine synergistically, producing a combined effect which is often greater than the sum of their individual effects, and that anti-adhesion-antibiotic-debridement combination therapy will be more effective than any of the treatment strategies used in isolation. Further, the use of inhibitors significantly reduces the minimum dose of antibiotics required to eliminate an infection, reducing the chances that bacteria will develop increased resistance. Lastly, we use our model to suggest treatment regimens capable of eliminating bacterial infections within clinically relevant timescales. Copyright © 2019 Roberts et al.

Robertson, C. and M. J. Bissell (2017). "Cell motility in a basement membrane gel concentrates ECM around breast epithelial cells, a feature lost in malignant cells." Cancer Research. Conference: AACR Special Conference: Engineering and Physical Sciences in Oncology. United States **77**(Supplement 2).

Introduction: The basement membrane (BM) underlying epithelial cells plays a key role in regulating cell function and suppressing malignancy; loss of this layer of ECM proteins is a hallmark of invasive cancer. Using 3D extracellular matrix (ECM) gels, we sought to understand how this structure develops by comparing nonmalignant breast epithelial cells (BEC), which develop into polarized, growth arrested structures to malignant breast cancer cells (BCC), which form disorganized masses under the same conditions. These two cell types show different movement patterns in the ECM gels: BEC rotate around their center of mass in a process termed coherent angular motion, whereas BCC migrate randomly, with unknown consequences for assembly of ECM into a basement membrane-like layer. We investigated whether coherent angular motion could concentrate exogenous ECM into a BM like structure, and whether these changes were due to the physical forces applied by the cells on their microenvironment. Method(s): To determine if cells undergoing coherent angular motion were better able to concentrate exogenous ECM at their surface compared to malignant cells, single human BEC and BCC from the HMT3522 breast cancer progression series were cultured in fluorescent laminin rich ECM gels (LrECM; using BD Matrigel), and ECM density at the cell surface was measured during growth with confocal microscopy. To determine how motility translated into forces on the microenvironment, cells were embedded in lrECM labeled with a dilute suspension of fluorescent microbeads. Confocal microscopy was performed over the first several days of culture, and traction force microscopy was used to determine the magnitude and spatial pattern of forces applied by the cells. After 5-6 days of culture, cells stained to determine whether cells had developed into polarized structures. Result(s): Over the first several days of culture, non-malignant BEC rotated as a coherent mass. At 24 hours, labeled ECM proteins were observed to concentrate in a spherical shell on surface of rotating clusters of BEC, whereas malignant, non-rotating cell masses had lower levels of ECM at the surface of the mass and higher levels of ECM proteins between the cells. Traction patterns between rotating and non-rotating cell masses were observed to differ-cells undergoing random motility applied strains to the ECM along the line of invasion, whereas cells undergoing coherent angular motion showed shear strains at the cell surface and even inward tractions. Conclusion(s): Coherent angular motion appears to affect concentration of exogenous ECM by physically pulling ECM proteins into an organized shell at the cell surface as an early aspect of formation of a basement membrane-like ECM structure in mammary epithelial cells in culture whereas this process is defective in malignant cells undergoing random motility. Further investigation will determine whether this process of motility, physically altering ECM density, is seen during normal development.

Robertson, I. (2019). "Detecting microplastics in foods and beverages." Food Technology **73**(3): 44-48.

Robidoux, J., et al. (2018). "Measuring red blood cell deformability using a microfluidic device: Development of an external standard based approach to reduce chip-to-chip variations." Transfusion **58 (Supplement 2)**: 205A.

Background/Case Studies: An impaired deformability of red blood cells (RBC) can be related to diseases or consequent to red cell concentrate (RCC) storage. A polydimethylsiloxane (PDMS) microfluidic device especially designed to reproduce RBC circulation in blood vessels was recently developed to assess RBC deformability. This single-use device is made of two inlets, two arrays of channels and a unique outlet. Flow rate measurements near the channel outlets correlates with RBC rheological properties. The analytical approach uses an external standard to account for chip-to-chip variations. This study aims at validating microbeads as an external standard to monitor RBC deformability during storage. Study Design/Method: A dye-doped carboxyl polystyrene microsphere (d = 1 +/- 0.05) solution was used as external standard in this study. The stock solution (DCCR004, BangLabs) was dispersed 1:20 in filtered phosphate buffered saline (PBS). Glycerol was added at 16% to match the average RBC flow rate previously recorded with the same microfluidic device on fresh RBC. Multiple hardware and software parameters were tested for their respective impacts on the performances of the analytical method (i.e. precision, accuracy), measured as the rate of occurrence of plugging events. To validate the external standard approach, three different external standard solutions were prepared (A, B and C) and tested using nine different chips in an experiment designed to evaluate the reproducibility of output results. The chip's left-hand side inlets were filled with standard A, while right-hand side inlets were filled with either standard A, B or C. The right/left flow rate ratios were used as the analytical output signal. RCC samples of different storage ages were analyzed using the external standard approach and compared with respect to their deformability. Results/Finding: Flow rates recorded for the left and right inlets were compared for each chip. The between-channels coefficient of variation (% C.V.) within the same chip was lower than 2 %, which demonstrates a high homogeneity in the channel mask used to fabricate PDMS chips. To evaluate the chip-to-chip manufacturing reproducibility, left inlets on each chip were filled standard A, and flow rates were compared. The % C.V. was <5 %, and was deemed within the acceptable range. Finally, there were no significant differences in recorded flow rates for standards A, B or C, and the overall flow rate for the external standard solution was determined at 0.270 +/- 0.011 nL/s (% C.V. = 4%), which was similar to flow rates observed for RCC samples in a previous study. Conclusion(s): Microfluidic methods are believed to be suitable for precise and sensitive RBC deformability analysis. The development of an appropriate external standard approach can be used to address chip-to-chip vari-ability, and the use of dye-doped carboxyl polystyrene microspheres has been found to be a reproducible method.

Robin, M., et al. (2019). "MEFV/miR-326 axis involvement in human macrophage polarization." Annals of the Rheumatic Diseases **78 (Supplement 1)**: A30-A31.

Introduction Familial Mediterranean fever (FMF) is an inherited autoinflammatory disease, characterized by acute selfresolving attacks of fever and serositis, which mainly prevails in populations around the Mediterranean sea. It is caused by mutations in the MEFV gene, which encodes the pyrin protein. The alteration of MEFV mRNA expression in monocytes is related to both genotype and phenotype of the disease, suggesting that the pathophysiology of FMF can be regulated on a quantitative defect of MEFV mRNA. Objectives Since microRNAs (miRNAs) are implicated in a number of diseases including FMF, the present study aimed at identifying miRNA regulators of MEFV expression involved in monocyte inflammatory response. Methods MiRWalk2.0 database was used to identify putative miRNA target sequences within the 3'-UTR mRNA of MEFV. Human primary CD14+ monocytes were sorted from peripheral blood of healthy donors using magnetic microbeads and differentiated into M1 or M2 macrophages following IFNgamma/ LPS or IL4/IL13 stimulation, respectively. Using RT-qPCR, M1/M2 polarization was validated by measuring the expression of prototypic M1 and M2 markers: the chemokine CXCL10 and the macrophage mannose receptor 1 (MRC1 also known as CD206), respectively, as well as the MEFV mRNA. We used loss-of-function method to evaluate the effect of candidate miRNA on CD14+ monocytes, i.e. its role on macrophages classical versus alternative polarization. IL-10 expression was quantified using ELISA. Results In silico analyses revealed that miR-326 targets putatively the 3'UTR mRNA of MEFV. miRNAs and mRNAs quantification in polarized macrophages showed that miR-326 is mainly expressed by the M2-type macrophages, and MEFV by the M1-type macrophages. Loss-of-function studies showed that neutralization of miR-326 in M2 macrophages induced the expression of MEFV and CXCL10 while reducing MRC1 expression level. Furthermore, enforced expression of miR-326 in M1 macrophages significantly repressed MEFV expression and induced the production of IL-10. Conclusions A miR-326/MEFV axis seems to be implicated in macrophage polarization and might explain the observed monocyte versatility in FMF.

Robin, R. S., et al. (2020). "Holistic assessment of microplastics in various coastal environmental matrices, southwest coast of India." Science of the Total Environment **703**: 134947.

Plastics in the marine environment are introduced through multiple pathways, and pose serious threats to aquatic biota. Recently microplastic pollution and its possible consequences in India have been recognized by the scientific community, however the extent of the crisis has not yet been quantified. The present study attempted to ascertain the abundance, distribution and characteristics of microplastics in coastal waters (14 locations), beach sediments (22 locations) and marine fishes (11 locations) from the state of Kerala, southwest coast of India. The results showed that the mean microplastic abundance was 1.25+/-0.88 particles/m³ in coastal waters and 40.7+/-33.2 particles/m² in beach sediments with higher concentrations in the southern coast of the state. The abundance of microplastics, mostly contributed by fragments, fibre/line and foam, in both coastal waters and beach sediments, were highly influenced by river runoff and proximity to urban agglomeration. Fourier Transform Infrared Spectroscopy-Attenuated Total Reflection (FTIR-ATR) revealed that polyethylene (PE) and polypropylene (PP) were the dominant polymers in the marine environment. The digestive tracts of 15 out of 70 commercially important fishes studied, contained 22 microplastic particles. Polyethylene (PE; 38.46%) followed by cellulose (CE; 23.08%), rayon (RY; 15.38%), polyester (PL; 15.38%) and polypropylene (PP; 7.69%) were the major contributors in the fish ingested microplastic composition. A broad range of heavy metals, metalloids and other elements that are potentially indicative of hazardous chemicals were present in microplastics collected from the beaches of Kerala. These results enhance our understanding on the sources, transport pathways and the associated environmental risks of microplastics to marine ecosystems.

Roccaro, R. M., et al. (2009). "MicroRNA changes occur in multiple myeloma cells in the context of bone marrow milieu." Blood. Conference: 51st Annual Meeting of the American Society of Hematology, ASH. New Orleans, LA United States. Conference Publication: **114**(22).

Background: We and Others have previously demonstrated that primary multiple myeloma (MM) cells are characterized by a specific microRNA (miRNA) signature compared to the related normal plasmacell counterpart; and that miRNAs play a crucial role in regulating MM pathogenesis. Nevertheless, miRNA changes that occur in MM cells in the context of the bone marrow microenvironment have not been previously examined. Therefore, characterization of miRNA profiling of MM cells in conjunction with bone marrow stromal cells (BMSCs) is important to better understand the underlying molecular changes that lead to initiation and progression of this disease. Method(s): We performed miRNA-expression-profiling of MM cell lines (MM.1S; RPMI8226) that were co-cultured with primary BMSCs obtained from 5 MM patients, using liquid phase Luminex microbead miRNA profiling (Luminex, Austin, TX). The expression patterns of unfiltered data were performed using unsupervised hierarchical clustering of samples, based on centroid linkage and 1-correlation distance metric, using dChip (www.dchip.org). To further define those miRNAs differentially expressed between groups (patients vs normal), the data were filtered on significance of differences using ANOVA test, ($P < 0.05$). Microbead-miRNA profiling data were validated data by stem-loop qRT-PCR. To identify specific predicted miRNA-targeted mRNAs, TargetScan, PicTar, and miRanda algorithms were used. Result(s): miRNA profiling of MM cells cultured with primary BMSCs (MM+BMSC system) differs from MM cells which were not grown in contact with primary BMSCs (MM cells alone). Specifically, we observed increased expression of miRNA-450, -432 -299-5p, -409-3p, -29b, -542-5p, -184, -517 -218, 128b, -142-5p and -211 ($P<0.05$) in MM cells obtained from the MM+BMSC system, compared to MM cells alone. Stem-loop qRT-PCR was performed on matched samples and showed expression patterns similar to those observed in miRNA analysis. Using algorithms commonly used to predict human miRNA gene targets (miRanda; TargetScan; PicTar), predicted targets of the increased miRNAs included negative regulators of NFkB, PI3K/Akt/mTOR, and MAPK/ERK signaling pathways, such as PTEN, KSR2, TWEAK, and DUSP; as well as tumor suppressors (MCC, TSSC1, TUSC1, FBW7, RHOBTB), pro-apoptotic factors and cyclin-dependent kinases inhibitors. These data demonstrate that bone marrow stromal cells exert a modulatory effect on miRNA profiling in MM cells, which results in promoting MM cell growth and reducing MM cell survival.

Roch, A., et al. (2019). "The paramagnetic properties of malaria pigment, hemozoin, yield clues to a low-cost system for its trapping and determination." Talanta **197**: 553-557.

The binding of malaria pigment, hemozoin, by a gradient magnetic field has been investigated in a manual trapping column system. Two types of magnetic filling have been tested to produce field gradients: nickel-plated steel wires, wrapped around a steel core, and superparamagnetic microbeads. The latter system allows an efficient trapping (>80%) of beta -hematin (a synthetic pigment with physical and paramagnetic properties analogous to those of hemozoin). Tests with a Plasmodium falciparum 3D7 culture indicate that hemozoin is similarly trapped. Off-line optical spectroscopy measurements present limited sensitivity as the hemozoin we detected from in vitro cultured parasites would correspond to only a theoretical 0.02% parasitemia (1000 parasites/ micro L). Further work needs to be undertaken to reduce this threshold to a practical detectability level. Based on these data, a magneto-chromatographic on-line system with reduced dead volumes is proposed as a possible low-cost instrument to be tested as a malaria diagnosis system.

Roch, S. and A. Brinker (2017). "Rapid and efficient method for the detection of microplastic in the gastrointestinal tract of fishes." Environmental Science & Technology **51**(8): 4522-4530.

The rising evidence of microplastic pollution impacts on aquatic organisms in both marine and freshwater ecosystems highlights a pressing need for adequate and comparable detection methods. Available tissue digestion protocols are time-consuming (>10 h) and/or require several procedural steps, during which materials can be lost and contaminants introduced. This novel approach comprises an accelerated digestion step using sodium hydroxide and nitric acid in combination to digest all organic material within 1 h plus an additional separation step using sodium iodide which can be used to reduce mineral residues in samples where necessary. This method yielded a microplastic recovery rate of >=95%, and all tested polymer types were recovered with only minor changes in weight, size, and color with the exception of polyamide. The method was also shown to be effective on field samples from two benthic freshwater fish species, revealing a microplastic burden comparable to that indicated in the literature. As a consequence, the present method saves time, minimizes the loss of material and the risk of contamination, and facilitates the identification of plastic particles and fibers, thus providing an efficient method to detect and quantify microplastics in the gastrointestinal tract of fishes.

Roch, S., et al. (2019). "A systematic study of the microplastic burden in freshwater fishes of south-western Germany - Are we searching at the right scale?" Science of the Total Environment **689**: 1001-1011.

In a comprehensive study of microplastic contamination in southern Germany, 1167 individual fish of 22 different species were sampled from 11 rivers and 6 lakes across the state. The microplastic burden of investigated fish was analyzed on the basis of habitat type, location, and a number of abiotic and biotic factors. A particle size distribution analysis of the detected microplastics was carried out. The results showed a relatively low plastic prevalence of 18.8%, with significant differences between rivers (20.6%) and lakes (16.5%). The number of ingested plastic particles ranged between 1 and 4 particles per fish. The majority of abiotic and biotic factors seem to play little or no role in the ingestion of microplastics, suggesting that in most cases uptake is passive or accidental. It is notable that piscivorous fish appeared significantly less burdened, suggesting a low transfer rate and no accumulation in the food web. However, size distribution analysis identified a power law growth fit in particle numbers at the smallest end of the distribution. This carries a worrying implication, that >95% of particles are likely to be smaller than 40 mum and thereby beyond the detection range of this and most other microplastic surveys conducted so far. When the frequency development of small particles is taken into account, the likely microplastic prevalence in the present study increases to 100%, with an average intensity of around 23 predominantly small particles per fish. A striking 70% of those particles would be smaller than 5 mum and therefore eligible for translocation into tissues, with critical implications for fish health and consumer exposure. This raises a question as to whether current estimates of microplastic burden in fishes generally might be overlooking a majority of potential contamination within the critical smaller particle size classes. Copyright © 2019 Elsevier B.V.

Rocha, R. J. M., et al. (2020). "Do microplastics affect the zoanthid Zoanthus sociatus?" Science of the Total Environment **713**: 136659.

Microplastics (1 mum-5 mm), a ubiquitous and persistent marine pollutant, pose a severe threat to coral reefs when recently associated with physiological distress and increased diseases on corals. Studies conducted so far have only reported effects on scleractinian species. Knowledge about its effects on other corals (e.g. Order Zoantharia) remains uncovered, and responses at biochemical levels remain poorly documented. This study aimed to assess the potential effects induced by the presence of microplastics (1 and 10 mg L⁻¹ low-density polyethylene, LDPE MP, or polyvinyl chloride, PVC MP) in the tropical and subtropical cosmopolitan species Zoanthus sociatus (order Zoantharia. Anthozoa: Hexacorallia), at organism level (survival and behaviour), endosymbionts (photosynthetic efficiency) and the cellular level (oxidative stress, detoxification capacity and energy metabolism). In a short-term exposure (96 h), this species was more sensitive to PVC MP. The presence of this polymer at a concentration of 10 mg L⁻¹ caused a ten-fold higher adhesion to the coral epidermis, increased

photosynthetic efficiency, lipid peroxidation, and antioxidant defences; without, however, inducing energetic costs. Although the observed physiological and biochemical effects did not compromise Z. sociatus survival in the short term, it does not rule out potential long-term (cumulative) effects that could endanger this and other physiologically similar species that underlie coral reefs.

Rochman, C. M. (2013). "Plastics and Priority Pollutants: A Multiple Stressor in Aquatic Habitats." Environmental Science & Technology **47**(6): 2439-2440.

In this article the author discusses the environmental impact of plastics and priority pollutants on aquatic habitats. Topics include the harmful effects of plastic debris on aquatic organisms, including the physical hazards posed from entanglement, ingestion, and smothering, mechanisms that make small plastic debris hazardous, such as sorption of persistent organic pollutants (POPs), and several hazardous monomers that comprise plastics, such as polyvinyl chloride (PVC).

Rochman, C. M. (2018). "Microplastics research-from sink to source." Science **360**(6384): 28-29.

Rochman, C. M. and A. B. A. Boxall (2014). Environmental relevance: A necessary component of experimental design to answer the question, 'So what?'. **10:** 311-312.

The article focuses on the issue of environmental relevance. The issue of relevance is acute for many of the emerging contaminants (ECs) such as nanoparticles, microplastics, and pharmaceuticals and personal care products (PPCPs). Policy-makers are demanding the same old information regarding their environmental impacts.

Rochman, C. M., et al. (2019). "Rethinking microplastics as a diverse contaminant suite." Environmental Toxicology and Chemistry **38**(4): 703-711.

Rochman, C. M., et al. (2016). "Plastic debris and policy: Using current scientific understanding to invoke positive change." Environmental Toxicology and Chemistry **35**(7): 1617-1626.

Captain Charles Moore introduced the world to the "Great Pacific Garbage Patch" in the mid-1990s, and images of plastic debris in the oceans began to sweep the media. Since then, there has been increasing interest from scientists, the public, and policy makers regarding plastic debris in the environment. Today, there remains no doubt that plastic debris contaminates aquatic (marine and freshwater) habitats and animals globally. The growing scientific evidence demonstrates widespread contamination from plastic debris, and researchers are beginning to understand the sources, fate, and effects of the material. As new scientific understanding breeds new questions, scientists are working to fill data gaps regarding the fate and effects of plastic debris and the mechanisms that drive these processes. In parallel, policy makers are working to mitigate this contamination. The authors focus on what is known about plastic debris that is relevant to policy by reviewing some of the weight of evidence regarding contamination, fate, and effects of the material. Moreover, they highlight some examples of how science has already been used to inform policy change and mitigation and discuss opportunities for future linkages between science and policy to continue the relationship and contribute to effective solutions for plastic debris. Environ Toxicol Chem 2016;35:1617-1626. © 2016 SETAC.

Rochman, C. M., et al. (2013). "Long-term field measurement of sorption of organic contaminants to five types of plastic pellets: Implications for plastic marine debris." Environmental Science and Technology

47(3): 1646-1654.

Concerns regarding marine plastic pollution and its affinity for chemical pollutants led us to quantify relationships between different types of mass-produced plastic and organic contaminants in an urban bay. At five locations in San Diego Bay, CA, we measured sorption of polychlorinated biphenyls (PCBs) and polycyclic aromatic hydrocarbons (PAHs) throughout a 12-month period to the five most common types of mass-produced plastic: polyethylene terephthalate (PET), high-density polyethylene (HDPE), polyvinyl chloride (PVC), low-density polyethylene (LDPE), and polypropylene (PP). During this long-term field experiment, sorption rates and concentrations of PCBs and PAHs varied significantly among plastic types and among locations. Our data suggest that for PAHs and PCBs, PET and PVC reach equilibrium in the marine environment much faster than HDPE, LDPE, and PP. Most importantly, concentrations of PAHs and PCBs sorbed to HDPE, LDPE, and PP were consistently much greater than concentrations sorbed to PET and PVC. These data imply that products made from HDPE, LDPE, and PP pose a greater risk than products made from PET and PVC of concentrating these hazardous chemicals onto fragmented plastic debris ingested by marine animals. © 2012 American Chemical Society.

Rochman, C. M., et al. (2015). "Scientific Evidence Supports a Ban on Microbeads." Environmental Science and Technology **49**(18): 10759-10761.

Rochman, C. M., et al. (2014). "Early warning signs of endocrine disruption in adult fish from the ingestion of polyethylene with and without sorbed chemical pollutants from the marine environment." Science of the Total Environment **493**: 656-661.

Plastic debris is associated with several chemical pollutants known to disrupt the functioning of the endocrine system. To determine if the exposure to plastic debris and associated chemicals promotes endocrine-disrupting effects in fish, we conducted a chronic two-month dietary exposure using Japanese medaka (Oryzias latipes) and environmentally relevant concentrations of microplastic (<1 mm) and associated chemicals. We exposed fish to three treatments: a no-plastic (i.e. negative control), virgin-plastic (i.e. virgin polyethylene pre-production pellets) and marine-plastic treatment (i.e. polyethylene pellets deployed in San Diego Bay, CA for 3 months). Altered gene expression was observed in male fish exposed to the marine-plastic treatment, whereas altered gene expression was observed in female fish exposed to both the marine- and virgin-plastic treatment. Significant down-regulation of choriogenin (Chg H) gene expression was observed in males and significant down-regulation of vitellogenin (Vtg I), Chg H and the estrogen receptor (ER alpha) gene expression was observed in females. In addition, histological observation revealed abnormal proliferation of germ cells in one male fish from the marine-plastic treatment. Overall, our study suggests that the ingestion of plastic debris at environmentally relevant concentrations may alter endocrine system function in adult fish and warrants further research.

Rochman, C. M., et al. (2014). "Polybrominated diphenyl ethers (PBDEs) in fish tissue may be an indicator of plastic contamination in marine habitats." Science of the Total Environment **476-477**: 622-633.

Abstract: The accumulation of plastic debris in pelagic habitats of the subtropical gyres is a global phenomenon of growing concern, particularly with regard to wildlife. When animals ingest plastic debris that is associated with chemical contaminants, they are at risk of bioaccumulating hazardous pollutants. We examined the relationship between the bioaccumulation of hazardous chemicals in myctophid fish associated with plastic debris and plastic contamination in remote and previously unmonitored pelagic habitats in the South

Atlantic Ocean. Using a published model, we defined three sampling zones where accumulated densities of plastic debris were predicted to differ. Contrary to model predictions, we found variable levels of plastic debris density across all stations within the sampling zones. Mesopelagic lanternfishes, sampled from each station and analyzed for bisphenol A (BPA), alkylphenols, alkylphenol ethoxylates, polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs), exhibited variability in contaminant levels, but this variability was not related to plastic debris density for most of the targeted compounds with the exception of PBDEs. We found that myctophid sampled at stations with greater plastic densities did have significantly larger concentrations of BDE#s 183 –209 in their tissues suggesting that higher brominated congeners of PBDEs, added to plastics as flame-retardants, are indicative of plastic contamination in the marine environment. Our results provide data on a previously unsampled pelagic gyre and highlight the challenges associated with characterizing plastic debris accumulation and associated risks to wildlife. [Copyright &y& Elsevier]
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Rochman, C. M., et al. (2017). "Direct and indirect effects of different types of microplastics on freshwater prey (Corbicula fluminea) and their predator (Acipenser transmontanus)." PLoS ONE **12**(11).
We examined whether environmentally relevant concentrations of different types of microplastics, with or without PCBs, directly affect freshwater prey and indirectly affect their predators. Asian clams (Corbicula fluminea) were exposed to environmentally relevant concentrations of polyethylene terephthalate (PET), polyethylene, polyvinylchloride (PVC) or polystyrene with and without polychlorinated biphenyls (PCBs) for 28 days. Their predators, white sturgeon (Acipenser transmontanus), were exposed to clams from each treatment for 28 days. In both species, we examined bioaccumulation of PCBs and effects (i.e., immunohistochemistry, histology, behavior, condition, mortality) across several levels of biological organization. PCBs were not detected in prey or predator, and thus differences in bioaccumulation of PCBs among polymers and biomagnification in predators could not be measured. One of the main objectives of this study was to test the hypothesis that bioaccumulation of PCBs would differ among polymer types. Because we could not answer this question experimentally, a bioaccumulation model was run and predicted that concentrations of PCBs in clams exposed to polyethylene and polystyrene would be greater than PET and PVC. Observed effects, although subtle, seemed to be due to microplastics rather than PCBs alone. For example, histopathology showed tubular dilation in clams exposed to microplastics with PCBs, with only mild effects in clams exposed to PCBs alone.

Rodale, R. (1989). "ORGANIC LIVING." Organic Gardening (08973792) **36**(2): 23-24.
Discusses the growth of organic gardening in the United States. Severity of the problem of plastic pollution; Increase in public support for recycling policies and plastic use; Number of states that require degradable plastics; Other laws and regulations that will make space for organic methods.

Rodiger, S., et al. (2011). "Fluorescence dye adsorption assay to quantify carboxyl groups on the surface of poly(methyl methacrylate) microbeads." Analytical Chemistry **83**(9): 3379-3385.

Microbead-based assays have evolved into powerful tools for the multiplex detection of biomolecules. Analytes are captured by DNA or protein capture molecules which are coupled on microbead surfaces. A homogeneous carboxylation of microbeads is essential for the optimal and reproducible coupling of capture molecules and thus a prerequisite for an optimal multiplex microbead-based assay performance. We developed a simple fluorescence dye adsorption assay for the description of microbead carboxylation and for the prediction of coupling successes of capture molecules. Using the fluorescence dye SYTO-62 it is possible to quantify the degree of carboxylation of poly(methyl methacrylate) (PMMA) microbeads within 1 h in a multiplex format by fluorescence microscopy or flow cytometry. Compared to conventional bulk assays which only provide an average degree of carboxylation the main advantage of the SYTO-62 assay is the single microbead analysis and therefore the description of the qualitative distribution of carboxylation in microbead populations. The SYTO-62 assay is sensitive enough to even determine weak carboxylation. Also, the quality of microbeads can be evaluated. To our knowledge this is the first report which applies a reversible noncovalent fluorescent dye adsorption assay to quantify the degree of carboxylation on surfaces.

Rodrigo, J., et al. (1997). "Starch determination in plant tissues using a computerized image analysis system." Physiologia Plantarum **99**(1): 105-110.

An image analysis system attached to a microscope developed to detect quantitative variations in starch in particular tissues or cells is presented. The procedure is based on the measurement of the optical density of black and white images obtained from the microscope. The system was used successfully to study the differences in starch content of sections from pistillar structures in apricots cv. Moniqui. Two staining methods, I₂KI (potassium iodide-iodine) and PAS (periodic acid Schiff's reagent), and two embedding techniques, paraffin and JB4 plastic resin, were compared. The best results were obtained using I₂KI-stained sections of paraffin-embedded material. Since the procedures used are non-destructive for the tissues studied, additional information can be obtained, on the same section, by the subsequent use of additional stains.

Rodrigo, P. J., et al. (2006). "GPC-based optical micromanipulation in 3D real-time using a single spatial light modulator." Optics Express **14**(26): 13107-13112.

Using a novel dual-beam readout with the generalized phase contrast (GPC) method, a multiple-beam 3D real-time micromanipulation system requiring only one spatial light modulator (SLM) has been realized. A theoretical framework for the new GPC scheme with two parallel illumination beams is presented and corroborated with an experimental demonstration. Three-dimensional arrays of polystyrene microbeads were assembled in the newly described system. The use of air immersion objective lenses with GPC-based optical trapping allowed the simultaneous viewing of the assemblies in two orthogonal bright-field imaging perspectives.

Rodrigues, A., et al. (2019). "Colonisation of plastic pellets (nurdles) by E. coli at public bathing beaches." Marine Pollution Bulletin **139**: 376-380.

The hard surface of waterborne plastic provides an ideal environment for the formation of biofilm by opportunistic microbial colonisers, and could facilitate a novel means of dispersal for microorganisms across coastal and marine environments. Biofilms that colonise the so-called 'plastisphere' could also be a reservoir for faecal indicator organisms (FIOs), such as Escherichia coli, or pathogenic bacteria such as species of Vibrio. Therefore, the aim of this study was to map the spatial distribution of beach-cast plastic resin pellets (nurdles) at five public bathing beaches, and quantify their colonisation by E. coli and Vibrio spp. Nurdles were heterogeneously

distributed along the high tide mark at all five beaches, and each beach contained nurdles that were colonised by E. coli and Vibrio spp. Knowledge of E. coli colonisation and persistence on nurdles should now be used to inform coastal managers about the additional risks associated with plastic debris.

Rodrigues, J. P., et al. (2019). "Significance of interactions between microplastics and POPs in the marine environment: A critical overview." TrAC - Trends in Analytical Chemistry **111**: 252-260.

The presence of plastic debris in the ocean is increasing and several effects in the marine environment have been reported. A great number of studies have demonstrated that microplastics (MPs) adsorb organic compounds concentrating them several orders of magnitude than the levels found in their surrounding environment, therefore they could be potential vectors of these contaminants to biota. However, a consensus on MPs as vectors of persistent organic pollutants (POPs) has not been reached since are opposing views among different researchers on this topic. However, all agree that more extensive studies are needed to clarify this relationship. This review reunites information reporting the factors that drive the sorption dynamics between MPs and POPs, which essentially corresponds to polymer properties and surrounding environmental variables. Furthermore, this review highlights several supporting and rebuttal arguments in the direction to clear up the real hazard enforced by the presence of MPs in marine environments. Copyright © 2018 Elsevier B.V.

Rodrigues, M. O., et al. (2018). "Spatial and temporal distribution of microplastics in water and sediments of a freshwater system (Antua River, Portugal)." Science of the Total Environment **633**: 1549-1559.

Microplastics (particles with a size<5mm), one of the most emerging aquatic pollutants, are of particular concern since they can reach high densities and interact with biotic and abiotic environment. The occurrence of microplastics in freshwater systems is less understood than in marine environment. Hence, the present study aims to provide new insights into microplastics abundances and distribution in Antua River (Portugal) by applying the isolation method of wet peroxide oxidation with addition of zinc chloride to water and sediment samples collected in March and October 2016, in three sampling sites. The abundance of microplastics in water ranged from 5 to 8.3mgm⁻³ or 58-193itemsm⁻³ in March and from 5.8-51.7mgm⁻³ or 71-1265itemsm⁻³ in October. In sediments, the abundance ranged from 13.5-52.7mgkg⁻¹ or 100-629itemskg⁻¹ in March and from 2.6-71.4mgkg⁻¹ or 18-514itemskg⁻¹ in October. The water and sediment samples with the greatest abundances were from Sao Joao da Madeira and Aguincheira, respectively. Spatio-temporal distribution showed different pattern according to methodological approaches, seasonal and hydrodynamic conditions and the proximity to urban/industry areas. Analysis of plastics by Fourier transform infrared spectroscopy underline polyethylene and polypropylene as the most common polymer types identified in this work. The low medium high oxidation ratio was 56:22:22 (%) in March and 61:31:8 (%) in October. Foams and fibers were the most abundant type in Sao Joao da Madeira, while fibers and fragments were the most abundant in Aguincheira and Estarreja in water and sediment samples, respectively. This study emphasizes the importance of rivers as carriage systems of microplastics. Further studies should be performed to identify point sources in order to mitigate the microplastics contamination in aquatic systems.

Rodrigues, M. O., et al. (2019). "Impacts of plastic products used in daily life on the environment and human health: What is known?" Environmental Toxicology & Pharmacology **72**: 103239.

Plastics are indispensable and persistent materials used in daily life that can be fragmented into micro- or nanoplastics. They are long polymer chains mixed with additives that can be toxic when in contact with distinct species. The toxicity can result from polymer matrix, additives, degradation products and adsorbed contaminants. Notwithstanding, there is still an immense gap of information concerning the individual and mixed impacts of plastics. Hence, in this study, we characterize the most common plastic materials widely used in our daily life by its polymer type and compile the environmental and human health hazards of these polymers including the impacts of monomers, additives, degradation products and adsorbed contaminants based on literature review. In summary, polyvinyl chloride is the most toxic polymer type used daily (monomer and additives); additives are more toxic than monomers to wildlife and humans; and the most toxic additives are benzene, phthalates and lead stabilisers.

Rodrigues, M. O., et al. (2018). "Spatial and temporal distribution of microplastics in water and sediments of a freshwater system (Antuã River, Portugal)." Science of the Total Environment **633**: 1549-1559.

Microplastics (particles with a size < 5 mm), one of the most emerging aquatic pollutants, are of particular concern since they can reach high densities and interact with biotic and abiotic environment. The occurrence of microplastics in freshwater systems is less understood than in marine environment. Hence, the present study aims to provide new insights into microplastics abundances and distribution in Antuã River (Portugal) by applying the isolation method of wet peroxide oxidation with addition of zinc chloride to water and sediment samples collected in March and October 2016, in three sampling sites. The abundance of microplastics in water ranged from 5 to 8.3 mg m^{-3} or 58–193 items m^{-3} in March and from 5.8–51.7 mg m^{-3} or 71–1265 items m^{-3} in October. In sediments, the abundance ranged from 13.5–52.7 mg kg^{-1} or 100–629 items kg^{-1} in March and from 2.6–71.4 mg kg^{-1} or 18–514 items kg^{-1} in October. The water and sediment samples with the greatest abundances were from São João da Madeira and Aguincheira, respectively. Spatio-temporal distribution showed different pattern according to methodological approaches, seasonal and hydrodynamic conditions and the proximity to urban/industry areas. Analysis of plastics by Fourier transform infrared spectroscopy underline polyethylene and polypropylene as the most common polymer types identified in this work. The low medium high oxidation ratio was 56:22:22 (%) in March and 61:31:8 (%) in October. Foams and fibers were the most abundant type in São João da Madeira, while fibers and fragments were the most abundant in Aguincheira and Estarreja in water and sediment samples, respectively. This study emphasizes the importance of rivers as carriage systems of microplastics. Further studies should be performed to identify point sources in order to mitigate the microplastics contamination in aquatic systems. [ABSTRACT FROM AUTHOR]

Rodrigues, S. M., et al. (2019). "Microplastic contamination in an urban estuary: abundance and distribution of microplastics and fish larvae in the Douro estuary." Science of the Total Environment **659**: 1071-1081.

Estuaries are productive environments used by many fish as nursery grounds. The initial stages of fishes are highly vulnerable to (a)biotic factors, and anthropogenic pressures, influencing fish

larvae assemblages along the estuary. Microplastics (MPs <5 mm) are particularly dangerous to early life stages of fishes because their ingestion can induce gut blockage, limiting food intake or exposing organisms to contamination due to MPs capacity to absorb pollutants. Present work aimed to investigate the contamination of an urban impacted estuary (Douro estuary, NW Portugal) by MPs, and study the abundance and distribution of MPs and fish larvae in this estuary. Monthly sampling surveys were performed from December 2016 to December 2017, in nine stations along the estuary. Sub-surface planktonic horizontal trawls were performed to collect fish larvae and MPs. Planktonic samples were sorted, and fish larvae identified. MPs density was determined using a protocol optimized in our laboratory. A total of 1498 fish larvae belonging to 32 taxa were collected, with a mean density of 11.66 fish larvae 100 m⁻³. During the spring-summer period, it was observed the typical increase in the density and diversity of the larval assemblage. Diversity was generally low, with the high dominance of very few taxa, namely the common goby, Pomatoschistus microps. Different types of MPs were found, namely fibers, soft/hard plastic, colorful/transparent plastic, in a total of 2152 particles, with a mean density of 17.06 MPs 100 m⁻³. Hard MPs and fibers were the most predominant types, representing 83% of the total MPs collected. In some months the number of MPs surpassed the number of fish larvae, with an average ratio of 1.0 fish larvae:1.5 MPs. Such results are concerning, highlighting that a higher availability of MPs may facilitate their ingestion by fish and therefore increase possible impacts in these communities.

Rodrigues, S. M., et al. (2019). "Adaptation of a laboratory protocol to quantity microplastics contamination in estuarine waters." MethodsX **6**: 740-749.

One of the most used protocols to extract and quantify MPs is NOAA protocol in aquatic environments. However, there is still no standardized method to extract and quantify MPs in estuarine waters. The aim of this work was to adapt the NOAA protocol to quantify microplastics in estuarine water and provide all the details and changes to improve the efficiency of the method. For that, four types of plastic (PE-LD; PET; PA; PE-HD) were used in artificial samples to test all the steps of the protocol. Several criteria were tested, namely: (i) quantities of H₂O₂ used for organic matter degradation; (ii) temperatures of drying samples; and (iii) density separation efficacy. With the proposed modifications, the microplastics extraction were above 90%, regardless the type of plastic, with PE-LD reaching 100% of efficiency. The new adapted protocol that we propose will allow a better efficiency in extraction and quantification of microplastics in samples from estuarine environments. *Four different types of plastic (PE-LD; PET; PA; PE-HD) were used to test the efficiency of the protocol*Details as the ideal quantity of H₂O₂, temperature and exact quantity of NaCl were tested and defined during the experiments*Efficiency of the microplastics extraction were above 90.

Rodríguez, A., et al. (2018). "Seabird plastic ingestion differs among collection methods: Examples from the short-tailed shearwater." Environmental Pollution **243**: 1750-1757.

Despite the increase of literature on seabird plastic ingestion in recent years, few studies have assessed how plastic loads vary according to different sampling methods. Most studies use necropsies of seabirds with a natural cause of death, e.g. beached or predated, to determine plastic loads and monitor marine debris. Sampling naturally dead seabirds may be biased as they have perished because of their intrinsic factors, e.g. poor body condition, high parasite loads, sickness or predation, affecting estimates of plastic loads. However, seabirds killed accidentally may be more representative of the population. Here, we used the short-tailed shearwater Ardenna tenuirostris to test different sampling methods: naturally beached fledglings and accidentally road-killed fledglings after being attracted and grounded by artificial lights. We compared plastic load, body condition, and feeding strategies (through using feathers' δ 13C and δ 15N isotope niche) between beached and road-killed fledglings. Beached birds showed higher plastic loads, poorer body condition and reduced isotopic variability, suggesting that this group is not a representative subsample of the whole cohort of the fledgling population. Our results might have implications for long-term monitoring programs of seabird plastic ingestion. Monitoring plastic debris through beached birds could overestimate plastic ingestion by the entire population. We encourage the establishment of refined monitoring programs using fledglings grounded by light pollution if available. These samples focus on known cohorts from the same population. The fledgling plastic loads are transferred from parents during parental feeding, accumulating during the chick-rearing period. Thus, these fledglings provide a higher and valuable temporal resolution, which is more useful and informative than unknown life history of beached birds. Graphical abstract Image 1 Highlights • Beached short-tailed shearwaters showed poorer condition and lower isotopic variability than road-killed ones. • Beached short-tailed shearwaters showed higher plastic loads than road-killed ones. • Plastic loads of beached fledglings are not representative of the fledgling population. • Light-induced shearwaters can be used as a control for the suitability of stranded birds. • Light-induced mortality provides additional samples for marine debris monitoring. Beached short-tailed shearwaters had higher plastic loads, poorer condition and reduced isotopic variability than road-killed individuals, showing that samples from beached seabirds can overestimate and mislead plastic ingestion monitoring studies. [ABSTRACT FROM AUTHOR]

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Rodriguez, A., et al. (2012). "High prevalence of parental delivery of plastic debris in Cory's shearwaters (Calonectris diomedea)." Marine Pollution Bulletin **64**(10): 2219-2223.

Plastic ingestion by adult Procellariiformes has been widely recorded, but few studies have evaluated intergenerational transfer. We assessed the prevalence of plastic particles, as well as their basic characteristics, in the gut content of dead Cory's shearwater fledglings stranded by light pollution on Canary Islands. Eighty-three percent of birds were affected, containing on average 8.0 plastic pieces per bird. The average plastic weight per bird was low (2.97+or-3.97 mg) compared with other petrel species. We found no relationships between plastic loads and body condition or body size, but negative effects may be hidden or delayed. We propose to use the fledglings stranded by light pollution to carry out more precise studies to understand the potential hidden costs of plastic ingestion; and to monitor in a long-term the marine debris to develop management actions for the control of pollution at the marine environment.

Rodriguez, A. E., et al. (2012). "Molecular characterization of chronic lymphocytic leukemia patients with a high number of losses in 13q14." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Deletion at 13q14 (13q) is the most common genomic aberration in CLL. It is present in more than 50% of cases, and is the sole documented cytogenetic abnormality in 36% of the patients. These latter cases are known to have a more favorable clinical course. However, recent data from our group and others, suggest that patients with CLL and 13q deletion as the only FISH

abnormality could have a different outcome depending on the number of cells displaying this aberration. Thus CLL patients with a high number of 13q cells usually had both shorter overall survival and shorter time to first therapy. However, to the best of our knowledge the molecular characteristics of these patients have not been so far analyzed in detail. A total of 102 samples were selected for the study, 32 of which served as a validation cohort. A complete immunophenotypic analysis by flow cytometry and FISH studies were carried out in all cases. The median age was 68 years (range, 35 to 90 years). For the purpose of the study, only samples with one cytogenetic abnormality were included. For the gene expression profile analysis, according to our previous results, two groups of patients with 13q were compared: those in whom 80% or more of cells showed 13q (13qH) and those in whom fewer than 80% of cells showed 13q losses (13qL). The distribution of cases in the study cohort was: 13qH (n=25; 36%), 13qL (n=27; 39%), normal FISH (nCLL, n=8; 11%) and 17p/11q (n= 10; 14%); and in the validation cohort: 13qH (n=7; 22%), 13qL (n=11; 34%) and nCLL (n=9; 28%). Peripheral blood mononuclear cells (PBMCs) were isolated from fresh peripheral blood samples using Ficoll gradient, snapfrozen and stored at 80degreeC. For the validation cohort, CD19positive B cells were purified by magnetically activated cell sorting (MACS) CD19 MicroBeads resulting in a >98% purity, as analyzed by flow cytometry. CD19positive normal B cells from peripheral blood of five healthy donors served as controls. All samples were hybridized with the Affymetrix Human Exon arrays 1.0 ST. A total of 3 450 genes significantly distinguished 13qH from 13qL patients, defining the 13qH signature. To determine the biological significance of the deregulated genes, a further analysis was carried out, revealing that apoptosis, BCR and NFkB signaling were the most significant affected pathways in 13qH CLL patients. Moreover, 13qH CLL patients were also characterized by a striking overrepresentation of deregulated miRNAs. A total of 15 miRNAs were deregulated in 13qH relative to 13qL patients. HsamiR155 was the most highly upregulated miRNA (Rfold=3.70), while hsamiR223 was the most significantly downregulated (Rfold=0.10). The posttranscriptional regulatory network of miRNA and genes in CLL patients with more than 80% of 13q cells was carried out by analyzing the miRNAmRNA relationships and the pathway analysis demonstrated that B cell receptor signaling, PI3K signaling and NFkB signaling were among the most strongly affected pathways in 13qH patients, highlighting the importance of miRNA regulation in CLL. The influence of other factors with prognostic relevance in CLL, such as IGVH mutational status, was discarded. We also analyzed the gene signature of CLL high risk cytogenetic subgroups in comparison with 13q patients. Surprisingly, our results suggest that some of the biological characteristics of 13qH CLL patients were similar to those of highrisk cytogenetic subgroups, since they share the deregulation of several key signaling pathways. To validate the differences observed between the subgroups of 13q CLL patients and get a visualization of these, we applied the Principal Component Analysis (PCA) in an independent series of patients. The expression pattern of CD19+ cells from CLL patients was notably different from the gene expression profile of CD19+ cells from healthy donors. Thus, CLL patients with a high number of 13q cells can be differentiated based on their expression profile. By contrast, the gene expression of B lymphocytes from 13qL and normal FISH subgroups was similar. Therefore, this s udy provides new evidences regarding the heterogeneity of 13q deletion in CLL patients. Thus an overexpression of BCR and NFKB patways and as well as a deregulation of the balance between the proliferative and apoptotic signals and miRNA expression are involved in cases with higher percentages of 13q- cells.

Rodríguez-Hernández, A. G., et al. (2019). "A novel and simple method for polyethylene terephthalate (PET) nanoparticle production." Environmental Science: Nano **6**(7): 2031-2036.

Common plastics, such as polyethylene terephthalate (PET), as pollutants in aquatic

environments in the form of micro/nanoparticles are of environmental and public health concern. Information on the impact of plastic nanoparticles on the environment and on public health is still scarce, thus an important research effort is needed. The lack of enough amounts of nanoparticles to perform these research studies is limiting the understanding of the effects of nanoplastics on the environment and public health. Here, a simple, fast and efficient method to produce PET nanoparticles to be used as nanoplastic models is described. Fine chips of PET were dissolved in a concentrated trifluoroacetic acid solution and reprecipitated as nanoparticles (50–200 nm) by the addition of aqueous solutions of the same solvent. The importance of this method for the production of PET nanoparticles is highly relevant since it could facilitate the PET nanoparticle availability to perform such imperative toxicological studies. The obtained nanosized particles were characterized and their effective ability for cell internalization in human macrophage cells was evaluated.

Rodriguez-Lozano, A. L., et al. (2015). "Antibodies to histocompatibility antigens in juvenile systemic lupus erythematosus patients." Arthritis and Rheumatology. Conference: American College of Rheumatology/Association of Rheumatology Health Professionals Annual Scientific Meeting, ACR/ARHP **67**(SUPPL. 10).

Background/Purpose: Microchimerism with HLA mismatched maternal cells can be readily demonstrated in normal individuals and is now established as a normal biological phenomenon. Pediatric SLE patients have decreased levels of blood maternal microchimerism, suggesting a loss of T-cell tolerance to maternal antigens. Because maternal MHC molecules are the most likely targets of the T-cell hyperactivity, we reasoned that pediatric lupus patients may also have B cell reactivity to maternal MHC. Method(s): To test for loss of B-cell tolerance to maternal MHC, we measured IgG specific for HLA Class II antigens in plasma samples from children who have never been pregnant: 81 with SLE (49 (60%) with active disease, SLEDAI >4), 20 patients (24%) with nephritis. Control groups consisted of 16 systemic sclerosis (SSc), 20 juvenile idiopathic arthritis (JIA), and 78 healthy children. OneLambda, Inc. LABScreen microbeads coated with purified Class II HLA antigens were used to detect specific IgG. Data acquisition and analysis was performed using LABScanTM Statistical analysis was performed using SPSS version 16.0, Mann Whitney was used to determine median difference between groups, Correlations were tested by Spearman and associations by Likelihood ratios or Fisher Exact Test, ROC curves were constructed to test for the specificity of HLAab for lupus diagnosis and active lupus. Result(s): All Subjects: The median values of 90% of specific HLAab were high in patients with SLE compared to controls. HLAab levels in JIA and SSc were similar to controls. Among the SLE patients, 27 out of 77 HLA antigens were increased in patients with active disease compared to those without active disease. Of these, a significant association was found with disease activity in 15 HLAab (see Table 1). ROC curves demonstrated specificity for active SLE in 4 HLAab, with AUC >.700: DQA1*0301-DQB1*0302 (AUC .758, 95% CI 0.66-.86, p<0.001), DQA1*0301-DQB1*0303, (AUC 0.76, 95% CI 0.66-.87, p<0.001), DQA1*0501-DQB1*0201 (AUC 0.73, 95% CI 0.61-.84, P=0.001, and DPB1*1401=DPA1*0201 (AUC 0.72, 95% CI 0.6-.84], P=0.001. Ten HLAab demonstrated a significant median difference between those with and without nephritis, and seven of those showed significant associations (Table 1). Conclusion(s): Children with SLE have high values and a considerable number of anti-HLA class II autoantibodies which seem to be specific, related with disease activity and to a lesser extent with nephritis. If confirmed, HLAab could represent useful biomarkers for disease activity. (Table Presented).

Rodriguez-Munoz, Y., et al. (2009). "Expression imbalance of Angiopoietin/Tie2 system in monocytes and

monocyte derived cells from chronic hepatitis C patients." Hepatology **4)**: 889A.

INTRODUCTION: Chronic hepatitis C (CHC) is a progressive inflammatory liver disease with an increased risk of cirrhosis and hepatocellular carcinoma (HCC) development. Angiogenesis, or the formation of new blood vessels from pre-existing ones, has been described as a pathological phenomenon associated with HCC and other inflammatory liver diseases. Some evidences exist regarding the central role of the Angiopoietin/Tie2 system in the regulation of both, angiogenesis and inflammation. Moreover, it has been recently established the proangiogenic and proinflammatory ability of Tie-2 expressing monocytes (TEMs). The AIM of this study was to analyze the expression of Angiopoietin/Tie-2 system in monocytes and in monocyte-derived macrophages (MDM) or in monocyte-derived dendritic cells (MD-DCs) from CHC patients. MATERIAL AND METHODS: Peripheral blood mononuclear cells (PBMCs) were purified from 10 CHC patients and 10 healthy donors by Ficoll density centrifugation. Monocytes were isolated from PBMCs by positive selection using CD14 microbeads following manufacturer's instructions. The obtained cells were cultured at 1x106 cell/ml density in RPMI medium supplemented with 10% fetal calf serum and 1% penicillin-streptomicin. The differentiation of monocytes to MDMs or MD-DCs was induced by the culture of CD14+ cells with granulocyte macrophage colony-stimulating factor (GMCS-F) or with GMCS-F and IL-4, respectively. MD-DCs were stimulated with LPS to obtain mature MD-DCs. The Tie-2 expression was measured in monocytes, macrophages and inmature/mature MD-DCs by flow cytometry and their Ang-1 and Ang-2 release was evaluated in the culture supernatants by ELISA. RESULT(S): The expression of Ang-2 was notably higher in monocytes as well as in all cell types derived from the monocytes of CHC patients, which resulted statistically significant in macrophages and in mature MD-DCs. On the contrary, the expression of Ang-1 was reduced in the supernatants of all CHC derived monocytic cells. These phenomena were jointed to a significant decrease of Tie-2 expression in mature MD-DCs from CHC patients. CONCLUSION(S): The observed expression imbalance of Angiopoietin/Tie-2 system in monocytes and monocyte-derived cells from CHC patients could account for the inflammatory and angiogenic disorders related to this chronic liver disease. Learning more about the regulation of Angiopoietin/Tie-2 system could be helpful for the design of new therapeutic strategies.

Rodriguez-Munoz, Y., et al. (2011). "Proinflammatory and proangiogenic monocyte subsets are increased in peripheral blood of patients with chronic hepatitis C." Journal of Hepatology **1)**: S124-S125.

Introduction: Hepatitis C virus infection evolves into chronic progressive liver disease due to ineffective immune response that fails to eradicate the virus. Monocytes constitute a heterogeneous group of myeloid cells that mediates both the innate and adaptive immune response. In addition to the pro-inflammatory properties described for CD16+ monocytes, it has recently been established the robust pro-angiogenic potential of the Tie-2+ subgroup of monocytes (TEMs). Our aim was to analyze these different monocyte subsets, particularly TEMs, in the blood of chronic hepatitis C (CHC) patients to examine their role in the disease progression and in the response to antiviral therapies. Material(s) and Method(s): Peripheral blood mononuclear cells were purified from 21 healthy donors and 39 CHC patients by Ficoll density centrifugation. Patients were divided in 3 groups based on their treatment and response: naive, responders and non-responders. Monocytes, isolated by anti-CD14 coupled magnetic microbeads, were cultured at 1x10⁶ cell/ml in complete RPMI medium during 24 hours. Subsequently, they were both individually and simultaneously characterized by flow cytometry with anti-CD14, anti-CD16 and anti-Tie-2 monoclonal antibodies conjugated to different fluorochromes. Angiopoietin-1 (Ang-1), Angiopoietin-2 (Ang-2) and other proangiogenic factors (Angiogenin, EGF, B-FGF, HB-EGF, HGF, Leptin, PDGF-BB, PlGF and VEGF) expression was evaluated in monocytes supernatants by ELISA and immunofluorescence protein arrays. Result(s): CD16 and Tie-2 expressing monocyte percentages were notably enhanced in the blood of CHC patients ($p < 0.005$ and $p < 0.05$, respectively). Monocytes dual immunostaining showed the same results, independently of the expression levels of the other simultaneously analyzed marker (CD16 or Tie2). Related to treatment, TEMs proportion was significantly higher in naive patients compared to non-responders and in non-responders versus responders ($p < 0.05$, both). Ang-1 expression was lower in supernatants of peripheral monocytes from CHC patients ($p < 0.05$), whereas other pro-angiogenic factors such as Angiogenin, B-FGF, Leptin, PDGF-BB and PIGF, were significantly up-regulated. Conclusion(s): The significant enrichment of pro-inflammatory and pro-angiogenic monocyte subsets in the peripheral blood of CHC patients and the imbalanced release of multiple angiogenic factors by these cells may account for the pathologic phenomena frequently related to chronic HCV infection such as angiogenesis, fibrosis and hepatocarcinoma development.

Rodriguez-Seijo, A., et al. (2018). "Oxidative stress, energy metabolism and molecular responses of earthworms (Eisenia fetida) exposed to low-density polyethylene microplastics." Environmental Science and Pollution Research **25**(33): 33599-33610.

Soils are both a sink and a pathway of plastic wastes, but there is a great lack of knowledge regarding their impacts on soil biota. To tackle the mechanisms of toxicity of these contaminants to soil invertebrates, earthworms (Eisenia fetida Savigny, 1826) were exposed during 28 days to different concentrations of low-density polyethylene microplastics (62, 125, 250, 500 and 1000 mg MPs kg⁻¹ soil_{dw}) with sizes ranging between 250 and 1000 micro m, in an artificial soil. The ecotoxicological responses were evaluated by analysing various oxidative stress biomarkers (catalase, glutathione S-transferase and thiobarbituric acid reactive substances), a biomarker of energy metabolism (lactate dehydrogenase) and overall organism molecular changes by Fourier transform infrared spectrometry (FTIR) and nuclear magnetic resonance (NMR) analyses. Significant effects resulting from an unbalanced oxidative stress system, expressed in terms of thiobarbituric acid reactive substances levels were recorded on earthworms exposed at the three highest concentrations tested. Despite that, no significant changes were recorded on the molecular profiles of earthworms by FTIR-ATR. NMR analysis pointed out for differences from the control, only for earthworms exposed to the lowest concentration of MPs. Considering that stress responses are complex, and involve multiple mechanisms, a cluster analysis taking into account all the parameters assessed, clearly identified two groups of earthworms separated by the concentration of 250 mg MPs kg⁻¹ soil_{dw}, above each meaningful effects were recorded.

Rodríguez-Seijo, A., et al. (2018). "Oxidative stress, energy metabolism and molecular responses of earthworms (<i>Eisenia fetida</i>) exposed to low-density polyethylene microplastics." Environmental science and pollution research international **25**(33): 33599-33610.

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Rodriguez-Seijo, A., et al. (2017). "Histopathological and molecular effects of microplastics in Eisenia andrei Bouche." Environmental Pollution **220**(Part A): 495-503.

The ocean has been assumed as the main sink of microplastics (MPs), however, soils may also receive MPs from different sources and through different pathways, which may affect the biota and their role in soil functions. To the best of our knowledge, only one study, until now, reported the effects of MPs on the survival and fitness of soil organisms (Lumbricus terrestris). In our study, epigeic earthworms, of the species E. andrei, were exposed to different concentrations of MPs (0, 62.5, 125, 250, 500 and 1000 mg/kg soil_{dw}) in an OECD artificial soil and tested for reproduction, survival and growth of adults, following a standard protocol. The size of the polyethylene MPs to which earthworms were exposed ranged between 250 and 1000 micro m. No significant effects were recorded on survival, number of juveniles and, in the final weight of adult earthworms after 28d of exposure, to the different concentrations of MPs. Nevertheless, FTIR-ATR of earthworms and histopathological analysis of the gut provided evidences of damages and immune system responses to MPs.

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Rodríguez-Seijo, A., et al. (2019). "Low-density polyethylene microplastics as a source and carriers of agrochemicals to soil and earthworms." Environmental chemistry (Online) **16**(1): 8-17.

Abstract. Microplastics (MPs) are of environmental concern to marine ecosystems owing to the

evidence of their presence in and adverse effects on organisms, but studies to address this problem on soils and its biota are scarce. Several questions can arise related to this major environmental problem and its impact on terrestrial ecosystems, mainly, whether MPs can transport contaminants (e.g. pesticides) to the soil matrix and if they can be a carrier of pesticides to soil biota. To contribute to the understanding of these issues, earthworms (Eisenia fetida) were exposed for 14 days to soil containing two different sized MPs (5?mm and 0.25 µm-1?mm) that were either previously sprayed or not with chlorpyrifos (CPF). Acetylcholinesterase (AChE) activity and thiobarbituric acid reactive substances (TBARS) were measured to track the exposure of the earthworms to MPs, both non-sprayed and sprayed with CPF. The behaviour of the earthworms in the test containers and the movement of MPs in the soil were assessed. The concentration of CPF in soil at the end of the experiment differed between the treatments with MPs of different sizes (17.9?ng?g?1 and 2442?ng?g?1 for large and small MPs, respectively). Despite the ability of the MPs to release CPF to the soil, the earthworms avoided the contaminated MPs at the highest contaminant level. At a lower concentration of CPF (large MPs), the earthworms avoided the MPs, but the contact time with contaminated soil was higher, as shown by the enhanced level of TBARs and AChE inhibition. However, no evidence of MPs uptake was recorded, thus it was not demonstrated that MPs can be carriers of pesticides to earthworms.

Roellecke, K., et al. (2015). "Establishing modified human CYP4B1 as a novel suicide gene system for adoptive T-Cell therapies." Blood **126 (23)**: 5550.

Retargeting autologous T-cells to recognize tumor-associated antigens by genetic modifications with viral vectors that express either enhanced T-cell receptors (TCRs) or chimeric antigen receptors (CARs) has shown successful activity against B-cells malignancies. Equipping the transduced T-cell with a suicide gene can prevent potential safety problems as on-target off-target toxicity, off-target reactivity and cytokine-release syndrome (Casucci et al., 2015). The concept of a suicide gene has already been utilized to prevent a Graft-versus-host-disease (GvHD) following donor lymphocyte infusion (DLI). The first suicide gene system used in clinical phase I/II studies was the human Herpes simplex virus type 1 thymidine kinase with its prodrug ganciclovir that was used to control Graft-versus-host-disease following donor lymphocyte infusion (DLI) for leukemia relapse after allogeneic stem cell transplantation. More recent examples for suicide gene systems are icasp9, an inducible apoptosis switch with a synthetic dimerizer protein as prodrug, and CD20 with rituximab as a prodrug. We recently published a novel potential human suicide gene system by rendering the inactive P450 cytochrome CYP4B1 with 13 amino acid changes into the highly active CYP4B1P+12 in combination with 4-ipomeanol (4-IPO) (Wiek et al., 2015). 4-IPO is furan produced by sweet potatoes infected with the common mold Fusarium javanicum and has been identified as the major lung toxin causing lung edema in livestock (Wilson et al., 1970). A second natural occurring substance causing lung edema in horses is the major component of the Perilla frutenscens fruit oil called perilla ketone (PK) (Wilson et al., 1977). Importantly, the only difference between PK and 4-IPO is a methyl group at C5 in PK, where 4-IPO has a hydroxyl group. Therefore in this work, we tested the hypothesis whether PK could function as a potential new prodrug for the CYP4B1P+12 suicide gene. Initially we compared the cytotoxicity caused by PK and 4-IPO in CYP4B1P+12 transduced primary human T-cells from healthy donors. For these experiments, we used third generation lentiviral vectors with T2A sites to express the suicide gene in combination with a truncated version of the low affinity nerve growth factor receptor (DNGFR) as a selection marker for Miltenyi MACS microbeads. Through the selection process, we were able to enrich the suicide gene expressing T-cell population from 61+/-6.0% to >=95+/-1.8%. After selection, we

challenged the CYP4B1P+12 expressing T-cells with increasing concentrations (2.9-90 muM) of both substrates and analyzed the survival of the cells. After 24h, 65.8+/-5.26% of CYP4B1P+12 positive T-cells incubated with 2.9 muM 4-IPO were still alive, while incubation with 90 muM lead to only 17.5+/-1.45% living T-cells. In contrast, incubation with 2.9 muM PK resulted in only 16.02+/-1.08% living cells, while 90 muM PK induced cell death in 94.2+/-0.79% of cells. Next, we demonstrated that a lower concentration, 0.9 muM, already led to only 13.2+/-0.46% alive cells after 24h. Monitoring apoptosis in the transduced T-cells by flow cytometry demonstrated that incubation with 90 muM 4-IPO for 4h decreased the rate of transduced T-cells to only 87.4+/-2.89%, while 10h and 24h incubation resulted in 20.4+/-4.9% and 5.8+/-0.93% living annexinV-negative cells. In contrast, 2h incubation with only 9 muM PK led to 88.7+/-2.07%, 4h to 60.2+/-5.47% and 10h to only 5.5+/-1.85% living annexinV-negative T-cells. Incubation of the T-cells with 90 muM did not change these numbers. Hence, we were able show that PK is not only more potent as 4-IPO, it also proves to have a faster kinetic in inducing apoptosis. After these promising in vitro results of using PK as a novel more potent prodrug for the CYP4B1P+12 human suicide gene, we performed dose escalation studies of PK in mice with targeted disruption of the Cyp4b1 gene. Using up to 25 mg PK/kg mouse daily up for 3d did not induce any clinical symptoms in the Cyp4b1-/- animals, while Cyp4b1+/+ animals needed to be sacrificed 4h and 7h fter a single i.p. injection of 10 mg/kg or 5 mg/kg PK, respectively, due to severe respiratory distress. Results of in vivo studies analyzing the elimination of CYP4B1P+12 positive syngenic T-cells in Cyp4b1-/- mice after injection with either 4-IPO or PK will be finalized and presented at the meeting.

Rogers, K. R., et al. (1999). "Organophosphorus hydrolase-based assay for organophosphate pesticides." Biotechnology Progress **15**(3): 517-521.

We report a rapid and versatile organophosphorus hydrolase (OPH)-based method for measurement of organophosphates. This assay is based on a substrate-dependent change in pH at the local vicinity of the enzyme. The pH change is monitored using fluorescein isothiocyanate (FITC), which is covalently immobilized to the enzyme. This method employs the use of poly(methyl methacrylate) beads to which the FITC-labeled enzyme is adsorbed. Analytes were then measured using a microbead fluorescence analyzer. The dynamic concentration range for the assay extends from 25 to 400 &mgr;M for paraoxon with a detection limit of 8 &mgr;M. Organophosphorus insecticides measured using this technique included ethylparathion, methylparathion, dursban, fensulfothion, crotoxyphos, diazinon, mevinphos, dichlorvos, and coumaphos. This technique was used to measure coumaphos in biodegradation samples of cattle dip wastes and showed a high correlation (r2 = 0.998) to an HPLC method.

Roggenbuck, D. (2014). "Simultaneous screening and confirmation of autoantibodies associated with autoimmune vasculitis." Clinical Chemistry and Laboratory Medicine **52 (11)**: eA122.

The novel CytoBead technology combines autoantibody analysis by cell-based screening with the confirmation of corresponding autoantigen reactivities by microbead multiplexing using immunofluorescence technique (IFT) in one reaction environment. CytoBead ANCA allows the simultaneous detection of anti-neutrophil cytoplasmic antibodies (ANCA) on ethanol-fixed neutrophils for screening and confirmation thereof using proteinase 3 (PR3) and myeloperoxidase (MPO) coated microbeads. Furthermore, the detection of Goodpasture antibodies is integrated by adding glomerular basement membrane (GBM) coated microbeads. Anti-GBM autoantibodies occur in 10% of rapid progressive glomerulonephritis patients together with ANCA and are required for the differential serological diagnosis in routine diagnostics. This assay format can be interpreted with a standard fluorescence microscope

(having a FITC channel) for semi-quantitative analysis and with the automated interpretation system Aklides for quantitative testing. The performance of the CytoBead ANCA assay was investigated using sera of 666 individuals including 118 patients with ANCA-associated vasculitis, 162 healthy controls, 352 disease controls and 34 anti-GBM positive sera. Receiver operating characteristics and inter-rater agreements (kappa) were used to compare the results of novel CytoBead ANCA assay with routine autoantibody investigation. The comparison of classical ANCA screening with ANCA screening by the novel CytoBead ANCA assay showed good agreement (kappa = 0.73-0.83). The results of anti-PR3, anti-MPO, and anti-GBM detection by this novel method compared to anti-PR3-, anti-MPO as well as anti-GBM by ELISA revealed good to very good agreement (0.72,0.78,0.87; respectively). Consequently, CytoBead ANCA assay is an attractive alternative to classical time-consuming single parameter ANCA and anti-GBM antibody detection and is applicable for high throughput routine diagnostics.

Roh, S., et al. (2017). "3D Printing by Multiphase Silicone/Water Capillary Inks." Advanced Materials **29**(30).

3D printing of polymers is accomplished easily with thermoplastics as the extruded hot melt solidifies rapidly during the printing process. Printing with liquid polymer precursors is more challenging due to their longer curing times. One curable liquid polymer of specific interest is polydimethylsiloxane (PDMS). This study demonstrates a new efficient technique for 3D printing with PDMS by using a capillary suspension ink containing PDMS in the form of both precured microbeads and uncured liquid precursor, dispersed in water as continuous medium. The PDMS microbeads are held together in thixotropic granular paste by capillary attraction induced by the liquid precursor. These capillary suspensions possess high storage moduli and yield stresses that are needed for direct ink writing. They could be 3D printed and cured both in air and under water. The resulting PDMS structures are remarkably elastic, flexible, and extensible. As the ink is made of porous, biocompatible silicone that can be printed directly inside aqueous medium, it can be used in 3D printed biomedical products, or in applications such as direct printing of bioscaffolds on live tissue. This study demonstrates a number of examples using the high softness, elasticity, and resilience of these 3D printed structures.

Roitsch, S., et al. (2018). "Detection by flow cytometry of anti-neutrophil cytoplasmic antibodies in a novel approach based on neutrophil extracellular traps." Autoimmunity **51**(6): 288-296.

BACKGROUND: Anti-neutrophil-cytoplasmic antibodies (ANCA) are auto-antibodies directed against components of neutrophil granulocytes and may be found in various inflammatory conditions, like small-vessel vasculitis or ulcerative colitis (UC). Routine ANCA screening is performed on ethanol-fixed neutrophils using indirect immunofluorescence technique. Yet, how neutrophil granule proteins become available to immunologic presentation is a matter of debate. In recent years, various studies have shown that neutrophils are able to extrude their chromatin decorated with granular proteins as neutrophil extracelullar traps (NETs).

AIM: We hypothesized that (I) ANCA immunoreactivity may be found on NETs and (II) NETs may serve as a useful tool in a novel approach for ANCA detection.

METHODS: Sera from patients suffering from either ANCA-associated vasculitis (n = 10), UC (n = 30) or sera from patients without diagnosed ANCA-associated diseases (n = 20), respectively, were subjected to indirect immunofluorescence and a newly developed method to detect ANCA by flow cytometry employing microbead technology.

RESULTS: ANCA-related immunofluorescence was readily detectable on ethanol-fixed NETs, establishing NETs as a structure carrying ANCA target antigens. Moreover, we observed that neutrophils form NETs in response to microbeads and stick to the surface of these beads. Using these

NET-coated microbeads in flow cytometry, we were capable of reliably detecting p-ANCA, c-ANCA, and a-ANCA in tested patient sera. UC-related complex DNase-1-sensitive ANCA (NET-ANCA) antigens were also detected on NET-coated microbeads.
CONCLUSION: NET-coated microbeads may be commercially developed as a novel tool for automated ANCA screening assays using flow cytometry.

Roje, Ž., et al. (2019). "Synergistic effects of parabens and plastic nanoparticles on proliferation of human breast cancer cells." Archives of Industrial Hygiene & Toxicology / Arhiv za Higijenu Rada I Toksikologiju **70**(4): 310-314.

Many personal care products on the market contain endocrine disrupting chemicals, including parabens. Parabens are well known chemical additives used as preservatives. They have been found in mammary glands and breast cancer tissues. At the same time, the general public is increasingly exposed to plastic micro- and nanoparticles generated during plastic production and waste disposal. Exposure to chemical cocktails is a realistic scenario of high public health interest, in which many types of compounds such as these two may exhibit synergistic or additive adverse effects. This study evaluated the effects of plastic nanoparticles, parabens, and their mixture on the viability and proliferation of two human breast cancer cell lines: MDA-MB 231, which lacks oestrogen receptors, and MCF-7, which expresses these receptors. Parabens increased proliferation of oestrogen-sensitive breast cancer cells, and this effect became synergistic in the presence of plastic nanoparticles. The mechanism behind synergy may be related to the translocation and adsorption properties of nanoplastics, which served as a Trojan horse to expose cells to parabens more efficiently. These preliminary findings support growing evidence warning about the urgent problem of human exposure to combinations of plastic waste and contingent chemicals. [ABSTRACT FROM AUTHOR]

Rokstad, A. M., et al. (2014). "Advances in biocompatibility and physico-chemical characterization of microspheres for cell encapsulation." Advanced Drug Delivery Reviews **67-68**: 111-130.

Cell encapsulation has already shown its high potential and holds the promise for future cell therapies to enter the clinics as a large scale treatment option for various types of diseases. The advancement in cell biology towards this goal has to be complemented with functional biomaterials suitable for cell encapsulation. This cannot be achieved without understanding the close correlation between cell performance and properties of microspheres. The ongoing challenges in the field of cell encapsulation require a critical view on techniques and approaches currently utilized to characterize microspheres. This review deals with both principal subjects of microspheres characterization in the cell encapsulation field: physico-chemical characterization and biocompatibility. The up-to-day knowledge is summarized and discussed with the focus to identify missing knowledge and uncertainties, and to propose the mandatory next steps in characterization of microspheres for cell encapsulation. The primary conclusion of this review is that further success in development of microspheres for cell therapies cannot be accomplished without careful selection of characterization techniques, which are employed in conjunction with biological tests.

Roldan-Alzate, A., et al. (2014). "Non-invasive assessment of cardiac function and pulmonary vascular resistance in an canine model of acute thromboembolic pulmonary hypertension using 4D flow cardiovascular magnetic resonance." <u>Journal of Cardiovascular Magnetic Resonance</u> **16 (1) (no pagination)**(23).

Background: The purpose of this study was to quantify right (RV) and left (LV) ventricular function, pulmonary artery flow (Q<inf>P</inf>), tricuspid valve regurgitation velocity (TRV), and aorta flow (Q<inf>S</inf>) from a single 4D flow cardiovascular magnetic resonance (CMR) (time-resolved three-directionally motion encoded CMR) sequence in a canine model of acute thromboembolic pulmonary hypertension (PH). Methods. Acute PH was induced in six female beagles by microbead injection into the right atrium. Pulmonary arterial (PAP) and pulmonary capillary wedge (PCWP) pressures and cardiac output (CO) were measured by right heart catheterization (RHC) at baseline and following induction of acute PH. Pulmonary vascular resistance (PVR<inf>RHC</inf>) was calculated from RHC values of PAP, PCWP and CO (PVR<inf>RHC</inf> = (PAP-PCWP)/CO). Cardiac magnetic resonance (CMR) was performed on a 3 T scanner at baseline and following induction of acute PH. RV and LV end-diastolic (EDV) and end-systolic (ESV) volumes were determined from both CINE balanced steady-state free precession (bSSFP) and 4D flow CMR magnitude images. Q <inf>P</inf>, TRV, and Q<inf>S</inf> were determined from manually placed cutplanes in the 4D flow CMR flow-sensitive images in the main (MPA), right (RPA), and left (LPA) pulmonary arteries, the tricuspid valve (TRV), and aorta respectively. MPA, RPA, and LPA flow was also measured using two-dimensional flow-sensitive (2D flow) CMR. Result(s): Biases between 4D flow CMR and bSSFP were 0.8 mL and 1.6 mL for RV EDV and RV ESV, respectively, and 0.8 mL and 4 mL for LV EDV and LV ESV, respectively. Flow in the MPA, RPA, and LPA did not change after induction of acute PAH (p = 0.42-0.81). MPA, RPA, and LPA flow determined with 4D flow CMR was significantly lower than with 2D flow (p < 0.05). The correlation between Q<inf>P</inf>/TRV and PVR<inf>RHC</inf> was 0.95. The average Q<inf>P</inf>/Q<inf>S</inf> was 0.96 +/- 0.11. Conclusion(s): Using both magnitude and flow-sensitive data from a single 4D flow CMR acquisition permits simultaneous quantification of cardiac function and cardiopulmonary hemodynamic parameters important in the assessment of PH. © 2014 Roldan-Alzate et al.; licensee BioMed Central Ltd.

Roldan-Alzate, A., et al. (2015). "Non-invasive right ventricular efficiency using 4D flow MRI." <u>Journal of Cardiovascular Magnetic Resonance. Conference: 18th Annual SCMR Scientific Sessions. Nice France. Conference Publication:</u> **17**(SUPPL. 1).

Background: Pulmonary arterial hypertension (PH) is a progressive disease of increased resistance to flow through the lungs, leading to right ventricular (RV) failure [1]. MRI is increasingly used to assess right ventricular (RV) function in PH. RV stroke work (SW) based on invasive pressure and volume measurements, is used to assess ventricular work. Determining RV work from MRI could enable a more complete characterization of RV and PA interactions in PH. The purpose of this study was to non-invasively estimate RV work from simultaneously acquired RV volume (V<inf>RV</inf>) and pulmonary artery flow (Q<inf>PA</inf>) using a 4D flow-sensitive MRI sequence in a canine model. Method(s): After IACUC approval, hemodynamic measurements were performed prior to and following induction of acute PH by injection of embolizing micro-beads; details are available elsewhere [2]. Pre- and postembolization right heart catheterization (RHC) was performed to measure hemodynamic changes in the RV and PA. 4D flow MRI (Phase Contrast with Vastly undersampled Isotropic Projection Reconstruction - PCVIPR) was performed on 3T clinical scanners (MR750, GE Healthcare, Waukesha, WI) after the intravenous administration of gadolinium-based contrast agents. PCVIPR parameters: FOV=32x32x22cm, isotropic 1.3mm spatial resolution, TR/TE=6.3/2.1ms, Venc=150cm/s, scan time: ~10min using adaptive respiratory gating of bellows and retrospective ECG gating [3]. Postprocessing was done using Mimics (Materialise, Ann Arbor, MI) for the segmentation of the V<inf>RV</inf> from dynamic magnitude images and Ensight (CEI, Apex, NC) for quantification of Q<inf>PA</inf>. RV pressure - V<inf>RV</inf> loops were generated to assess SW by calculating the area inside the loop. Q<inf>PA</inf> - V<inf>RV</inf> loops were generated and their area calculated for comparison to the SW calculations (Fig 1). Direct comparison was used for the analysis of the results and a student ttest was used to compare the two methods. Result(s): In all cases embolization induced an increase in SW (180 +/- 140 vs 374 +/- 210mmHg*cm³). Similarly the calculated area of the Q<inf>PA</inf> - V<inf>RV</inf> loops increased for all the cases (369 +/- 210 vs 785 +/- 486 s-1) (Fig 2). No significant difference was found between the percent increase of SW and the Q<inf>PA</inf> - V<inf>RV</inf> loops area (53 +/- 15 vs 52 +/- 12%, p = 0.95). Conclusion(s): QMPA - V<inf>RV</inf> loop area estimated noninvasively using 4D flow MRI can be used to evaluate right ventricular stroke work. The results from this study indicate that 4D flow-sensitive MRI with PC VIPR can also be used to estimate right ventricular work, complementing the analysis of alterations in flow patterns in the heart and pulmonary arteries in patients with cardiopulmonary disease, however more studies need to be done for validation of the model. (Figure Presented).

Roldan-Alzate, A., et al. (2012). "Pulmonary arterial distensibility - 2D phase contrast vs 2D bSSFP." Journal of Cardiovascular Magnetic Resonance. Conference: 15th Annual SCMR Scientific Sessions **14**(SUPPL. 1).

Summary: Main pulmonary artery distensibility is a strong predictor of mortality in patients with pulmonary arterial hypertension. This study shows that either 2D PC or 2D bSSFP can be used to reliably noninvasively assess it by measuring MPA relative area change. Background(s): The pulmonary circulation is a highly compliant system that generates little resistance to blood flow. However, in the presence of pulmonary arterial hypertension (PAH), blood pressure and vascular resistance in the pulmonary circulation are elevated. This leads to distension and stiffening of the main pulmonary artery (MPA) and vessel wall remodeling, which in itself may influence stiffness [1]. Proximal arterial distensibility is a parameter that depends mainly on the anatomy (geometry) of the vessel and can be estimated noninvasively with cross-sectional imaging techniques. In particular, the relative area change (RAC) of the MPA, which is inversely proportional to arterial stiffness, is a strong predictor of mortality in patients with PAH [2]. The purpose of this study was to compare two non-invasive magnetic resonance imaging (MRI) methods for quantification of MPA distensibility using an acute PAH dog model. (Figure presented) Methods: Six adult female beagles were anesthetized with isoflurane. MRI was performed prior to and following injection of micro-beads into the right atrium and ventricle to induce PAH, resulting 12 comparison studies. The presence of PAH was confirmed by right heart catheterization (RHC). All MR images were acquired on a 3T scanner (MR750, GE Healthcare, Waukesha, WI). Double-oblique images perpendicular to the direction of the flow in the MPA were obtained using ECG-triggered 2D CINE balanced steady-state free precession (bSSFP) and through-plane velocityencoded 2D phase contrast (PC) at the same level [3]. PC and bSSFP images were segmented using dedicated cardiovascular analysis software (CV-Flow and and MASS-Analysis, respectively, Medis, Leiden, NL). Maximum and minimum MPA areas (A<inf>max</inf> and A<inf>min</inf>, respectively) were used to calculate RAC = (A<inf>max</inf>-A<inf>min</inf>)/A<inf>max</inf>. Bland-Altman analysis was used to study the differences between PC and bSSFP to calculate A<inf>max</inf>, A<inf>min</inf>, and RAC. Student t-test was used to evaluate statistical significance of the differences between techniques in all three paramenters. Result(s): The mean values for RAC, A<inf>max</inf> and A<inf>min</inf> were 36.38+/-7.86%, 241.98+/-71.62cm2, and 157.06+/-58.51cm2 for PC, respectively and 31.14 +/-6.95%, 220.88+/-62.76cm2, and 155.34+/-58.38cm2 for bSSFP, respectively (p=0.10, 0.45, and 0.94, respectively). The mean differences for RAC, A<inf>max</inf> and A<inf>min</inf> were -5.23+/-8.44%, -21.10+/-40.67cm2, -1.72+/-40.89cm2, respectively. Conclusion(s): No statistically significant difference is present between PC and bSSFP for measuring RAC, A<inf>max</inf> or A<inf>min</inf>. The differences between the two methods for measuring these parameters are small suggesting that either technique (PC or bSSFP) can be used to reliably non-invasively measure MPA distensibility. A benefit of using PC for measuring RAC is that it can also be used to quantify blood flow.

Roloff, A., et al. (2019). "Quantification of Aldehydes on Polymeric Microbead Surfaces via Catch and Release of Reporter Chromophores." Analytical Chemistry **91**(14): 8827-8834.

Aldehyde moieties on 2D-supports or micro- and nanoparticles can function as anchor groups for the attachment of biomolecules or as reversible binding sites for proteins on cell surfaces. The use of aldehyde-based materials in bioanalytical and medical settings calls for reliable methods to detect and quantify this functionality. We report here on a versatile concept to quantify the accessible aldehyde moieties on particle surfaces through the specific binding and subsequent release of small reporter molecules such as fluorescent dyes and nonfluorescent chromophores utilizing acylhydrazone formation as a reversible covalent labeling strategy. This is representatively demonstrated for a set of polymer microparticles with different aldehyde labeling densities. Excess reporter molecules can be easily removed by washing, eliminating inaccuracies caused by unspecific adsorption to hydrophobic surfaces. Cleavage of hydrazones at acidic pH assisted by a carbonyl trap releases the fluorescent reporters rapidly and quasi-quantitatively and allows for their fluorometric detection at low concentration. Importantly, this strategy separates the signal-generating molecules from the bead surface. This circumvents common issues associated with light scattering and signal distortions that are caused by binding-induced changes in reporter fluorescence as well as quenching dye-dye interactions on crowded particle surfaces. In addition, we demonstrate that the release of a nonfluorescent chromophore via disulfide cleavage and subsequent quantification by absorption spectroscopy gives comparable results, verifying that both assays are capable of rapid and sensitive quantification of aldehydes on microbead surfaces. These strategies enable a quantitative comparison of bead batches with different functionalization densities, and a qualitative prediction of their coupling efficiencies in bioconjugations, as demonstrated in reductive amination reactions with Streptavidin.

Roloff, F., et al. (2013). "Schwann cell-free adult canine olfactory ensheathing cell preparations from olfactory bulb and mucosa display differential migratory and neurite growth-promoting properties in vitro." BMC Neuroscience **14**: 141.

BACKGROUND: Transplantation of olfactory ensheathing cells (OEC) and Schwann cells (SC) is a promising therapeutic strategy to promote axonal growth and remyelination after spinal cord injury. Previous studies mainly focused on the rat model though results from primate and porcine models differed from those in the rat model. Interestingly, canine OECs show primate-like in vitro characteristics, such as absence of early senescence and abundance of stable p75NTR expression indicating that this species represents a valuable translational species for further studies. So far, few investigations have tested different glial cell types within the same study under identical conditions. This makes it very difficult to evaluate contradictory or confirmatory findings reported in various studies. Moreover, potential contamination of OEC preparations with Schwann cells was difficult to exclude. Thus, it remains rather controversial whether the different glial types display distinct cellular properties.

RESULTS: Here, we established cultures of Schwann cell-free OECs from olfactory bulb (OB-OECs) and mucosa (OM-OECs) and compared them in assays to Schwann cells. These glial cultures were obtained from a canine large animal model and used for monitoring migration, phagocytosis and the effects on in vitro neurite growth. OB-OECs and Schwann cells migrated faster than OM-OECs in a scratch wound assay. Glial cell migration was not modulated by cGMP and cAMP signaling, but activating protein kinase C enhanced motility. All three glial cell types displayed phagocytic activity in a microbead assay. In co-cultures with of human model (NT2) neurons neurite growth was maximal on OB-OECs.

CONCLUSIONS: These data provide evidence that OB- and OM-OECs display distinct migratory behavior and interaction with neurites. OB-OECs migrate faster and enhance neurite growth of human model neurons better than Schwann cells, suggesting distinct and inherent properties of these closely-related cell types. Future studies will have to address whether, and how, these cellular properties correlate with the in vivo behavior after transplantation.

Roman, L., et al. (2019). "Is plastic ingestion in birds as toxic as we think? Insights from a plastic feeding experiment." Science of the Total Environment **665**: 660-667.

Plastic pollution is a modern tragedy of the commons, with hundreds of species affected by society's waste. Birds in particular mistake plastic for prey, and millions of wild birds carry small plastic loads in their stomach and are exposed to potential toxicological effects. It is currently unknown how severely the toxicological and endocrine disrupting chemicals in plastic affect avian development, reproduction and endocrine function. To address this question, we conducted multi-generational plastic feeding experiments to test the toxicological consequences of plastic ingestion at environmentally relevant loads in Japanese quail, Coturnix japonica, investigating parental and two filial generations. Contrary to expectations, we found no evidence of lasting toxicological effects on mortality, adult body weight, organ histology, hormone levels, fertility, hatch rates and eggshell strength in birds experimentally fed plastic. However, we found plastic ingestion causes higher frequencies of male reproductive cysts and minor delays in chick growth and sexual maturity, though without affecting ultimate survival or reproductive output. We report that although plastic ingestion causes detectable endocrine effects in our model species, our lack of finding mortality, morbidity and adverse reproductive outcomes may challenge the common hypothesis of severe toxicological harm and population-level effects when environmentally relevant loads of plastic are ingested.

Romeo, T., et al. (2016). "First record of plastic debris in the stomach of Mediterranean lanternfishes." Acta Adriatica **57**(1): 115-122.

This study highlights for the first time the presence of plastic debris in the stomachs of Mediterranean lanternfishes (Myctophidae): Electrona risso, Diaphus metopoclampus, Hygophum benoiti and Myctophum punctatum. Samples were collected in the central Mediterranean Sea between 2010 and 2014. Plastics ingested belonged to small microplastics (0.2 - 2 mm), large microplastics (2 - 5 mm) and mesoplastics (5 - 25 mm), having mainly clear colors. Their frequency of occurrence in stomachs was equal to 2.7%, but it increases to 5.8% if only migratory species are considered. The higher number of plastics was found in E. risso and H. benoiti (5 in both species). The plastic ingestion may represent a risk for vertical migrant lanternfishes due to the increase in buoyancy. Ecotoxicological aspects linked to the potential effects of contaminants on lanternfish biology and to the transfer of pollutants throughout the marine trophic web up to top predators should be deepened.Original Abstract: Ova studija istice

po prvi put prisutnost plasticnih otpadaka u zelucima mediteranskih zaboglavki. (Myctophidae): Electrona risso, Diaphus metopoclampus, Hygophum benoiti i Myctophum punctatum. Uzorci su prikupljeni u sredisnjem Mediteranu u periodu izmedu 2010. i 2014. godine. Progu tane cestice plastike pripadaju maloj mikroplastici (0,2-2 mm), velikoj mikroplastici (2-5 mm) i mezoplastici (5-25 mm), te su uglavnom jasnih boja. Njihova ucestalost pojavljivanja u probavilima iznosila je 2.7%, dok je kod migratornih vrsta iznosila 5.8%. Veci broj cestica plastike pronaden je kod vrsta E. risso i H. benoiti (5 po vrsti). Gutanje plastike moze predstavljati rizik za vertikalne migratore iz porodice zaboglavki zbog povecanja uzgona. Potrebno je produbiti istrazivanja ekotoksikoloskih aspekata povezanih s mogucim ucincima zagadivala na biologiju zaboglavki, kao i onih povezanih s prijenosom zagadivala kroz troficku mrezu u moru sve do glavnih grabezljivaca.

Romeo, T., et al. (2015). "First evidence of presence of plastic debris in stomach of large pelagic fish in the Mediterranean Sea." Marine Pollution Bulletin **95**(1): 358-361.

This study focuses, for the first time, on the presence of plastic debris in the stomach contents of large pelagic fish (Xiphias gladius, Thunnus thynnus and Thunnus alalunga) caught in the Mediterranean Sea between 2012 and 2013. Results highlighted the ingestion of plastics in the 18.2% of samples. The plastics ingested were microplastics (<5. mm), mesoplastics (5-25. mm) and macroplastics (>25. mm).These preliminary results represent an important initial phase in exploring two main ecotoxicological aspects: (a) the assessment of the presence and impact of plastic debris on these large pelagic fish, and (b) the potential effects related to the transfer of contaminants on human health. Copyright © 2015 Elsevier Ltd.

Romera-Castillo, C., et al. (2018). "Dissolved organic carbon leaching from plastics stimulates microbial activity in the ocean." Nature communications **9**(1): 1430.

Approximately 5.25 trillion plastic pieces are floating at the sea surface. The impact of plastic pollution on the lowest trophic levels of the food web, however, remains unknown. Here we show that plastics release dissolved organic carbon (DOC) into the ambient seawater stimulating the activity of heterotrophic microbes. Our estimates indicate that globally up to 23,600 metric tons of DOC are leaching from marine plastics annually. About 60% of it is available to microbial utilization in less than 5 days. If exposed to solar radiation, however, this DOC becomes less labile. Thus, plastic pollution of marine surface waters likely alters the composition and activity of the base of the marine food webs. It is predicted that plastic waste entering the ocean will increase by a factor of ten within the next decade, resulting in an increase in plastic-derived DOC that might have unaccounted consequences for marine microbes and for the ocean system.

Romero-Martinez, L., et al. (2017). "Assessment of imaging-in-flow system (FlowCAM) for systematic ballast water management." Science of the Total Environment **603-604**: 550-561.

Assessing the disinfection of ballast water and its compliance with international standards requires determining the size, viability, and concentration of planktonic organisms. The FlowCAM (Flow Cytometer and Microscope) is an Imaging Flow Cytometry designed to obtain the particle concentration, images, and quantitative morphologic information. The objective in this paper is to establish the basis for transforming the FlowCAM from being a laboratory analyzer into a tool for systematic monitoring of ballast water. The capacity of the FlowCAM was evaluated by analyzing artificial microbeads, phytoplankton monocultures, and real seawater samples. Microbead analyses reported high accuracy and precision in size and concentration measurements. Monoculture analyses showed the effect of disinfection treatments in cell appearance and growth. Low concentration and heterogeneity of particles in real seawater

analyses require the comprehensive observation of images by experts. Additionally, some physical characteristics of the device must be improved. The optimization of device configuration enables the quick transferring of files and information between parties involved in ballast water management. FlowCAM may become a feasible technology for this after the device and protocols are adapted.

Ronda, A. C., et al. (2019). "Synthetic microfibers in marine sediments and surface seawater from the Argentinean continental shelf and a Marine Protected Area." Marine Pollution Bulletin **149 (no pagination)**(110618).

In this work, samples were collected from the Argentinean continental shelf -including a Marine Protected Area (MPA) - to assess the occurrence and distribution of synthetic microfibers (MFs), a widespread type of microplastic. MFs were present at 100% of the samples showing an average concentration of 182.85 +/- 115.14 particles per Kg of dry sediment and 0.14 +/- 0.08 items per m³ of marine water. MFs less than 1 mm were the most abundant (56.4% and 63%, for sediment and surface seawater respectively), followed by 1-2 mm and then 2-3 mm. In regards to the colour, both sediments and water had the major percentage of black MFs (25.6% and 28%, respectively) and the lowest one of green MFs (2.5% and 3%, respectively). Finally, MFs content in sediments was inversely correlated with depth (r = -0.93, p < 0.05). These findings provide the first evidence of microplastic contamination at the Argentinean continental shelf. Copyright © 2019

Roppel, R. M. and E. W. Retzlaff (1975). "A technique for evaluating blood perfusion rate in muscle and visceral organs." Biophysical Journal **15**(2 II): 246A.

In efforts to develop a means for evaluating relative rates of blood perfusion through solid tissues, microbead thermistors of special construction were implanted via small hypodermic needles in muscle and visceral organs of hamsters. Both normal animals and a strain bearing hereditary muscular dystrophy were used, the general purpose being to test the hypothesis that the muscle disease is causally related to a defect in vascular control mechanisms. The thermistors were powered by a constant current source to operate in the self heating mode, the voltage drop across the thermistor being taken as a measure of blood perfusion rate in the vicinity of the bead. This potential was recorded as a function of time, while the instrumented hamsters were administered a variety of naturally occurring and synthetic vasoactive substances. Results of these studies are described and the potential of this kind of probe as a diagnostic tool is discussed.

Rosa, D. S., et al. (2009). "Role of polyethylene-graft-glycidyl methacrylate compatibilizer on the biodegradation of poly(Delta *e-caprolactone)/cellulose acetate blends." Polymers for Advanced Technologies **20**(12): 863-870.

Biodegradable polymers provide an attractive solution to reduce environmental pollution caused by the accumulation of plastic waste in landfills. In this study, the effect of polyethylene-graft-glycidyl methacrylate (PE-g-GMA) on the biodegradation of blends of poly(Delta *e-caprolactone) (PCL) and cellulose acetate (CA) (80/20, 60/40, 40/60, and 20/80 PCL/CA, w/w) was assessed by mass retention, tensile strength, and morphological properties. The principal fungal strains present in the soil after biodegradation were also identified. PCL and the blends containing 60% and 80% PCL showed greater mass loss and superficial change in simulated soil. PE-g-GMA increased the tensile strength retention during 3 months of aging in simulated soil. Scanning electron microscopy (SEM) indicated that pure PCL was more porous, which enhanced the hydrolysis and biodegradation of PCL. PE-g-GMA decreased the mass loss of the polymers, possibly by enhancing the interaction between PCL and CA, with the formation of hydrogen bonds between the carbonyl groups of PCL and the hydroxyl groups of CA. This effect was marked in blends with >40% PCL. Microbiological analysis revealed the presence of several species of fungi in the soil.

Rosas, M. A. C. (2018). "FACTORES AMBIENTALES DETERMINANTES DE SALUD EN LOS HABITANTES DE LA COLONIA AMERICAS III, CHETUMAL." Revista Internacional de Contaminacion Ambiental = International Journal of Environmental Pollution **34**: 472.

En la ciudad de Chetumal, Quintana Roo, la colonia Las Américas III es una de las más cercanas al sitio de disposición final de los residuos sólidos de la ciudad. Ubicada apenas a los reglamentarios 500 metros de distancia, inicia la colonia cuyas vías cargadas de residuos, cuentan la evidencia del paso continuo de los camiones recolectores por la colonia para llegar a su destino final. A simple vista se puede apreciar basura, perros y gatos en la calle, una gran cantidad de polvo, pero no se tienen datos precisos sobre las cantidades, ni de fauna o polvo, con la que los habitantes de esta colonia tienen que vivir y convivir en su día a día. Justificación Considerando las condiciones ambientales evidentes a simple vista en la colonia, esta investigación es una primera aproximación hacia el conocimiento de la cantidad de perros en situación de calle, heces fecales en la vía pública, así como caracterización y estimación de la cantidad de polvo a la que está expuesta la población de la colonia. Estos datos serán contrastados con datos perceptuales de la misma población sobre su estado de salud y estadísticos del sector salud. El tener conocimiento de las condiciones ambientales permitirá más adelante el diseño de estrategias que contribuyan a mejorar y mantener la salud de la población. Objetivo: Identificar y cuantificar diversos factores ambientales que potencialmente inciden en la salud de la población de la colonia Américas III, en la ciudad de Chetumal, Quintana Roo. Objetivos específicos: Estimar la población canina en situación de calle por unidad de área en la colonia Las Américas III. Estimar la cantidad y características de excretas en la vía pública por unidad de área en la colonia Las Américas III. Cuantificar y caracterizar el cantidad de polvo por unidad de área, acumulable en una semana, en la colonia Las Américas III. Determinar mediante encuestas, la percepción de salud e incidencia de enfermedades de los habitantes de la colonia Las Américas III. Metodología: La investigación se desarrolló en tres etapas: la primera consistente en la elaboración de los instrumentos para colecta de datos de campo, consistentes en una cédula para el censo de población canina, una cédula para cuantificación e identificación de características de excretas en vía pública, el diseño de los cuadrantes para caracterización de polvo, así como el diseño del cuestionario dirigido a la población y métodos de muestreo. La segunda etapa consistió en el trabajo de campo, realizado en un periodo de cuatro semanas, entre los meses de marzo y abril, en los que se realizaron cuatro visitas (una por semana) para el conteo de excretas y perros, así como la aplicación de las encuestas, colocación y posterior recoja de las trampas de polvo. La tercera etapa consistió en el vaciado, análisis de información y elaboración del reporte final. Resultados. Lo resultados preliminares nos indican que hay diferentes densidades de perros por calle, teniendo el mayor número en la zona norte de la colonia, la más cercana al sitio de disposición final de residuos y los menores en la porción sureste de la colonia, es decir el área más alejada. En cuanto a composición del polvo encontrado se pudo observar presencia de ácaros, pelo de animales y de humanos, arenas, parásitos (lombrices), mosquitos, mosquitas, microfibras, microplásticos, fragmentos de hueso, carbón e incluso fue posible determinar la presencia de bacterias por medio de tinción. En lo que se refiere a las encuestas, en principio los habitantes comentan estar saludables, sin embargo reportan afecciones frecuentes de alergias, infecciones respiratorias, intestinales y se quejan de los frecuentes problemas por malos olores, moscas, humos (cuando el basurero se incendia), e incluso ya han identificado las “temporadas” de los mismos. Conclusiones: La presencia de animales en situación de calle, fecalismo animal al aire libre y la cercanía al sitio de disposición final de residuos de la ciudad, constituyen fact res ambientales determinantes en el deterioro de la salud de los habitantes de la Colonia. La presencia de patógenos, alérgenos y micro-plásticos, así como bacterias en el polvo ambiental, definitivamente se puede asociar a los padecimientos referidos por la población, sin embargo, es necesario realizar otro tipo de análisis (bacteriológico) y llevar un control en mayores escalas de tiempo, por ejemplo en las diferentes estaciones del año, para poder determinar relaciones de estacionalidad y definir los patrones que refieren los habitantes sobre las diferentes “temporadas” de los factores ambientales.

Rose, D. and M. Webber (2019). "Characterization of microplastics in the surface waters of Kingston Harbour." Science of the Total Environment **664**: 753-760.

Microplastic contamination of the marine environment has garnered global attention in recent years, and its distribution and effects in many small island developing states (SIDS) are still undetermined. As such, this study serves to detail an investigation of the abundance, spatial distribution and characteristics of surface water microplastics in the Kingston Harbour, a heavily polluted embayment in Jamaica. Fortnightly sampling with a manta trawl (335mum mesh) revealed non-variable concentrations of 0-5.73 particles/m³ (0-2,697,674.13 particles/km²) across stations adjacent to mangrove forests, key nursery grounds for many commercially important finfish and shellfish. Microplastics found in samples were predominantly fragments and were between 1mm and 2.5mm. Fourier Transform Infrared (FT-IR) spectroscopy identified polyethylene and polypropylene in fragments selected for analysis. These data serve to establish a crucial baseline of the status of microplastic pollution in Kingston Harbour.

Rosenbaum, J., et al. (2012). "Cardiac cirrhosis and hepatocellular carcinoma in a 13-year-old treated with doxorubicin microbead transarterial chemoembolization." Journal of Paediatrics & Child Health **48**(3): E140-143.

Increasing numbers of children are surviving into adulthood following surgery to correct or palliate congenital heart disease. This surgery can occasionally result in long-standing elevated right heart pressures and chronic hepatic venous congestion leading to cardiac cirrhosis. We report the first paediatric case of hepatocellular carcinoma in the setting of cardiac cirrhosis. A 13-year-old girl developed inoperable hepatocellular carcinoma and was treated with transarterial embolization with lipiodol and doxorubicin eluting microbeads. Promoting awareness of this association, even in younger patients, will hopefully result in better surveillance and screening of hepatic complications in survivors of complex cardiac surgery.

Rosenberger, S., et al. (2011). "Principles of an enhanced MBR-process with mechanical cleaning." Water Science & Technology **64**(10): 1951-1958.

Up to date, different physical and chemical cleaning protocols are necessary to limit membrane fouling in membrane bioreactors. This paper deals with a mechanical cleaning process, which aims at the avoidance of hypochlorite and other critical chemicals in MBR with submerged flat sheet modules. The process basically consists of the addition of plastic particles into the loop circulation within submerged membrane modules. Investigations of two pilot plants are presented: Pilot plant 1 is equipped with a 10 m(2) membrane module and operated with a translucent model suspension; pilot plant 2 is equipped with four 50 m(2) membrane modules and operated with pretreated sewage.

Ross, P. S. and C. Morales-Caselles (2015). Out of sight, but no longer out of mind: Microplastics as a global pollutant. **11:** 721-722.

The article reports on the growing problem of global microplastic contamination. Topics discussed include the impact of microplastic debris on marine ecology, the types of microplastics and the sources of microplastics to aquatic environments. Also discussed are the international agreements established to control microplastic pollution and the three levels of actions that the global community should take to combat microplastic contamination.

Rossi, J., et al. (2017). "Polyfunctional anti-CD19 CAR T cells determined by single-cell multiplex proteomics associated with clinical activity in patients with advanced non-Hodgkin's lymphoma." Cancer Research. Conference: American Association for Cancer Research Annual Meeting **77**(13 Supplement 1).

Introduction: Autologous anti-CD19 CAR T cells have shown promising clinical efficacy in B cell malignancies, with T cell expansion and blood levels for IL-15, IL-10 and Granzyme B as correlates of objective response and toxicity (Kochenderfer et al. J Clin Oncol 2016; 34:LBA3010). It is unclear, however, which key immune programs in CAR T cells impact their in vivo expansion and clinical outcome. We evaluated in detail the functionality of anti-CD19 CAR T cells by using single-cell proteomics analysis (Lu et al. PNAS 2015;113:607-615). We explored how the polyfunctionality of pre-infusion CAR T cell products, post-stimulation with the CD19 antigen in vitro, associated with CAR T cell expansion in vivo and objective response. Method(s): Product T cells were separated into CD4+ or CD8+ T cell subsets using microbeads. CD4+ or CD8+ fractions were then co-cultured with CD19-K562 targets or NGFR-K562 control cells, at a 1:2 ratio for 20 hrs. Single cells were then analyzed using a 32-plex panel of secreted cytokines, chemokines, and cytotoxic molecules. Specifically, T cells were loaded onto a single-cell barcode chip capable of assaying 32 secreted proteins/cell. The polyfunctional profile and strength (pSI) of each sample was determined (Ma et al. Cancer Discov 2013;3:418-429) and analyzed relative to in vivo expansion of the CAR T cells and patient response to the CAR T cell therapy. CAR T cell expansion in blood was measured by quantitative PCR. Result(s): Single-cell pSI of patient CAR T cells showed a statistically significant association ($p = 0.011$) with objective response (complete or partial response) to the therapy. While product pSI showed variability across patients, the median pSI was 2+ times higher for responders versus non-responders. The polyfunctional profiles for both CD4+ and CD8+ cells were dominated by effector molecules, stimulatory cytokines and chemokines. Polyfunctional CD4+ and CD8+ subsets with IFN-gamma, IL-8 and/or MIP-1alpha correlated best with patient outcome, with CD8+ T cells showing co-expression of Granzyme B, and CD4+ T cells also comprising IL-17A+IL8+ and IL5+IL8+ subsets. While CAR expansion in vivo also correlated with objective response ($p = 0.032$), the association between product pSI and CAR cell expansion in vivo did not reach statistical significance ($p = 0.079$), suggesting that they bring independent contributions to predicting objective response. In support of that, a composite index integrating pSI and CAR T cell expansion in vivo associated best with clinical response ($p = 0.005$). Conclusion(s): Polyfunctionality of CAR T cells, in conjunction with their expansion in vivo, correlates with clinical outcome in an anti-CD19 CAR T cell clinical trial. Single-cell multiplexed proteomics measurements may provide powerful insight into the clinical performance of CAR T cell products.

Rossol, M. and D. Hinkamp (2001). "Hazards in the theater." Occupational Medicine **16**(4): 595-608, iv.

The authors offer a survey of the myriad and unique safety and health hazards faced past and present by performers and theatrical workers, from preproduction work, through the show, and during the strike (dismantling). Special emphasis is given to health hazards posed by the many new plastic resin systems and adhesives used in set, prop, and costume construction; the hazards of special-effect fogs, smokes, haze, dusts, and pyrotechnic emissions; and theatrical makeup. [References: 72]

Rotjan, R. D., et al. (2019). "Patterns, dynamics and consequences of microplastic ingestion by the temperate coral, Astrangia poculata." Proceedings of the Royal Society of London - Series B: Biological Sciences **286**(1905): 20190726.

Microplastics (less than 5 mm) are a recognized threat to aquatic food webs because they are ingested at multiple trophic levels and may bioaccumulate. In urban coastal environments, high densities of microplastics may disrupt nutritional intake. However, behavioural dynamics and consequences of microparticle ingestion are still poorly understood. As filter or suspension feeders, benthic marine invertebrates are vulnerable to microplastic ingestion. We explored microplastic ingestion by the temperate coral Astrangia poculata. We detected an average of over 100 microplastic particles per polyp in wild-captured colonies from Rhode Island. In the laboratory, corals were fed microbeads to characterize ingestion preference and retention of microplastics and consequences on feeding behaviour. Corals were fed biofilmed microplastics to test whether plastics serve as vectors for microbes. Ingested microplastics were apparent within the mesenterial tissues of the gastrovascular cavity. Corals preferred microplastic beads and declined subsequent offerings of brine shrimp eggs of the same diameter, suggesting that microplastic ingestion can inhibit food intake. The corals co-ingested Escherichia coli cells with microbeads. These findings detail specific mechanisms by which microplastics threaten corals, but also hint that the coral A. poculata, which has a large coastal range, may serve as a useful bioindicator and monitoring tool for microplastic pollution.

Rowdhwal, S. S. S. and J. Chen (2018). "Toxic Effects of Di-2-ethylhexyl Phthalate: An Overview." BioMed Research International **2018**: 1750368.

Di-2-ethylhexyl phthalate (DEHP) is extensively used as a plasticizer in many products, especially medical devices, furniture materials, cosmetics, and personal care products. DEHP is noncovalently bound to plastics, and therefore, it will leach out of these products after repeated use, heating, and/or cleaning of the products. Due to the overuse of DEHP in many products, it enters and pollutes the environment through release from industrial settings and plastic waste disposal sites. DEHP can enter the body through inhalation, ingestion, and dermal contact on a daily basis, which has raised some concerns about its safety and its potential effects on human health. The main aim of this review is to give an overview of the endocrine, testicular, ovarian, neural, hepatotoxic, and cardiotoxic effects of DEHP on animal models and humans in vitro and in vivo.

Roy, E., et al. (2014). "From cellular lysis to microarray detection, an integrated thermoplastic elastomer (TPE) point of care Lab on a Disc." Lab on a Chip **15**(2): 406-416.

We present an all-thermoplastic integrated sample-to-answer centrifugal microfluidic Lab-on-Disc system (LoD) for nucleic acid analysis. The proposed CD system and engineered platform were employed for analysis of Bacillus atrophaeussubsp. globigiispores. The complete assay comprised cellular lysis, polymerase chain reaction (PCR) amplification, amplicon digestion, and microarray hybridization on a plastic support. The fluidic robustness and operating efficiency of the assay were ensured through analytical optimization of microfluidic tools enabling beneficial implementation of capillary valves and accurate control of all flow timing procedures. The assay reliability was further improved through the development of two novel microfluidic strategies for reagents mixing and flow delay on the CD platform. In order to bridge the gap between the proof-of-concept LoD and production prototype demonstration, low-cost thermoplastic elastomer (TPE) was selected as the material for CD fabrication and assembly, allowing the use of both, high quality hot-embossing and injection molding processes. Additionally, the low-temperature and pressure-free assembly and bonding properties of TPE material offer a pertinent solution for simple and efficient loading and storage of reagents and other on-board components. This feature was demonstrated through integration and conditioning of microbeads, magnetic discs, dried DNA buffer reagents and spotted DNA array inserts. Furthermore, all microfluidic functions and plastic parts were designed according to the current injection mold-making knowledge for industrialization purposes. Therefore, the current work highlights a seamless strategy that promotes a feasible path for the transfer from prototype toward realistic industrialization. This work aims to establish the full potential for TPE-based centrifugal system as a mainstream microfluidic diagnostic platform for clinical diagnosis, water and food safety, and other molecular diagnostic applications.

Roy, P. K., et al. (2011). "Degradable polyethylene: fantasy or reality." Environmental Science & Technology **45**(10): 4217-4227.

Plastic waste disposal is one of the serious environmental issues being tackled by our society today. Polyethylene, particularly in packaging films, has received criticism as it tends to accumulate over a period of time, leaving behind an undesirable visual footprint. Degradable polyethylene, which would enter the eco-cycle harmlessly through biodegradation would be a desirable solution to this problem. However, the "degradable polyethylene" which is presently being promoted as an environmentally friendly alternative to the nondegradable counterpart, does not seem to meet this criterion. This article reviews the state of the art on the aspect of degradability of polyethylene containing pro-oxidants, and more importantly the effect these polymers could have on the environment in the long run. On exposure to heat, light, and oxygen, these polymers disintegrate into small fragments, thereby reducing or increasing the visual presence. However, these fragments can remain in the environment for prolonged time periods. This article also outlines important questions, particularly in terms of time scale of complete degradation, environmental fate of the polymer residues, and possible accumulation of toxins, the answers to which need to be established prior to accepting these polymers as environmentally benign alternatives to their nondegradable equivalents. It appears from the existing literature that our search for biodegradable polyethylene has not yet been realized.

Roy, S. and K. M. Manjanna (2012). "Formulation and evaluation of guar gum glipizide microspheres for oral controlled release drug delivery." International Journal of Pharmaceutical Research **4**(4): 85-91.

The successful optimization and development of drug entity, design of dosage form then plays important role. In the present research work, guar gum microspheres containing glipizide were prepared by emulsification cross-linking method using polyvinyl alcohol coating polymer and glutaraldehyde as a cross-linking agent. No significant drug-polymer interactions and physical state of the drug in the formulation were observed by Fourier infrared spectroscopy and differential scanning calorimetry. The shape and surface characteristics were determined by scanning electron microscopy. Particle size distribution was determined by standard sieve analysis. Particle size, shape and surface morphology, swelling ratio, drug entrapment efficiency and in-vitro release were significantly affected by concentration of guar gum and glutaraldehyde. The drug entrapment efficiency was obtained in the range of 81.30-94.24 %w/v. In-vitro drug release profile glipizide from microbeads was examined in simulated intestinal pH 7.4 at end of 12h. The mechanism of drug release from guar gum and polyvinyl alcohol microspheres was diffusion controlled followed by First order kinetics and whereas coated microspheres approaching to near Zero- order kinetics.

Rozenstein, O., et al. (2017). "Development of a new approach based on midwave infrared spectroscopy for post-consumer black plastic waste sorting in the recycling industry." Waste Management **68**: 38-44.

Waste sorting is key to the process of waste recycling. Exact identification of plastic resin and wood products using Near Infrared (NIR, 1-1.7micro m) sensing is currently in use. Yet, dark targets characterized by low reflectance, such as black plastics, are hard to identify by this method. Following the recent success of Midwave Infrared (MWIR, 3-12micro m) measurements to identify coloured plastic polymers, the aim of this study was to assess whether this technique is applicable to sorting black plastic polymers and wood products. We performed infrared reflectance contact measurements of 234 plastic samples and 29 samples of wood and paper products. Plastic samples included black, coloured and transparent Polyethylene Terephthalate (PET), Polyethylene (PE), Polyvinyl Chloride (PVC), Polypropylene (PP), Polylactic acid (PLA) and Polystyrene (PS). The spectral signatures of the black and coloured plastic samples were compared with clear plastic samples and signatures documented in the literature to identify the polymer spectral features in the presence of coloured material. This information was used to determine the spectral bands that best suit the sorting of black plastic polymers. The main NIR-MWIR absorption features of wood, cardboard and paper were identified as well according to the spectral measurements. Good agreement was found between our measurements and the absorption features documented in the literature. The new approach using MWIR spectral features appears to be useful for black plastics as it overcomes some of the limitations in the NIR region to identify them. The main limitation of this technique for industrial applications is the trade-off between the signal-to-noise ratio of the sensor operating in standoff mode and the speed at which waste is moved under the sensor. This limitation can be resolved by reducing the system's spectral resolution to 16cm⁻¹, which allows for faster spectra acquisition while maintaining a reasonable signal-to-noise ratio.

Ruan, J., et al. (2018). "Controlling measures of micro-plastic and nano pollutants: A short review of disposing waste toners." Environment International **118**: 92-96.

Micro-plastic and nano-particle have been the focal pollutants in environmental science. The printer toner is omitted micro-plastic and nano pollutant. It is comprised of micro polyacrylate styrene and nano-Fe<inf>3</inf>O<inf>4</inf> particles. Polyacrylate styrene and nano-metal were proved to be irreversibly toxic to biological cells. Therefore, toners have the potential environmental risk and healthy harm due to include micro plastics and nano-metal. To our knowledge, few studies provided the specific collection and treatment of micro-plastic pollutant. This paper has chosen a kind of micro-plastic and nano pollutant toxic toner and provided technical guidance and inspiration for controlling the micro-plastic and nano pollutants. The method of vacuum-gasification-condensation was adopted for controlling the micro-plastic and nano pollutant toner. We believe this review will open up a potential avenue for controlling micro-plastic and nano pollutants for environmental protection. Copyright © 2018 Elsevier Ltd

Ruan, W., et al. (2007). "Nanobarcode gene expression monitoring system for potential miniaturized space applications." Advances in Space Research **40**(4): 513-522.

Manned mission to space has been threatened by various cosmos risks including radiation, mirogravity, vacuum, confinement, etc., which may cause genetic variations of astronauts and eventually lead to damages of their health. Thus, the development of small biomedical devices, which can monitor astronaut gene expression changes, is useful for future long-term space missions. Using magnetic microbeads packed with nanocrystal quantum dots at controlled

ratios, we were able to generate highly multiplexed nanobarcodes, which can encode a flexible panel of genes. Also, by using a reporter quantum dot, this nanobarcode platform can monitor and quantify gene expression level with improved speed and sensitivity. As a comparison, we studied TGF-β1 induced transcription changes in human bone marrow mesenchymal stem cells with both the nanobarcode microbead system and the Affymetrix GeneChip ® HTA system, which is currently considered as the industrial standard. Though using only 1/20 of the sample RNA, the nanobarcode system showed sensitivity equivalent to Affymetrix GeneChip ® system. The coefficient of variation, dynamic range, and accuracy of the nanobarcodes measurement is equivalent to that of the GeneChip ® HTA system. Therefore, this newly invented nanobarcode microbead platform is thought to be sensitive, flexible, cost-effective and accurate in a level equivalent to the conventional methods. As an extension of the use of this new platform, spacecrafts may carry this miniaturized system as a diagnostic tool for the astronauts. © 2007.

Ruan, Y., et al. (2019). "A preliminary screening of HBCD enantiomers transported by microplastics in wastewater treatment plants." Science of the Total Environment **674**: 171-178.

Hexabromocyclododecane (HBCD), a commonly used flame retardant, causes public concern due to its potential negative effects on organisms. Microplastics are suspected to contain certain amounts of HBCD. Wastewater treatment plants (WWTPs) are believed to be one of the largest sources of microplastics and a sink for micropollutants, providing opportunities for interactions between them, especially for hydrophobic micropollutants such as HBCD. There is a lack of studies focusing on the prevalence of microplastics and HBCD they carry. The present study investigated two typical WWTPs in Hong Kong, Stonecutters Island WWTP (SCI) and Shek Wu Hui WWTP (SWH), which employ different treatment technologies. The abundance of microplastics decreased with the treatment flow, and the microplastic concentrations in effluent were at intermediate levels (0.40 and 0.27particles/L) compared with the levels reported in previous studies. The concentrations of HBCD transported by microplastics reached 4184.4 ng/g in the effluent, whereas that in sewage water (dissolved phase) was 0.8 pg/L. For microplastics, 7.32 x 10⁷ and 2.24 x 10⁷ particles per day were estimated to be released from SCI and SWH, respectively into the environment; the release of HBCD carried by microplastics potentially reached 15.5 g per day, whereas the dissolved HBCD in the effluent may reach 0.067 g per day. A preliminary risk assessment of HBCD transported by microplastics showed that HBCD posed negligible risk; nevertheless, attention should be paid to the continual discharge of microplastics from WWTPs. Copyright © 2019 Elsevier B.V.

Rubin, J. P., et al. (2007). "Collagenous microbeads as a scaffold for tissue engineering with adipose-derived stem cells." Plastic & Reconstructive Surgery **120**(2): 414-424.

BACKGROUND: Standard approaches to soft-tissue reconstruction include autologous tissue flaps and alloplastic implants. Both of these approaches have disadvantages, including donor-site morbidity, implant migration, and foreign body reaction. Autologous fat transplantation, with a minimally invasive cannula harvest, has lower donor-site morbidity than tissue flaps do, but there is an unpredictable degree of resorption of the transplanted fat over time. Adipose-derived stem cells isolated from harvested fat are better able to withstand the mechanical trauma from the suction cannula and may allow for improved cell survival and generation of new fat tissue after transfer to another anatomic site. The authors hypothesized that porous collagenous microbeads (CultiSphers; Sigma, St. Louis, Mo.) could be useful as injectable cell delivery vehicles for adipose-derived stem cells. This strategy would allow induction of differentiation ex vivo and precise placement of cells and scaffold in a tissue bed. The objective of this study was to assess the ability of the stem cells to proliferate and differentiate on these microbeads.

METHODS: Adipose-derived stem cells were isolated from discarded human adipose tissue and cultured on porous collagenous microbeads in a stirred bioreactor (spinner flask). The cells attached and proliferated on the microbeads and maintained high viability over several weeks of culture.

RESULTS: When exposed to adipogenic or osteogenic medium, the cells differentiated into adipocytes and osteoblasts, respectively, while attached to the microbeads.

CONCLUSION: Collagenous microbeads are a favorable scaffold for adipose-derived stem cells, allowing ex vivo proliferation and differentiation on particles that are small enough to be injected.

Rubio, L., et al. (2019). "Potential adverse health effects of ingested micro- and nanoplastics on humans. Lessons learned from in vivo and in vitro mammalian models." Journal of Toxicology & Environmental Health Part B: Critical Reviews: 1-18.

In recent years, increasing global attention has focused on "microplastics" (MPs) and "nanoplastics" (NPs) resulting in many studies on the effects of these compounds on ecological and environmental aspects. These tiny particles (<5000 micro m), predominantly derived from the degradation of plastics, pollute the marine and terrestrial ecosystems with the ability to enter into the food chain. In this manner, human consumption of food contaminated with MPs or NPs is unavoidable, but the related consequences remain to be determined. The aim of this review is to complement previous reviews on this topic by providing new studies related to exposure, absorption, and toxicity in mammalian in vivo and in vitro systems. With respect to novel information, gaps and limitations hindering attainment of firm conclusions as well as preparation of a reliable risk assessment are identified. Subsequently, recommendations for in vivo and in vitro testing methods are presented in order to perform further relevant and targeted research studies.

Rubio-Palis, Y., et al. (2017). "Population fluctuations of Aedes aegypti (Diptera: Culicidae) and dengue cases in 6 municipalities of Aragua state, Venezuela." Boletin de Malariologia y Salud Ambiental **57**(1): 1-16.

Aragua State, located in north-central Venezuela, is considered hyperendemic for dengue virus transmission, with circulation of Chikungunya and Zika viruses since 2014. In order to investigate the impact of water supply and climate variability on inmature Aedes aegypti populations and dengue cases, a longitudinal study was conducted in 6 localities situated in 6 different municipalities during 13 months. During the study, 2,296 houses were visited and 9,358 containers were examined for larvae and pupae. The Aedes house index was not homogeneous spatially or temporarily with significant differences among locations (P<0.0001). The 200 L drums were the most frequent type of containers found (82.3%), followed by tanks of 1,000 L or more (9.05%), 12 L containers (4.98%), various types (2.13%) (tires, cans, small plastic waste containers, plant pots, etc.), and 100 L containers (1.58%). During the study 69,765 larvae and 6,896 pupae were collected. The overall container index was 18.63%; tanks of >=1000 L had the highest larvae index per positive container (63.84) while containers of various types had the highest pupae index per positive container (8.03%). Cryptic larval habitats were not observed. Deficiencies in piped water supply was closely related to high Aedes indices. There was significant correlation between monthly total dengue cases and rainfall with lags of one, two and three months in each municipality. The correlations between monthly Ae. aegypti abundance (larvae and pupae, container ratios, container index), climate parameters (monthly rainfall, mean monthly temperature, mean minimum monthly temperature and maximum temperature) and dengue incidence were not significant (P>0.05). Although the container, house and Breteau indices can be used to evaluate the elimination of containers, they are not relevant for the prediction of dengue outbreaks.

Ruddock, J. (2008). "Pub talk gives a measure of progress on plastics." Materials Recycling Week **191**(26): 3-3.

The article comments on developments in plastic recycling in Great Britain. Better designed packaging has made a major contribution to avoiding plastic waste through light-weighting and re-use of materials. Consumers and businesses have an option of using improved technology and developing new facilities towards plastic recycling. Progress in recycling is evident in the increasing number of recycled plastic bottles with more than 90 percent of the region's local authorities offering some kind of plastics recycling service.

Ruiz-Compean, P., et al. (2017). "Baseline evaluation of sediment contamination in the shallow coastal areas of Saudi Arabian Red Sea." Marine Pollution Bulletin **123**(1-2): 205-218.

Despite the growing recognition of the importance of water and sediment quality there is still limited information on contamination levels in many regions globally including the Red Sea. This study provides a comprehensive assessment of three classes of contaminants (Polycyclic Aromatic Hydrocarbons - PAH; metals; plastics) in coastal sediments along the Saudi Arabian Red Sea mainly collected using grabs. Background concentrations are provided for metals in the region. Concentrations of metals and PAH were generally low in comparison to international guidelines. A clear relationship between the concentration of metals and anthropogenic sources was not always apparent and dust and vegetation may be relevant players in the region. Microplastic items (mainly polyethylene) were abundant (reaching up to 1gm⁻² and 160piecesm⁻²) and in general associated with areas of high human activity. This study provides critical information for future monitoring and the development of national policies within the Red Sea region.

Ruiz-Medina, A. and E. J. Llorent-Martinez (2012). Flow optosensing applied to the analysis of trace elements, Nova Science Publishers, Inc.**:** 31-54.

The determination of trace amounts of inorganic ions is of growing interest in several fields including environmental analysis, process control, biology, medicine, etc., and there is now a particular need for simple and fast field analytical tests. In contrast to well-established laboratory methods, such as atomic absorption or emission spectrometry, mass spectrometry or voltammetry, chemical sensors have attracted a great deal of interest in the last decade because of their great potential for in the field, in situ, continuous and remote, if required, applications. Flow-through optosensing emerged from the combination of Solid-Phase Spectroscopy (SPS) and Flow Injection Analysis (FIA). In SPS, an active solid support is used to pre-concentrate the target analyte and its spectroscopic detection is performed on the same solid support microbeads. The most remarkable features of SPS are its high sensitivity (it can be easily increased one hundred-fold due to the concentration of the target analyte on the solid beads) and selectivity (the interaction between the target chemical species and the solid phase beads is usually different from that one of co-existing species). In addition, the implementation of SPS in flow methods of analysis adds the inherent advantages of flow analysis, improving the analytical methods in terms of rapidity, commodity, automation, less consumption of reagents, etc. In these flow optosensors, the (micro) zone of the solid phase, where the signal is continuously monitored, is surrounded by a continuous stream flowing through it. The separation and retention of the species of interest on the solid phase takes place in the detection area itself and the spectroscopic determination is simultaneously performed. In this chapter, we will first describe the fundamentals of SPS from its origin, including some relevant examples. After that, we will focus on the versatility and potential of flow-through optosensing for the analysis of trace elements in a wide variety of samples related to human health, such as clinical samples (drugs, urine, and serum), food or environmental waters, emphasizing the most recent advances and future trends in this field. 2012 Nova Science Publishers, Inc. All rights reserved.

Ruiz-Orejon, L. F., et al. (2016). "Floating plastic debris in the Central and Western Mediterranean Sea." Marine Environmental Research **120**: 136-144.

In two sea voyages throughout the Mediterranean (2011 and 2013) that repeated the historical travels of Archduke Ludwig Salvator of Austria (1847-1915), 71 samples of floating plastic debris were obtained with a Manta trawl. Floating plastic was observed in all the sampled sites, with an average weight concentration of 579.3 g dw km(-2) (maximum value of 9298.2 g dw km(-2)) and an average particle concentration of 147,500 items km(-2) (the maximum concentration was 1,164,403 items km(-2)). The plastic size distribution showed microplastics (<5 mm) in all the samples. The most abundant particles had a surface area of approximately 1 mm(2) (the mesh size was 333 mum). The general estimate obtained was a total value of 1455 tons dw of floating plastic in the entire Mediterranean region, with various potential spatial accumulation areas.

Ruiz-Orejon, L. F., et al. (2018). "Now, you see me: High concentrations of floating plastic debris in the coastal waters of the Balearic Islands (Spain)." Marine Pollution Bulletin **133**: 636-646.

Coastal ecosystems are under significant human pressure, partly due to the proximity of pollution sources. In this study, a total of 20 samples were taken in summer around the coastal waters of the Balearic Islands (Spain) using a manta trawl net to examine the concentrations of floating plastic debris through the NIXE III project campaign. Although plastic concentrations showed high variability along the coast, the higher particle concentration (max: 4,576,115 items km⁻²) and weight (max: 8,102.94 g(DW) km⁻²) values were located at the north of the Balearic Promontory. The particle size analysis showed the high prevalence of microplastics (< 5mm) in these waters, where particles of approximately 0.7mm and 1mm² were the most frequent in the range analyzed. The high plastic concentration values in the N-NW coast of Ibiza and Mallorca in sparsely populated locations suggest that the plastic particle distribution was mostly conditioned by the hydrodynamic surface conditions.

Ruiz-Palacios, M., et al. (2020). "Establishment of a brain cell line (FuB-1) from mummichog (Fundulus heteroclitus) and its application to fish virology, immunity and nanoplastics toxicology." Science of the Total Environment **708**: 134821.

The marine fish mummichog (Fundulus heteroclitus), extensively used as research model, including in ecotoxicology, for over a century has been surpassed by other fish species. This fact may be associated with the lack of cell lines from this species, excellent models for the comprehension of fish physiology, immunology, toxicology and virology, that contribute to the reduction in the number of animals used in research. We have generated, for the first time, a brain-derived cell line from mummichog, FuB-1, and evaluated its application to the fields of fish virology, immunity and toxicology. First, FuB-1 cells show epithelial morphology and neural stem/astroglial origin. Secondly, FuB-1 cells effectively supports the replication of both spring viremia carp (SVCV) and infectious pancreatic necrosis (IPNV) viruses, but not nodavirus (NNV), indicating its potential use for fish virology. Related to this, FuB-1 cells infected with NNV up-regulate the transcription of genes related to the antiviral immune response, leading to cell resistance; while they are unaltered when infected with IPNV and SVCV, facilitating viral replication. Finally, FuB-1 cells were used for toxicological purposes and we demonstrated that

exposure to either polystyrene nanoplastics (PS-100) or several human-usage pharmaceuticals are cytotoxic. Additionally, PS-100 particles increase the antioxidant catalase and glutathione S-transferase activities and decrease the total non-protein thiols in FuB-1 cells. However, PS-100 particles are able to reduce the cytotoxic effects induced by the pharmaceuticals. In conclusion, we have generated a cell line from mummichog, which might represent a valuable model for fish studies in the fields of virology, immunology and toxicology.

Ruiz-Ruiz, J. C., et al. (2016). "Diospyros cuneata inhibition of Fusarium oxysporum: aqueous extract and its encapsulation by ionic gelation." Journal of Plant Pathology and Microbiology **7**(2).

The application of plant extracts to control fungal crop pathogens is an ecological strategy that could potentially be useful in agriculture. Aqueous extracts of some species of the genus Diospyros spp have been tested against fungal pathogens of crops. Nevertheless, there is no information about the inhibitory effect of aqueous extracts of Diospyros cuneata on the micelial growth of Fusarium oxysporum, a pathogen responsible for "Panama disease" and "vanilla stem rot disease". Therefore, the antifungal activity of aqueous extracts of Diospyros cuneata leaves collected during the dry and rainy seasons was tested in-vitro against spores of Fusarium oxysporum. Only the aqueous extract from leaves collected during the dry season had an inhibitory effect on the micelial growth of asexual spores (2.5% minimum inhibitory concentration). Phytochemical analysis showed that both aqueous extracts contained mainly flavonoids and tannins; the chromatographic profile showed a larger abundance of polar compounds in the dry season extract. Furthermore, the antifungal activity observed is probably correlated with the abundance of some secondary metabolites produced by water stress and dry season conditions. The bioactivity of aqueous extracts of Diospyros cuneata leaves could be stored and released through encapsulation; an effective example of this was tested using alginate-inulin to prepare microbeads by ionic gelation.

Ruj, B. and J. S. Chang (2012). "Combustible gases from thermal plasma treatment of plastic waste with special reference to mobile phone waste." International Journal of Plastics Technology **16**(2): 182-193.

Recently disposal and recycle of mobile phone becomes a significant problem throughout the world. Primordial recycling or disposal of mobile phone waste to landfills and incinerators causes irreversible environmental damage by polluting water and soil, and contaminating air. The disposal of mobile phones thus requires to be considered in an effective, economical and environmental friendly way. The present work describes the treatment of mobile phone waste by thermal plasma under reducing condition. Combustible reformed gas (CO, H sub(2) and hydrocarbons) having high calorific value was recovered. Generation of hydrogen gas and hydrocarbons are from the plastic part (whose major elements are carbon and hydrogen with some trace elements like oxygen and nitrogen) of the mobile phone waste. CO sub(2) generation is almost below the detection limit. No significant other toxic gases such as NO sub(x) and H sub(2)S were observed. For better understanding of treatment under reduced condition, experiments have also been done under argon-air gas mixture condition without mobile phone waste. The present investigation provides an option for energy recovery with volume reduction, reduction of toxic gases and potential recovery of precious metals present in the mobile phone waste.

Rummel, C. D., et al. (2019). "Effects of Leachates from UV-Weathered Microplastic in Cell-Based Bioassays." Environmental Science & Technology **53**(15): 9214-9223.

Standard ecotoxicological testing of microplastic does not provide insight into the influence that environmental weathering by, e.g., UV light has on related effects. In this study, we leached chemicals from plastic into artificial seawater during simulated UV-induced weathering. We tested largely additive-free preproduction polyethylene, polyethylene terephthalate, polypropylene, and polystyrene and two types of plastic obtained from electronic equipment as positive controls. Leachates were concentrated by solid-phase extraction and dosed into cell-based bioassays that cover (i) cytotoxicity; (ii) activation of metabolic enzymes via binding to the arylhydrocarbon receptor (AhR) and the peroxisome proliferator-activated receptor (PPARgamma); (iii) specific, receptor-mediated effects (estrogenicity, ERalpha); and (iv) adaptive response to oxidative stress (AREc32). LC-HRMS analysis was used to identify possible chain-scission products of polymer degradation, which were then tested in AREc32 and PPARgamma. Explicit activation of all assays by the positive controls provided proof-of-concept of the experimental setup to demonstrate effects of chemicals liberated during weathering. All plastic leachates activated the oxidative stress response, in most cases with increased induction by UV-treated samples compared to dark controls. For PPARgamma, polyethylene-specific effects were partially explained by the detected dicarboxylic acids. Since the preproduction plastic showed low effects often in the range of the blanks future studies should investigate implications of weathering on end consumer products containing additives.

Rummel, C. D., et al. (2016). "Plastic ingestion by pelagic and demersal fish from the North Sea and Baltic Sea." Marine Pollution Bulletin **102**(1): 134-141.

Plastic ingestion by marine biota has been reported for a variety of different taxa. In this study, we investigated 290 gastrointestinal tracts of demersal (cod, dab and flounder) and pelagic fish species (herring and mackerel) from the North and Baltic Sea for the occurrence of plastic ingestion. In 5.5% of all investigated fishes, plastic particles were detected, with 74% of all particles being in the microplastic (<5mm) size range. The polymer types of all found particles were analysed by means of Fourier transform infrared (FT-IR) spectroscopy. Almost 40% of the particles consisted of polyethylene (PE). In 3.4% of the demersal and 10.7% of the pelagic individuals, plastic ingestion was recorded, showing a significantly higher ingestion frequency in the pelagic feeders. The condition factor K was calculated to test differences in the fitness status between individuals with and without ingested plastic, but no direct effect was detected.

Rummler, S., et al. (2012). "Extracorporeal treatment of antibody mediated heart or lung transplant rejection." Journal of Heart and Lung Transplantation **1)**: S179.

Purpose: The immunological risk of acute rejection episodes increases particularly with retransplantations and with evidence of human leukocyte antigen antibodies (HLA-ab). Elevated panel reactive antibodies (PRA) prior to transplantation are the only factor with a significant impact on patient survival. Antibody mediated rejection (AMR) remains an unsolved problem and typically does not respond to conventional therapies. An essential pillar of antihumoral therapy are the extracorporeal procedures like plasma exchange (PE), and immunoadsorption (IA) because only they have the ability to quickly and effectively remove preformed or de novo tested antibodies. Methods and Materials: A total of 28 patients (3 patients prior to heart transplantation (HTX), 9 patients after HTX, 3 patients after combined heart and lung transplantation, 2 patients prior to lung transplantation (LuTX) and 11 after LuTX) were treated for prevention or in case of rejection with PE and/or IA. All patients were tested positive for HLAantibodies (HLA-ab) either donor specific or de novo HLA-ab. 6 patients were also tested positive for non HLA-ab, like PF4 antibodies. HLA-ab were detected using immunological tests like complement-dependent cytotoxicity assay (CDC), Enzyme-linked Immunosorbent Assay (ELISA) and microbead array assay (Luminex). Result(s): All heart transplant recipients treated with PE or IA prior to TX have a functioning graft. 6/8 HTX patients with AMR survived with stable graft function. 3 patients with combined H/LuTX developed hyperacute rejection. We used PE and IA to eliminate their non and/or HLA-ab completely. Those patients also survived with stable transplant function. 11/13 LuTX patients we treated have a functioning graft after successful reduction of non- and HLA-ab. One patient with HLA-ab (PRA 73%) suffered from primary graft dysfunction and the other patient suffered from severe sepsis. Both patients deceased. Conclusion(s): The extracorporeal procedures we performed are qualified for rescue therapy of hyperacute and acute rejection episodes.

Rummler, S., et al. (2010). "Desensitization is an efficient rescue therapy for rejection in immunized heart and lung transplant recipients." Tissue Antigens **75 (5)**: 585.

Peritransplant desensitization can be a useful treatment strategy for solid organ graft rejection in immunized patients. In this study, we report on 15 patients who were treated by therapeutic plasma exchange, immunoadsorption or immunofiltration with or without administration of intravenous immunoglobulin. 6 of the patients had received heart transplantation (HTX), 5 lung transplantation (LuTX), 2 combined H/LuTX, and 2 were sensitized patients on the waiting list. All patients had either preformed donorspecific or third party HLA-antibodies (HLA-ab), or de novo production of HLA-ab or non HLA-ab. HLA-ab were detected by immunological assays including the complement-dependent cytotoxicity assay (CDC), the Enzyme-linked Immunosorbent Assay (ELISA) and the microbead array assay (Luminex). Despite negative donor CDC cross matches, the 6 HTX patients developed rejection episodes. 3 of these patients had de novo production of HLA-ab, 1 had primary HLA-ab, 1 had third party HLA-ab and 1 had non HLA-ab. The latter two patients experienced hyperacute rejection episodes. In all 6 cases, we performed daily plasma exchange using SD-plasma with a single plasma volume at least 3 times. Acute rejection episodes > 21 days post-transplant were additionally treated by protein A immunoadsorption. Using these procedures, we were able to rescue the graft in 4 of the 6 patients. Of the 5 LuTX patients, 4 have a functioning graft after successful reduction of non HLA-ab (1 case), third party HLA-ab (1 case), preformed donor specific HLA-ab (1 case) and de novo HLA-ab (1 case). One patient with detection of non HLA-ab (anti-Cardiolipin) suffered from primary graft dysfunction and died. The 2 patients with combined H/LuTX developed hyperacute rejection because of preformed non HLA-ab. We eliminated the antibodies completely and both patients survived with stable transplant function. For the 2 patients on the waiting list, preformed HLA- and non HLA-ab were eliminated by our desensitization procedure, however one of the patients died without receiving a transplant. In conclusion, our protocols of desensitization by extracorporeal procedures are qualified for rescue therapy of hyperacute and acute rejections. Especially non HLA-ab may represent a group of alloantibodies that is often underestimated.

Rustagi, N., et al. (2011). "Public health impact of plastics: An overview." The Indian Journal of Occupational & Environmental Medicine **15**(3): 100-103.

Plastic, one of the most preferred materials in today's industrial world is posing serious threat to environment and consumer's health in many direct and indirect ways. Exposure to harmful chemicals during manufacturing, leaching in the stored food items while using plastic packages or chewing of plastic teethers and toys by children are linked with severe adverse health outcomes such as cancers, birth defects, impaired immunity, endocrine disruption, developmental and reproductive effects etc. Promotion of plastics substitutes and safe disposal of plastic waste requires urgent and definitive action to take care of this potential health hazard in future.

Rusu, M., et al. (2003). "POWDER COATINGS-BASED ORGANIC FILMS." Environmental Engineering & Management Journal (EEMJ) **2**(3): 217-234.

Powder coatings are finely grounded plastic particles consisting of resin, cross-linking agents (not used in thermoplastic powders), pigments, extenders and specific additives. When baked at a sufficiently high temperature, powder coatings melt out to form a continuous film. For thermosetting powders, a chemical reaction, either condensation or addition, also takes place. This fused film has the uniformity, color, toughness, and other properties generally associated with protective and decorative coatings, and presents superior properties, such as adhesion, corrosion and chemical resistance. Powder coatings applied as a dry material contain very little, if any, volatile organic compounds (VOCs). As no solvent is involved in the production and application of powder coatings, there is a reduction in fire risk, there are no costly wastes of organic solvents, and the health hazard to operators is reduced, too. [ABSTRACT FROM AUTHOR]

Ruth, L. H., et al. (2012). "SNPS analysis in pro-inflammatory and anti-inflammatory cytokine polymorphisms: TNF-alpha, TGF-beta, IFN-gamma, IL-6, IL-12P40, IL-10, IL-1-alpha, IL-1-beta, IL-1R and IL-1RA in inflammatory bowel disease (IBD)." Tissue Antigens **79 (6)**: 575.

Pro- and anti-inflammatory cytokines have an important role in inflammatory response. Cytokine/Cytokine receptor interactions not only play a pivotal role in the pathogenesis of inflammatory response, but also cause apoptosis, cell proliferation and differentiation. In this sense, alterations in the regulation of cytokines have been implicated in a variety of autoimmune disorders, including IBD [Crohn's disease (CD) and ulcerative colitis (UC)]. In this sense, IL-1 signalling via IL-1RI is also an important pathway in inflammatory process. These physiological effects are mediated by the activation of JNK and p38 MAP kinases, and up-regulation of genes via NF-kB, AP-1 and C/EBPb. On the other hand, IL-12p40, a subunit of IL-12p70 and IL-23, has previously been shown to inhibit IL-12p70 and IFN-gamma production and plays a key role in promoting Th1 responses. Thus, the aim of this study was to determine the relationship between pro- and anti-inflammatory cytokine polymorphisms and the differential IBD pathologies in a Spanish population. This was performed using PCR-SSOP for the SNPs of cytokines by using a microbeads Luminex assay. The following polymorphisms were determined: TNF-alpha [-238G/A and -308G/A], IFN-gamma [+874A/T], TGF-beta [+869C/T and +915G/C], IL- 10 [-1082A/A, -592A/C, -819C/T], IL-6 [-174C/G], IL-12p40 [3' UTR -1188 A/C (rs3212227)], IL-1-alpha [-889C/T], IL-1- beta [-511C/T and +3962C/T], IL-1R [Pst-1 1970C/T] and IL- 1Ra [Mspa-1 11100C/T]. When investigating each polymorphism separately and in conjunction, no statistical differences in the TNF-alpha, IFN-gamma, TGF-beta, IL-10, IL-6, IL-1 gene cluster genotypes and allele distributions between the IBD groups and controls were found. However, we observed significant differences in the 3' UTR -1188 A/C polymorphism of IL-12 p40. Thus, -1188A allele was increased in UC patients and the -1188C allele (high IL-12p40 production) was increased in CD patients. These data are in concordance with the fact of that CD has been shown to be associated with a Th1 T-cell mediated inflammation and high IL-12/IFN-gamma production at histologically affected sites. These data suggest that the IL-12p40 3' UTR -1188 A/C polymorphism seems to be associated with a differential IBD

development.

Rutkowska, M., et al. (2018). "Birds' feathers - Suitable samples for determination of environmental pollutants." TrAC - Trends in Analytical Chemistry **109**: 97-115.

The intensive development of industry and human population results in large amounts of different xenobiotic emitted into individual ecosystem components. As a consequence, monitoring of the level of pollution of particular elements of the environment by exotoxins has become a common interest. The determination of environmental changes by different types of biological indicators is called bioindication, which is used as one of the basic methods in the monitoring of environmental pollution. The following review paper contains comprehensive information about the use of bird feathers to assess the environmental contamination level. Types of contaminants (trace metals, microplastics, persistent organic pollutants) and analytical methods used for their determination are described in detail. In addition, the types of feathers used and the techniques for preparing them as samples for analysis are summarized. Copyright © 2018 Elsevier B.V.

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Ryan, M. G., et al. (2019). "Hudson River juvenile Blueback herring avoid ingesting microplastics." Marine Pollution Bulletin **146**: 935-939.

Microplastics in aquatic environments, and specifically their effects on the health of organisms, are of growing concern worldwide. Of particular concern are microplastics in a similar size range to zooplankton, as they have been found in the digestive tracks of organisms, such as fish, who typically seek zooplankton as a food source. It is unclear, however, to what degree, if any, fish select for or against microplastic particles when feeding. It is also unclear whether ingestion of microplastics affects fish condition. To answer these questions, the estimated physical condition and degree of selective feeding on microplastics were determined for juvenile fish collected from the Hudson River. Considering only particles 0.335-5.0 mm, microplastics made up 12% of fish diets but 21% of particles found in the surrounding water column. Relying on Jacob's Modified Electivity (JME) to quantify selectivity in feeding, our results reveal selective feeding on zooplankton and avoidance of microplastics. There was no correlation between condition and degree of selectivity toward any particular food types, including microplastics. Future work needs to consider fish with different feeding strategies and potential bioaccumulation of microplastics in the food web. Fish selectivity of ingestion in regards to microplastics should additionally be tested on wider spatial and temporal scales.

Ryan, P. G. (1987). "The incidence and characteristics of plastic particles ingested by seabirds." Marine Environmental Research **23**(3): 175-206.

The ingestion of plastic was recorded for 36 of 60 seabird species sampled in the southern hemisphere (mostly off southern Africa). Biases of different sampling techniques were considered. Plastic was most frequent in procellariiforms, notably Blue Petrels, Great Shearwaters, White-faced Storm-petrels and Pintado Petrels. Particles were compared with those found at sea. The size of ingested particles was related to body size and this affected the proportions of plastic types ingested. Pale particles were underrepresented, suggesting selection for darker-coloured particles. Small species were less colour-selective and exhibited a higher incidence of plastic ingestion than did large species. The incidence of ingested plastic was directly related to foraging technique and inversely related to the frequency of egestion of indigestible stomach contents. Secondary ingestion of plastic through contaminated prey was important in only one species sampled.

Ryan, P. G. (1988). "Concern about plastic pollution in Southern Ocean seabirds." CORMORANT. **16**(1): 1-2.

During the last few years there has been growing concern worldwide about marine plastic pollution. The Southern Ocean has not escaped this problem. Plastic now frequently is encountered at sea in the Southern Ocean and washed up on remote Antarctic and sub-Antarctic beaches. But does plastic pollution have environmental impacts other than reducing the aesthetic appeal of the far south? Seabirds and seals occasionally are entangled in plastic debris, causing debilitating wounds or death. A potentially much more serious problem is that of plastic ingestion by seabirds in the Southern Ocean.

Ryan, P. G. (1988). "Intraspecific variation in plastic ingestion by seabirds and the flux of plastic through seabird populations." Condor **90**(2): 446-452.

Patterns of intraspecific variability of ingested plastic loads in seabirds were examined for species collected off southern Africa. Sampling took place at sea off the southwestern cape, South AFrica, and at Inaccessible Island (37 degree 50'S, 12 degree 30'W), Gough Island (40 degree 21'S, 9 degree 53'W), and the Prince Edward Islands (46 degree 45'S, 37 degree 50'E). The incidence of plastic pollution was shown to be increasing during the 1980s. Both large- and small-scale geographic variation in plastic loads occurred as a function of variable plastic density in the environment. Intergenerational transfer of plastic particles was identified as an important pathway for plastic flow in those species that accumulate plastic particles and feed their chicks by regurgitation.

Ryan, P. G. (2008). "Seabirds indicate changes in the composition of plastic litter in the Atlantic and south-western Indian Oceans." Marine Pollution Bulletin **56**(8): 1406-1409.

I compare plastic ingested by five species of seabirds sampled in the 1980s and again in 1999-2006. The numbers of ingested plastic particles have not changed significantly, but the proportion of virgin pellets has decreased 44-79% in all five species: great shearwater Puffinus gravis, white-chinned petrel Procellaria aequinoctialis, broad-billed prion Pachyptila vittata, white-faced storm petrel Pelagodroma marina and white-bellied storm petrel Fregetta grallaria. The populations sampled range widely in the South Atlantic and western Indian Oceans. The most marked reduction occurred in great shearwaters, where the average number of pellets per bird decreased from 10.5 to 1.6. This species migrates between the South and North Atlantic each year. Similar decreases in virgin pellets have been recorded in short-tailed shearwaters Puffinus tenuirostris in the Pacific Ocean and northern fulmars Fulmarus glacialis in the North

Sea. More data are needed on the relationship between plastic loads in seabirds and the density of plastic at sea in their foraging areas, but the consistent decrease in pellets in birds suggests there has been a global change in the composition of small plastic debris at sea over the last two decades.

Ryan, P. G. (2015). "How quickly do albatrosses and petrels digest plastic particles?" Environmental Pollution **207**: 438-440.
Understanding how rapidly seabirds excrete or regurgitate ingested plastic items is important for their use as monitors of marine debris. van Franeker and Law (2015) inferred that fulmarine petrels excrete ~75% of plastic particles within a month of ingestion based on decreases in the amounts of plastic in the stomachs of adult petrels moving to relatively clean environments to breed. However, similar decreases occur among resident species due to adults passing plastic loads to their chicks. The few direct measures of wear rates and retention times of persistent stomach contents suggest longer plastic residence times in most albatrosses and petrels. Residence time presumably varies with item size, type of plastic, the amount and composition of other persistent stomach contents, and the size at which items are excreted, which may vary among taxa. Accurate measures of ingested plastic retention times are needed to better understand temporal and spatial patterns in ingested plastic loads within marine organisms, especially if they are to be used as indicators of plastic pollution trends.

Ryan, P. G., et al. (2012). "Long-term decreases in persistent organic pollutants in South African coastal waters detected from beached polyethylene pellets." Marine Pollution Bulletin **64**(12): 2756-2760.
Polyethylene pellets provide a convenient means to monitor Persistent Organic Pollutants (POPs) in marine systems. Pellets collected between 1984 and 2008 at three South African beaches were analysed for PCB, HCH and DDT. Concentrations of all three POPs decreased over the last two decades, although this signal was less clear for PCBs, and further monitoring is needed to assess trends in this family of compounds. DDT concentrations at two sites were higher than previous records for southern Africa, but there is no evidence of a link to the ongoing use of DDT for malaria control. HCHs concentrations were lower than in pellets from the east coast of southern Africa, suggesting that this pesticide was mainly used in the eastern part of the region. Our study demonstrates the potential for International Pellet Watch to track temporal as well as geographical patterns in the abundance of POPs in marine environments. © 2012 Elsevier Ltd.

Ryan, P. G., et al. (1988). "Plastic ingestion and PCBs in seabirds: Is there a relationship?" Marine Pollution Bulletin **19**(4): 174-176.
Multivariate analyses were used to assess the independent determinants of four organochlorines (OCs) in the fat and eggs of breeding female Great Shearwaters Puffinus gravis . The amounts of polychlorinated biphenyls (PCBs), DDE, DDT, and dieldrin, in both adult fat tissue and in eggs were positively correlated. Positive correlations between the amounts of different OCs in adults and in eggs suggest that individual differences in non-breeding range, diet and age are determinants of pollutant levels within a species. The mass of ingested plastic was positively correlated only with PCBs, a group of chemicals commonly found in plastics. It is probable that seabirds assimilate PCBs and other toxic chemicals partly from ingested plastic particles.

Ryan, P. G., et al. (2019). "Rapid increase in Asian bottles in the South Atlantic Ocean indicates major debris inputs from ships." Proceedings of the National Academy of Sciences of the United States of

America **116**(42): 20892-20897.

Most plastic debris floating at sea is thought to come from land-based sources, but there is little direct evidence to support this assumption. Since 1984, stranded debris has been recorded along the west coast of Inaccessible Island, a remote, uninhabited island in the central South Atlantic Ocean that has a very high macrodebris load (~5 kg.m⁻¹). Plastic drink bottles show the fastest growth rate, increasing at 15% per year compared with 7% per year for other debris types. In 2018, we examined 2,580 plastic bottles and other containers (one-third of all debris items) that had accumulated on the coast, and a further 174 bottles that washed ashore during regular monitoring over the course of 72 d (equivalent to 800 bottles.km⁻¹.y⁻¹). The oldest container was a high-density polyethylene canister made in 1971, but most were polyethylene terephthalate drink bottles of recent manufacture. Of the bottles that washed up during our survey, 90% were date-stamped within 2 y of stranding. In the 1980s, two-thirds of bottles derived from South America, carried 3,000 km by the west wind drift. By 2009, Asia had surpassed South America as the major source of bottles, and by 2018, Asian bottles comprised 73% of accumulated and 83% of newly arrived bottles, with most made in China. The rapid growth in Asian debris, mainly from China, coupled with the recent manufacture of these items, indicates that ships are responsible for most of the bottles floating in the central South Atlantic Ocean, in contravention of International Convention for the Prevention of Pollution from Ships regulations.

Ryan, P. G. and S. Jackson (1987). "The lifespan of ingested plastic particles in seabirds and their effect on digestive efficiency." Marine Pollution Bulletin **18**(5): 217-219.

The assimilation efficiencies of fledgling Whitechinned Petrels Procellaria aequinoctialis artifically fed large quantities of plastic particles were assessed. No significant differences were detected in either assimilation efficiency or the rate of mass loss between experimental and control birds. Polyethylene pellets lost 1% of their mass after 12 days in the experimental birds' stomachs, suggesting a half-life of at least one year. No instances of plastic causing intestinal obstruction, and few cases of physical damage to te stomach lining, were found in over 400 individuals of 25 species of seabirds containing ingested plastic. These results suggest ingested plastic seldom impairs digestive efficiency in seabirds.

Ryan, P. G. and C. L. Moloney (1990). "Plastic and other artefacts on South African beaches: Temporal trends in abundance and composition." S. AFR. J. SCI./S.-AFR. TYDSKR. WET. **86**(7-10): 450-452.

Plastic debris has rapidly become one of the most abundant marine pollutants, with economic as well as ecological consequences. Surveys of 50 South African beaches in 1984 and again in 1989 show that the densities of all types of plastic objects have increased significantly. Floating plastic objects and other artefacts have three main impacts on the marine environment: 1) they are ingested by and entangle many marine animals; 2) they increase the amount of substratum available for epiphytic organisms; and 3) when stranded, they reduce the aesthetic appeal and tourism potential of beaches. The authors present preliminary measures of trends in plastic abundance off South Africa, estimated from sampling both micro- and macro-plastic particles stranded at a range of beaches over a five-year period.

Ryan, P. G., et al. (2019). "Sampling microfibres at the sea surface: The effects of mesh size, sample volume and water depth." Environmental Pollution: 113413.

Microfibres are one of the most ubiquitous particulate pollutants, occurring in all environmental compartments. They are often assumed to be microplastics, but include natural as well as synthetic textile fibres and are perhaps best treated as a separate class of pollutants given the

challenges they pose in terms of identification and contamination. Microfibres have been largely ignored by traditional methods used to sample floating microplastics at sea, which use 300-500mum mesh nets that are too coarse to sample most textile fibres. There is thus a need for a consistent set of methods for sampling microfibres in seawater. We processed bulk water samples through 0.7-63mum filters to collect microfibres in three ocean basins. Fibre density increased as mesh size decreased: 20mum mesh sampled 41% more fibres than 63mum, and 0.7mum filters sampled 44% more fibres than 25mum mesh, but mesh size (20-63mum) had little effect on the size of fibres retained. Fibre density decreased with sample volume when processed through larger mesh filters, presumably because more fibres were flushed through the filters. Microfibres averaged 2.5 times more abundant at the sea surface than in water sampled 5m sub-surface. However, the data were noisy; counts of replicate 10-L samples had low repeatability (0.15-0.36; CV=56%), suggesting that single samples provide only a rough estimate of microfibre abundance. We propose that sampling for microfibres should use a combination of <1mum and 20-25mum filters and process multiple samples to offset high within-site variability in microfibre densities.

S, A. N. (2019). "Preliminary study and first evidence of presence of microplastics and colorants in green mussel, Perna viridis (Linnaeus, 1758), from southeast coast of India." Marine Pollution Bulletin **140**: 416-422.

Pollution by microplastics (MPs) is currently a global problem in the coastal and marine environment. Transfer of MPs from land to sea and their inclusion in the food web has a significant adverse effect on the marine life and human health. The present study was carried out at the fishing harbour of Chennai, southeast coast of India. The possible MPs were isolated from the soft tissues of the commercially important bivalve Perna viridis and examined by microscopic and DXR Raman spectroscopic methods. The MPs were identified as to be polystyrene polymers in the soft tissues. This investigation revealed that size and color are the major factors affecting the bioavailability of MPs to bivalves in the study area. The presence of colorants in organisms revealed an anthropogenic origin through the use of a wide array of applications. Hence, coastal zones are a hotspot for pollution by MPs, and filter feeding bivalves are at the highest risk. Therefore, further studies are required to understand the accumulation rates and residence time of MPs across the food webs.

Sa, L. C. d., et al. (2015). "Effects of microplastics on juveniles of the common goby (Pomatoschistus microps): confusion with prey, reduction of the predatory performance and efficiency, and possible influence of developmental conditions." Environmental Pollution **196**: 359-362.

Microplastics (MP) are ubiquitous contaminants able to cause adverse effects on organisms. Three hypotheses were tested here: early Pomatoschistus microps juveniles can ingest MP; the presence of MP may reduce fish predatory performance and efficiency; developmental conditions may influence the prey selection capability of fish. Predatory bioassays were carried out with juveniles from two estuaries with differences in environmental conditions: Minho (M-est) and Lima (L-est) Rivers (NW Iberian coast). Polyethylene MP spheres (3 types) alone and in combination with Artemia nauplii were offered as prey. All the MP types were ingested, suggesting confusion with food. Under simultaneous exposure to MP and Artemia, L-est fish showed a significant reduction of the predatory performance (65%) and efficiency (up to 50%), while M-est fish did not, suggesting that developmental conditions may influence the prey selection capability of fish. The MP-induced reduction of food intake may decrease individual and population fitness.

Sa, L. C. d., et al. (2018). "Studies of the effects of microplastics on aquatic organisms: what do we know and where should we focus our efforts in the future?" Science of the Total Environment **645**: 1029-1039.

The effects of microplastics (MP) on aquatic organisms are currently the subject of intense research. Here, we provide a critical perspective on published studies of MP ingestion by aquatic biota. We summarize the available research on MP presence, behaviour and effects on aquatic organisms monitored in the field and on laboratory studies of the ecotoxicological consequences of MP ingestion. We consider MP polymer type, shape, size as well as group of organisms studied and type of effect reported. Specifically, we evaluate whether or not the available laboratory studies of MP are representative of the types of MPs found in the environment and whether or not they have reported on relevant groups or organisms. Analysis of the available data revealed that (1) despite their widespread detection in field-based studies, polypropylene, polyester and polyamide particles were under-represented in laboratory studies; (2) fibres and fragments (800-1600 micro m) are the most common form of MPs reported in animals collected from the field; (3) to date, most studies have been conducted on fish; knowledge is needed about the effects of MPs on other groups of organisms, especially invertebrates. Furthermore, there are significant mismatches between the types of MP most commonly found in the environment or reported in field studies and those used in laboratory experiments. Finally, there is an overarching need to understand the mechanism of action and ecotoxicological effects of environmentally relevant concentrations of MPs on aquatic organism health.

Saad, J. M. and P. T. Williams (2016). "Catalytic dry reforming of waste plastics from different waste treatment plants for production of synthesis gases." Waste Management **58**: 214-220.

Catalytic dry reforming of mixed waste plastics, from a range of different municipal, commercial and industrial sources, were processed in a two-stage fixed bed reactor. Pyrolysis of the plastics took place in the first stage and dry (CO<inf>2</inf>) reforming of the evolved pyrolysis gases took place in the second stage in the presence of Ni/Al<inf>2</inf>O<inf>3</inf> and Ni-Co/Al<inf>2</inf>O<inf>3</inf> catalysts in order to improve the production of syngas from the dry reforming process. The results showed that the highest amount of syngas yield was obtained from the dry reforming of plastic waste from the agricultural industry with the Ni/Al<inf>2</inf>O<inf>3</inf> catalyst, producing 153.67 mmol<inf>syngas</inf> g⁻¹ <inf>waste</inf>. The addition of cobalt metal as a promoter to the Ni/Al<inf>2</inf>O<inf>3</inf> catalyst did not have a major influence on syngas yield. Overall, the catalytic-dry reforming of waste plastics from various waste treatment plants showed great potential towards the production of synthesis gases. Copyright © 2016 Elsevier Ltd

Saavedra, J., et al. (2019). "Influence of nanoplastic surface charge on eco-corona formation, aggregation and toxicity to freshwater zooplankton." Environmental Pollution **252**(Part A): 715-722.

Concerns about possible environmental implications of nano- and micro-plastics are continuously raising. Hence, comprehensive understanding of their behaviour, bioaccumulation and toxicity potential is required. Nevertheless, systematic studies on their fate and possible effects in freshwaters, as well as the influence of particle-specific and environmental factors on their behaviour and impacts are still missing. The aims of the present study are thus two-fold: (i) to examine the role of the surface charge on nanoplastic stability and acute effects to freshwater zooplankton; (ii) to decipher the influence of the refractory natural organic matter (NOM) on the nanoplastic fate and effects. Amidine and carboxyl-stabilized polystyrene (PS) spheres of 200 nm diameter characterized by opposite primary surface charges and neutral buoyancy were selected as model nanoplastics. The results demonstrated that the surface functionalization of the polystyrene nanoplastics controls their aggregation behaviour. Alginate

or Suwannee River humic acid (SRHA) modified significantly the surface charge of positively-charged amidine PS nanoplastic and the aggregation state, while had no significant influence on the negatively-charged carboxyl PS nanoplastic. Both amidine and carboxyl PS nanoplastics were ingested by the zooplankton and concentrated mainly in the gut of water flea Daphnia magna and larvae Thamnocephalus platyurus, and the stomach of rotifer Brachionus calyciflorus. Amidine PS nanoplastic was more toxic than carboxyl one. The toxicity decreased in the order D. magna (48 h - immobilization) > B. calyciflorus (24 h - lethality) > T. platyurus (24 h - lethality). Alginate or SRHA reduced significantly the toxicity of both amidine and carboxyl PS nanoplastics to the studied zooplankton representatives. The implications of this laboratory study findings to natural environment were discussed.

Sabharwal, J., et al. (2017). "Elevated IOP alters the space-time profiles in the center and surround of both ON and OFF RGCs in mouse." Proceedings of the National Academy of Sciences of the United States of America **114**(33): 8859.

Glaucoma is a leading cause of blindness worldwide, and is characterized by progressive retinal ganglion cell (RGC) death. An experimental model of glaucoma has been established by elevating the intraocular pressure (IOP) via microbead occlusion of ocular fluid outflow in mice. Studies in this model have found visual dysfunction that varied with adaptational state, occurred before anatomical changes, and affected OFF RGCs more than ON RGCs. These results indicate subtle alterations in the underlying retinal circuitry that could help identify disease before irreversible RGC changes. Therefore, we looked at how RGC function was altered with elevated IOP under both photopic and scotopic conditions. We first found that responses to light offset are diminished with IOP elevation along with a concomitant decrease in receptive field center size for OFF RGCs. In addition, the antagonistic surround strength and size was reduced in ON RGCs. Furthermore, elevation of IOP significantly accelerated the photopic temporal tuning of RGC center responses in both ON and OFF RGCs. We found that some of the IOP-induced functional changes to OFF RGCs relied on ON cross-over pathways, indicating dysfunction in inner retinal circuitry. Overall, these results suggest that IOP alters multiple functions in the retina depending on the adaptational state. They provide a basis for designing multiple functional tests for early detection of glaucoma and for circuit-specific therapeutic targets in treatment of this blinding disease.

Saborowski, R., et al. (2019). "How to get rid of ingested microplastic fibers? A straightforward approach of the Atlantic ditch shrimp Palaemon varians." Environmental Pollution **254**(Part B).

Microplastic fibers represent a significant share of the global marine micrcroplastic pollution, particularly in coastal areas. In controlled laboratory experiments, we offered fluorescent microplastic fibers (40-4400 micro m lengths, median 150 micro m) and spherical microplastic beads (9.9 micro m O) together with commercial fish food to the Atlantic ditch shrimp Palaemonetes varians. The shrimps ingested fibers and beads along with the food. Upon ingestion, the beads and the shortest fibers (up to 100 micro m) passed from the stomach into the gut and were egested within the fecal strings. The longer fibers first remained in the stomach but were regurgitated, i.e. extruded through the esophagus, within 12-14 h. Regurgitation is an evolutionary adaptation of particular crustacean species and other invertebrates to remove large and indigestible food particles from the stomach. Accordingly, the process of regurgitation attained a new task nowadays, i.e. the elimination of anthropogenic filamentous microplastic debris from the stomach to avoid harm. This behavioral feature may represent a selective advantage in view of the continuously increasing environmental plastic pollution.

Sachithanantham, P., et al. (2016). "Effect of raw and re-engineered GFRP waste as an admixture in cement concrete." Journal of Chemical and Pharmaceutical Sciences **9**(2): E168-E172.

Recent Scientific developments led to tremendous progress in infrastructure development to mankind but also led to negative impact on the environment. Generation of glass fibre reinforced plastic (GFRP) waste has been a source of concern. The increase in GFRP waste pollutes not only land and water but also the air. If GFRP is dumped on land it chokes the soil making it infertile and useless. Dumping glass fibre reinforced plastics in water endangers the lives of the aquatic animals thus effectively disrupting the balance in nature. Disposal of GFRP waste by incineration generates toxic gases which are harmful not only to the flora and fauna but also to the atmosphere. The problem is more serious with thermo set plastic which is neither recyclable nor bio-degradable. In this paper an attempt is made to find an efficient way of utilizing the plastic waste as an admixture to cement concrete. To validate this, experimental investigations are carried out on concrete of M25 grade with raw GFRP and re-engineered GFRP in percentage ranging 0, 0.2, 0.3, and 0.4 which is designed as per IS standards. Tests on fresh concrete to determine the values of, compacting factor, Vee-Bee Consistency and slump are conducted. Compression, Tension and Flexure tests are conducted on hardened concrete. Conclusions are made from the results of fresh and hardened concrete properties by comparing with those of normal concrete. Copyright © 2018 SPB Pharma Society. All rights reserved.

Sadler, D. E., et al. (2019). "Temperature and clone-dependent effects of microplastics on immunity and life history in Daphnia magna." Environmental Pollution **255**(Pt 1): 113178.

Microplastic (MP) pollution is potentially a major threat to many aquatic organisms. Yet we currently know very little about the mechanisms responsible for the effects of small MPs on phenotypes, and the extent to which effects of MPs are modified by genetic and environmental factors. Using a multivariate approach, we studied the effects of 500nm polystyrene microspheres on the life history and immunity of eight clones of the freshwater cladoceran Daphnia magna reared at two temperatures (18degreeC/24degreeC). MP exposure altered multivariate phenotypes in half of the clones we studied but had no effect on others. In the clones that were affected, individuals exposed to MPs had smaller offspring at both temperatures, and more offspring at high temperature. Differences in response to MP exposure were unrelated to differences in particle uptake, but were instead linked to an upregulation of haemocytes, particularly at high temperature. The clone-specific, context-dependent nature of our results demonstrates the importance of incorporating genetic variation and environmental context into assessments of the impact of plastic particle exposure. Our results identify immunity as an important mechanism underpinning genetically variable responses to MP pollution and may have major implications for predicting consequences of MP pollution.

Saez, J., et al. (2016). Phantom microbeads chromatography column in microfluidics. 20th International Conference on Miniaturized Systems for Chemistry and Life Sciences, MicroTAS 2016.

Water pollution is one of the biggest concerns of society at the moment. Among all water pollutants, oils and surfactants are especially harmful for human health and the environment; therefore they should be continually monitored to avoid water contamination.[1] In this work we propose a new microfluidic device composed by packed microbeads invisible in water. This system enables an alternative methodology to detect polluting compounds in water samples.

Safarik, I., et al. (2008). "Hydrogen peroxide removal with magnetically responsive Saccharomyces cerevisiae cells." Journal of Agricultural & Food Chemistry **56**(17): 7925-7928.

Hydrogen peroxide (HP) is a promising chemical sanitizer for use in the food industry. Its residues have to be decomposed, usually using an enzyme process employing catalase. In order to offer an inexpensive biocatalyst and to simplify subsequent manipulation, we have prepared magnetically responsive alginate beads containing entrapped Saccharomyces cerevisiae cells and magnetite microparticles. Larger beads (2-3 mm in diameter) were prepared by dropping the mixture into calcium chloride solution, while microbeads (the diameter of majority of particles ranged between 50 and 100 microm) were prepared using the water in oil emulsification process. In general, microbeads enabled more efficient HP decomposition. The prepared microparticulate biocatalyst caused efficient decomposition of HP in water solutions (up to 2% concentration), leaving very low residual HP concentration after treatment (below 0.001% under appropriate conditions). The biocatalyst was stable; the same catalytic activity was observed after one month storage at 4 degrees C, and the microbeads could be used at least five times.

Safeukui, I., et al. (2013). "Surface Area Loss and Increased Sphericity Account for the Splenic Entrapment of Subpopulations of Plasmodium falciparum Ring-Infected Erythrocytes. e60150." PLoS ONE **8**(3).

Ex vivo perfusion of human spleens revealed innate retention of numerous cultured Plasmodium falciparum ring-infected red blood cells (ring-iRBCs). Ring-iRBC retention was confirmed by a microsphiltration device, a microbead-based technology that mimics the mechanical filtering function of the human spleen. However, the cellular alterations underpinning this retention remain unclear. Here, we use ImageStream technology to analyze infected RBCs' morphology and cell dimensions before and after fractionation with microsphiltration. Compared to fresh normal RBCs, the mean cell membrane surface area loss of trophozoite-iRBCs, ring-iRBCs and uninfected co-cultured RBCs (uRBCs) was 14.2% (range: 8.3-21.9%), 9.6% (7.3-12.2%) and 3.7% (0-8.4), respectively. Microsphilters retained 100%, 50% and 4% of trophozoite-iRBCs, ring-iRBCs and uRBCs, respectively. Retained ring-iRBCs display reduced surface area values (estimated mean, range: 17%, 15-18%), similar to the previously shown threshold of surface-deficient RBCs retention in the human spleen (surface area loss: >18%). By contrast, ring-iRBCs that successfully traversed microsphilters had minimal surface area loss and normal sphericity, suggesting that these parameters are determinants of their retention. To confirm this hypothesis, fresh normal RBCs were exposed to lysophosphatidylcholine to induce a controlled loss of surface area. This resulted in a dose-dependent retention in microsphilters, with complete retention occurring for RBCs displaying >14% surface area loss. Taken together, these data demonstrate that surface area loss and resultant increased sphericity drive ring-iRBC retention in microsphilters, and contribute to splenic entrapment of a subpopulation of ring-iRBCs. These findings trigger more interest in malaria research fields, including modeling of infection kinetics, estimation of parasite load, and analysis of risk factors for severe clinical forms. The determination of the threshold of splenic retention of ring-iRBCs has significant implications for diagnosis (spleen functionality) and drug treatment (screening of adjuvant therapy targeting ring-iRBCs).

Safeukui, I., et al. (2013). "Surface area loss and increased sphericity account for the splenic entrapment of subpopulations of Plasmodium falciparum ring-infected erythrocytes." PLoS ONE [Electronic Resource] **8**(3): e60150.

Ex vivo perfusion of human spleens revealed innate retention of numerous cultured Plasmodium falciparum ring-infected red blood cells (ring-iRBCs). Ring-iRBC retention was confirmed by a microsphiltration device, a microbead-based technology that mimics the mechanical filtering function of the human spleen. However, the cellular alterations underpinning this retention

remain unclear. Here, we use ImageStream technology to analyze infected RBCs' morphology and cell dimensions before and after fractionation with microsphiltration. Compared to fresh normal RBCs, the mean cell membrane surface area loss of trophozoite-iRBCs, ring-iRBCs and uninfected co-cultured RBCs (uRBCs) was 14.2% (range: 8.3-21.9%), 9.6% (7.3-12.2%) and 3.7% (0-8.4), respectively. Microsphilters retained 100%, ~50% and 4% of trophozoite-iRBCs, ring-iRBCs and uRBCs, respectively. Retained ring-iRBCs display reduced surface area values (estimated mean, range: 17%, 15-18%), similar to the previously shown threshold of surface-deficient RBCs retention in the human spleen (surface area loss: >18%). By contrast, ring-iRBCs that successfully traversed microsphilters had minimal surface area loss and normal sphericity, suggesting that these parameters are determinants of their retention. To confirm this hypothesis, fresh normal RBCs were exposed to lysophosphatidylcholine to induce a controlled loss of surface area. This resulted in a dose-dependent retention in microsphilters, with complete retention occurring for RBCs displaying >14% surface area loss. Taken together, these data demonstrate that surface area loss and resultant increased sphericity drive ring-iRBC retention in microsphilters, and contribute to splenic entrapment of a subpopulation of ring-iRBCs. These findings trigger more interest in malaria research fields, including modeling of infection kinetics, estimation of parasite load, and analysis of risk factors for severe clinical forms. The determination of the threshold of splenic retention of ring-iRBCs has significant implications for diagnosis (spleen functionality) and drug treatment (screening of adjuvant therapy targeting ring-iRBCs).

Safin, R. R., et al. (2019). THE STUDY OF THE DESTRUCTIVE PROPERTIES OF WOOD-FILLED COMPOSITES FOR THE PRODUCTION OF BIODEGRADABLE PACKAGING MATERIALS. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **19:** 541-546.

Today it is difficult to imagine the area of human life, where polymeric materials are not used. However, the increasing consumption of polymers for packaging, as well as other household disposable products creates a problem of plastic waste and a threat to the environment. The chemical stability of polymers makes it possible to withstand the effects of physicochemical (solar radiation, heat, humidity, oxygen of the air) and biological (microorganisms) natural factors for many decades without noticeable destruction. In this connection, the development, production and use of new types of biodegradable composite materials for the packaging industry, which can biodegrade to environmentally friendly components under appropriate conditions, is relevant. This article discusses the possibility of using a biodegradable composite material, based on polylactide and filler, made of thermally modified wood flour, for packaging. It has been established that polylactide packaging with the addition of 60% thermo-modified wood filler would provide a high rate of biodegradation of the used packaging, thereby reducing the environmental stress on the environment. At the same time, the resulting composite will have acceptable physicomechanical and special characteristics intended for use as a package.

Sagar, K., et al. (2013). "Bio-degradation of 40 micron plastic bags by Aspergillus niger and optimization of pre-treatment methods." Environment Conservation Journal **14**(3): 61-68.

Lack of degradability and the closing of landfill sites as well as growing water and land pollution problems have led to concern about plastics. Among the various types of plastics, the most extensively used type is polyethylene bags. A survey on 40 micron polyethylene bags was done by obtaining the information from the City corporation office, Belgaum, Karnataka, India on the amount of plastic waste generated in the city. Polyethylene bags having a thickness less than 40 micron are not recycled, thus have to be degraded. In this work, Aspergillus niger is been employed to degrade the 40 micron plastic. Various pre-treatment methods are used which

include UV, nitric acid, thermal and UV+nitric acid treatments to effectively degrade the plastic. Different media having pre treated plastic as the carbon source are tested for the degradation of plastic along with the growth of the fungi. Incubation period was taken as 15 and 30 days. Optimization of pre-treatment methods was done to improve the degradation efficiency. Various analysis methods such as FTIR spectroscopy and dry-weight analysis were done to confirm the degradation of plastic.

Sagawa, N., et al. (2018). "Abundance and size of microplastics in a coastal sea: Comparison among bottom sediment, beach sediment, and surface water." Marine Pollution Bulletin **133**: 532-542.

Microplastics have adverse effects on marine life. This study examined the abundance and size of microplastics as well as their polymer types in the surface water and the bottom and beach sediments of Hiroshima Bay. The fragmentation process and sinking factors of foamed polystyrene (FPS) microplastics were also examined. Serious FPS pollution spread out not only in the beach sediments but also in the bottom sediments. The average size of FPS particles in the bottom sediments was significantly smaller than that of beached FPS particles. Field emission scanning electron microscopy images suggest that large amounts of microsized or nanosized FPS fragments are likely to be generated from the margins of beached FPS microplastics. X-ray computed tomography images show that FPS microplastics from the bottom sediments had tunnel-like structures inside the particle. Based on these images, FPS microplastics in the bottom sediments were susceptible to biofouling and soil deposition.

Sagis, L. M. C. (2019). "Coarse-grained models for diffusion in oil-filled hydrogel microbeads." Food Hydrocolloids **89**: 294-301.

Diffusion of digestive enzymes in oil-filled hydrogel microbeads is a highly complex process which is difficult to model, particularly for systems with high volume fractions of incorporated nano-droplets. In this paper coarse-grained models for this process are compared. The results show that the interplay between adsorption at the oil-water interface and diffusion through the matrix of the bead can lead to a front-like motion of the enzyme. This motion can be described by combining the mass balance for the enzyme with a Maxwell-Cattaneo type equation for the mass flux vector. Solutions of the resulting partial differential equation show that when tau << t_d (where tau and t_d are characteristic times for adsorption and diffusion) the time evolution of the enzyme concentration is identical to the profile calculated using Fick's law. For tau >>t_d and time t <= tau the enzyme migrates through the hydrogel as a sharp front. The position of the front changes linearly with time, and this corresponds well with findings of a recent experimental study (van Leusden et al. (2018), Food Hydrocolloids, 85, 242-247). The effects of poly-dispersity of the interior oil droplet phase were described using a multi-mode generalization of the Maxwell-Cattaneo model, and the results show that a widening of the droplet size distribution leads to smoothing of the front. The results show that this level of coarse-grained modelling can capture the dynamics of these complex systems quite accurately.

Sahay, N. (2018). "Plastic pollution, a study of knowledge, attitude and practices among students." Indian Journal of Public Health Research and Development **9**(10): 1014-1021.

Over the years, plastic pollution has unquestionably surfaced as most pervasive pollution problem of the century afflicting land, waterways and seas. The intemperate interference of the mankind in the natural cycles has been wreaking havoc on natural environment. It is necessary to understand as to what extent the individuals are aware of these facts, what are their attitude and whether they are at all taking any step to address these issues. The objective of the study is

to have complete knowledge, attitude and practice among the students who are pursuing PhD, Post Graduate and Under Graduate studies. Students belonging to diverse academic background were the respondents. Area of study is the capital city of India i.e. Delhi and NCR. A structured questionnaire was prepared to assess the KAP of students towards plastic pollution. A Google Form was created and shared with the respondents. A total of 200 students participated in the survey. Both Male and female students were included in this research. Findings of the study show the Knowledge, Attitude and Practices existing among the students. Further an analysis was made of the findings. Recommendations to empower the students with knowledge and skill to curb this plastic pollution is also included in this research paper. © 2018, Indian Journal of Public Health Research and Development. All rights reserved.

Sahoo, S. K., et al. (2013). "Formulation, in vitro drug release study and anticancer activity of 5-fluorouracil loaded gellan gum microbeads." Acta Poloniae Pharmaceutica **70**(1): 123-127.

5-Fluorouracil loaded calcium-zinc-gellan and calcium-zinc-gellan-ethyl cellulose microbeads were successfully prepared by simple ionotropic gelation and oil in water ionotropic gelation technique, respectively. Prepared microbeads were characterized by scanning electron microscopy, Fourier transform infrared spectroscopy and evaluated for particle size, drug content, encapsulation efficiency, drug release and cell cytotoxicity study. Microbeads formed were spherical with rough surface. As concentration of gellan and ethyl cellulose has increased encapsulation efficiency, particle size and sustained drug release effect also increased. The release of 5-fluorouracil from microbeads has followed Hixson Crowell model suggesting the mechanism of drug release as dissolution controlled. Cytotoxicity analysis on HT-29 human colon cancer cell lines indicated that 5-FU loaded gellan gum/gellan in combination with ethyl cellulose microbeads leads to sustained releases of drug and thus delayed apoptosis over a long period of time. The formulation with drug:gellan:ethyl cellulose ratio 2.5:7.5:1 was found to be more effectual in terms of sustained drug release activity in addition to anti-cancer activity.

Sahoo, S. K., et al. (2015). "Microspheres embedded in microbeads: A novel approach to improve various controlled release characteristics of highly water soluble drug through ionic gelation method." Indian Journal of Pharmaceutical Education and Research **49**(2): 140-145.

The major hindrance behind the preparation of gellan microbeads by simple ionic gelation technique with aqueous soluble drugs is their low entrapment efficiency and sometimes its faster dissolution characteristics. This limits the employment of such a simple method for the preparation of microbeads of water-soluble drugs like stavudine. In the present study a novel attempt has been undertaken by embedding stavudine loaded Eudragit RSPO microspheres into gellan microbeads by ionotropic gelation method with an aim to improve its controlled drug delivery characteristics. The prepared microbeads were characterized by scanning electron microscopy, Fourier transform infrared spectroscopy, and optical microscopy for surface topography, drug polymer interaction and particle size analysis respectively. Other studies like drug content, encapsulation efficiency and drug release studies were also carried out. The resulting microspheres embedded in microbeads were free flowing in nature with mean particle size ranging from 544.2-564.2 micro m. SEM photomicrographs distinctly shows the microspheres embedded within the microbeads effectively with a smooth surface topography and the gellan microbeads containing D4T only are spherical in nature with rough surface. The FTIR study ascertained the compatibility of the drug within the formulation. The microspheres embedded in microbeads had enhanced percentage of drug content, drug entrapment efficiency and controlled release characteristics as compared to beads containing stavudine only. The mechanism of drug release from the formulations were found to follow non Fickian type diffusion with "n" value between 0.5 to 1but in case of stavudine loaded Eudragit RSPO microspheresit was found to be Fickian type. Copyright ©2015,Indian Journal of Pharmaceutical Education and Research.ALL RIGHTS.RESERVED.

Sai, X., et al. (2013). "Isolation of hepatic stellate cells from mice infected with Schistosoma japonicum." China Tropical Medicine **13**(8): 915-917.

Objective: To explore a steady and effective method for isolation of hepatic stellate cells (HSCs) from mice infected with Schistosoma japonicum.

Said, T., et al. (2018). "Assessment of the impact of CryoFlex tubing on sperm, cryopreservation outcome." Human Reproduction **33 (Supplement 1)**: i174.

Study question: Does wrapping cryovials with CryoFlex tubing prior to immersion in liquid nitrogen (LN) impact sperm cryopreservation outcome and the post-thaw recovery of motile sperm? Summary answer: The use of CryoFlex tubing can negatively impact the out-come of sperm cryopreservation. The tubing should be removed prior to thawing to prevent such outcome. What is known already: Cryovials are widely used to store cryopreserved semen samples. Nevertheless, they are not considered to provide effective bio-containment. Thus, LN penetration in addition to contamination of samples and LN tanks remain a concern. It has been suggested that wrapping cryovials in heat-shrinkable tubing prior to immersion in LN could reduce these risks. The tubing is made of a safe plastic resin polymer, however it has a poor tem-perature capability, which could affect cryopreservation-thawing protocols. It is not yet known if the use of CryoFlex tubing will impact the outcome of sperm cryopreservation, specifically, cryosurvival rates. Study design, size, duration: Semen samples (n = 34) were included in this cross-sectional study. Following dilution with cryoprotectant media, each sample was split into 2 equal aliquots: 1) sample with CryoFlex wrapping, and 2) control without CryoFlex wrapping. The CryoFlex tubing remained wrapped during the thawing in 20 samples; while it was removed prior to thawing in 14 samples. All trials were conducted over the course of 3 months. Participants/materials, setting, methods: Samples were provided by healthy donors. All aliquots were cryopreserved in vials with internal threading and silicon gasket (Nunc CryoTubes, Thermo Scientific). Heat-sealable wrapping (Nunc CryoFlex, Thermo Scientific) was applied to the sample aliquots, vials without wrapping served as controls. Thereafter, aliquots were placed in liquid nitrogen vapor for 20 minutes followed by plunging in liquid nitrogen. Thawing was performed after a minimum of 24 hours by immersion in 37 C water bath for 4 minutes. Main results and the role of chance: Cryosurvival rates were calculated by dividing total motile sperm post-thaw by total motile sperm pre-freeze X 100. Statistical analysis was conducted using paired t-test with two-tailed test of sig-nificance. In samples thawed with the CryoFlex wrapping, the post-thaw sperm percentage motility and cryosurvival rates were significantly lower compared to controls (26.4 +/- 6.1 vs. 30.9 +/- 8.2, P = 0.003 and 60.6 +/- 11.7 vs. 70.2 +/- 12.8, P = 0.007, respectively). In samples where CryoFlex wrapping was removed prior to the thawing, no significant differences were noted in post-thaw sperm percentage motility and cryosurvival rates (32.1 +/- 12.9 vs. 32.9 +/- 12.8 and 69.0 +/- 20.4 vs. 71.0 +/- 12.5, respectively). Overall, the results showed that whenever the CryoFlex tubing is kept wrapped around the vials during the thawing process, a significant decline in the recovery of cryopreserved spermatozoa post-thaw will occur. No such decline was seen when the CryoFlex tubing was removed prior to thawing. Limitations, reasons for caution: Our results are solely based on the evalu-ation of semen samples from healthy donors with normal semen parameters using a single cryopreservation protocol. It cannot be assumed that semen samples with lower quality parameters or the use of other cryopreservation protocol will yield with the same

results. Wider implications of the findings: This pilot provides new insights into the impact on CryoFlex tubing on sperm cryopreservation outcome. While it may alleviate some of the safety concerns associated with the use cryovials in sperm cryopreservation, CryoFlex can also negatively impact the outcome of sperm cryopreservation unless removed prior to thawing.

Saido, K., et al. (2014). "New analytical method for the determination of styrene oligomers formed from polystyrene decomposition and its application at the coastlines of the North-West Pacific Ocean." Science of the Total Environment **473-474**: 490-495.

Abstract: The pollution caused by plastic debris is an environmental problem with increasing concern in the oceans. Among the plastic polymers, polystyrene (PS) is one of the most problematic plastics due to the direct public health risk associated with their dispersion, as well as the numerous adverse environmental impacts which arise both directly from the plastics and from their degradation products. Little is known about their potential distribution characteristics throughout the oceans. For the first time, we report here on the regional distribution of styrene monomer (SM), styrene dimers (SD; 2,4-diphenyl-1-butene, SD1; 1,3-diphenyl propane, SD2), and styrene trimer (2,4,6-triphenyl-1-hexene: ST1), as products of PS decomposition determined from samples of sand and seawater from the shorelines of the North-West Pacific ocean. In order to quantitatively determine SM, SD (=SD1+SD2), and ST1, a new analytical method was developed. The detection limit was $3.3\mu gL^{-1}$, based on a signal-to-noise ratio of three, which was well-suited to quantify levels of SM, SD, and ST1 in samples. Surprisingly, the concentrations of SM, SD, and ST1 in sand samples from the shorelines were consistently greater than those in seawater samples from the same location. The results of this study suggest that SM, SD, and ST1 can be widely dispersed throughout the North-West Pacific oceans. [Copyright &y& Elsevier]

Saifuddin, N., et al. (2011). "Chitosan-silver nanoparticles composite as point-of-use drinking water filtration system for household to remove pesticides in water." Asian Journal of Biochemistry **6**(2): 142-159.

Adsorption techniques are widely used to remove certain classes of pollutants from water and wastewater. Biosorbents such as natural and waste materials from industries and agriculture can be used as alternatives adsorbents which are inexpensive and easily obtainable. The objective of this study was to prepare silver nanoparticles embedded in chitosan, which is a non-toxic and biodegradable natural polymer, using microwave irradiation for the removal of pesticides from water. Cross-linked chitosan-silver nanoparticle composite bioadsorbent was prepared in order to investigate the adsorption and release behaviours of the pesticide, Atrazine. The concentration and time dependencies of the adsorbent for the pesticide were studied. The equilibrium time was found to be 65 min for 1, 5, 10, 20 and 25 ppm Atrazine concentration. A sharp increase in percent reduction of the pesticide content was observed in water as the adsorbent dose was increased from 0.5 to 2.0 g. At 2.0 g dosage of cross-linked chitosan-silver nanoparticle composite micro-beads, 98% removal was observed for 1 L of pesticide solution at 1 ppm concentration (1 mg L⁻¹). From the batch studies, the adsorbent capacity of the cross-linked chitosan-silver nanoparticle composite micro-beads toward Atrazine was 0.5 mg g⁻¹ of the adsorbent in 65 min. An on-line filter was

made using a column of cross-linked chitosan-silver nanoparticle composite micro-beads and the device was used for pesticide removal for extended periods. From the breakthrough curves, the results of breakthrough adsorption capacity and the total adsorption capacity were, respectively 115 and 360 micro g mL⁻¹ cross-linked chitosan-silver nanoparticles composite micro beads.

Saito, S., et al. (2012). "CD19-Specific T-Cell therapy for refractory philadelphia-chromosome-positive acute lymphoblastic leukemia using piggybac transposon-based gene modification and low autoserum-containing, but xeno-free and tumor cell line-free culture system." Molecular Therapy **1)**: S184-S185.

BCR-ABL tyrosine kinase inhibitors (TKIs) would improve the prognosis of patients with Philadelphia chromosome-positive (Ph+) ALL. However, TKI treatment often induces drug-resistance mutations. In particular, T315I mutation is refractory to second generation TKIs, dasatinib and nilotinib. Consequently, the prognosis of patients after TKI failure is very poor. Immunotherapy may be a promising strategy to overcome drug-resistant leukemic clones because Ph+ALL is subject to an apoptotic signal via TRAIL (Uno et al., 2003). We have previously demonstrated the nonviral piggyBac-transposon can efficiently and stably modify human T cells (Nakazawa et al., 2009), and cytotoxic T cells modified with piggyBac to express HER2-specific chimeric antigen receptor (CAR) directing towards HER2-positive tumors in vivo (Nakazawa et al., 2011). Aim of this study was to determine whether T cells modified to express CD19-specific CAR by piggyBac could induce potent cytotoxic effects in Ph+ALL. To generate CD19CAR expressing T cells, 1 x 107 peripheral blood mononuclear cells were nucleofected with a transposon encoding CD19CAR and a piggyBac. Nucleofected cells were stimulated with anti-CD3/CD28 antibodies, cultured in T-cell medium containing 2% autoserum and interleukin-15 for 7 days, and then selected with anti-CAR biotin-conjugated antibody followed by anti-biotin microbeads. The positively selected T cells were restimulated and further expanded for 14 days on UVB-irradiated negatively fractionated T cells as feeder cells in the G-Rex10 device. Generated T cells (CAR-T) were expanded up to 6 x 107 within 3 weeks of culture, and expressed CD19CAR at ~30%. To evaluate the anti-leukemia effect, we cocultured CAR-T with seven Ph+ALL lines (TKIs-resistant in 3 lines including a T315I mutatant) at effector/target ratios of 1:1, 1:5, 1:10, 1:50, and 1:100. In all cocultures from 1:1 to 1:10, CAR-T almost eradicated Ph+ALL cells on day 5, and in 5 of 7 cocultures even at effector/target ratios of 1:50 and 1:100, CAR-T enabled reducing Ph+ALL cells by day 10. By contrast, in control cocultures, non-transfected T cells did not show killing effect except cocultures at a 1:1 ratio. In conclusion, CD19CAR-T cells could develop superior cytotoxicity against Ph+ALL, even if the number is small for Ph+ALL cells. For transplant patients, the infusion of 1 x 106 cells/kg of recipient weight would not be great risk for graftversus- host disease. Additionally, our non-viral gene-transfer and T-cell culture system with 2% autoserum and without animal/tumorderived materials would be safe and cost-efficient for clinical use.

Sajdak, M. and K. Slowik (2014). "Use of plastic waste as a fuel in the co-pyrolysis of biomass: part II. Variance analysis of the co-pyrolysis process." Journal of Analytical and Applied Pyrolysis **109**: 152-158.

The aim of our study described in this article was statistical evaluation of the influence of process conditions on the chemical and physical properties of products obtained from biomass and plastic waste co-pyrolysis. To estimate the effects of the process conditions on the chemical and physical properties of products, analysis of variance (ANOVA) was used. Furthermore, a mathematical equation that can be used to determine the degree of change in chemical and physical properties of the solid, liquid and gaseous products from co-pyrolysis depending on

process conditions is presented in this article. In investigation were used alder wood (hardwood) and pine wood (softwood) with polypropylene addition which were carbonized in various thermal conditions. In the presented studied was described significant effect among char, liquid and gaseous fraction properties according to polymer addition. Analysis of variance (ANOVA) employed to exploratory analysis shows that the type of material has the most significant effect on the nitrogen concentration in the char, the nitrogen and sulphur concentration in the liquid fraction and the carbon mono- and dioxide, methane concentration in gaseous fraction.

Sakai, K., et al. (2011). "3-D collagen-dependent cell surface expression of MT1-MMP and MMP-2 activation regardless of integrin beta1 function and matrix stiffness." Biochemical & Biophysical Research Communications **412**(1): 98-103.

Matrix metalloproteinases (MMPs) play roles in spatially dynamic processes, including morphogenesis, wound healing, and tumor invasion. Three-dimensional (3-D) type I collagen stimulates cellular activation of MMP-2, however, the mechanisms underlying this are controversial. The present study investigated mechanisms for 3-D collagen-induced MMP-2 activation in highly invasive human malignant mesothelioma cells. MMP-2 was effectively activated by cells cultured in 3-D collagen but not in 2-D collagen, whereas MMP-2 activation was not regulated by the flexibility of collagen. The 3-D collagen did not largely increase the gene expression of MMP-2 and MT1-MMP. However, MT1-MMP exposed to the cell surface was much increased by 3-D collagen, and loss of MT1-MMP abolished MMP-2 activation in response to 3-D collagen. MT1-MMP and integrin beta1 translocated to pericellular regions interacting with collagen-coated microbeads, however their localization was different. Importantly, inhibition of integrin beta1 function and expression did not affect 3-D collagen-induced cell surface localization of MT1-MMP and MMP-2 activation. Our results strongly suggest that 3-D collagen scaffolding may provide opportunity for direct and multivalent interaction with MT1-MMP, by which MMP-2 activation occur in abundant cell surface MT1-MMP-dependent manner, rather than a manner regulated by matrix stiffness and integrin beta1 function.

Sakai, M. (2007). "Biomass Moves From "Biodegradable" To "Carbon Neutral"." BioCycle **48**(2): 54.

Voluntary industry standards for food containers are in place regarding use of PLA (Polylactic Acid) products, and standards are being examined for PBS (Poly Butylene Succinate) in Japan. Work is underway to use biomass plastics to improve heat proof, impact proof and crystallization speeds. The Biomass Nippon Strategy provides the strategic background for biomass use complete with specific goals and an action plan. In the strategy for biomass plastics, specific goals include a decrease in the price of biomass plastic resin to 200 yen in 2010, from a current price of 400 to 500 yen per kg. Registered products exceed 100 items as of the end of September 2006.

Sakudo, A., et al. (2007). "Recent developments in prion disease research: diagnostic tools and in vitro cell culture models." Journal of Veterinary Medical Science **69**(4): 329-337.

After prion infection, an abnormal isoform of prion protein (PrP^{Sc}) converts the cellular isoform of prion protein (PrP^C) into PrP^{Sc}. PrP^C-to-PrP^{Sc} conversion leads to PrP^{Sc} accumulation and PrP^C deficiency, contributing etiologically to induction of prion diseases. Presently, most of the diagnostic methods for prion diseases are dependent on PrP^{Sc} detection. Highly sensitive/accurate specific detection of PrP^{Sc} in many different samples is a prerequisite for attempts to develop reliable detection methods. Towards this goal, several methods have recently been developed to facilitate sensitive and

precise detection of PrP^{Sc}, namely, protein misfolding cyclic amplification, conformation-dependent immunoassay, dissociation-enhanced lanthanide fluorescent immunoassay, capillary gel electrophoresis, fluorescence correlation spectroscopy, flow microbead immunoassay, etc. Additionally, functionally relevant prion-susceptible cell culture models that recognize the complexity of the mechanisms of prion infection have also been pursued, not only in relation to diagnosis, but also in relation to prion biology. Prion protein (PrP) gene-deficient neuronal cell lines that can clearly elucidate PrP^C functions would contribute to understanding of the prion infection mechanism. In this review, we describe the trend in recent development of diagnostic methods and cell culture models for prion diseases and their potential applications in prion biology.

Šál, J. and P. Nováková (2019). APPLICATION OF PET BOTTLES FOR CONCRETE MASONRY BLOCKS. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **19:** 19-24.

The production of cavity blocks, also referred to as concrete masonry blocks (CMU) or concrete lost formwork, takes place in a mobile or stationary press by extruding a special matrix through solid fresh concrete. This production is relatively cheap, simple and fast, provided we have the appropriate press. This article examines whether such concrete blocks can be manufactured without specialized equipment. This can be beneficial, for example, in slums or areas dependent on humanitarian aid, where there is not enough dwelling. On the contrary, in these areas there is a large amount of plastic waste, washed up from the oceans and landfilled in illegal dumps. Several methods of using PET bottles for forming cavities in concrete blocks are proposed in this article. PET bottles can save some of the concrete and create a closed air cavity that improves the thermal properties of the block. Moreover, it is a way to use plastic waste that needs to be recycled and which is a huge problem of the present.

Saleem, J., et al. (2015). "Combating oil spill problem using plastic waste." Waste Management **44**: 34-38.

Thermoplastic polymers (such as polypropylene, polyethylene, polyethylene terephthalate (PET) and high density polyethylene (HDPE)) constitute 5-15% of municipal solid waste produced across the world. A huge quantity of plastic waste is disposed of each year and is mostly either discarded in landfills or incinerated. On the other hand, the usage of synthetic polymers as oil sorbents, in particular, polyolefins, including polypropylene (PP), and polyethylene (PE) are the most commonly used oil sorbent materials mainly due to their low cost. However, they possess relatively low oil absorption capacities. In this work, we provide an innovative way to produce a value-added product such as oil-sorbent film with high practical oil uptake values in terms of g/g from waste HDPE bottles for rapid oil spill remedy.

Saleem, M., et al. (2019). "Fundamental investigation of solid waste generation and disposal behaviour in higher education institute in the Kingdom of Saudi Arabia." Indoor and Built Environment **28**(7): 927-937.

Waste characterization is a fundamental step for the development of solid waste management plan. In this regard, understanding the waste generation and disposal patterns plays a crucial role in developing realistic waste reduction strategies. Presently, there exists no solid waste management plan for higher education institutes in the Kingdom of Saudi Arabia. Hence, this article details the fundamental study related to the waste generation and disposal behaviour. The study also dwells into the existing practices of solid waste management and sheds light on the new polices that can be adopted for waste reduction, along with highlighting barriers to optimization of solid waste management. Through investigation, it was found that by adopting

E-learning system for examination and replacing paper towels with air dryers in washroom and by revising policy related to printing, considerable reduction in paper waste could be achieved. Furthermore, the adoption of the proposed sustainable drinking water solution led to 90% reduction in plastic pet bottle waste. The recommendations made by the presented investigation can be employed by other similar sized institutes in developing countries for the development of sustainable green campuses. Copyright © The Author(s) 2018.

Saley, A. M., et al. (2019). "Microplastic accumulation and biomagnification in a coastal marine reserve situated in a sparsely populated area." Marine Pollution Bulletin **146**: 54.

Toxic chemicals within and adsorbed to microplastics (0.05–5 mm) have the potential to biomagnify in food webs. However, microplastic concentrations in highly productive, coastal habitats are not well understood. Therefore, we quantified the presence of microplastics in a benthic community and surrounding environment of a remote marine reserve on the open coast of California, USA. Concentrations of microplastic particles in seawater were 36.59 plastics/L and in sediments were 0.227 ± 0.135 plastics/g. Densities of microplastics on the surfaces of two morphologically distinct species of macroalgae were 2.34 ± 2.19 plastics/g (Pelvetiopsis limitata) and 8.65 ± 6.44 plastics/g (Endocladia muricata). Densities were highest in the herbivorous snail, Tegula funebralis, at 9.91 ± 6.31 plastics/g, potentially due to bioaccumulation. This study highlights the need for further investigations of the prevalence and potential harm of microplastics in benthic communities at remote locations as well as human population centers.

Salih, B., et al. (1998). "Determination of inorganic and organic mercury compounds by capillary gas chromatography coupled with atomic absorption spectrometry after preconcentration on dithizone-anchored poly(ethylene glycol dimethacrylate-hydroxyethylmethacrylate) microbeads." Analytica Chimica Acta **371**(2-3): 177-185.

Poly(EGDMA-HEMA) microbeads were prepared by suspension polymerization of ethylene glycol dimethacrylate (EGDMA) and hydroxyethyl methacrylate (HEMA). Poly(vinyl alcohol), benzoyl peroxide and toluene were used as stabilizer, initiator, and diluent, respectively. A chelating ligand, dithizone, was then attached. The microbeads were characterized by FTIR spectrometers and elemental analysis. The affinity microbeads containing 118.9mumol dithizoneg⁻¹ polymer were used for the adsorption/desorption of inorganic mercury [Hg], methyl mercury chloride [CH<inf>3</inf>HgCl] and ethyl mercury chloride [C<inf>2</inf>H<inf>5</inf>HgCl] from aqueous media at concentrations in the range 5-1000mugl⁻¹ and various pH values (2.0-8.0). Adsorption rates were high, and adsorption equilibria were reached in about 30min. The maximum adsorption of mercury species onto the dithizone-anchored microbeads from their individual solutions was 138mgg⁻¹ for Hg(II), 221mgg⁻¹ for CH<inf>3</inf>HgCl and 207mgg⁻¹ for C<inf>2</inf>H<inf>5</inf>HgCl. The same behavior was observed during competitive adsorption in the case of the adsorption from their mixture. The affinity order of mercury species was CH<inf>3</inf>HgCl > C<inf>2</inf>H<inf>5</inf>HgCl > Hg(II). Dithizone-anchored microbeads are suitable for repeated use for more than 5 cycles without noticeable loss of adsorption capacity. Speciation of organomercurials was performed using a Gas chromatography-atomic absorption spectrometry coupled system. Detection limits were increased at least 120-fold with this preconcentration approach using the dithizone-anchored microbeads. Copyright (C) 1998 Elsevier Science B.V.

Saliu, F., et al. (2018). "Microplastic and charred microplastic in the Faafu Atoll, Maldives." Marine Pollution Bulletin **136**: 464-471.

Microplastics are recognized as a growing threat for the marine environment that may even affect areas generally considered pristine. In this work we surveyed the microplastic contamination in the Faafu Atoll (Maldives, Indian Ocean) across twelve sampling station, located either inside or outside the reef rim. Sediments and seawater samples were collected. Despite the remoteness of the atoll, the scarce local population and low touristic annual afflux, the detected average abundance were 0.32+/-0.15particles/m³ in the surface water and 22.8+/-10.5particles/m² in the beach sediments. Polymers identified through Fourier-Transform Infrared spectroscopy were mostly polyethylene, polypropylene, polystyrene, polyvinylchloride, polyethyleneterephtalate, and polyamide. Elastomeric residues and charred microparticles were also found. In particular, the charred microparticles were prevalently located nearby the inhabited island and they might be considered a peculiarity of the area, related to local practice of burning plastic waste at the shoreline.

Saliu, F., et al. (2020). "Biocompatible solid-phase microextraction coupled to liquid chromatography triple quadrupole mass spectrometry analysis for the determination of phthalates in marine invertebrate." Journal of Chromatography **A.**: 460852.

This paper describes the development and validation of a new procedure for the determination of phthalates in marine invertebrates, based on biocompatible solid-phase microextraction (BioSPME) followed by liquid chromatography coupled to mass spectrometry. The importance of this application relies on the current use of marine organisms as bioindicators for microplastic contamination through the detection of phthalates in their tissues. Challenges originate from the availability and/or possible restriction on the use of the biological materials, the need for user- friendly procedures for simplifying and speeding up operations in the marine environments, and the ubiquitous presence of phthalates in the laboratory environments that may cause background contamination. BioSPME served as an effective solution to all these issues, owing to the extreme minimization of the sample manipulation. Sampling operations were limited to the direct transfer of small amounts of the biological materials (150 mg) inside glass vials capped with aluminium lids; extractions were carried out by ultrasonication in acetone followed by dilution in ultrapure water and BioSPME clean-up; Electrospray (ESI) LC-MS/MS was employed for the final analytical determinations on the purified extracts. Tests were carried out on samples belonging to three different phyla, namely Cnidaria, Porifera, and Mollusca obtained from Maldivian coral reef environments and used for a current microplastic contamination biomonitoring project. Overall, very good sensitivity and repeatability, with negligible back contamination of the blanks were observed. The limits of detections were between 0.2 and 2.1 ng/g and precision, calculated as relative standard deviation (RSD), was below 14% for all the tested phthalates.

Saliu, F., et al. (2019). "Microplastics as a threat to coral reef environments: Detection of phthalate esters in neuston and scleractinian corals from the Faafu Atoll, Maldives." Marine Pollution Bulletin **142**: 234-241.

The impact of microplastics (MPs) on reef-building corals are still largely unknown. The scientific literature provides evidence from lab feeding trials that coral may ingest MPs. Several adverse effects, i.e., necrosis and bleaching, have also been highlighted. However, field studies are limited. Here, we investigated for the first time the possible correlation between MP seawater contamination and the presence of phthalic acid esters (PAEs), a class of MP-associated contaminants, in scleractinian corals. The survey was carried out in a remote coral reef atoll in the Indian Ocean located in the Maldivian archipelago, considered as a case study. MPs and PAEs were monitored in subsurface neustonic tow samples and scleractinian corals across twelve sampling sites. The results showed widespread MP contamination and the presence of appreciable levels of PAEs in the scleractinian corals sampled inside the atoll rim near an inhabited island, which correlated with the highest MP concentration. Copyright © 2019 Elsevier Ltd

Salles-Loustau, G., et al. (2018). "Cytocoded passwords: BioMEMS based barcoding of biological samples for user authentication in microfluidic diagnostic devices." Biomedical Microdevices **20**(3): 1-9.

Smart and connected point-of-care (POC) medical devices are becoming ever more ubiquitous and have the potential to radically improve disease diagnosis and health monitoring. This emerging connectivity can potentially create serious security issues where patient privacy can be easily compromised. Protection of patient data from malicious cyber-physical attackers requires radical solutions at the BioMEMS level. Ideally, the information exchange between the patient and practitioner is an automated and transparent process for the patient. In practice, this exchange requires both the patient and the test results to be authenticated and validated respectively on the storage service to ensure that the medical diagnostic results are properly stored and their access is protected. This secure authentication phase is particularly critical for medical diagnostics: patient data exposure could lead to negative social effects. This work focuses on providing a transparent authentication mechanism for patient blood tests performed using impedance flow cytometry. The goal is twofold: first, to alleviate the user from security procedures, precisely an authentication step, while using the medical device; second, to provide a unique identifier for the test results when stored in a remote server. This paper describes a domain specific authentication method for impedance flow cytometry devices. We spike into the blood samples synthetic micro-beads of different sizes, at determined concentrations, to generate a unique authentication string that uniquely identify a test result on the remote storage service. These authentication strings are embedded in the test devices and can be used as a convenient alternative to generic authentication methods, such as logins and passwords. This alternative method removes the authentication burden from the user and protects patient's privacy further by preventing them from linking their personal information to their test results.

Salles-Loustau, G., et al. (2018). "Cytocoded passwords: BioMEMS based barcoding of biological samples for user authentication in microfluidic diagnostic devices." Biomedical Microdevices **20**(3): 63.

Smart and connected point-of-care (POC) medical devices are becoming ever more ubiquitous and have the potential to radically improve disease diagnosis and health monitoring. This emerging connectivity can potentially create serious security issues where patient privacy can be easily compromised. Protection of patient data from malicious cyber-physical attackers requires radical solutions at the BioMEMS level. Ideally, the information exchange between the patient and practitioner is an automated and transparent process for the patient. In practice, this exchange requires both the patient and the test results to be authenticated and validated respectively on the storage service to ensure that the medical diagnostic results are properly stored and their access is protected. This secure authentication phase is particularly critical for medical diagnostics: patient data exposure could lead to negative social effects. This work focuses on providing a transparent authentication mechanism for patient blood tests performed using impedance flow cytometry. The goal is twofold: first, to alleviate the user from security procedures, precisely an authentication step, while using the medical device; second, to provide a unique identifier for the test results when stored in a remote server. This paper describes a domain specific authentication method for impedance flow cytometry devices. We spike into

the blood samples synthetic micro-beads of different sizes, at determined concentrations, to generate a unique authentication string that uniquely identify a test result on the remote storage service. These authentication strings are embedded in the test devices and can be used as a convenient alternative to generic authentication methods, such as logins and passwords. This alternative method removes the authentication burden from the user and protects patient's privacy further by preventing them from linking their personal information to their test results.

Salma, N., et al. (1994). "Production of OKT3 monoclonal antibody at moderate scale by hybridoma encapsulation in calcium alginate." Biotecnologia Aplicada **11**(2): 131.

The entrapment of cells in calcium gel microbeads is a technique that is well adapted for use in biotechnology. One of the applications has been in the monoclonal antibody production field, in moderate of large scale. The encapsulation procedure takes advantage of the calcium-mediated gelation of sodium alginate. In this study, we encapsulated the OKT3 hybridoma at a concentration of 1.5 x 10 super(6) cells/mL of alginate, cultivated in a spinner vessel of 500 mL. The hybridoma showed a high cell density (reached a maximum of 11.7 x 10 super(6) cells/g alginate) and viability. The monoclonal antibody production was elevated, maintaining around 70 mg/mL of supernatant during the culture. The harvested supernatant was concentrated and purified without pyrogens. The results showed that the monoclonal antibody production was superior compared to conventional cultures. In this manner, the immobilization of hybridomas significantly promotes productivity.

Salvador Cesa, F., et al. (2017). "Synthetic fibers as microplastics in the marine environment: A review from textile perspective with a focus on domestic washings." Science of the Total Environment **598**: 1116-1129.

The ubiquity of plastic materials in the environment has been, for long, a matter of discussion. Smaller particles, named microplastics (<5mm), gained attention more recently and are now the focus of many studies, especially for their particularities regarding sources, characteristics and effects (e.g., surface-area-to-volume ratio which can increase their potential to transport toxic substances). Fibers from textile materials are a subgroup of microplastics and can be originated from domestic washings, as machine filters and wastewater treatment plants (WWTPs) are not specifically designed to retain them. Once in the environment, fibers can reach concentrations up to thousands of particles per cubic meter, being available to be ingested by a broad range of species. In this scenario, this review adds and details the textile perspective to the microplastics exploring nomenclature, characteristics and factors influencing emission, but also evidencing gaps in knowledge needed to overcome this issue. Preliminarily, general information about marine litter and plastics, followed by specific aspects regarding textile fibers as microplastics, were introduced. Then fiber sources to microplastic pollution were discussed, mainly focusing on domestic washings that pass through WWTPs. Studies that reveal domestic washing as microplastic sources are scarce and there is a considerable lack of standardization in methods as well as incorporation of textile aspects in experimental design. Knowledge gaps include laundry parameters (e.g., water temperature, use of chemicals) and textile articles characteristics (e.g., yarn type, fabric structure) orchestrated by consumers' choice. The lack of information on the coverage and efficiency of sewage treatment systems to remove textile fibers also prevent a global understanding of such sources. The search of alternatives and applicable solutions should come from an integrated, synergic and global perspective, of both environmental and textile area, which still need to be fostered.

Salvaggio, A., et al. (2019). "Biomarkers of Exposure to Chemical Contamination in the Commercial Fish Species Lepidopus caudatus (Euphrasen, 1788): A Particular Focus on Plastic Additives." Frontiers in Physiology **10**: 905.

In recent years, the Mediterranean Sea has become an accumulation zone for waste generated by the 22 countries bordering its shores. Although the effects of plastic litter on the marine environment and on organisms have recently been studied in other areas, further information is needed for the Mediterranean Sea and, in particular, about plastics additives inputs and interactions with the biota and the trophic network, such as phthalates and bisphenol A. Plastic material production, use and disposal contribute also to the release of heavy metals into the environment, such as mercury (Hg), often used during the production of chlorine, the primary ingredient in PVC, lead (Pb) and cadmium (Cd), which are used as stabilizers in PVC and leach out of products during use and disposal. Our research aims to evaluate phthalates, bisphenol A and heavy metals contamination in Lepidopus caudatus (Pisces, Trichiuridae), which could be considered as a potential sentinel species. For the evaluation of toxicological effects, we evaluated the expression of vitellogenin and metallothioneins 1. In all samples analyzed, we have not found microplastics in the gastrointestinal tract but chemical analysis revealed the presence of high content of phthalates, and in particular high quantities of DIDP, DEHP, bis-benzylester phthalate, bis-butyl ester phthalate and mono-N-butyl ester phthalate in different organs. Instead, trace elements detected in tissue revealed a trend of concentrations generally higher in liver and intestine than gill and muscle tissues. Immunohistochemical analysis for anti-metallothionein 1 antibody showed a strong positivity of liver cells, both in females and males. Analysis for the anti-vitellogenin antibody showed in females a strong positivity both in the liver cells and in the gonads, in male specimens was found to be always negative except for a specimen, in which it was highlighted a positivity in some areas of the liver and of the gonad.

Samaras, V. C. and D. P. Margaris (2010). "The Influence of a High Density Phase in a Multiphase Air-Lift Pump Performance." International Review of Chemical Engineering **2**(2): 240-245.

Pump performance of a lab-scale air-lift system for transporting solid particles is investigated experimentally. The internal diameter of the upriser varies between two values, 28 mm and 40 mm, while its total height is 4080 mm. Plastic particles of 3/8 in. are used as solid particles. The relation between the discharged liquid flux and the flux of injected air are obtained, varying injecting air flux, particles flux, type of upriser and submergence ratio. Experimental data are obtained, which represent the triangular relationship between the flow rate of air supplied and the flow rates of water and particles discharged. The results are presented on the flow-regime map. In addition, the particle motion in the upriser is investigated in detail by means of photographic observation. The physics of the phenomena is discussed from the practical viewpoint.

Samyuktha Rani, B., et al. (2012). "Mucoadhesive microbeads of metformin Hcl: A promising sustained drug delivery system." International Research Journal of Pharmacy **3**(5): 263-273.

The present work was investigated to reduce the dosing frequency, improve patient compliance, to improve gastric residence and to decrease GI side effects by designing and evaluating controlled Release Mucoadhesive (CRM) microbeads of Metformin hydrochloride for effective control of diabetes type-II. Microbeads were prepared by employing ionic gelation method by using various natural and synthetic polymers such as sodium alginate as main polymer and sodium carboxy methyl cellulose(SCMC), carboxy methyl cellulose(CMC), methyl cellulose (MC), poly vinyl pyrrolidine (PVP) as co-polymers which mainly containing mucoadhesive property.

These polymers are used with various proportions using calcium chloride as across linking agent. The mucoadhesive property of four polymers is in the following order (SCMC > CMC > MC > PVP).Twenty formulations were prepared. The mucoadhesive beads were characterized for micromeritic properties such as bulk density, tapped density, hausner's ratio, compressibility index, angle of repose, percentage drug content, entrapement effieciency, swelling index, In-vitro drug release, mucoadhesion test, drug kinetics and FT-IR studies. The drug entrapment efficiency increased progressively with increasing concentration of co - polymer resulting in the formation of larger microbeads entrapping greater amounts of the drug. No significant drug-polymer interactions were observed in FT-IR studies. The kinetics of drug release and their mucoadhesive nature in vitro using goat intestinal mucosa was also investigated at physiological pH 1.2 HcL. The effective mucoadhesion property with controlled release profile was observed from optimized mucoadhesive beads consisting of Sodium alginate and SCMC (1:5). The prepared microspheres exhibited prolonged drug release as the concentration of copolymer increased, as the SCMC polymer concentration increases the mucoadhesion increased and the drug release rate decreased at higher concentration of sodium alginate.

Sanchez, C. (2019). "Fungal potential for the degradation of petroleum-based polymers: An overview of macro- and microplastics biodegradation." Biotechnology Advances: 107501.

Petroleum-based plastic materials as pollutants raise concerns because of their impact on the global ecosystem and on animal and human health. There is an urgent need to remove plastic waste from the environment to overcome the environmental crisis of plastic pollution. This review describes the natural and unique ability of fungi to invade substrates by using enzymes that have the capacity to detoxify pollutants and are able to act on nonspecific substrates, the fungal ability to produce hydrophobins for surface coating to attach hyphae to hydrophobic substrates, and hyphal ability to penetrate three dimensional substrates. Fungal studies on macro- and microplastics biodegradation have shown that fungi are able to use these materials as the sole carbon and energy source. Further research is required on novel isolates from plastisphere ecosystems, on the use of molecular techniques to characterize plastic-degrading fungi and enhance enzymatic activity levels, and on the use of omics-based technologies to accelerate plastic waste biodegradation processes. The addition of pro-oxidants species (photosensitizers) and the reduction of biocides and antioxidant stabilizers used in the plastic manufacturing process should also be considered to promote biodegradation. Interdisciplinary research and innovative fungal strategies for plastic waste biodegradation, as well as ecofriendly manufacturing of petroleum-based plastics, may help to reduce the negative impacts of plastic waste pollution in the biosphere.

Sanchez, W., et al. (2014). "Wild gudgeons (Gobio gobio) from French rivers are contaminated by microplastics: preliminary study and first evidence." Environmental Research **128**: 98-100.

Marine ecosystem contamination by microplastics is extensively documented. However few data is available on the contamination of continental water bodies and associated fauna. The aim of this study was to address the occurrence of microplastics in digestive tract of gudgeons (Gobio gobio) from French rivers. These investigations confirm that continental fish ingested microplastics while 12% of collected fish are contaminated by these small particles. Further works are needed to evaluate the occurence of this contamination.

Sanchez-Moran, H., et al. (2019). "Oxime Cross-Linked Alginate Hydrogels with Tunable Stress Relaxation." Biomacromolecules **20**(12): 4419-4429.

Stress relaxation is an important design parameter of biomaterials that can provide an artificial microenvironment mimicking natural extracellular matrix (ECM). Here, we report a novel hydrogel platform based on sodium alginate (NaAlg) with tunable stress relaxation. We first developed a new synthesis route to introduce alkoxyamine functional groups into the alginate polymer backbone. By mixing the resulting polymer (NaAlg-AA) with aldehyde-containing oxidized alginate (NaAlg-Ald), oxime cross-linked alginate hydrogels were prepared. We demonstrate that highly tunable stress relaxation and mechanical properties can be achieved by systematically varying the composition (concentration, polymer mixing ratios, degree of oxidation of NaAlg-Ald) or environmental factors (pH, temperature, and use of catalyst). Combined with the natural capability of the alginate to be cross-linked by divalent cations, the developed hydrogel formations possess the unique capability of dual cross-linking mechanisms with different gelation kinetics. We demonstrated that this dual cross-linking capability can (i) be utilized for the creation of hydrogels in microbead or microthread geometries and (ii) be useful for biomedical applications that require both the fast encapsulation of cells in hydrogels (fast calcium cross-linking) and the provision of controlled viscoelastic environments to cultured cells for an extended period (durable oxime cross-linking). With biocompatibility confirmed by the culture of a B-cell line encapsulated within the developed hydrogel, this novel hydrogel platform provides a good prospect in various applications where stress relaxation plays a key role in cell-matrix interactions.

Sánchez-Nieva, J., et al. (2017). "A new analytical technique for the extraction and quantification of microplastics in marine sediments focused on easy implementation and repeatability." Analytical Methods **9**(45): 6371-6378.

A new analytical approach has been developed to extract and quantify HDPE microparticles from marine sediments. This is the first method that has been proposed using routine laboratory equipment that incorporates slow mixing and air flux for floatation in order to collect the supernatant by overflow, using NaCl saturated solutions. The technique developed in this study comprised the preparation of an HDPE standard of different sizes and calibration curves for artificial enrichment of sediments. Two different techniques were used and compared regarding quantification: (a) stereoscopic microscopy and visual sorting and (b) confocal microscopy and image-processing counting. Microplastics of different sizes were extracted and quantified in sediments with several total concentrations of particles, and different groups of sizes were identified ranging from 0.850 to 0.100 mm. Recoveries exceeding 90% for sediments with higher concentrations of microplastics and above 80% for those with lower concentrations emphasise the potential of this methodology. This is even more remarkable if it is taken into account that different sizes were also used in these experiments. The use of this technique will result not only in a more complete assessment of microplastic concentrations but also in higher repeatability in inter-laboratory comparisons. In addition, this methodology is also suitable for applying the extraction of different polymers of microplastics using other salt solutions such as NaI or ZnCl2.

Sancho, J. A., et al. (2008). "Catalytic Air Gasification of Plastic Waste (Polypropylene) in Fluidized Bed. Part I: Use of in-Gasifier Bed Additives." Industrial & Engineering Chemistry Research **47**(4): 1005-1010.

Gasification of 100 wt % polypropylene waste was carried out for this work. The main objective of this study was to compare the effectiveness of tar elimination by some additives in the gasifier bed with an inert bed. Dolomite and olivine were used as in-gasifier bed additives. Dolomite was more active than olivine when using the same amount in the gasifier bed (30 wt %). Tar content was reduced by 92% when dolomite was used, whereas the reduction of tar with olivine was 40% when compared with an inert bed. However, dolomite caused a few problems by plugging the gas cleaning devices because of the high amount of particulates; this did not happen with olivine. Therefore, olivine was used as the preferred gasifier bed material. The bed was then tested with 100 wt % olivine, which is a hard material. The results achieved were good and promising, obtaining from the gasifier a tar content of 2 g/nm3 at the exit, with an L.H.V. of 6 MJ/Nm3 and a gas yield of 6 Nm3/kgdaf.

Sander, M., et al. (2019). "Assessing the environmental transformation of nanoplastic through ¹³C-labelled polymers." Nature Nanotechnology **14**(4): 301-303.

To assess potential risks posed by plastic nanoparticles, we must study the way in which they transfer and transform in the environment. Using ¹³C-labelled nanoplastics could provide a safe and effective way to establish whether the plastic is mineralized or whether it persists in the environment. Copyright © 2019, Springer Nature Limited.

Sanderson, J. P., et al. (2009). "Enrichment of lipid specific immuneregulatory T lymphocytes with magnetic CD1d-microbeads." Rheumatology **1)**: i31.

Background: The highly conserved CD1d-restricted invariant Natural Killer T cells (iNKT) are key players of immunological tolerance and defects in the repertoire of iNKT cells are associated with autoimmune disease in animals and humans. Autologous adoptive transfer of human iNKT cells has been discussed as a possible future treatment option to restore normal tolerance in autoimmune patients. However, iNKT cells are often strongly reduced in peripheral blood of autoimmune patients, which poses challenges for their effective and sterile enrichement. The aim of this study was to design a new type of magnetic microbead coated with recombinant CD1d-molecules for effective ex vivo enrichement of human iNKT cells. Method(s): The extracellular alpha1-alpha3 domains of human CD1d were amplified from human dendritic cell cDNA and cloned into a pET expression vector, expressed in E.coli, and refolded with beta-2 microglobulin (B2m) and different glycolipids. Monomeric CD1d/B2m/lipid molecules were specifically biotinylated via an engineered BirA-motif at the COOH-terminus of the CD1d protein. After repurification of the biotinylated CD1d/B2m/lipid-complexes they could be conjugated to streptavidincoated magnetic microbeads at different molar ratios (biotin to streptavidin). Result(s): Dependent on the CD1d packaging density of the microbeads and the specific ligands bound to the CD1d molecules we were able to completely deplete human peripheral blood mononuclear cell (PBMC) samples of all iNKT cells. On the other hand the beads allowed for rapid strong enrichment of human iNKT cells (>90%) from PBMC samples, even when iNKT precursor frequencies were very low (<0.1%). Conclusion(s): Magnetic CD1d/B2m/Lipid-microbeads are a powerful tool to directly isolate human iNKT cells from peripheral blood and allow for effective enrichement of these immuneregulatory T cells. Compared to fluorescent activated cell sorter (FACS) based methods isolation of the rare iNKT lymphocyte populations from autoimmune patients using magnetic CD1d-microbeads should be both faster and cleaner.

Sangale, M. K., et al. (2019). "Potential of fungi isolated from the dumping sites mangrove rhizosphere soil to degrade polythene." Scientific Reports **9**(1): 5390.

Polythene is the most widely used plastic around the globe. Among the total plastic waste generated, polythene contributes the maximum share (64%). Various strategies/methods are being utilized to deal with the increasing rate of plastic waste, but among all the methods, bioremediation is regarded as the ecofriendly and widely accepted method. In the current investigation, we have attempted to discover the elite polythene deteriorating fungi (isolated from the rhizosphere soil of Avicennia marina). From 12 different eco-geographical locations along the West Coast of India, total 109 fungal isolates were recorded. The polythene deteriorating fungi were screened at varied pH (3.5, 7 and 9.5) based on changes in weight and tensile strength of the treated polythene at ambient temperature with continuous shaking for 60 days. BAYF5 isolate (pH 7) results in maximum reduction in weight (58.51 +/- 8.14) whereas PNPF15 (pH 3.5) recorded highest reduction in tensile strength (94.44 +/- 2.40). Surprisingly, we have also reported weight gain, with highest percent weight gain (28.41 +/- 6.99) with MANGF13 at pH 9.5. To test the reproducibility of the results, the elite polythene degrading fungal isolates based on weight loss and reduction in tensile strength were only used for repetition experiment and the results based on the reduction in tensile strength were found only reproducible. Polythene biodegradation was further confirmed using Scanning Electron Microscopy (SEM) and Fourier Transform Infrared Spectroscopy (FTIR) analysis. The most efficient polythene deteriorating fungal isolates were identified as Aspergillus terreus strain MANGF1/WL and Aspergillus sydowii strain PNPF15/TS using both morphological keys and molecular tools.

Sanganyado, E., et al. (2018). "Bioaccumulation of organic pollutants in Indo-Pacific humpback dolphin: a review on current knowledge and future prospects." Environmental Pollution **237**: 111-125.

Indo-Pacific humpback dolphin (Sousa chinensis) are chronically exposed to organic pollutants since they inhabit shallow coastal waters that are often impacted by anthropogenic activities. The aim of this review was to evaluate existing knowledge on the occurrence of organic pollutants in Indo-Pacific humpback dolphins, identify knowledge gaps, and offer recommendations for future research directions. We discussed the trends in the bioaccumulation of organic pollutants in Indo-Pacific humpback dolphins focusing on sources, physicochemical properties, and usage patterns. Furthermore, we examined factors that influence bioaccumulation such as gender, age, dietary intake and tissue-specific distribution. Studies on bioaccumulation in Indo-Pacific humpback dolphin remain scarce, despite high concentrations above 13,000 ng/g lw we previously detected for PFOS, Sigma PBDE and chlorinated paraffins. The maximum concentration of organochlorines detected was 157,000 ng/g wt. Furthermore, variations in bioaccumulation were shown to be caused by factors such as usage patterns and physicochemical properties of the pollutant. However, restrictions in sampling inhibit investigations on exposure pathway and toxicity of organic pollutants in Indo-Pacific humpback dolphin. We proposed the use of biopsy sampling, predictive bioaccumulation and toxicity modeling, and monitoring other emerging contaminants such as microplastics and pharmaceuticals for future health risk assessment on this critically endangered marine mammal species.

Santana, M. F. M., et al. (2016). "Microplastic contamination in natural mussel beds from a Brazilian urbanized coastal region: rapid evaluation through bioassessment." Marine Pollution Bulletin **106**(1/2): 183-189.

Microplastic pollution (particles <5 mm) is a widespread marine threat and a trigger for biological effects, especially if ingested. The mussel Perna perna, an important food resource, was used as bioindicator to investigate the presence of microplastic pollution on Santos estuary, the most urbanized area of the coast of Sao Paulo State, Brazil. A simple and rapid assessment showed that 75% of sampled mussels had ingested microplastics, an issue of human and environmental concern. All sampling points had contaminated mussels and this contamination had no clear pattern of distribution along the estuary. This was the first time that microplastic bioavailability was assessed in nature for the southern hemisphere and that wild P. perna was found contaminated with this pollutant. This is an important issue that should be better assessed due to an increase in seafood consumption and culture in Brazil and worldwide.

Santana, M. F. M., et al. (2018). "Continuous exposure to microplastics does not cause physiological effects in the cultivated mussel Perna perna." Archives of Environmental Contamination and Toxicology **74**(4): 594-604.

The environmental impact of microplastics is a challenging theme, especially under realistic experimental conditions. We investigated physiological responses to 0.1-1.0 micro m PVC particles intake by the mussel Perna perna after a relative long-term exposure (90 days) at a less extreme concentration compared with previous studies (0.125 g/L). Microplastic intake was inferred by the presence of PVC in the feces of mussels, and physiological damages were assessed through ingestion rate, assimilation efficiency, growth rate, cellular and molecular biomarkers (lysosomal integrity, lipid peroxidation, and DNA damage), and condition index. All physiological responses showed nonsignificant effects of the microplastics on the exposed mussels. We suggest that, despite the experimental concentration of microplastics, mussels were able to acclimate to the exposure through their abilities for long-term recovery and tolerance to stresses. These data have positive implications for environmental health and in terms of human food resource because mussel farming is a worldwide practice that heavily relies on plastic materials, increasing the chances of microplastic exposure and mussels contamination.

Santana, M. F. M., et al. (2017). "Trophic transference of microplastics under a low exposure scenario: insights on the likelihood of particle cascading along marine food-webs." Marine Pollution Bulletin **121**(1/2): 154-159.

Microplastics are emergent pollutants in marine environments, whose risks along food-web still need to be understood. Within this knowledge gap, MPs transference and persistence along trophic levels are key processes. We assessed the potential occurrence of these processes considering a less extreme scenario of exposure than used previously, with microplastics present only in the hemolymph of prey (the mussel Perna perna) and absent in the gut cavity. Predators were the crab Callinectes ornatus and the puffer fish Spheoeroides greeleyi. Transference of microplastics occurred from prey to predators but without evidences of particle persistence in their tissues after 10 days of exposure. This suggests a reduced likelihood of trophic cascading of particles and, consequently, a reduced risk of direct impacts of microplastics on higher trophic levels. However, the contact with microplastics along food-webs is still concerning, modulated by the concentration of particles in prey and predators' depuration capacity and rate.

Santana, M. F. M. and A. Turra (2020). Toxicity of microplastics in the marine environment. Wallingford, A handbook of environmental toxicology
CABI**:** 436-453 many ref.

Marine litter is one of the most expanding and devastating problems in the marine environment. Among several types of items and origins, microplastics have been drawing attention due to their small particle size (<5 mm), persistence and the potential to be ingested by a high variety of organisms and act as vectors of chemical pollutants. This chapter provides a broad and updated review of the ecotoxicological effects of microplastics on marine biodiversity. Effects of microplastics have been demonstrated from the biochemical to physiological, behavioural and even ecological levels of organization. Most information comes from a range of biomarkers on low levels of organization, such as oxidative stress (lipid peroxidation, DNA damage and the activation of antioxidant enzymes) and immunological responses (phagocytosis activity, signs of inflammation and enzyme/protein response).

However, the variety of experimental conditions, including plastic size and shape, polymer type, additives, concentration and period of exposure, and biological model, still does not allow a clear and wide understanding on the effects on the environment and, indeed, humans. This scenario calls for additional and coordinated efforts to improve scientific knowledge on this subject.

Santhi, K., et al. (2013). "Formulation and evaluation of Nifedipine microbeads using Guar gum as a release modifier." International Journal of Pharmaceutical Sciences Review and Research **21**(1): 270-275.

A great deal of attention has been given to the formulation of alginate micro beads which has potential as carrier in controlled drug delivery. The drug Nifedipine has low bioavailability, hence to improve its bioavailability; Nifedipine-loaded mucoadhesive microbeads were prepared by Ionotropic gelation and cross linking technique by using sodium alginate as the hydrophilic carrier in combination with Guar gum as release modifier. Micro beads with different ratio of sodium alginate and guar gum were formulated and evaluated for particle size, swelling ratio, and percentage yield. An optimized batch was selected from the previous study and four different concentrations of Nifedipine were loaded. The drug loaded batches were evaluated for drug entrapment, bio adhesiveness, in vitro release, and release kinetics. Particle size distribution of beads was measured by both optical microscopy and SEM. No significant drug-polymer interactions were observed in FT-IR studies. In-vitro drug release profile of Nifedipine micro beads in phosphate buffer pH 6.8 exhibited zero order release with kinetics of super case II-transport. The in vitro wash-off test using goat intestine revealed that the sodium alginate micro beads of Nifedipine possess good mucoadhesive properties. The drug loaded batches were found to have good drug loading. Hence the formulated Microbeads of Sodium alginate with guar gum as release modifiers could be used as an alternative and cost effective carrier for the development of oral controlled release capsules or tablets the of Nifedipine as once daily formulation.

Santillo, D., et al. (2017). "Microplastics as contaminants in commercially important seafood species." Integrated Environmental Assessment & Management **13**(3): 516-521.

The ingestion of microplastic fragments, spheres, and fibers by marine mollusks, crustaceans, and fish, including a number of commercially important species, appears to be a widespread and pervasive phenomenon. Evidence is also growing for direct impacts of microplastic ingestion on physiology, reproductive success and survival of exposed marine organisms, and transfer through food webs, although the ecological implications are not yet known. Concerns also remain over the capacity for microplastics to act as vectors for harmful chemical pollutants, including plastic additives and persistent organic pollutants, although their contribution must be evaluated alongside other known sources. The potential for humans, as top predators, to consume microplastics as contaminants in seafood is very real, and its implications for health need to be considered. An urgent need also exists to extend the geographical scope of studies of microplastic contamination in seafood species to currently underrepresented areas, and to finalize and adopt standardized methods and quality-assurance protocols for the isolation, identification, and quantification of microplastic contaminants from biological tissues. Such developments would enable more robust investigation of spatial and temporal trends, thereby contributing further evidence as a sound basis for regulatory controls. Despite the existence of considerable uncertainties and unknowns, there is already a compelling case for urgent actions to identify, control, and, where possible, eliminate key sources of both primary and secondary microplastics before they reach the marine environment. Integr Environ Assess Manag 2017;13:516-521. © 2017 SETAC.

Santos, A. D. O., et al. (2015). "Marine Pollution: The Problematic of Microplastics." Journal of Marine Science. Research & Development **5**(3): 1.

Throughout the history of mankind and the of conquest of the seas and oceans these water masses were always seen as unlimited sinks of wastes since they were assumed as being able to disperse, dilute and redistribute natural and synthetic substances. However, in the last few decades the authors have finally realized that this capacity is not unlimited. The concern about the presence of plastics in marine environments comes from many years ago. The impacts of microplastics still remains unclear nevertheless some conclusions and suspicions were already raised by recent studies. Nevertheless, the contamination of marine environments by microplastics may have other types of impacts, indirectly affecting organisms. The ingestion of microplastics by small animals may cause a decrease in food consumption due to satiation feeling and/or intestinal blockage leading to death. Further, the permeability of the sand increases with the presence of microplastics.

Santos, D. C. M. d., et al. (2015). "Histological alterations in liver and testis of Astyanax aff. bimaculatus caused by acute exposition to zinc." Revista Ceres **62**(2): 133-141.

This study investigated the effect of acute exposition to zinc (Zn) on histology of the liver and testes of yellow tail lambari (Astyanax aff. bimaculatus). The exposure consisted of six concentrations of Zn (0, 3, 5, 10, 15, and 20 mg/L) for 96 hours of exposure. Fragments of liver and testis were routinely processed and embedded in plastic resin based on glycol methacrylate. Fragments of bones, muscles, liver and testis were dehydrated and digested to quantify the absorption levels of Zn in the tissue. Acute exposure to concentrations above 10 mg/L has produced structural changes in the liver and gonads. The changes found in the liver were vascular congestion; decrease of cellular volume; displacement of the hepatocyte nucleus; necrosis; disarrangement of cordon structure; leukocyte infiltrate and vacuolization. The changes found in the gonads were ruptured cyst, delayed development of germ cells, pyknotic nucleus, cell cluster, displacement of cyst wall and vacuolization. The histological changes observed were compatible with the increasing concentration of zinc in environment, compromising liver and reproductive functions, because there was an increase in relative frequency of hepatocytes and reduced sperm production.

Santos Ode, S., et al. (2015). "Manganese ore tailing: optimization of acid leaching conditions and recovery of soluble manganese." Journal of Environmental Management **147**: 314-320.

Manganese recovery from industrial ore processing waste by means of leaching with sulfuric acid was the objective of this study. Experimental conditions were optimized by multivariate experimental design approaches. In order to study the factors affecting leaching, a screening step was used involving a full factorial design with central point for three variables in two levels (2(3)). The three variables studied were leaching time, concentration of sulfuric acid and sample amount. The three factors screened were shown to be relevant and therefore a Doehlert design was applied to determine the best working conditions for leaching and to build the response surface. By applying the best leaching conditions, the concentrations of 12.80 and 13.64 %w/w of manganese for the global sample and for the fraction -44 + 37 mum, respectively, were found. Microbeads of chitosan were tested for removal of leachate acidity and recovering of soluble manganese. Manganese recovery from the leachate was 95.4%. Upon drying the leachate, a solid containing mostly manganese sulfate was obtained, showing that the proposed optimized method is efficient for manganese recovery from ore tailings.

Santos, R. G., et al. (2016). "Marine debris ingestion and Thayer's law - The importance of plastic color." Environmental Pollution **214**: 585-588.

In recent years marine plastic pollution has gained considerable attention as a significant threat to marine animals. Despite the abundant literature related to marine debris ingestion, only a few studies attempted to understand the factors involved in debris ingestion. Plastic ingestion is commonly attributed to visual similarities of plastic fragments to animal's prey items, such as plastic bags and jellyfish. However, this simple explanation is not always coherent with the variety of debris items ingested and with the species' main prey items. We assess differences in the conspicuousness of plastic debris related to their color using Thayer's law to infer the likelihood that visual foragers detect plastic fragments. We hypothesize that marine animals that perceive floating plastic from below should preferentially ingest dark plastic fragments, whereas animals that perceive floating plastic from above should select for paler plastic fragments. Copyright © 2016 Elsevier Ltd. All rights reserved.

Santos-Oliveira, J. R., et al. (2011). "Evidence that lipopolisaccharide may contribute to the cytokine storm and cellular activation in patients with visceral leishmaniasis." PLoS Neglected Tropical Diseases [electronic resource] **5**(7): e1198.

BACKGROUND: Visceral leishmaniasis (VL) is characterized by parasite-specific immunosuppression besides an intense pro-inflammatory response. Lipopolisaccharide (LPS) has been implicated in the immune activation of T-cell deficient diseases such as HIV/AIDS and idiopathic lymphocytopenia. The source of LPS is gram-negative bacteria that enter the circulation because of immunological mucosal barrier breakdown. As gut parasitization also occurs in VL, it was hypothesized that LPS may be elevated in leishmaniasis, contributing to cell activation.

METHODOLOGY/PRINCIPAL FINDINGS: Flow cytometry analysis and immunoassays (ELISA and luminex micro-beads system) were used to quantify T-cells and soluble factors. Higher LPS and soluble CD14 levels were observed in active VL in comparison to healthy subjects, indicating that LPS was bioactive; there was a positive correlation between these molecules ($r = 0.61; p<0.05$). Interestingly, LPS was negatively correlated with CD4(+) ($r = -0.71; p<0.01$) and CD8(+) T-cells ($r = -0.65; p<0.05$). Moreover, higher levels of activation-associated molecules (HLA-DR, CD38, CD25) were seen on T lymphocytes, which were positively associated with LPS levels. Pro-inflammatory cytokines and macrophage migration inhibitory factor (MIF) were also augmented in VL patients. Consistent with the higher immune activation status, LPS levels were positively correlated with the inflammatory cytokines IL-6 ($r = 0.63; p<0.05$), IL-8 ($r = 0.89; p<0.05$), and MIF ($r = 0.64; p<0.05$). Also, higher plasma intestinal fatty acid binding protein (IFABP) levels were observed in VL patients, which correlated with LPS levels ($r = 0.57; p<0.05$).

CONCLUSIONS/SIGNIFICANCE: Elevated levels of LPS in VL, in correlation with T-cell activation and elevated pro-inflammatory cytokines and MIF indicate that this bacterial product may contribute to the impairment in immune effector function. The cytokine storm and chronic immune hyperactivation status may contribute to the observed T-cell depletion. LPS probably originates from microbial translocation as suggested by IFABP levels and, along with Leishmania antigen-mediated immune suppression, may play a role in the immunopathogenesis of VL. These findings point to possible benefits of antimicrobial prophylaxis in conjunction with anti-Leishmania therapy.

Santos-Oliveira, J. R., et al. (2011). "Evidence That Lipopolisaccharide May Contribute to the Cytokine Storm and Cellular Activation in Patients with Visceral Leishmaniasis: e1198." PLoS Neglected Tropical Diseases **5**(7): e1198.

Background Visceral leishmaniasis (VL) is characterized by parasite-specific immunosuppression besides an intense pro-inflammatory response. Lipopolisaccharide (LPS) has been implicated in the immune activation of T-cell deficient diseases such as HIV/AIDS and idiopathic lymphocytopenia. The source of LPS is gram-negative bacteria that enter the circulation because of immunological mucosal barrier breakdown. As gut parasitization also occurs in VL, it was hypothesized that LPS may be elevated in leishmaniasis, contributing to cell activation. Methodology/Principal Findings Flow cytometry analysis and immunoassays (ELISA and luminex micro-beads system) were used to quantify T-cells and soluble factors. Higher LPS and soluble CD14 levels were observed in active VL in comparison to healthy subjects, indicating that LPS was bioactive; there was a positive correlation between these molecules ($r = 0.61; p<0.05$). Interestingly, LPS was negatively correlated with CD4+ ($r = -0.71; p<0.01$) and CD8+ T-cells ($r = -0.65; p<0.05$). Moreover, higher levels of activation-associated molecules (HLA-DR, CD38, CD25) were seen on T lymphocytes, which were positively associated with LPS levels. Pro-inflammatory cytokines and macrophage migration inhibitory factor (MIF) were also augmented in VL patients. Consistent with the higher immune activation status, LPS levels were positively correlated with the inflammatory cytokines IL-6 ($r = 0.63; p<0.05$), IL-8 ($r = 0.89; p<0.05$), and MIF ($r = 0.64; p<0.05$). Also, higher plasma intestinal fatty acid binding protein (IFABP) levels were observed in VL patients, which correlated with LPS levels ($r = 0.57; p<0.05$). Conclusions/Significance Elevated levels of LPS in VL, in correlation with T-cell activation and elevated pro-inflammatory cytokines and MIF indicate that this bacterial product may contribute to the impairment in immune effector function. The cytokine storm and chronic immune hyperactivation status may contribute to the observed T-cell depletion. LPS probably originates from microbial translocation as suggested by IFABP levels and, along with Leishmania antigen-mediated immune suppression, may play a role in the immunopathogenesis of VL. These findings point to possible benefits of antimicrobial prophylaxis in conjunction with anti-Leishmania therapy.

Sanz, M., et al. (2017). "Compact, cost-effective and field-portable microscope prototype based on MISHELF microscopy." Scientific Reports **7**: 43291.

We report on a reduced cost, portable and compact prototype design of lensless holographic microscope with an illumination/detection scheme based on wavelength multiplexing, working with single hologram acquisition and using a fast convergence algorithm for image processing. All together, MISHELF (initials coming from Multi-Illumination Single-Holographic-Exposure Lensless Fresnel) microscopy allows the recording of three Fresnel domain diffraction patterns in a single camera snap-shot incoming from illuminating the sample with three coherent lights at once. Previous implementations have proposed an illumination/detection procedure based on a tuned (illumination wavelengths centered at the maximum sensitivity of the camera detection channels) configuration but here we report on a detuned (non-centered ones) scheme resulting in prototype miniaturization and cost reduction. Thus, MISHELF microscopy in combination with a novel and fast iterative algorithm allows high-resolution (mum range) phase-retrieved (twin image elimination) quantitative phase imaging of dynamic events (video rate recording speed). The performance of this microscope prototype is validated through experiments using both amplitude (USAF resolution test) and complex (live swine sperm cells and flowing microbeads) samples. The proposed method becomes in an alternative instrument improving some capabilities of existing lensless microscopes.

Saphirstein, R., et al. (2011). "The focal adhesion: A regulator of vascular stiffness?" Molecular Biology of the Cell. Conference: Annual Meeting of the American Society for Cell Biology, ASCB **22**(24).

Despite the fact that arterial stiffening with age is now known to be an independent and early predictor of cardiovascular disease, relatively little is known about the contributions of different tissue components to vascular stiffness. The extracellular matrix (ECM) has traditionally been regarded as the main determinant of vascular tissue stiffness, but a recent study (Qiu et al. Circ Res. 2010) implicates the actomyosin-based stiffness of vascular smooth muscle cells as a significant contributor. Here, we investigated the role of differentiated vascular smooth muscle cells in determining tissue stiffness. We measured the stiffness of vascular tissue strips in vitro and observed that stiffness increases unexpectedly when tissue strips are treated with PP2, a small molecule inhibitor of the master focal adhesion (FA) tyrosine kinase Src. This result suggests that FAs, which mechanically link the ECM to the internal actin CSK, may regulate vascular tissue stiffness. To further confirm FA involvement, we examined tyrosine phosphorylation as a biochemical signature of FA signaling and turnover. Phosphotyrosine screening of vascular tissue homogenates via Western blots reveals roles for the FA proteins Src, FAK, and CAS in vasoconstrictor-induced signaling. To directly confirm the role of FAs in the regulation of stiffness, we used optical tweezers to measure stiffness in A7r5 smooth muscle cells by applying piconewton forces localized directly to FAs via cell-bound RGD-coated microbeads. We found that A7r5 stiffness is modulated by FAs and by A7r5 activation state. Stimulation with the vasoconstrictor lysophosphatidic acid (LPA) increases stiffness in a PP2-attenuated manner. Cell immunofluorescence imaging suggests that A7r5 stiffness is related to FA size as well as FA stiffness, since FA size increases in a PP2-attenuated manner with LPA stimulation. Our findings indicate that the FA is a significant component of vascular stiffness.

Sappington, R. M., et al. (2010). "The microbead occlusion model: a paradigm for induced ocular hypertension in rats and mice." Investigative Ophthalmology & Visual Science **51**(1): 207-216.

PURPOSE. Elevated intraocular pressure (IOP) is an important risk factor for glaucoma. Animal models often involve techniques for IOP elevation that are surgically invasive. Here the authors describe a novel and relatively simple method for inducing a highly consistent, modest, and repeatable elevation in IOP for rats and mice. METHODS. IOP was elevated unilaterally by injection of polystyrene microbeads into the anterior chamber to occlude aqueous outflow in rats (2.5-7 micro L) and mice (1 micro L). The fellow eye received an equivalent saline injection as internal control. The authors used tonometry to measure microbead-induced IOP elevations. Optic nerves were processed histologically to determine axon loss. RESULTS. For rats, a single injection of microbeads raised IOP by 21% to 34%, depending on volume, for approximately 2 weeks, though they were not tracked to full recovery. IOP in the saline-injected eye was constant. An additional injection (5 micro L) extended the elevation to 8 weeks. Cumulative pressure exposure for both injections increased linearly. For mice, a single 1- micro L injection of microbeads elicited a highly regular 30% elevation in IOP that persisted for more than 3 weeks, with a linear rise in cumulative pressure exposure. For both rats and mice, interanimal variability on a given day was modest, approximately 5% of the mean IOP measurement. Extended elevations (4-5 weeks) induced approximately a 20% loss of axons in both rats and mice. CONCLUSIONS. These data support a novel and flexible model of modest ocular hypertension with axon loss. The maximal duration of IOP elevation will be further characterized in future studies.

Saputra, E., et al. (2015). "An edible film characteristic of chitosan made from shrimp waste as a plasticizer." Journal of Natural Sciences Research **5**(4): 118-124.

The edible film is expected to replace the plastic packaging, so it can reduce plastic waste used. Information about edible film as food packaging that is stored at room temperature is still very few found. The aims of research is to assess the characteristics of an edible film from chitosan for biodegradable packaging to substitute plastic in general that it could not be processed further. The results of characterization making edible film chitosan with the addition of a plasticizer from carrageenan produce the value of the thickness, and tensile strength film meet the criteria of standard value for characterization of edible film, while the transmission of water vapor and the percentage of lengthening is not yet meet the criteria of standard value for characterization of edible film. Packaging is the final part of a process for the production of foodstuffs or other products. Today, the packaging industry is dominated by packaging materials made from plastic. This resulted in the increase of plastic waste in the world. Plastic packaging commonly used type of polyethylene, polystyrene, polyvinylchloride (PVC) and resins that many impacts are not as good as the environmental damage can not be decomposed by microorganisms, expensive in recycling and contamination of foodstuffs was due to the presence of certain substances migrated into the food material. One alternative solution is the use of edible film which has several advantages, which are able to protect the product, the original appearance of the product can be maintained, safe for the environment and can be eaten.

Saraji, M., et al. (2015). "Sol-gel/nanoclay composite as a solid-phase microextraction fiber coating for the determination of organophosphorus pesticides in water samples." Analytical and bioanalytical chemistry **407**(4): 1241-1252.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis A novel solid-phase microextraction (SPME) fiber coated with a sol-gel/nanoclay composite was prepared by the sol-gel technique involving the hydrolysis reaction of alkoxysilanes and the subsequent condensation reaction with hydroxyl groups of the nanoclay on a stainless steel wire. A method based on direct immersion SPME and gas chromatography-corona discharge ion mobility spectrometry was developed for the determination of four organophosphorus pesticides in aqueous samples. The effect of different experimental parameters on the extraction efficiency of the method was investigated. The sol-gel/nanoclay fiber showed higher extraction performance for the organophosphorus pesticides compared with Ppy/nanoclay, sol-gel coating, and three commercial fibers (polydimethylsiloxane (PDMS), PDMS/divinylbenzene (DVB), and polyacrylate (PA)). Limits of detection (LOD) and quantitation (LOQ) of the method were in the range of 0.003-0.012 and 0.01-0.02 [mu]g L^sup -1^, respectively. The calibration curves were linear in a concentration range from 0.01 to 2.0 [mu]g L^sup -1^ (r ^sup 2^>0.995). The relative standard deviations for intra- and inter-day precision were 3.3-5.6 and 6.4-8.4 %, respectively. Fiber-to-fiber reproducibility for three prepared fibers was 7.4-10.2 %. Finally, the method was successfully applied for the extraction of the studied compounds from water samples. The relative recovery obtained for the spiked real-water samples were 86-104 %. [Figure not available: see fulltext.]

Saralidze, K., et al. (2003). "Injectable polymeric microspheres with X-ray visibility. Preparation, properties, and potential utility as new traceable bulking agents." Biomacromolecules **4**(3): 793-798.

The copolymer of methyl methacrylate (MMA) and 2-[2',3',5'-triiodobenzoyl]oxoethyl methacrylate (1), ratio 3:1 (mass:mass), was prepared via a free-radical polymerization in bulk. The copolymer (M<inf>w</inf> = 97.8 kD and M<inf>n</inf> = 41.5 kD was dissolved in chloroform and subsequently transformed into beads with a diameter in the micrometer range, using a solvent evaporation technique. The resulting microbeads were characterized by different

techniques, including NMR spectroscopy, differential scanning calorimetry, gel permeation chromatography, and scanning electron microscopy. The latter technique was used as the basis for statistical analysis of the bead size. Typically, an average diameter of 96 mum and a standard deviation of 21 mum were obtained. The beads were also subjected to some preliminary tests regarding cytotoxicity. The copolymer of MMA and 1 contains covalently bound iodine. Therefore, the material is intrinsically radiopaque, i.e., capable of absorbing X-radiation while no contrast additive is needed. Our interest in these microspheres stems primarily from their possible utility as injectable and afterward traceable (radiopaque) bulking agents, e.g., for use in urology for the treatment of female stress incontinence due to sphincter deficiency. As a first test into this direction, a sample of the microbeads was mixed with ethylene glycol, and the resulting suspension was studied with respect to injectability and radiopacity. The results suggest that the radiopaque microbeads may provide access to improved bulking agents. Further modification of the surface may be necessary in order to suppress the migratory aptitude of the radiopaque polymeric microspheres in vivo.

Sargin, I., et al. (2016). "Microfungal spores (Ustilago maydis and U. digitariae) immobilised chitosan microcapsules for heavy metal removal." Carbohydrate Polymers **138**: 201-209.

Designing effective chitosan-based biosorbents from unexploited biomass for heavy metal removal has received much attention over the past decade. Ustilago, loose smut, is a ubiquitous fungal plant pathogen infecting over 4000 species including maize and weed. This study aimed to establish whether the spores of the phytopathogenic microfungi Ustilago spores can be immobilised in cross-linked chitosan matrix, and it reports findings on heavy metal sorption performance of chitosan/Ustilago composite microcapsules. Immobilisation of Ustilago maydis and U. digitariae spores (from maize and weed) in chitosan microcapsules was achieved via glutaraldehyde cross-linking. The cross-linked microcapsules were characterised using scanning electron microscopy, FT-IR spectroscopy and thermogravimetric analysis. Sorption capacities of chitosan-U. maydis and chitosan-U. digitariae microcapsules were investigated and compared to cross-linked chitosan beads: Cu(II): 66.72, 69.26, 42.57; Cd(II): 49.46, 53.96, 7.87; Cr(III): 35.88, 49.40, 43.68; Ni(II): 41.67, 33.46, 16.43 and Zn(II): 30.73, 60.81, 15.04mg/g, respectively. Sorption experiments were conducted as a function of initial metal ion concentration (2-10mg/L), contact time (60-480min), temperature (25, 35 and 45degreeC), amount of the sorbent (0.05-0.25g) and pH of the metal solution. The microcapsules with spores exhibited better performance over the plain chitosan beads, demonstrating their potential use in water treatment.

Sari, M. M., et al. (2011). "Monosize microbeads for pseudo-affinity adsorption of human insulin." Colloids & Surfaces B: Biointerfaces **84**(1): 140-147.

Affinity adsorption technique is increasingly used for protein purification, separation and other biochemical applications. Therapeutic molecules such as antibodies, cytokines, therapeutic DNA and plasma proteins must be purified before characterization and utilization. The aim of this study was to prepare micronsized spherical polymeric beads and to investigate the extent of their human insulin adsorption capability. Monosize poly(ethylene glycol dimethacrylate-N-methacryloyl-(L)-histidine) [poly(EDMA-MAH)] beads were prepared by modified suspension copolymerization. Functional monomer (MAH) was synthesized using methacryloyl chloride and L-histidine. The beads were characterized using scanning electron microscopy (SEM), Fourier transform infrared spectroscopy, swelling test and elemental analysis. MAH incorporation into monosize polymeric beads, having an average size around 2-3 mum, was estimated as 55.3 mumol MAH/g bead. Equilibrium swelling ratios of poly(EDMA-MAH) and poly(EDMA) beads were 65% and 55%, respectively. Adsorption experiments were performed under different conditions (i.e., pH, temperature, protein concentration and ionic strength). It was found that adsorption characteristics are strongly depend on these conditions. Maximum insulin adsorption capacity was achieved as 24.7 mg insulin/g poly(EDMA-MAH) beads.

Sari, P. K., et al. (2017). "Utilization of banana pseudo stem as media grow with various source of nutrient to growth of Pre Nursery of palm oil (Elaesis guinensis Jacg)." Journal of Applied Agricultural Science and Technology **1**(1): 37-47.

This research objective is to examine how the effect of banana pseudo stems, as a substitute for polybags at the seedling stage of Pre Nursery of palm oil. Obtaining the best organic material on the growth of oil palm seedlings is an appropriate technology to reduce environmental pollution due to plastic waste, publication media and scientific articles, scientific journals. researching and doing field analysis on the object of research taken. Utilization of banana pseudo stem as media grow with various source of nutrient to growth of Pre Nursery of palm oil can be concluded that the best vegetative growth in utilization of banana pseudo stem as media grow on various element of nutrient to growth of Pre Nursery of palm oil by using media of polybag with planting medium consisting of a mixture of top soil with manure with a ratio of 1:1. With a leaf length of 9.545 cm and for leaf width of 2.933 cm. But the Utilization of banana pseudo stem as a medium grown with various sources of nutrients to the growth of Pre Nursery palm allow can be used as an alternative to polybag because the result of its growth shows that the seeds in the polybag not much different growth with the seeds in banana stems on the top soil planting medium + manure. It's just that the climate factor is very influential on the success in the implementation of Pre Nursery seedling of this oil palm. The result of this research is based on 3 aspects of consideration in breeding with the method of Utilization of banana pseudo stem as media grow with various sources of nutrients to the growth of Pre Nursery of palm oil that is economical, agronomic, and environmental use of banana pseudo stem better than polybag.

Sarkar, D., et al. (2014). "Ex Vivo Expanded Autologous Polyclonal Regulatory T Cells Suppress Inhibitor Formation in Hemophilia." Molecular Therapy Methods & Clinical Development **1**: 30.

Adoptive cell therapy utilizing ex vivo expanded polyclonal CD4⁺CD25⁺FOXP3⁺ regulatory T cells (Treg) is in use in clinical trials for the treatment of type 1 diabetes and prevention of graft vs host disease in bone marrow transplantation. Here we seek to evaluate this approach in the treatment of inherited protein deficiencies, i.e. hemophilia, which is often complicated by antibody formation against the therapeutic protein. Treg from mice that express GFP-marked FoxP3 were highly purified by two-step magnetic/flow sorting and ex vivo expanded 50- to 80-fold over a 2-week culture period upon stimulation with antibody-coated microbeads. FoxP3 expression was maintained in >80% of expanded Treg, which also expressed high levels of CD62L and CTLA-4. Transplanted Treg suppressed inhibitory antibody formation against coagulation factors VIII and IX in protein and gene therapies in strain-matched hemophilia A and B mice, including in mice with pre-existing antibodies. Although transplanted Treg became undetectable within two weeks, suppression persisted for >2 months. Additional studies suggested that antigen-specific suppression emerged due to induction of endogenous Treg. The outcomes of these studies support the concept that cell therapy with ex vivo expanded autologous Treg can be used successfully to minimize immune responses in gene and protein replacement therapies.

Sarkar, P. (2019). "Response of DNA damage genes in acrolein-treated lung adenocarcinoma cells."

Molecular & Cellular Biochemistry **450**(1-2): 187-198.

Acrolein is a alpha-beta-unsaturated aldehyde and is toxic to human upon its exposure from the environment. Sources of exposure to acrolein can be from heating cooking oil, automobile exhaust, tobacco smoke, and plastic waste. Acrolein exposure to lung is a major concern because of its volatile nature and due to its presence in the urban atmospheric air. Acrolein being highly reactive forms DNA and protein adducts, thereby making the cells vulnerable to long-term damage. Such long-term effect can lead to high susceptibility towards malignant transformation as has been reported in cigarette smokers. The response of DNA damaging genes by acrolein can perhaps give an insight to the cause of damage in the DNA by acrolein. The aim of this study was to examine the response of the DNA damage responsive genes by acrolein in A549 lung adenocarcinoma cells. Acrolein treatment at IC50 concentration showed a robust response of the DNA repair genes but eventually failed to rescue the cells from undergoing apoptosis. The cells pretreated with acrolein and followed by growing the same cells in fresh medium in the absence of acrolein did not help the cells to proliferate. These results conclude that exposure to acrolein marks long-lasting damage to DNA, irrespective of the DNA repair response.

Sarkar, S., et al. (2011). "Optical properties of breast tumor phantoms containing carbon nanotubes and nanohorns." Journal of Biomedical Optics **16**(5): 051304.

The degree by which optical properties of tumors are altered following introduction of carbon nanotubes (CNTs) of varying concentration and type is poorly understood, making it difficult to predict the impact of CNT inclusion on the photothermal response to laser therapies. Optical properties were measured of phantoms representative of breast tumor tissue incorporated with multiwalled carbon nanotubes (MWNTs), single-walled carbon nanotubes (SWNTs), and single-walled carbon nanohorns (SWNHs) of varying concentration (0.01-0.1 mg/ml). Tissue phantoms were made from sodium alginate (3 g/ml) incorporated with polystyrene microbeads (3 mum diam and 1 mg/ml) and talc-France powder (40 mg/ml). Absorption (mu(a)) and reduced scattering (mu's) coefficients of phantoms containing CNTs were determined by the inverse adding-doubling algorithm for the wavelength range of 400-1300 nm. Optical properties of phantoms without CNTs were in the range of mu(a) = 1.04-0.06 mm(-1) and mu's' = 0.05-0.07 mm(-1) at a wavelength of 900 nm, which corresponds with published data for human breast tumor tissue. Incorporating MWNTs, SWNTs, and SWNHs in phantoms with a concentration of 0.1 mg/ml increased (mu(a)) by 20- to 30-fold, 5- to 6-fold, and 9- to 14-fold, respectively, for the wavelength range of 800-1100 nm with minimal change in mu's (1.2- to 1.3-fold). Introduction of CNTs into tissue phantoms increased absorption, providing a means to enhance photothermal therapy.

Sarkar, S., et al. (2018). "Barrier Restitution Effects of Egcg Driven in Part by Its Effect on Il-10 Family Cytokines." Gastroenterology **154 (6 Supplement 1)**: S-1018.

Introduction: The anti-inflammatory properties of (-) epigallocatechin-3-gallate (EGCG), the major green tea polyphenol (GTP), have sparked considerable interest in its potential as a therapy for inflammatory bowel disease (IBD), including both Crohn's disease (CD) and ulcerative colitis (UC). In this study, we evaluated the effect of EGCG on IL-10 family members IL-10 and IL-22 in the epithelial Caco2 cell line in order to enhance our understanding of the role this compound plays in the treatment of IBD. IL-22 has demonstrated important effects on epithelial restitution and tight-junction protein (TJP) composition. Aim(s): Investigate the effect of EGCG on IL-10 family members IL-10 and IL-22 production by human Caco2 epithelial colon cells, evaluating its role in barrier restitution. Method(s): CaCo-2 cells were used in this

experiment. Untreated control cells were compared to cells treated with two concentrations of EGCG (5 or 10mug/ml), LPS, or both. Effects on production of IL-10 and IL-22 were measured by microbead ELISA and compared to effects on IL-12 family cytokines IL-12, IL-17A, and IL-23. RNA message for all cytokines was measured by real-time polymerase chain reaction. Specific claudins relevant to barrier function were measured by Western blot. Result(s): EGCG (5 or 10mug/ml) demonstrated striking effects on cytokine production and RNA message compared to basal production or LPS stimulated cells (Table1). EGCG significantly enhanced IL-10 and -22 production, while suppressing IL-12 family members. Interestingly, this pattern of cytokine modulation corresponded with a "tightening" effect as it modulated TJP composition in Caco-2 monolayers. LPS dramatically increased claudin-2 and down-regulated claudins-1 and 5. EGCG by itself enhanced occludin, ZO-1 and claudin-1 and -5, while decreasing claudin-2. EGCG co-administered with LPS reversed the decline in claudin-1 and -5, while suppressing claudin-2. These changes correlated with a reversal of LPS-induced changes in TER. Discussion(s): While initially considered to be proinflammatory and epithelial barrier disrupting, IL-22 has now been recognized as an important contributor to innate immune responses against enteric pathogens. In combination with IL-10, IL-22 promotes barrier restitution. We have now linked EGCG administration with both and IL-10 and IL-22 production, changes that correlate with favorable alterations in TJP composition. Particularly, we have confirmed that elevated IL-22 production contributes to an upregulation of claudins-1and -5, while suppressing claudin-2. The evidence linking EGCG administration to enhanced IL-10 and -22 production provides additional insight into the clinical benefits seen from EGCG on IBD and pouchitis. [Table Presented] [Table Presented] Copyright © 2018 AGA Institute. All rights reserved.

Sarker, M., et al. (2012). "Alternative Diesel Grade Fuel Transformed from Polypropylene (PP) Municipal Waste Plastic Using Thermal Cracking with Fractional Column Distillation." Energy and Power Engineering **4**(3): 165.

Day by day worldwide use of plastics is increasing because of their light weight and durable characteristics. Waste plas- tics are major environmental problems all over the world. Waste plastics are not bio-degradable, it remains in the land- fill for a long period of time causing vegetation and aquatic ecosystem dilemmas. Abandoned waste plastic thrown into the ocean causes friction of ocean waves and then broken down by sunlight into small pieces and takes the shape of plastic like soup. Aquatic organism mistakes the plastic soup as their food and can't digest, either they die or through food chain it affects human health. To avoid severe environmental degradation problems of waste plastics some coun- tries and big cities banned or restricted the use of plastic products. The worldwide generation of waste plastics is ap- proximately 280 million tons/year. All most all of these waste plastics are dumped either in land or ocean. City munici- palities spend huge amount of money each year just to dispose of these waste plastics into landfill because most waste plastics are not recycled. When the waste plastics are subjected to incineration, they release harmful toxic gas into the environment causing severe pollution. These waste plastics gradually enhance the hazardous environmental problems. Generally plastics are made from crude oil, however crude oil is a very limited natural resource and non-renewable. Every year millions of barrels of crude oil are to produce the waste plastics and when plastics are discarded after use the energy source is lost. A new developed technology plan minimizes the environment pollution problems simultaneously boost up energy sector by renovating the waste plastics into high energy content fuel. The produced fuel is obtained using a unique thermal degradation of waste plastics and converting them into hydrocarbon fuel like materials. Prelimi- nary tests proved that this fuel burns cleaner and the production cost is very low. Unique production setup demonstrated to produce 93% fuel from

waste plastic in the pilot scale. The Fuel produced has been tested and proven to work on majority types of internal combustion engines. This technology utilized can avoid waste plastic pollution problem worldwide by the implementation of newly developed technology. Through the utilization of the technology the use of reliable plastics won't need to be banned and serve as a very reliable alternate source of energy. The technology will also help reduce a significant amount of import oil from foreign countries and help provide a steady economy.

Sasaki, N., et al. (2017). "Molecular crowding improves bead-based padlock rolling circle amplification." Analytical Biochemistry **519**: 15-18.

Bead-based padlock rolling circle amplification (RCA), an ultrasensitive and accurate DNA detection technique, was conducted in a molecular crowding environment created by poly(ethylene glycol) (PEG). The number of RCA products generated increased and exhibited a bell-shaped dependence on PEG concentration. Experiments using magnetic beads suggested that facilitation of DNA ligation and hybridization is the main reason for the observed increase. Selectivity of the technique was retained in the presence of PEG. This technique is simple and can be utilized to detect target DNA with high accuracy and sensitivity in a variety of areas such as medical diagnosis and food analysis.

Sasso, L. A., et al. (2013). "Continuous Monitoring of Inflammation Biomarkers During Simulated Cardiopulmonary Bypass Using a Microfluidic Immunoassay Device-A Pilot Study." Artificial Organs **37**(1): E9-E17.

This work demonstrates the use of a continuous online monitoring system for tracking systemic inflammation biomarkers during cardiopulmonary bypass (CPB) procedures. The ability to monitor inflammation biomarkers during CPB will allow surgical teams to actively treat inflammation and reduce harmful effects on postoperative morbidity and mortality, enabling improved patient outcomes. A microfluidic device has been designed which allows automation of the individual processing steps of a microbead immunoassay to allow continuous tracking of antigen concentrations. Preliminary experiments have demonstrated that the results produced by the microimmunoassay are comparable to results produced from a standard enzyme-linked immunosorbent assay (r = 0.98). Additionally, integration of the assay with a simulated CPB circuit has been demonstrated with temporal tracking of C3a concentrations within blood continuously sampled from the circuit. The presented work describes the motivation, design challenges, and preliminary experimental results of this project.

Sasso, L. A., et al. (2013). "Continuous Monitoring of Inflammation Biomarkers During Simulated Cardiopulmonary Bypass Using a Microfluidic Immunoassay Device--A Pilot Study." Artificial Organs **37**(1): E9-E17.

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Sasso, L. A., et al. (2012). "Automated microfluidic processing platform for multiplexed magnetic bead immunoassays." Microfluidics & Nanofluidics **13**(4): 603-612.

A microfluidic platform is presented which fully automates all incubation steps of a three-stage, multiplexed magnetic bead immunoassay, such as the Luminex xMAP technology. Magnetic actuation is used to transfer the microbeads between co-infused adjacent laminar flow streams to transport the beads into and out of incubation and wash solutions, with extended incubation channels to allow sufficient bead incubation times (1-30 min, commonly 5 min per stage) to enable high-sensitivity. The serial incubation steps of the immunoassay are completed in succession within the device with no operator interaction, and the continuous flow operation with magnetic bead transfer defines the incubation sequencing requiring no external fluidic controls beyond syringe pump infusion. The binding kinetics of the assay is empirically characterized to determine the required incubation times for specific assay sensitivities in the range 1 pg/ml to 100 ng/ml. By using a Luminex xMAP duplex assay, concurrent detection of IL-6 and TNF-alpha was demonstrated on-chip with a detection range 10 pg/ml to 1 ng/ml. This technology enables rapid automation of magnetic microbead assays, and has the potential to perform continuous concentration monitoring.

Sasso, L. A., et al. (2010). "Autonomous magnetically actuated continuous flow microimmunofluorocytometry assay." Microfluidics & Nanofluidics **9**(2-3): 253-265.

This article presents a microfluidic device which integrates autonomous serial immunofluorocytometry binding reactions of cytometric beads with fluorescence detection and quantification in a continuous flow environment. The microdevice assay is intended to alleviate the extensive benchwork and large sample volumes used when conducting traditional immunoassays, without requiring complex external controls. The technology is based on the miniaturization and automation of the serial processing steps of an antigen sandwich immunoassay, with integrated fluorescence detection using paramagnetic microbeads. The continuous flow design may enable temporal tracking of time-varying protein concentrations in a continuously infused sample for clinical applications, specifically for monitoring inflammation marker proteins in blood produced during cardiac surgeries involving cardiopulmonary bypass (CPB) procedures. The device operation was first validated via a single incubation device which measured the concentration of a fluorescently labeled biotin molecule using streptavidin-coated paramagnetic cytometric beads. Subsequently, a dual incubation device was tested with samples of the anaphylatoxin complement protein C3a, and was shown to be capable of differentiating between samples at typical systemic concentrations of the protein (1-5 mug/ml), with very low sample usage (<6 mul/h). It is believed that this continuous flow, automated microimmunosensor technology will be a platform for high sample rate immunoassays capable of tracking and more thoroughly characterizing the systemic inflammation process, and may aid in the development of better treatment options for systemic inflammation during and after CPB.

Sasso, L. A., et al. (2011). "Multiplexed real-time monitoring of systemic inflammation during mechanical circulatory support." Artificial Organs **35 (4)**: A24-A25.

Background: Mechanical circulatory support procedures such as cardiopulmonary bypass and extracorporeal life support are known to cause significant inflammatory responses, which lead to complications and diminished patient outcomes. The ability to thoroughly characterize the systemic inflammatory response is limited by the available assaying techniques, especially due to the limited blood volume available for testing. By combining microfluidic technology with a multiplexed microbead-based cytokine immunoassay, we are developing a system which will monitor and thoroughly characterize the inflammatory response at high sampling rates and with real-time output. Method(s): A multi-layer microfluidic chip is fabricated by conventional soft lithography. The device is infused with the reagents of the Bio-Rad Bio-Plex kit via syringe pump, which includes antibody coated magnetic microbeads, secondary labeling antibody, and fluorescent tagging solution. The microbead solution is pre-mixed to allow detection of between one and fifty cytokines simultaneously. The blood plasma sample is provided as a continuous stream from a microfil-tration device, and a flow controller ensures a steady stream of sample plasma into the immunoassay device. Upon reaching the outlet of the device, the microbeads are fluorescently labeled, having a fluorescence intensity which is proportional to concentration of each analyte in the blood. The incubated beads are currently being collected in fractions and interrogated by flow cytometry, and in future work they will flow directly into a flow cytometer for real-time, continuous measurements. Result(s): Preliminary results have shown that the microfluidic device is able to perform the necessary incubations with continuous flow operation. It has also been shown that that the assay incubation times can be reduced from the typical 30 minutes per stage to as low as 2 minutes, although the sensitivity is reduced. A trade-off must be chosen between assay lag time and minimum cytokine concentration sensitivity. Conclusion(s): The fully integrated assay will allow continuous measurement of inflammatory markers during mechanical circulatory support procedures with very high sampling rates and lag times likely below 20 minutes.

Sasso, P. d., et al. (2010). "The use of geographical information systems analysis for the detection of the use of protective plastic." Colture Protette **39**(2): 66-72.

The ever growing use of plastic materials in agriculture, whether on a seasonal basis or for several years, poses environmental problems related to their correct disposal, as well as their affect on the landscape. Plastic waste in agriculture mainly derives from the covering of greenhouses and small and large tunnels, mulching and the protection of fruit trees, including vines grown in overhead trellis and, to a lower extent, peach and cherry trees. Other plastic waste results from irrigation pipes, silage films, containers, boxes, etc. There is an urgent need to tackle the issues related to the disposal of this type of waste, which currently occurs only sporadically and without any consideration for specific applicable standards, with significant repercussions on the landscape and the environment. This phenomenon appears to be quire widespread, especially in the Bari metropolitan area, due to the presence of greenhouses, vines grown in trellis and many vegetable varieties that use plastic films for covering, protection and/or mulching. This study assessed the quantity of plastic films and nets used to protect the crops in the study area, identifying the location of those crops for which these are used through surveys conduced with the GIS.

Sasuga, Y., et al. (2006). "Development of a microscopic platform for real-time monitoring of biomolecular interactions." Genome Research **16**(1): 132-139.

We developed a new microscopic platform for the real-time analysis of molecular interactions by combining microbead-tagging techniques with total internal reflection fluorescent microscopy (TIRFM). The optical manipulation of probe microbeads, followed by photo immobilization on a solid surface, enabled us to generate arrays with extremely high density (>100 microbeads in a 25 mu m x 25 mu m area), and TIRFM made it possible to monitor the binding reactions of fluorescently labeled targets onto probe microbeads without removal of free targets. We demonstrated the high performance of this platform through analyses of interactions between antigen and antibody and between small compounds and proteins. Then, recombinant protein levels in total cellular lysates of Escherichia coli were quantified from the association kinetics using antibody-immobilized microbead arrays, which served as a model for a protein-profiling array. Furthermore, in combination with in vitro synthesis-coupled protein labeling, we could kinematically analyze the interaction of nuclear factor Kappa B (p50) with DNA. These results demonstrated that this platform enabled us to: (1) monitor binding processes of fluorescently labeled targets to multiple probes in real-time without removal of free targets, (2) determine concentrations of free targets only from the association kinetics at an early phase, and (3) greatly reduce the required volume of the target solution, in principle to subnanoliter, for molecular interaction analysis. The unique features of this microbead-based microarray system open the way to explore molecular interactions with a wide range of affinities in extremely small volumes of target solutions, such as extracts from single cells.

Satake, E., et al. (2017). "Resveratrol suppresses inflammatory responses of peritoneal macrophages in endometriosis." Journal of Obstetrics and Gynaecology Research **43 (12)**: 1900.

Objective Resveratrol is shown to control endometriosis in a mouse model but the mechanism is undetermined. Our group previously showed that resveratrol suppresses inflammatory responses in endometriotic stromal cells. This study was aimed at investigating whether resveratrol suppresses inflammatory responses of peritoneal macrophages in endometriosis patients. Methods Under IRB approval and informed consents, peritoneal fluid was collected from patients with endometriosis. Macrophages were isolated using CD14 MicroBeads, cultured at a density of 5.0x105 cells/ml, and exposed to resveratrol at doses of 25, 50, and 100 muM one hour before the stimulation. Stimulation was done by treatment with IL1beta(5 ng/ml)or LPS(100 ng/ml)to mimic local inflammation. After 24 hours, supernatants were collected and concentrations of IL6 and IL8 were measured by ELISA. Results Resveratrol significantly reduced IL1 betainduced IL6 and IL8 secretions to 96.7+/-46.0% and 81.0+/- 4.3%(25 muM), 89.0+/-13.2% and 67.3+/-10.8%(50 muM), and 62.0+/- 22.3% and 55.8+/-14.1%(100 muM), of that without any stimulation or treatment, respectively. Similarly, resveratrol significantly decreased LPSinduced IL6 and IL8 secretions to 48.9+/-3.8% and 60.2+/-8.7%(25 muM), 8.1+/-1.8% and 46.0+/-13.2%(50 muM), and 5.7+/-3.8% and 38.5+/-18.1%(100 muM), respectively(n=3, mean +/-SEM, p<0.05). Conclusion Resveratrol reduced the secretion of inflammatory cytokines from peritoneal macrophages, which may contribute to the therapeutic effects of resveratrol on endometriosis.

Sathe, T. R., et al. (2006). "Mesoporous silica beads embedded with semiconductor quantum dots and iron oxide nanocrystals: dual-function microcarriers for optical encoding and magnetic separation." Analytical Chemistry **78**(16): 5627-5632.

Mesoporous beads are promising materials for embedding functional nanoparticles because of their nanometer-sized pores and large surface areas. Here we report the development of silica microbeads embedded with both semiconductor quantum dots (QD) and iron oxide (Fe3O4) nanocrystals as a new class of dual-function carriers for optical encoding and magnetic separation. The embedding (doping) process is carried out by either simultaneous or sequential addition of quantum dots and iron oxide (Fe3O4) nanocrystals in solution. The doping process is fast and quantitative, but the incorporated iron oxide strongly attenuates the signal intensity of QD fluorescence. We find that this attenuation is not due to conventional fluorescence quenching but is caused by the broad optical absorption spectrum of mixed-valence Fe3O4. For improved biocompatibility and reduced nonspecific binding, the encoded beads are further coated with amphiphilic polymers such as octylamine poly(acrylic acid). The results indicate that the polymer-coated beads are well suited for target capturing and enrichment, yielding magnetic separation efficiencies higher than 99%. By combining the multiplexing capability of QDs with the superparamagnetic properties of iron oxide nanocrystals, this class of encoded beads is expected to find broad applications in high-throughput and multiplexed biomolecular assays.

Sathish, T. (2017). "Performance Measurement on Extracted Bio-Diesel from Waste Plastic." Journal of Applied Fluid Mechanics **10**: 41.

This paper presents an important analysis on the fuel extracted from waste plastic using the process of pyrolysis. Here, the plastics collected from local municipality are used for conversion of solid plastic waste to liquid fuel. The fuel prepared is blended with mixtures of oxygenated compounds to test the performance of the fuel. The bio-diesel or waste plastic oil (WPO) from the waste solid plastic is tested with other blended mixtures to find the mechanical efficiency, emission rate, brake test efficiency and total fuel consumption. Here, the efficiency between the pure diesel mixture and WPO with different blends that varied between 10-50% of pure diesel oil is tested. The performance of the produced WPO-diesel blended oil performs with better efficiency than the other fuels.

Sati, P. C., et al. (2012). "Oxidative status in workers engaged in recycling of plastic: occupational hazard." Indian Journal of Physiology & Pharmacology **56**(3): 234-238.

Recycling plastic industry is on rise. Plastic waste in environment is a pollutant so recycling of it can save environment and is economical too. However its recycling is associated with harmful effects on workers engaged in it. The present study was designed to elucidate the role of free radicals and cytochrome c in pathogenesis of polypropylene associated diseases. Thirty workers from plastic recycling factory occupationally exposed to polypropylene between the age of 18-40 years and working for atleast 8 hours a day for more than a year but less than 10 years were selected for the study. A trend in increase of FRAP and decrease of MDA was observed but they could not reach the level of significance. The level of serum cytochrome c, which is an indirect marker of oxidative stress, was also detectable in only two subjects. Since the number of subjects in the study was less, the result needs to be confirmed on larger number. More over cause of pulmonary dysfunction and carcinomas in these workers needs to be investigated.

Sato, K., et al. (2010). "Microbead-based rolling circle amplification in a microchip for sensitive DNA detection." Lab on a Chip **10**(10): 1262-1266.

The sensitive detection and quantification of DNA targets in the food industry and in environmental and clinical settings are issues of utmost importance in ensuring contamination-free food, monitoring the environment, and battling disease. Selective probes coupled with powerful amplification techniques are therefore of major interest. In this study, we set out to create an integrated microchemical chip that benefits from microfluidic chip technology in terms of sensitivity and a strong detection methodology provided jointly by padlock probes and rolling circle amplification (RCA). Here, we have integrated padlock probes and RCA into a microchip. The chip uses solid phase capture in a microchannel to enable washing cycles and decrease analytical area, and employs on-bead RCA for single-molecule amplification and detection. We investigated the effects of reagent concentration and amount of padlock probes, and demonstrated the feasibility of detecting Salmonella.

Sauer, J. J. and J. P. Schnydrig (1974). "Plastic waste separate collection and recycling. [French]." Iswa Informat.Bull **No. 14-15**: 17-27.

The inhabitants of the city of Morges, Switzerland, have been separating glass and paper from household refuse for over one year. The savings achieved by the municipality due to the lower incineration costs, the improvement of collection and the proceeds from the sale of recovered products have led to the segregation of plastic wastes as well. This additional separation was considered because of the important volume of plastic wastes, incineration problems and for the recovery of raw materials. The separate collection of plastic wastes was carried out 4 times in the autumn of 1973. As a result, 28% of the total plastic wastes containing 1 to 2% foreign matter could be collected. These results can be considered very satisfactory, since households do not have any home separating devices yet that would permit waste segregation into 4 components. Recovered plastics (3,600 kg) were sent to W. Germany for recycling experiments. Loose unprocessed plastics were replasticized in a mixer utilized by the rubber industry. From this process one can obtain either foils, by lamination, or granulated material, by grinding the replasticized mass. The granulated material could be used as foundation for roads or transformed into products by means of conventional machines used in plastics manufacturing. Processing and incineration problems created by plastic wastes are discussed and it is concluded that a separate collection and recycling are possible, but technical and economical aspects should be examined more thoroughly.

Savin, H., et al. (1987). "Digitalis hemoperfusion: increase of column binding capacity by pretreatment with ouabain." Biomaterials, Artificial Cells, & Artificial Organs **15**(3): 539-547.

Extracorporeal hemoperfusion through polyacrolein microsphere beads (APAMB) attached to antidigoxin antibodies is an effective treatment of digitalis intoxication. In order to increase the binding capacity of the APAMB columns the active sites of the antidigoxin antibodies were protected by ouabain during the binding to the microbeads. This brought about an 11-18 percent increase in digoxin binding capacity of the columns. It was also found that binding capacity does not increase with the rise of antibody concentration beyond a certain limit. Protection of antibody binding sites and determination of optimal concentration are, therefore necessary steps during preparation of antibody based hemoperfusion columns.

Savoca, M. S., et al. (2017). "Odours from marine plastic debris induce food search behaviours in a forage fish." Proceedings of the Royal Society B. Biological Sciences **284**(1860).

Plastic pollution is an anthropogenic stressor in marine ecosystems globally. Many species of marine fish (more than 50) ingest plastic debris. Ingested plastic has a variety of lethal and sublethal impacts and can be a route for bioaccumulation of toxic compounds throughout the food web. Despite its pervasiveness and severity, our mechanistic understanding of this maladaptive foraging behaviour is incomplete. Recent evidence suggests that the chemical signature of plastic debris may explain why certain species are predisposed to mistaking plastic for food. Anchovy (Engraulis sp.) are abundant forage fish in coastal upwelling systems and a critical prey resource for top predators. Anchovy ingest plastic in natural conditions, though the mechanism they use to misidentify plastic as prey is unknown. Here, we presented wild-caught schools of northern anchovy (Engraulis mordax) with odour solutions made of plastic debris and clean plastic to compare school-wide aggregation and rheotactic responses relative to food and food odour presentations. Anchovy schools responded to plastic debris odour with increased aggregation and reduced rheotaxis. These results were similar to the effects food and food odour presentations had on schools. Conversely, these behavioural responses were absent in clean plastic and control treatments. To our knowledge, this is the first experimental evidence that adult anchovy use odours to forage. We conclude that the chemical signature plastic debris acquires in the photic zone can induce foraging behaviours in anchovy schools. These findings provide further support for a chemosensory mechanism underlying plastic consumption by marine wildlife. Given the trophic position of forage fish, these findings have considerable implications for aquatic food webs and possibly human health.

Savoca, S., et al. (2019). "Microplastics occurrence in the Tyrrhenian waters and in the gastrointestinal tract of two congener species of seabreams." Environmental Toxicology & Pharmacology **67**: 35-41.
In this work it is reported for the first time the characterization of microplastics from sea water samples and in two congener species of seabreams: Pagellus erythrinus and P. bogaraveo, Mediterranean fish species of great commercial importance. An experimental survey was conducted on May–June 2017 in the southernmost part of the Tyrrhenian Sea. Microplastics found in the sea water and in the grastrointestinal tract of two teleosts were characterized by Raman and IR spectroscopies. Microplastics found in sea water samples appeared in the form of fragments made of plastics of low and high density (PVC and LPDE). All the microplastics found in fish belonged to Nylon 66, typical fibers used in industry and in fisheries. Our findings highlighted the importance of further studies along the food web chain for a better understanding of the diffusion and possible consequences of this terrible threat. [ABSTRACT FROM AUTHOR]

Savoca, S., et al. (2019). "Detection of artificial cellulose microfibers in Boops boops from the northern coasts of Sicily (Central Mediterranean)." Science of the Total Environment **691**: 455-465.
Pollution deriving from textile wastes, including industrial and household waste, is recently of great interest due to their environmental impacts. Anthropogenic and synthetic fibers are responsible for negative effects on the quality of water and soil, and, also, their presence damages plant and animal health. In this work, the authors revealed the occurrence of man-made cellulose fibers in specimens of Boops boops from the Northern Sicilian coasts. Bogue was chosen as target species as it has been used as an indicator within the European Marine Strategy Framework Directive (MSFD 2008/56/EC) in order to value the "microplastics status" in the stomach contents. Of the 30 specimens examined, 63.3% of these had ingested fibers items. The number of fibers ranged from 1 to 10 per specimens with an average of 2.7 items/specimen. Fibers length ranged from 0.5 to 30 mm, most of them were black (95%), and a small percentage was red (5%). The ingestion of man-made cellulose fibers, observed for the first time, in Boops boops in the Mediterranean Sea wake-up call and it should attract the attention of the EU for new guidelines where this new type of contaminant is classified harmful as well as plastics. Unlabelled Image • Microfibers were found in GIT of Boops boops (63%) from Northern Sicilian coasts (Central Mediterranean Sea). • The microfibers ranged from 1 to 10 per specimens with an average of 2.7 items/specimens. • Man-made fibers derived from regenerated cellulose were identified by the spectroscopic techniques SEM and μ-Raman. [ABSTRACT FROM AUTHOR]

applies to all Abstracts.)

Sawitzke, A. L., et al. (2005). "Improvements in histological quality and signal retention following in situ hybridization in early chick embryos using plastic resin and recolorization." Biotechnic and Histochemistry **80**(1): 35-41.

We describe a novel method that allows reliable detection of in situ hybridization signals in thin sections of plastic embedded embryos. Sections from plastic embedded embryos are thinner and have superior histological quality compared to paraffin, gelatin, agarose embedded sections or cryosections; however, plastic resin traditionally has not been used as an embedding medium following in situ hybridization because of loss of signal. When signal is detected with alkaline phosphatase and NBT/BCIP, the resulting colored precipitate is subject to fading when samples are exposed to organic compounds. The colored precipitate can be redeposited by repeating the NBT/BCIP reaction following plastic sectioning. This recolorization shows no loss of specificity, because signal is detected only where the anti-digoxigenin/alkaline phosphatase conjugated antibody is bound to the riboprobe. Strong signals can be detected without recolorization; however, weaker signals require the recolorization step. This novel method of re-depositing colored precipitate after processing and sectioning allows accurate determination of the location of gene expression and study of this expression in high quality histological sections of early chick embryos. © Biological Stain Commission Biotechnic & Histochemistry 2005.

Say, R., et al. (2003). "Preconcentration of copper on ion-selective imprinted polymer microbeads." Analytica Chimica Acta **480**(2): 251-258.

Molecular recognition-based separation techniques have received much attention in various fields because of their high selectivity for target molecules. Molecular imprinting has been recognized as a promising technique for the preparation of such systems. In this study, we have prepared a novel molecular imprinted adsorbent to remove heavy metal ions with high selectivity. The Cu(II)-imprinted poly(ethylene glycol dimethacrylate-methacryloylamidohistidine/Cu(II)) (poly(EGDMA-MAH/Cu(II))) microbeads with an average size of 150-200mum were prepared by dispersion polymerization. These Cu(II) imprinted microbeads were used in the adsorption-desorption of copper(II) ions from metal solutions. Adsorption equilibria was achieved in about 1h. The maximum adsorption of Cu(II) ions onto imprinted microbeads was about 48mg/g. The pH significantly affected the adsorption capacity of imprinted microbeads. The observed adsorption order under competitive conditions was Cu(II) > Zn(II) > Ni(II) > Co(II) in mass basis. The imprinted microbeads can be easily regenerated by 0.1M EDTA solution with higher effectiveness. The imprinted microbeads showed excellent selectivity for the target molecule (i.e. Cu(II) ions due to molecular geometry). These features make imprinted microbeads very good candidate for selective removal of Cu(II) ions at high adsorption capacity. Detection limit was increased at least 1000-folds with the preconcentration approach using the imprinted microbeads. The method was also applied to certified reference and seawater samples. © 2003 Elsevier Science B.V. All rights reserved.

Saygin, D., et al. (2011). "Potential of best practice technology to improve energy efficiency in the global chemical and petrochemical sector." Energy **36**(9): 5779-5790.

The chemical and petrochemical sector is by far the largest industrial energy user, accounting for 30% of the industry's total final energy use. However, due to its complexity its energy efficiency potential is not well understood. This article analyses the energy efficiency potential on a country level if Best Practice Technologies (BPT) were implemented in chemical processes. Two approaches are applied and an improved dataset referring to Europe has been developed for BPT energy use. This methodology has been applied to 66 products in fifteen countries that represent 70% of chemical and petrochemical sector's energy use worldwide. The results suggest a global energy efficiency potential of 16% for this sector, excluding savings in electricity use and by higher levels of process integration, combined heat and power (CHP) and post-consumer plastic waste treatment. The results are more accurate than previous estimates. The results suggest significant differences between countries, but a cross-check based on two different methods shows that important methodological and data issues remain to be resolved. Further refinement is needed for target setting, monitoring and informing energy and climate negotiation processes. For the short and medium term, a combination of benchmarking and country level analysis is recommended.

Sayyed, R. Z., et al. (2020). "Production, purification and evaluation of biodegradation potential of PHB depolymerase of Stenotrophomonas sp. RZS7." PLoS ONE [Electronic Resource] **15**(1): e0220095.

There are numerous reports on poly-beta-hydroxybutyrate (PHB) depolymerases produced by various microorganisms isolated from various habitats, however, reports on PHB depolymerase production by an isolate from plastic rich sites scares. Although PHB has attracted commercial significance, the inefficient production and recovery methods, inefficient purification of PHB depolymerase and lack of ample knowledge on PHB degradation by PHB depolymerase have hampered its large scale commercialization. Therefore, to ensure the biodegradability of biopolymers, it becomes imperative to study the purification of the biodegrading enzyme system. We report the production, purification, and characterization of extracellular PHB depolymerase from Stenotrophomonas sp. RZS7 isolated from a dumping yard rich in plastic waste. The isolate produced extracellular PHB depolymerase in the mineral salt medium (MSM) at 30degreeC during 4 days of incubation under shaking. The enzyme was purified by three methods namely ammonium salt precipitation, column chromatography, and solvent purification. Among these purification methods, the enzyme was best purified by column chromatography on the Octyl-Sepharose CL-4B column giving optimum yield (0.7993 Umg-1mL-1). The molecular weight of purified PHB depolymerase was 40 kDa. Studies on the assessment of biodegradation of PHB in liquid culture medium and under natural soil conditions confirmed PHB biodegradation potential of Stenotrophomonas sp. RZS7. The results obtained in Fourier-Transform Infrared (FTIR) analysis, High-Performance Liquid Chromatography (HPLC) study and Gas Chromatography Mass-Spectrometry (GC-MS) analysis confirmed the biodegradation of PHB in liquid medium by Stenotrophomonas sp. RZS7. Changes in surface morphology of PHB film in soil burial as observed in Field Emission Scanning Electron Microscopy (FESEM) analysis confirmed the biodegradation of PHB under natural soil environment. The isolate was capable of degrading PHB and it resulted in 87.74% biodegradation. A higher rate of degradation under the natural soil condition is the result of the activity of soil microbes that complemented the biodegradation of PHB by Stenotrophomonas sp. RZS7.

Scanes, E., et al. (2019). "Microplastics detected in haemolymph of the Sydney rock oyster Saccostrea glomerata." Marine Pollution Bulletin **149**: 110537.

Plastic waste is ubiquitous in marine environments. Despite the sheer volume of plastic waste, it remains relatively unknown how marine invertebrates will interact with microplastics (plastic <1mm). Microplastics (<2mum) were ingested by the economically and ecologically significant Sydney rock oyster Saccostrea glomerata and translocated to the haemolymph, perhaps via phagocytosis. The presence of microplastics in the haemolymph indicates that filter feeding S. glomerata can ingest and accumulate microplastics which are prevalent in the environment. This research shows microplastics can enter marine molluscs and highlights the need to monitor microplastics in the marine environment and aquaculture to safeguard the seafood industry.

Scarascia-Mugnozza, G., et al. (2010). "Technical characteristics of regenerated plastic profiles produced through recycling agricultural plastic material." International Conference on Agricultural Engineering AgEng.

The use of plastics for agricultural use is steadily increasing in the world thanks to the significant increases in production that it is able to obtain. This causes a high and growing volume of plastic waste that is not usually enough well managed, causing heavy consequences to the environment and loss of energy and material. The mechanical recycling of post-consume plastic is a suitable system for the recovery of these materials, that could determine new economic profit deriving by the re-use of agricultural plastic waste as secondary raw material. With the aim to evaluate the mechanical properties of rigid profiles obtained by the recycling of agricultural plastic film, experimental tests were performed by recycling different blends of plastic material, adding specific additives in the waste stream. These profiles were analyzed by bending, compression and tensile tests and their mechanical characteristics were determined in order to estimate their new possible use.

Schefzyk, M., et al. (2009). "Eosinophil granulocytes: functional differences of a new isolation kit compared to the isolation with anti-CD16-conjugated MicroBeads." Experimental Dermatology **18**(7): 653-655.

BACKGROUND/PURPOSE: Using a new eosinophil isolation kit, we were not able to confirm our previous findings of a delayed apoptosis of eosinophils in atopic dermatitis. Thus, we investigated whether this new isolation kit modulates the functional activity of eosinophils.

METHODS: Peripheral blood eosinophils were isolated with the new isolation kit as well as conventionally with anti-CD16-conjugated MicroBeads. We analysed viability, apoptosis, CD69 and CD95 expression, streptavidin binding and superoxide anion release.

RESULTS: Purity of eosinophils was higher using the new isolation kit ($P < 0.05$). However, these eosinophils had a decreased survival ($P < 0.05$-0.01), presented morphological features of apoptosis, showed an increased percentage of apoptotic nuclei ($P < 0.01$), an increased release of superoxide anions ($P < 0.05$), a higher expression of CD69 and CD95 ($P < 0.05$) and an increased binding to streptavidin compared to eosinophils isolated with anti-CD16 conjugated MicroBeads.

CONCLUSION: The new eosinophil isolation kit should not be used for the investigation of eosinophils as it potently affects their functional activity.

Schepky, A., et al. (2009). "Development of an in vitro sensitization assay based on monocyte-derived dendritic cells." Toxicology Letters **1)**: S66.

Dendritic cells, including Langerhans cells, forming a sentinel network for pathogen detection are the most abundant antigen presenting cells in the skin. Through their ability of hapten uptake, processing and presentation to T-cells they play a critical role in the induction of contact allergies. In this process dendritic cells undergo fundamental changes, e.g. surface marker expression. Their observance marks a potential endpoint in the experimental set-up of a predictive in vitro skin sensitization assay. Thus, CD1a-/CD14+ peripheral blood monocytes from donors where purified by density centrifugation and positive selection of anti-CD14-Ig coupled magnetic microbeads. CD1a-/CD14+ monocytes were differentiated into immature dendritic cells by 5-day culture in the presence of IL4 and GM-CSF. Substance treatment for 48h was followed by FACS analysis of HLA-DR; CD86; CD80; CD14; CD1a and CD83. In this assay all strong

sensitizers tested as well as non-sensitizers where identified correctly referring to their allergic potential in the LLNA, whereas moderate sensitizers (according to the LLNA) showed surface marker changes only close to cytotoxic concentrations. Limitations, e.g. donor variability and work intensiveness are widely discussed. However, this assay leads to results that reflect the reaction of a healthy donor population in contrast to single individuals of cell lines. Moreover, after interpretation of comprehensive investigation we assume that a classification of the sensitizing potential of substances may be possible, marking a clear advantage over an all-or-none interpretation of cell line based assays already established. Therefore this assay provides a basic application in assessing the allergic potential of active components.

Scherer, C., et al. (2017). "Feeding type and development drive the ingestion of microplastics by freshwater invertebrates." Scientific Reports **7**(1).

Microscopic plastic items (microplastics) are ubiquitously present in aquatic ecosystems. With decreasing size their availability and potential to accumulate throughout food webs increase. However, little is known on the uptake of microplastics by freshwater invertebrates. To address this, we exposed species with different feeding strategies to 1, 10 and 90 micro m fluorescent polystyrene spheres (3-3 000 particles mL⁻¹). Additionally, we investigated how developmental stages and a co-exposure to natural particles (e.g., food) modulate microplastic ingestion. All species ingested microplastics in a concentration-dependent manner with Daphnia magna consuming up to 6 180 particles h⁻¹, followed by Chironomus riparius (226 particles h⁻¹), Physella acuta (118 particles h⁻¹), Gammarus pulex (10 particles h⁻¹) and Lumbriculus variegatus (8 particles h⁻¹). D. magna did not ingest 90 micro m microplastics whereas the other species preferred larger microplastics over 1 micro m in size. In C. riparius and D. magna, size preference depended on the life stage with larger specimens ingesting more and larger microplastics. The presence of natural particles generally reduced the microplastics uptake. Our results demonstrate that freshwater invertebrates have the capacity to ingest microplastics. However, the quantity of uptake depends on their feeding type and morphology as well as on the availability of microplastics.

Scherer, C., et al. (2019). "Toxicity of microplastics and natural particles in the freshwater dipteran Chironomus riparius: Same same but different?" Science of the Total Environment: 134604.

Microplastics (MP) are contaminants of emerging concern in aquatic ecosystems. While the number of studies is rapidly increasing, a comparison of the toxicity of MP and natural particulate matter is largely missing. In addition, research focusses on the impacts of hydrophobic chemicals sorbed to plastics. However, the interactive effects of MP and hydrophilic, dissolved chemicals remain largely unknown. Therefore, we conducted chronic toxicity studies with larvae of the freshwater dipteran Chironomus riparius exposed to unplasticised polyvinyl chloride MP (PVC-MP) as well as kaolin and diatomite as reference materials for 28 days. In addition, we investigated the effects of particles in combination with the neonicotinoid imidacloprid in a multiple-stressor experiment. High concentrations of kaolin positively affected the chironomids. In contrast, exposure to diatomite and PVC-MP reduced the emergence and mass of C. riparius. Likewise, the toxicity of imidacloprid was enhanced in the presence of PVC-MP and slightly decreased in the co-exposure with kaolin. Overall, parallel experiments and chemical analysis indicate that the toxicity of PVC-MP was not caused by leached or sorbed chemicals. Our study demonstrates that PVC-MP induce more severe effects than both natural particulate materials. However, the latter are not benign per se, as the case of diatomite highlights. Considering the high, environmentally irrelevant concentrations needed to induce adverse effects, C. riparius is insensitive to exposures to PVC-MP.

Schettini, E., et al. (2005). "Physical properties of innovative biodegradable spray coating for soil mulching in greenhouse cultivation." Acta Horticulturae **691**(Vol 2): 725-732.

To overcome with the serious drawback of huge quantities of plastic waste obtained at the end of the life of agricultural plastic mulching films, research on innovative biodegradable materials have been developing. The paper examines a new sustainable approach in which a water solution of natural biodegradable polymers is sprayed on a cultivation area to form a mulch coating. The material used is a blend of two polysaccharides, such as guar gum and locust bean gum added with glycerol. A protected field experiment was conducted to test the effectiveness of spray black biodegradable mulching coating in a tomato crop in Southern Italy. Field performance and physical properties, evaluated by means of laboratory tests, are compared to those of commercial low density polyethylene and biodegradable starch based mulch films. The spray mulching coating is opaque in the solar radiation range and behaved as a black body. The tested spray coating showed much lower values of tensile stress and elongation at break in comparison with the values of commercial low density polyethylene and biodegradable starch based mulch films. Such innovative coatings were characterized by functionality during their use in field. Results indicate that the biodegradable spray coatings could be a sustainable alternatives to plastic films based on fossil raw materials.

Scheurer, M. and M. Bigalke (2018). "Microplastics in Swiss Floodplain Soils." Environmental Science & Technology **52**(6): 3591-3598.

Microplastics (MPs) are small (<5 mm diameter) but have clear implications for the environment. These artificial particles are found in and pose threats to aquatic systems worldwide. MPs have terrestrial sources, but their concentrations and fates in the terrestrial environment are poorly understood. While global plastic production continues to increase, so do the environmental concentrations and impacts of MPs. In this first study of MPs in floodplain soils, we developed a method for identifying, quantifying, and measuring the sizes of most commonly produced MPs in soil by FT-IR microscopy. For small MP (<1 mm) analysis, MP were separated by density separation and oxidation of organic matter. In this study we analyzed 29 floodplains in Swiss nature reserves associated with catchments covering 53% of Switzerland. We found evidence that 90% of Swiss floodplain soils contain MPs. The highest MP concentrations were associated with the concentration of mesoplastics (5 mm - 2.5 cm diameter), indicating plastic waste as source. Furthermore, MP concentration was correlated with the population of the catchment. The wide distribution of MPs, their presence in remote unsettled high mountain areas, decoupling of MEP and MP compositions, and the dominance of MPs by small (<500 mum diameter) particles, indicate that MPs enter soils via diffuse aeolian transport.

Scheytt, T. and J. v. Freyberg (2015). "A comparison of different methods for sampling of solid material for microbial studies." Grundwasser **20**(4): 253-261.

Sediment sampling for microbial characterization is often associated with cross-contamination. The aim of this study was to assess the suitability of widely used sediment-sampling techniques for obtaining microbially uncontaminated samples from the saturated zone. Three different methods were applied: Continuous percussion drilling, discontinuous drilling with Direct-Push technology and a freeze corer using liquid nitrogen for cooling. Microbial contamination was monitored with dye tracers and fluorescent micro beads. It was assumed that microbial contamination would take place mainly at the ground surface. The results show that the sediment cores in the liners from both the conventional core driver and from Direct-Push yielded little to no contamination if the uppermost 30 cm and the outer part of the sediment core were discarded. A broken core resulted in a high degree of contamination. The freeze corer did not meet the expectations and lead to unsatisfactory results.

Scheytt, T. and F. Jana von (2015). "Vergleich unterschiedlicher Methoden zur Entnahme von Feststoffproben für mikrobielle Untersuchungen." Grundwasser **20**(4): 253-261.

Bei der Probennahme von Feststoffproben für die mikrobielle Charakterisierung kann es zu einer Verunreinigung des Feststoffmaterials durch Einschleppen von Fremdmaterial kommen. Das Ziel dieser Studie ist eine Bewertung von allgemein gebräuchlichen Probennahmeverfahren für Feststoffe im Hinblick auf die Gewinnung mikrobiell unkontaminierter Proben aus dem Grundwasserleiter. Hierfür wurden Feststoffproben mittels konventioneller Kleinrammbohrverfahren (kontinuierlich mittels Rammkernsondierung, diskontinuierlich mittels Direct-Push-Verfahren) und Stickstoff-Gefrierkernverfahren aus dem wassergesättigten Bereich gewonnen. Zur Ermittlung der mikrobiellen Verunreinigung wurden Farbstoffe und Partikeltracer eingesetzt, wobei eine mikrobielle Verunreinigung von der Geländeoberfläche aus angenommen wurde. Die mit der Rammkernsondierung und der Direct-Push-Sondierung gewonnenen Bohrkerne zeigen gute Ergebnisse hinsichtlich einer mikrobiell einwandfreien Beprobung, wenn der obere Teil des Bohrkerns (ca. 30 cm) und der äußere Bereich verworfen werden. Das Zerbrechen des Sedimentkerns ist eine wichtige Ursache für Kontaminationen des inneren Bohrkerns, wobei das Ausmaß nur schwer abzuschätzen ist. Das hier benutzte Gefrierkernverfahren erwies sich als untauglich für die Gewinnung mikrobiell unkontaminierter Proben.Alternate abstract:Sediment sampling for microbial characterization is often associated with cross-contamination. The aim of this study was to assess the suitability of widely used sediment-sampling techniques for obtaining microbially uncontaminated samples from the saturated zone. Three different methods were applied: Continuous percussion drilling, discontinuous drilling with Direct-Push technology and a freeze corer using liquid nitrogen for cooling. Microbial contamination was monitored with dye tracers and fluorescent micro beads. It was assumed that microbial contamination would take place mainly at the ground surface. The results show that the sediment cores in the liners from both the conventional core driver and from Direct-Push yielded little to no contamination if the uppermost 30 cm and the outer part of the sediment core were discarded. A broken core resulted in a high degree of contamination. The freeze corer did not meet the expectations and lead to unsatisfactory results.

Schildgen, B. (2014). "How to Handle Microbeads." Sierra **99**(4): 1-2.

The article focuses on the management of microbeads and their harmful effects on humans and the environment. Topics discussed include the description an overview of microbeads, the components of the beads, their presence in cosmetics,their disposal, and the efforts in banning microbeads and replaced with safer materials.

Schirinzi, G. F., et al. (2017). "Cytotoxic effects of commonly used nanomaterials and microplastics on cerebral and epithelial human cells." Environmental Research **159**: 579-587.

Plastic wastes are among the major inputs of detritus into aquatic ecosystems. Also, during recent years the increasing use of new materials such as nanomaterials (NMs) in industrial and household applications has contributed to the complexity of waste mixtures in aquatic systems. The current effects and the synergism and antagonisms of mixtures of microplastics (MPLs), NMs and organic compounds on the environment and in human health have, to date, not been well understood but instead they are a cause for general concern. The aim of this work is to contribute to a better understanding of the cytotoxicity of NMs and microplastics/nanoplastics (MPLs/NPLs), at cell level in terms of oxidative stress (evaluating Reactive Oxygen Species effect) and cell viability. Firstly, the individual cytotoxicity of metal nanoparticles (NPs) (AgNPs and AuNPs), of metal oxide NPs (ZrO₂NPs, CeO₂NPs, TiO₂NPs, and Al₂O₃NPs), carbon nanomaterials (C₆₀fullerene, graphene), and MPLs of polyethylene (PE) and polystyrene (PS) has been evaluated in vitro. Two different cellular lines T98G and HeLa, cerebral and epithelial human cells, respectively, were employed. The cells were exposed during 24-48h to different levels of contaminants, from 10ng/mL to 10micro g/mL, under the same conditions. Secondly, the synergistic and antagonistic relationships between fullerenes and other organic contaminants, including an organophosphate insecticide (malathion), a surfactant (sodium dodecylbenzenesulfonate) and a plasticiser (diethyl phthalate) were assessed. The obtained results confirm that oxidative stress is one of the mechanisms of cytotoxicity at cell level, as has been observed for both cell lines and contributes to the current knowledge of the effects of NMs and MPLs-NPLs.

Schirmel, J., et al. (2018). "Plasticulture changes soil invertebrate assemblages of strawberry fields and decreases diversity and soil microbial activity." Applied Soil Ecology **124**: 379-393.

In agriculture, the use of plastic mulch (plasticulture) is globally increasing. Besides beneficial effects on crop yield and quality, possible adverse environmental effects associated with plastic mulch are currently under debate. Aside from the obvious disadvantages of substantial amounts of (micro)plastic waste, adverse effects on soil quality and biodiversity might be assumed. We compared the effect of plastic mulch and organic mulch (straw) systems in strawberry cultivation on soil invertebrates and biological activity in an observational field study in the Upper Rhine valley, Germany. Soil invertebrates were collected using pitfall traps and Berlese-Tullgren-funnels, earthworms by hand sorting. Soil biological activity was determined using bait-lamina sticks and the MicroResp^{TM} system. Soil samples from test fields were analysed for physicochemical and microbial parameters. Despite minor effects on soil physicochemical parameters, our results showed that the mulch system had a significant effect on the community structure of soil invertebrates. In strawberry fields with plastic mulch we found a decreased taxonomic richness and taxonomic richness decreased with increasing soil temperature. About 50% of the analysed taxa had significantly lower abundances in plastic mulched fields compared to fields with organic mulch. No investigated taxon had a higher abundance in plastic mulched fields. Soil moisture was the most important environmental variable in explaining invertebrate abundances. The soil microbial activity was significantly lower in plastic mulched fields than in fields with organic mulch. Our results indicate that even little shifts in abiotic (e.g. temperature, water content) and biotic (e.g. food availability) conditions associated with the plastic mulch system can have strong effects on soil invertebrates and soil microbial activity. Hence, plastic mulch might pose a threat to soil biodiversity and related ecosystem functions in agroecosystems. We call for further studies analysing the influence of plasticulture, to better evaluate the long-term consequences on agrobiodiversity and soil quality as well as sustainability.

Schirmer, D., et al. (2016). "Therapeutic potential of GPR64 specific CAR T cells in pediatric ewing sarcoma." Monatsschrift fur Kinderheilkunde **164 (12)**: 1176.

Background: Ewing Sarcoma (ES) is the second most common bone malignancy in children and young adolescents with a high potential of dissemination into lung and bones. Patients with localized disease receiving current treatment, have an approximate long-term survival of >65 %.

Patients with disseminated disease into the bone have an approximate longterm survival rate of only 10 %, compelling the search for new therapeutic treatment modalities like engineered T cell therapy. Here the therapeutic potential of chimeric antigen receptor (CAR) transgenic T cells directed against G-protein coupled receptor 64 (GPR64), an orphan receptor with normal expression restricted to human epididymis and significant overexpression in ES, was examined. Method(s): Therefore, two different monoclonal antibodies (mAb) directed against the extracellular region of GPR64 were generated and characterized. Subsequently, retroviral constructs containing second generation CARs together with the scFv fragments of the respective mAbs were designed. Primary lymphocytes were transduced and tested in vitro via flow cytometry, ELISpot and xCelligence assay. Result(s): Antibodies specifically stained ES cells as determined by flow cytometry. The signal intensity was reduced after RNAi mediated down-regulation of GPR64 in ES cell lines confirming specificity of mAbs. Following sequence determination of those mAbs two different CAR constructs were designed. Retroviruses containing such CARs transduced primary lymphocytes with good efficiency. The CAR transgenic T cells could be enriched for CD8+CAR+ cells via microbead isolation and showed strong proliferative capacities in vitro. Furthermore, target structures were specifically recognized as determined by ELISpot and xCelligence assays. Conclusion(s): CAR transgenic T cells targeting GPR64 show a promising approach to transfer the success of CARs in hematological malignancies to solid tumors. The cells generated in this study show strong specificity towards GPR64 and are able to control tumor cell growth in vitro. Since GPR64 expression is not restricted to ES but also up-regulated in a number of carcinomas derived from prostate, kidney or lung, GPR64-specific CARs may also be a future treatment option for other tumor entities.

Schleser, A., et al. (2016). "The impact of disposables towards more eco-friendly and less costly haemodialysis." Nephrology Dialysis Transplantation **1)**: i494.

Introduction and Aims: In Europe, over 50 million dialysis treatments are carried out annually, producing substantial amounts of contaminated and eco-damaging plastic waste. As part of the green dialysis concept, we examined the impact of 3 types of haemodialysis (HD)-disposables on the amount of plastic waste produced per treatment and the associated costs of disposal. Method(s): In a standard 3-times per week double-needle HD-setting, the weight of disposables (bloodlines and dialysers) was analysed after reinfusion for 3 haemodialysis machines: Gambro Artis (in HD mode), Fresenius Medical Care 5008 and Fresenius Medical Care 6008 (both in HDF mode). The weights were then correlated with the average costs of disposal of contaminated waste (mean of 17 European countries: 1.56 /kg; range: 0.47 - 9.08 /kg). Result(s): Conclusion(s): The weight of disposable waste differs considerably for the 3 HD-machine systems. The unused CareSet blood-cassette of the Fresenius Medical Care 6008 system is the lightest in weight; further, after treatment and reinfusion, it weighs 0.2 kg less than its precursor, the Fresenius Medical Care 5008 AV-Set. In comparison, the weight of disposable waste for Gambro Artis in HD-mode is below that of Fresenius Medical Care 5008 in HDF-mode. Application of Gambro Artis in HDF-treatments would necessitate the usage of the ArtiSet ULTRA, which is ca. 120 gr heavier than the standard ArtiSet and therefore even more costly to dispose. Projecting the difference between the Fresenius Medical Care 5008 and 6008 machines (0.2 kg less disposable waste per treatment for 6008) to 10,000 treatments/year (typical number of treatments for many clinics), approx. 2,000 kg less waste would be produced annually and costs would be reduced by ~ 3120 (at a mean of 1.56 /kg). As part of the environmentally-conscious development concept, the new automatic blood-cassette drainage-feature of the Fresenius 6008 system will further lead to a reduction of disposable weight by approx. 30 gr/treatment. The provision of healthcare, particularly dialysis, is associated with substantial usage of energy,

water and plastic materials, adding to the carbon footprint of dialysis. Sustainable and cost effective dialysis practices, aiming at a reduced consumption of energy, water and plastic materials are a responsibility of the entire dialysis community and should be an important global goal towards making dialysis more eco-friendly1,2. 1 Agar JWM. Personal viewpoint: hemodialysis-water, power, and waste disposal: rethinking our environmental responsibilities. (Table Presented).

Schlosser, O., et al. (2015). "Extension of the sorting instructions for household plastic packaging and changes in exposure to bioaerosols at materials recovery facilities." Waste Management **46**: 47-55.

The aim of this study was to assess how extending the sorting instructions for plastic packaging would affect the exposure of workers working at materials recovery facility (MRF) to dust, endotoxins, fungi and bacteria, taking into consideration other factors that could have an influence on this exposure. Personal sampling was carried out at four MRFs during six sampling campaigns at each facility, both in sorting rooms and when the workers were involved in "mobile tasks" away from the rooms. The data was analysed by describing the extension of sorting instructions both using a qualitative variable (after vs before) and using data for the pots and trays recycling stream, including or excluding plastic film. Overall, before the extension of the sorting guidelines, the geometric mean of personal exposure levels in sorting rooms was 0.3mg/m(3) for dust, 27.7 EU/m(3) for endotoxins, 13,000 CFU/m(3) for fungi and 1800 CFU/m(3) for bacteria. When workers were involved in mobile tasks away from the rooms, these averages were 0.5mg/m(3), 25.7 EU/m(3), 28,000 CFU/m(3) and 5100 CFU/m(3) respectively.The application by households of instructions to include pots, trays and film with other recyclable plastic packaging led to an increase in exposure to endotoxins, fungi and bacteria at MRFs. For an increase of 0.5 kg per inhabitant per year in the pots, trays and film recycling stream, exposure in sorting rooms rose by a factor of 1.4-2.2, depending on the biological agent. Exposure during mobile tasks increased by a factor of 3.0-3.6. The age of the waste amplified the effect of the extension of sorting instructions on exposure to fungi, bacteria and endotoxins. Factors that had a significant influence on the exposure of workers to dust and/or bioaerosols included the presence of paper, newspapers and magazines in the sorted waste, the order in which incoming waste was treated and the quality of the ventilation system in the sorting rooms. The levels of exposure observed in this study highlight the need to implement appropriate preventive measures against bioaerosols at MRFs for dry waste. There are grounds to justify these preventive measures, both inside sorting rooms and for the MRF as a whole, regardless of whether the decision to extend sorting instructions for household plastic waste is adopted.

Schmaelzlin, E., et al. (2006). "Monitoring hormone-induced oxygen consumption in the salivary glands of the blowfly, Calliphora vicina, by use of luminescent microbeads." Sensors and Actuators B: Chemical **119**(1): 251-254.

The salivary glands of the blowfly were injected with luminescent oxygen- sensitive microbeads. The changes in oxygen content within individual gland tubules during hormone-induced secretory activity were quantified. The measurements are based on an upgraded phase-modulation technique, where the phase shift of the sensor phosphorescence is determined independently from concentration and background signals. We show that the combination of a lock-in amplifier with a fluorescence microscope results in a convenient setup to measure oxygen concentrations within living animal tissues at the cellular level.

Schmalzlin, E., et al. (2005). "An optical multifrequency phase-modulation method using microbeads for

measuring intracellular oxygen concentrations in plants." Biophysical Journal **89**(2): 1339-1345.

A technique has been developed to measure absolute intracellular oxygen concentrations in green plants. Oxygen-sensitive phosphorescent microbeads were injected into the cells and an optical multifrequency phase-modulation technique was used to discriminate the sensor signal from the strong autofluorescence of the plant tissue. The method was established using photosynthesis-competent cells of the giant algae Chara corallina L., and was validated by application to various cell types of other plant species.

Schmetterer, K. G., et al. (2009). "Generation of allergen-specific T regulatory cells by multicistronic vector based retroviral transfer of T cell receptor alpha and beta chains and Foxp3 or TGF-beta." European Journal of Immunology **1)**: S413.

Background: Ectopic overexpression of transgenes in T-cells can modify T-cell function. Recently, we have shown that transfer of T-cell receptor (TCR) alpha and beta chains specific for allergen-derived epitopes can transfer allergen-specificity to peripheral blood T-cells. Similarly, retro- and lentiviral overexpression of Foxp3 has been shown to generate T-cells with regulatory function. Our aim is to combine these two approaches to generate allergen-specific regulatory T-cells (Treg) that might become useful in immunotherapeutic approaches. Method(s): Multicistronic expression constructs containing the respective alpha and beta chains of two TCRs specific for the Artv1<inf>25-36</inf> (TRAV17/TRBV18) and Betv1<inf>142-153</inf> (TRAV6/TRBV20) and the cDNAs encoding human Foxp3 and TGF-beta1 (TGFb) were generated by using internal ribosomal entry sites (IRES) and picornaviral 2A sequences. Subsequently, retrovirally transduced peripheral blood T-cells of non-allergic individuals were assessed for their regulatory capacity using either transfected HEK-293 as artificial antigen presenting cells or anti-CD3/CD28 coated microbeads as polyclonal stimulus. Result(s): Both Foxp3⁺ and TGFb⁺ T-cells showed the typical characteristics of Treg: hyporesponsiveness to polyclonal and antigen-specific activation, low cytokine secretion and proliferation in response to exogenous IL-2. Furthermore, TCR⁺Foxp3⁺ transgenic T-cells could inhibit T-cell proliferation of antigen-specific responder T-cells in a dose-dependent fashion both in response to antigen-specific and polyclonal activation. Importantly, Foxp3⁺ transgenic T-cells expressing their endogenous or a non-specific T-cell receptor could only inhibit activation of antigen-specific responder T-cells after polyclonal activation, supporting the view that Foxp3-mediated regulation is an active mechanism requiring activation of the regulatory T-cell. In contrast, both in an activated and resting state TGFb⁺ T-cells produced sufficient amounts of TGFb to inhibit T-cell activation. Conclusion(s): Our results show the feasibility to generate T regulatory cells, which exert their function only in response to allergen-specific activation. Such approaches might become useful for tolerance induction in allergic and other immune-mediated diseases.

Schmid, S., et al. (2010). "Real-time particle mass spectrometry based on resonant micro strings." Sensors **10**(9): 8092-8100.

Micro- and nanomechanical resonators are widely being used as mass sensors due to their unprecedented mass sensitivity. We present a simple closed-form expression which allows a fast and quantitative calculation of the position and mass of individual particles placed on a micro or nano string by measuring the resonant frequency shifts of the first two bending modes. The method has been tested by detecting the mass spectrum of micro particles placed on a micro string. This method enables real-time mass spectrometry necessary for applications such as personal monitoring devices for the assessment of the exposure dose of airborne nanoparticles.

Schmidt, C., et al. (2017). "Export of Plastic Debris by Rivers into the Sea." Environmental Science and Technology **51**(21): 12246-12253.

A substantial fraction of marine plastic debris originates from land-based sources and rivers potentially act as a major transport pathway for all sizes of plastic debris. We analyzed a global compilation of data on plastic debris in the water column across a wide range of river sizes. Plastic debris loads, both microplastic (particles <5 mm) and macroplastic (particles >5 mm) are positively related to the mismanaged plastic waste (MMPW) generated in the river catchments. This relationship is nonlinear where large rivers with population-rich catchments delivering a disproportionately higher fraction of MMPW into the sea. The 10 top-ranked rivers transport 88-95% of the global load into the sea. Using MMPW as a predictor we calculate the global plastic debris inputs form rivers into the sea to range between 0.41 and 4 x 10⁶ t/y. Due to the limited amount of data high uncertainties were expected and ultimately confirmed. The empirical analysis to quantify plastic loads in rivers can be extended easily by additional potential predictors other than MMPW, for example, hydrological conditions. Copyright © 2017 American Chemical Society.

Schmidt, J., et al. (2016). "Effect of Tris, MOPS, and phosphate buffers on the hydrolysis of polyethylene terephthalate films by polyester hydrolases." FEBS Open Bio **6**(9): 919-927.

The enzymatic degradation of polyethylene terephthalate (PET) occurs at mild reaction conditions and may find applications in environmentally friendly plastic waste recycling processes. The hydrolytic activity of the homologous polyester hydrolases LC cutinase (LCC) from a compost metagenome and TfCut2 from Thermobifida fusca KW3 against PET films was strongly influenced by the reaction medium buffers tris(hydroxymethyl)aminomethane (Tris), 3-(N-morpholino)propanesulfonic acid (MOPS), and sodium phosphate. LCC showed the highest initial hydrolysis rate of PET films in 0.2 m Tris, while the rate of TfCut2 was 2.1-fold lower at this buffer concentration. At a Tris concentration of 1 m, the hydrolysis rate of LCC decreased by more than 90% and of TfCut2 by about 80%. In 0.2 m MOPS or sodium phosphate buffer, no significant differences in the maximum initial hydrolysis rates of PET films by both enzymes were detected. When the concentration of MOPS was increased to 1 m, the hydrolysis rate of LCC decreased by about 90%. The activity of TfCut2 remained low compared to the increasing hydrolysis rates observed at higher concentrations of sodium phosphate buffer. In contrast, the activity of LCC did not change at different concentrations of this buffer. An inhibition study suggested a competitive inhibition of TfCut2 and LCC by Tris and MOPS. Molecular docking showed that Tris and MOPS interfered with the binding of the polymeric substrate in a groove located at the protein surface. A comparison of the K i values and the average binding energies indicated MOPS as the stronger inhibitor of the both enzymes.

Schmidt, L. K., et al. (2018). "Multi-temporal surveys for microplastic particles enabled by a novel and fast application of SWIR imaging spectroscopy - Study of an urban watercourse traversing the city of Berlin, Germany." Environmental Pollution **239**: 579-589.

Following the widespread assumption that a majority of ubiquitous marine microplastic particles originate from land-based sources, recent studies identify rivers as important pathways for microplastic particles (MPP) to the oceans. Yet a detailed understanding of the underlying processes and dominant sources is difficult to obtain with the existing accurate but extremely time-consuming methods available for the identification of MPP. Thus in the presented study, a novel approach applying short-wave infrared imaging spectroscopy for the quick and semi-automated identification of MPP is applied in combination with a multitemporal survey concept. Volume-reduced surface water samples were taken from transects at ten points along

a major watercourse running through the South of Berlin, Germany, on six dates. After laboratory treatment, the samples were filtered onto glass fiber filters, scanned with an imaging spectrometer and analyzed by image processing. The presented method allows to count MPP, classify the plastic types and determine particle sizes. At the present stage of development particles larger than 450 mum in diameter can be identified and a visual validation showed that the results are reliable after a subsequent visual final check of certain typical error types. Therefore, the method has the potential to accelerate microplastic identification by complementing FTIR and Raman microspectroscopy. Technical advancements (e.g. new lens) will allow lower detection limits and a higher grade of automatization in the near future. The resulting microplastic concentrations in the water samples are discussed in a spatio-temporal context with respect to the influence (i) of urban areas, (ii) of effluents of three major Berlin wastewater treatment plants discharging into the canal and (iii) of precipitation events. Microplastic concentrations were higher downstream of the urban area and after precipitation. An increase in microplastic concentrations was discernible for the wastewater treatment plant located furthest upstream though not for the other two. Short-wave imaging spectroscopy automatizes and accelerates the analysis of microplastic particles >450 mum extracted from environmental samples and thus opens the door for extensive (spatial and/or temporal) sampling surveys. Copyright © 2018 Elsevier Ltd

Schmidt, R., et al. (1983). "Fast and efficient purification of yeast plasma membranes using cationic silica microbeads." Biochimica et Biophysica Acta **732**(2): 421-427.

A fast and efficient procedure for the purification of plasma membranes of Saccharomyces cerevisiae is described. Protoplasts served as starting material. They were coated with cationic silica microbeads. After lysis, the plasma membranes were washed free from debris and cell organelles. This procedure resulted in a high yield (about 85%) of plasma membranes, as judged by measuring vanadate-sensitive ATPase as a plasma membrane marker. The enzyme was enriched 12-fold relative to the homogenate after lysis. Its specific activity was 1.5--2.0 micromol/min per mg protein, the pH optimum was 6.5, and 10 microM vanadate was sufficient to obtain maximum inhibition. Based on the assay of internal markers and electron microscopic studies, we found our preparation essentially free of contamination from other cell organelles.

Schmidt, R., et al. (1985). "High-yield purification of plasma membranes from transformed human keratinocytes in culture." Journal of Investigative Dermatology **85**(1): 50-53.

The density pertubation technique with cationic silica microbeads was applied to prepare highly purified plasma membranes from cultured human keratinocytes. Trypsinized cells were coated successively with the beads (diameter approximately 50 nm, gravity greater than 2 g/cm3) and polyacrylic acid before they were lysed by osmotic shock and mechanical shear. The plasma membranes remained in the form of large open sheets which could easily be separated from other cell organelles and the cytosol by low-speed centrifugation. The membrane preparation was characterized by scanning and transmission electron microscopy, marker enzyme activities, one-dimensional sodium dodecyl sulfate polyacrylamide electrophoresis, and the specific beta-adrenergic receptor count. A yield of 79 +/- 9% was calculated by comparing the amount of beta-adrenoceptors in the purified membrane preparation with that of a crude cellular particulate fraction. The specific beta-adrenoceptor count of these two preparations was 1.2 +/- 0.02 and 0.2 +/- 0.05 pmol/mg protein, respectively, indicating a 6-fold improved purification with this microbead technique. The purified membranes were essentially free from contamination of other cell organelles.

Schmidt-Hieber, M., et al. (2012). "Cytogenetic heterogeneity in clonal plasma cell disorders: A study in highly purified aberrant plasma cells." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Background: Recurrent immunoglobulin heavy chain (IGH) translocations - t(14q32) - such as t(4;14) or t(11;14) are considered to be primary cytogenetic events which play an important role in the pathogenesis of clonal plasma cell (PC) disorders. However, previous cytogenetic studies in these diseases have mainly been done in whole bone marrow or CD138+ microbead-enriched PC; the latter technique has several pitfalls such as coexistence of CD138+ and CD138- aberrant PC or apoptotic loss of CD138. Design and Methods: Overall, highly-purified aberrant PC (purity >=98%) from 217 patients with either multiple myeloma (MM; n=155) or monoclonal gammopathy of undetermined significance (MGUS; n=62) were analyzed for the presence of different cytogenetic alterations such as del(13q14), del(17p13) and t(14q32) by multicolor interphase fluorescence in situ hybridization (iFISH). Purity of sorted PC populations was further confirmed by iFISH studies of residual normal - i.e. polyclonal - PC fractions in a subgroup of 10 exemplarily cases with clonal PC disorder. Additionally, analysis of IGH gene arrangements and complementarity determining region 3 (CDR3) sequencing was carried out in a subset of patients (n=9) and simultaneous application of iFISH and immunofluorescent protein staining (FICTION) was performed in selected cases to confirm the clonal relationship between different fractions of tumor PC from individual patients and specific cytogenetic findings. Result(s): At diagnosis, 96% of all MM vs. 77% of MGUS cases (p<0.001) showed >=1 cytogenetic alteration and/or hyperdiploidy. Interestingly, among cases with t(14q32), in 24% of MM vs. 62% of MGUS patients (p=0.02) aberrant PC with and without IGH translocation - e.g. t(4;14) or t(11;14) - coexisted in the same patient. Furthermore, longitudinal cytogenetic studies in a subset of MM patients at different stages of the disease showed that an aberrant PC subclone lacking a recurrent t(14q32) might even expand during disease evolution. PCR and sequencing studies confirmed the existence of only one unique CDR3 sequence - in the absence of an oligo-/polyclonal background - in all tested samples indicating clonal relationship of cytogenetically-defined aberrant PC subclones. These observations together with FICTION analyses performed in selected cases, led further to assume that our findings are not due to contaminating residual normal PC. Finally, MM and MGUS cases frequently showed different but related cytogenetic profiles when other cytogenetic alterations which were presumably sequentially acquired by the PC, such as deletions/gains of IGH, FGFR3, CCND1 and MAF, as well as the DNA ploidy status determined by multiparameter flow cytometry were additionally considered. Conclusion(s): Our findings using highly-purified aberrant PC suggest that also recurrent IGH translocations might evolve secondarily during disease evolution in a significant fraction of MGUS and MM cases, which raises the question about their precise role in the pathogenesis of clonal PC disorders. Our data further supports the existence of a high intratumoral cytogenetic heterogeneity in MM and MGUS, challenging individualized treatment approaches in these diseases.

Schneck, N. A., et al. (2015). "Current trends in magnetic particle enrichment for mass spectrometry-based analysis of cardiovascular protein biomarkers." Nanomedicine **10**(3): 433-446.

Magnetic particles have traditionally been utilized to isolate and enrich various cardiovascular protein biomarkers for mass spectrometry-based proteomic analysis. The application of functionalized magnetic particles for immunocapture is attractive due to their easy manipulation, large surface area-to-volume ratios for maximal antibody binding, good recovery and high magnetic saturation. Magnetic particle enrichment coupled with mass spectrometry can act as a complementary tool for clinical sandwich-immunoassay development since it can provide improved target specificity and true metrological traceability. The purpose of this review is to summarize current separation methods and technologies that use magnetic particles to enrich protein biomarkers from complex matrices, specifically focusing on cardiovascular disease-related proteins and the advantages of magnetic particles over existing techniques.

Schnurr, R. E. J., et al. (2018). "Reducing marine pollution from single-use plastics (SUPs): A review." Marine Pollution Bulletin **137**: 157-171.

Single-use plastics, or SUPs (plastic bags, microbeads, cutlery, straws and polystyrene) are substantial sources of plastic marine pollution, yet preventable via legislative and non-legislative interventions. Various international legislative strategies have been reported to address plastic marine pollution from plastic bags and microbeads, but these have since been accompanied by recent increasing public awareness triggered by international agencies and organizations. The Sixth International Marine Debris Conference highlighted increasing intervention strategies to mitigate SUP pollution. This study presents new multi-jurisdictional legislative interventions to reduce SUPs since 2017 and incorporates emergence of new non-legislative interventions to mitigate other types of SUPs at individual and private-sector levels that complement or influence legislative interventions. Further, effectiveness of SUP bag interventions (e.g., bans vs. levies) to help reduce SUP marine pollution are presented and range between 33 and 96% reduction in bag use. Copyright © 2018 Elsevier Ltd

Schoeman, J. J. and J. F. van Staden (1991). "Evaluation of Sealed-Cell Electrodialysis for Industrial Effluent Treatment." Water S. A. **17**(4): 307.

Sealed-cell electrodialysis (SCED) involves the use of membranes sealed together at their edges to form membrane bags, which can be placed between a pair of electrodes in a simple membrane stack. The performance of a SCED unit for industrial effluent treatment is described. The ion-exchange membranes used in the demonstration were composed of microbeads of styrene-divinyl benzene copolymer that were modified to cation- and anion-exchange particles. The desalination/concentration of sodium chloride, ammonium nitrate, ammonium sulfate, sodium sulfate, sodium nitrate, and calcium chloride solutions as a function of time at constant cell pair voltage are presented. SCED was shown to effectively treat dilute NH sub(4)NO sub(3) and to moderately treat (NH sub(4)) sub(2)SO sub(4) . Calcium sulfate treatment was not possible, because of membrane scaling.

Schoenberger, T., et al. (2016). "Forensic examination of electrical tapes using high resolution magic angle spinning ^sup 1^H NMR spectroscopy." Analytical and bioanalytical chemistry **408**(1): 123-129.

Issue Title: Quo vadis, analytical chemistry?/E-Health - a topic for analytical chemists?/Precision mixology challenge/Advances in explosives analysis The application of high resolution magic angle spinning (HR-MAS) ^sup 1^H NMR spectroscopy is ideally suited for the differentiation of plastics. In addition to the actual material composition, the different types of polymer architectures and tacticity provide characteristic signals in the fingerprint of the ^sup 1^H NMR spectra. The method facilitates forensic comparison, as even small amounts of insoluble but swellable plastic particles are utilized. The performance of HR-MAS NMR can be verified against other methods that were recently addressed in various articles about forensic tape comparison. In this study samples of the 90 electrical tapes already referenced by the FBI laboratory were used. The discrimination power of HR-MAS is demonstrated by the fact that more tape groups can be distinguished by NMR spectroscopy than by using the combined evaluation of several commonly used analytical techniques. An additional advantage of this robust and quick method is the very simple sample preparation.

Schoenholzer, F., et al. (1999). "Origins and fate of fungi and bacteria in the gut of Lumbricus terrestris L. studied by image analysis." FEMS Microbiology Ecology **28**(3): 235-248.

The effect of the passage through the gut of the earthworm Lumbricus terrestris L. on fungi and bacteria ingested with decomposing leaves of Taraxacum officinale and with soil was quantified using image analysis tools. Both leaf and soil material were labeled with fluorescent latex microbeads to allow a quantification of the food sources in the fore-, mid-, and hindgut of the earthworms. The content of leaf material in the gut varied in a range between 4 and 59% of the total gut content in different earthworms and the different parts of the intestine of individual animals. Filamentous fungi in the gut compartments were found to originate mainly from leaf material (7700 plus or minus 1800 mu g (g leaf (dry wt.)) super(-1)), however, the major part was disrupted before arriving in the intestine. Remaining hyphae in the foregut with a biomass of up to 900 plus or minus 150 mu g (g gut content (dry wt.)) super(-1) were completely digested during passage through the earthworm gut. Spores of fungi were not detected in our studies. Bacterial cell numbers in the gut compartments ranged from 63 plus or minus 5 x 10 super(8) to 327 plus or minus 16 x 10 super(8) (g gut content (dry wt.)) super(-1) and were significantly higher than the numbers found in the soil (50 plus or minus 1 x 10 super(8) cells (g soil (dry wt.)) super(-1)). Cell numbers usually increased from fore- to hindgut. This increase was not correlated to contents of organic material and only partially due to a multiplication of bacterial cells. Numbers of dividing cells accounted in total for approximately 12% of all bacteria, increasing significantly from fore- to hindgut, counts were from 10 plus or minus 1 x 10 super(8) to 25 plus or minus 2 x 10 super(8) (g gut content (dry wt.)) super(-1), respectively. Average cell volumes of bacteria calculated from cell size distributions in leaf and soil material differed significantly, being 0.197 and 0.063 mu m super(3), respectively. In the gut compartments, average cell volumes ranged from 0.043 to 0.070 mu m super(3), which may indicate the disruption of large cells originating from the leaves before arriving in the foregut.

Scholz, M., et al. (2017). "In vitro chlorhexidine release from alginate based microbeads for periodontal therapy." PLoS ONE [Electronic Resource] **12**(10): e0185562.

Periodontitis is one of the most common infectious diseases globally that, if untreated, leads to destruction of the tooth supporting tissues and finally results in tooth loss. Evidence shows that standard procedures as mechanical root cleaning could be supported by further treatment options such as locally applied substances. Due to gingival crevicular fluid flow, substances are commonly washed out off the periodontal pockets. The evaluation of administration techniques and the development of local drug releasing devices is thus an important aspect in periodontal research. This study describes the development and examination of a new alginate based, biodegradable and easily applicable drug delivery system for chlorhexidine (CHX). Different micro beads were produced and loaded with CHX and the release profiles were investigated by high performance liquid chromatography (HPLC). The in vitro-demonstrated release of CHX from alginate based beads shows comparable releasing characteristics as clinically approved systems. Yet many characteristics of this new delivery system show to be favourable for periodontal therapy. Easy application by injection, low production costs and multifunctional adaptions to patient related specifics may improve the usage in routine care.

Schonau, A., et al. (1998). "A one-step solid phase immunoassay for simultaneous detection of serum IgG and IgM antibodies to Borrelia burgdorferi." Journal of Immunological Methods **218**(1-2): 9-17.

A one-step immunoassay for simultaneous detection of serum IgG and IgM antibodies to

Borrelia burgdorferi has been developed. The assay is based on C1q, which binds to immune complexes containing IgG and/or IgM antibodies. Micro-beads pre-coated with antibodies to human C1q are mixed with human serum samples and fluorochrome-labelled B. burgdorferi flagellum antigen. In the presence of serum IgG and/or IgM antibodies to B. burgdorferi, fluorochrome-labelled antigen/antibody complexes are formed. These are then bound by serum C1q and are subsequently captured on the anti-C1q-coated beads. The sample is analysed on a flow cytometer and the presence of fluorescent beads is, thus, indicative of a positive test result. In the present study the sensitivity and specificity of the assay are compared to those of the indirect IDEIA B. burgdorferi IgG and the mu-chain capture IDEIA B. burgdorferi IgM ELISAs for separate determination of IgG and IgM. Detection using a flow cytometer can be performed without separation of the beads from the reaction mixture, which means that in practice, the method is carried out as a one-step assay and it is, thus, very suitable for automation. Other advantages of this kind of assay includes an antibody/antigen reaction which occurs in solution and the potential of using the method for the detection of antibodies against several antigens from the same or different infectious agents (multi-parameter screening).

Schönholzer, F., et al. (1999). "Origins and fate of fungi and bacteria in the gut of <i>Lumbricus terrestris</i> L. studied by image analysis." FEMS Microbiology Ecology **28**(3): 235-248.

The effect of the passage through the gut of the earthworm Lumbricus terrestris L. on fungi and bacteria ingested with decomposing leaves of Taraxacum officinale and with soil was quantified using image analysis tools. Both leaf and soil material were labeled with fluorescent latex microbeads to allow a quantification of the food sources in the fore-, mid-, and hindgut of the earthworms. The content of leaf material in the gut varied in a range between 4 and 59% of the total gut content in different earthworms and the different parts of the intestine of individual animals. Filamentous fungi in the gut compartments were found to originate mainly from leaf material (7700±1800 μg (g leaf (dry wt.))−1), however, the major part was disrupted before arriving in the intestine. Remaining hyphae in the foregut with a biomass of up to 900±150 μg (g gut content (dry wt.))−1 were completely digested during passage through the earthworm gut. Spores of fungi were not detected in our studies. Bacterial cell numbers in the gut compartments ranged from 63±5×108 to 327±16×108 (g gut content (dry wt.))−1 and were significantly higher than the numbers found in the soil (50±1×108 cells (g soil (dry wt.))−1). Cell numbers usually increased from fore- to hindgut. This increase was not correlated to contents of organic material and only partially due to a multiplication of bacterial cells. Numbers of dividing cells accounted in total for approximately 12% of all bacteria, increasing significantly from fore- to hindgut, counts were from 10±1×108 to 25±2×108 (g gut content (dry wt.))−1, respectively. Average cell volumes of bacteria calculated from cell size distributions in leaf and soil material differed significantly, being 0.197 and 0.063 μm3, respectively. In the gut compartments, average cell volumes ranged from 0.043 to 0.070 μm3, which may indicate the disruption of large cells originating from the leaves before arriving in the foregut.

Schoof, R. A. and J. DeNike (2017). "Microplastics in the context of regulation of commercial shellfish aquaculture operations." Integrated Environmental Assessment & Management **13**(3): 522-527.

ABSTRACT Shellfish aquaculture in the Salish Sea (encompassing the Strait of Juan de Fuca, Puget Sound, and the Georgia Strait) is a major source of clams, oysters, and mussels in the United States and Canada. Plastic gear is necessary for the viability of many of these operations. During the past few years, shellfish farm permits issued in Washington State have been challenged on various bases that have included allegations that the plastic gear is releasing microplastics, commonly defined as particles less than 5 mm in diameter. Published survey data

on sources of marine plastic debris demonstrate the very limited contribution of aquaculture gear. Both permits and industry codes of practice provide procedures to minimize loss of gear to the marine environment. Plastic gear is also designed specifically to maintain its integrity and not degrade in the marine environment. Plastic degradation is greatest on beaches with high UV exposure, whereas aquaculture gear is mostly underwater and/or covered by biofoulants. Available data for microplastics in water, sediment, and biota of the Salish Sea do not suggest significant release of microplastics from shellfish aquaculture operations. Integr Environ Assess Manag 2017;13:522-527. © 2017 SETAC [ABSTRACT FROM AUTHOR]
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Schrank, I., et al. (2019). "Effects of microplastic particles and leaching additive on the life history and morphology of Daphnia magna." Environmental Pollution **255**(Part 2).
Plastic waste is continuously introduced not only into marine, but also freshwater environments, where it fragments into microplastics. Organisms may be affected by the particles themselves due to ingestion and indirectly via incorporated additives such as plasticizers, since these substances have the ability to leach out of the polymer matrix. Although it has been indicated that the likelihood of additives leaching out into the gut lumen of organisms exposed to microplastics is low, studies distinguishing between the effects of the synthetic polymer itself and incorporated additives of the same polymer are scarce. Since this is obligatory for risk assessment, we analyzed the chronic effects of flexible polyvinylchloride (PVC), a widely used polymer, containing the plasticizer diisononylphthalate (DiNP) on morphology and life history of the freshwater crustacean Daphnia magna and compared these effects with the effects of rigid PVC, lacking DiNP, as well as a glass bead control. After up to 31 days of exposure, rigid PVC and glass beads did not affect body length and relative tail spine length of D. magna, whereas flexible PVC led to an increased body length and a reduced number of offspring. None of the treatments increased the mortality significantly. We were able to show that 2.67 micro g/L DiNP leached out of the flexible PVC into the surrounding medium using GC-MS. Yet, we were not able to measure leachate inside the gut lumen of D. magna. The effects emerged towards the end of the experiment, due to the time dependent process of leaching. Therefore, the results highlight the relevance of long-term chronic exposure experiments, especially as leaching of additives takes time. Further, our study shows the importance to distinguish between microplastics containing leachable additives and the raw polymer in ecotoxicological testing.

Schroder, H., et al. (2017). "Immuno-PCR with digital readout." Biochemical & Biophysical Research Communications **488**(2): 311-315.
Immuno-PCR (IPCR) combines the versatile ELISA antigen detection with ultrasensitive PCR signal amplification, thereby enabling the highly sensitive detection of a broad range of targets with a typically very large dynamic detection range. The quantification of the antigen is usually achieved by real-time PCR, which provides a correlation between the target concentration and amplified DNA marker. We here report on the implementation of digital droplet PCR as a means for direct quantification of DNA copies to enable the highly sensitive detection of protein biomarkers. To this end, two alternative approaches, based on either magnetic microbead-based IPCR or a microplate-release IPCR were tested. The latter format worked well

and revealed an extraordinary high robustness and sensitivity. While rtIPCR already fulfills typical immunoassay acceptance criteria, ddIPCR enables improved accuracy and precision of the assay because signal response and analyte concentrations are directly correlated. The utility of the novel ddIPCR technology is demonstrated at the example of two cytokines, interleukin 2 and interleukin 6 (IL2, IL6, respectively), with an overall average CV% of 5.0 (IL2) and 7.4 (IL6).

Schuldt, U., et al. (2019). "Characterization of mechanical parameters of microbeads by means of analytical centrifugation. (Special Issue: Gums and stabilisers.)." Food Hydrocolloids **86**: 201-209.

Microcapsules, microspheres and microbeads are widely used in the food industry, pharmacy, agriculture, cosmetics, construction, textile industry and printing to protect immobilized substances against harsh conditions or to mask bad taste, as well as to enable and control the release of substances e.g. active pharmaceutical ingredients. The knowledge of the mechanical properties is a key parameter in development, application and control of processing. The paper focuses on the experimental determination of the stiffness of alginate beads (about 400 micro m) in terms of bulk compressional behaviour by using a commercial available multisample analytical centrifuge (LUMiSizer). The basic principle consists in applying an increasing centrifugal force on an alginate bead column in a measuring cell and to record the height of the bead column (volume) in dependence on the applied force during centrifugation. The packing/compression of beads is quantified by the decreased column volume in relation to the applied force. It was shown that beads made of alginate of high alpha -L-guluronic acid (G) content are more stable compared to alginate types of high beta -D-mannuronic acid (M) content. In contrast, gelling cations and their concentrations have less influence on the mechanical behaviour. The described ensemble method is sensitive, reproducible, easy to perform and, due to the simultaneous analysis of up to 12 samples, time saving. The new method is especially suitable for quality control during microsphere production.

Schulte-Uebbing, C., et al. (2017). "Endocrine disruptors in drinking water. Do plastic particles, softeners, pesticides and heavy metals in drinking water stimulate (hormone-dependent) tumors?. [German]." Pravention und Rehabilitation **29**(1): 1-13.

Compared, e.g., with water in Africa, Asia, or South America, our drinking water is still acceptable. But some new scientific studies have shown that there are a lot of endocrine disruptors in our drinking water: (micro-and nano-) plastic particles, pesticides, heavy metals, radioactive substances (uranium, radon) etc. These substances can interfere with the hormone system, possibly leading to the development, growth, and metastasis of (hormone-dependent) tumors, e.g., ovarian, corpus, and female breast cancer. By applying modern (direct-flow) drinking water cleaning and finishing systems, endocrine disruptors can be removed from the drinking water. This can be a very important and effective preventive and therapy-accompanying measure. Copyright © 2017 Dustri-Verlag Dr. Karl Feistle.

Schultz, P., et al. (2008). "[Reconstruction of the anterior mandibule using a porous titanium implant: a case report]." Revue de Laryngologie Otologie Rhinologie **129**(3): 201-205.

OBJECTIVE: Anterior mandibular arch reconstruction.

PATIENT AND METHOD: A 55-year-old immuno-depressed female underwent resection of the lower third of the face subsequent to extensive mucormycosis-related necrosis. Reconstruction of the anterior part of the mandible and adjacent soft tissue was carried out with a mandibular prosthesis and a latissimus dorsi flap. The mandibular prosthesis was made of titanium T40 micro-beads, consolidated by two parallel plates of titanium. The porous structure is intended to enhance cellular and bone integration.

RESULTS: The tolerance of the prosthesis was still excellent after 36 months. Labial continence was restored in a second procedure. Unrestricted diet was allowed from the third month. Radiological investigations confirm the good stability of the prosthesis.
CONCLUSION: This original prosthesis design offers an alternative to the reconstruction of an anterior mandibular arch by plate or by vascularised free osseous tissue transfer that is sometimes associated with significant morbidity.

Schultz, S. (2017). "Reducing Plastic Pollution." Alternatives Journal **43**(2): 68-69.
Plastic is made to last so that people can use it repeatedly. Ironically, the average plastic bag is used for only 5 to 12 minutes. It's not biodegradable, which means bacteria can't decompose it like food waste. Instead, it slowly degrades into tiny pieces that still cause harm to the environment. Imagine that plastic pollution isn't a problem. There is no plastic in oceans. Landfills aren't mountains in the distance. There is more wildlife that isn't getting choked by plastic poison. Here, Schultz discusses ways how to reduce plastic pollution.

Schulz, U., et al. (2017). "Evaluation of a new microbeads assay for granulocyte antibody detection." Transfusion **57**(1): 70-81.
BACKGROUND: To reduce the risk of transfusion-associated acute lung injury (TRALI), a high number of plasma donors were tested for human leukocyte antigen (HLA) and human neutrophil antigen (HNA) antibodies. For HNA antibody detection, the gold standard is a combination of the granulocyte immunofluorescence test (GIFT) and the granulocyte agglutination test (GAT). However, these tests are not suitable for a high-throughput of samples.
STUDY DESIGN AND METHODS: To evaluate the new generation of the LABScreen MULTI assay (One Lambda, Inc.), which has special new beads for all the known HNA specificities, including HNA-3a, 97 sera samples containing well-defined HNA antibodies were used. For background testing, we used 91 samples from plasma donors previously identified by GAT, GIFT, and the monoclonal antibody-specific immobilization of granulocyte antigens (MAIGA) assay.
RESULTS: Compared with previous tests, the new LABScreen MULTI assay was highly specific for the HNA-1a, HNA-1b, HNA-2, and HNA-3a antibody specificities required to prevent TRALI. Ninety-eight percent of the HNA-1a, HNA-1b, and HNA-2 antibodies could be detected as true positive; and 90% of the HNA-3a antibodies were recognized correctly as positive. False-positive reactions were identified in 5.5% of samples that previously tested negative.
CONCLUSION: The detection of HNA-3a antibody specificities could be integrated into the new LABScreen MULTI assay; however, we detected only 90%. In addition, we detected further HNA antibodies, such as HNA-1c, HNA-1d, and some HNA-3b and HNA-4a antibodies. The new generation of LABScreen MULTI is a great step toward feasible high-throughput testing for HNA antibodies. Nevertheless, GIFT and GAT remain the gold-standard methods for the differentiation of rare and currently unknown HNA specificities.

Schulz, U., et al. (2015). "Evaluation of the microbeads assay labscreen multi for granulocyte antibody detection." Transfusion **3)**: 122A.
Background/Case Studies: In order to reduce the risk of TRALI, a high number of plasma donors were tested for HLA- and HNA-Abs. For HNA-Ab detection, the gold standard is a combination of the granulocyte immunofluorescence test (GIFT) and the granulocyte agglutination test (GAT). However, these tests are not suitable for a high sample throughput. By introducing the LabScreen Multi as a pre-screening test for HNA-1 and -2 Ab in our lab in 2009, we were able to significantly reduced the number of GIFTs used. HNA-3a Abs were exclusively detected by GAT. With the clarification of the molecular structure of HNA-3, it was possible to extend the test to

HNA-3a and -3b Abs. Here, we report the results of our initial study evaluating the new generation of LabScreen Multi, including special new beads coated with recombinant antigens for HNA-1a, -1b, -1c, -2 and additional beads for the detection of HNA-3a, -3b, and -4a, focusing on confirmation of well-defined HNA-Abs. Study Design/Methods: For evaluation of the new generation of LabScreen Multi, 98 sera containing well-defined HNA-Abs were used. The Abs were identified during routine testing in the involved labs by GIFT, GAT, and MAIGA. The test procedure for LabScreen Multi was carried out according to the manufacturer's instruction. The cutoff was set for the beads HNA-1a, -1b, -1c, -3a, -3b, and -4a to a ratio >5. The bead for HNA-2 was evaluated with ratios of >10 and >20. Results/Findings: Compared to the previous tests, the new LabScreen Multi reacts highly specifically for the specificities HNA-1a, -1b, -2, and -3a that are required to prevent TRALI, as shown in the Table. 100% of the HNA-1a, -1b, -1c, -1d, and -2 Abs could be detected as true-positives; 92% of the HNA-3a Abs (35/38) were correctly recognized as positive. Conclusion(s): The detection of HNA- 3a specificities was integrated in the new LabScreen Multi, without performing additional testing of samples by GAT. However we found that not 100% of the HNA-3a-positive sera were detected. In addition, we are able to detect new and rare HNA-Abs, such as HNA-1c, -1d and some HNA-3b and -4a Abs, although their importance is still unclear in terms of TRALI. The new generation of LabScreen Multi is a great step toward feasible highthroughput testing for HNA-Ab. Nevertheless, GIFT and GATremain the gold standard methods for the differentiation of rare and currently unknown HNA specificities, because of the use of granulocytes with their unmodified natural structures.

Schulz Vicentini, D., et al. (2019). "Toxicological Evaluation and Quantification of Ingested Metal-Core Nanoplastic by <i>Daphnia magna</i> Through Fluorescence and Inductively Coupled Plasma-Mass Spectrometric Methods." Environmental Toxicology and Chemistry **38**(10): 2101-2110.

There are few studies on nanoplastic that propose quantification of the amount ingested combined with evaluation of the toxic effects on aquatic organisms. We propose 2 methods to quantify the amount of polystyrene nanoplastic (PSNP) ingested by Daphnia magna: fluorescence intensity, where a fluorescent monomer (F) is added to the PSNP and quantified through fluorescence light microscopy, and total aluminum quantification, where PSNP is synthesized with Al2O3 metal-core nanoparticles and used for quantification of the nanoplastic ingested by the organism Daphnia magna using inductively coupled plasma-mass spectrometry. In addition, the PSNP was functionalized with palmitic acid to simulate the environmental conditions leading to biological and chemical transformations. Acute and chronic toxicity tests were performed with fluorescent PSNP (PSNP/F) and palmitic acid-functionalized PSNP/F (PSNP/F-PA). The ingestion quantified was higher by factors of 2.8 and 3.0 for PSNP/F-PA and 1.9 and 1.7 for PSNP/F applying the fluorescence intensity and total Al quantifying methods, respectively, when compared to PSNP. These results are consistent with the data obtained in the toxicity tests, which showed an approximately 3 times increase in the adverse effect of PSNP/F-PA on the mobility and reproduction of the organisms. Thus, the strong inhibition of D. magna reproduction caused by PSNP/F-PA in the chronic toxicity tests could be associated with a greater amount of this nanoplastic being ingested by the organisms. Environ Toxicol Chem 2019;38:2101–2110. © 2019 SETAC.

Schunck, T. and P. Poulet (2000). "Oxygen consumption through metabolism and photodynamic reactions in cells cultured on microbeads." Physics in medicine and biology **45**(1): 103-119.

Oxygen consumption by cultured cells, through metabolism and photosensitization reactions, has been calculated theoretically. From this result, we have derived the partial oxygen pressure PO<inf>2</inf> in the perfusion medium flowing across sensitized cultured cells during photodynamic experiments. The PO<inf>2</inf> variations in the perfusate during light irradiation are related to the rate of oxygen consumption through photoreactions, and to the number of cells killed per mole of oxygen consumed through metabolic processes. After irradiation, the reduced metabolic oxygen consumption yields information on the cell death rate, and on the photodynamic cell killing efficiency. The aim of this paper is to present an experimental set-up and the corresponding theoretical model that allows us to control the photodynamic efficiency for a given cell-sensitizer pair, under well defined and controlled conditions of irradiation and oxygen supply. To demonstrate the usefulness of the methodology described, CHO cells cultured on microbeads were sensitized with pheophorbide a and irradiated with different light fluence rates. The results obtained, i.e. oxygen consumption of about 0.1 muM s⁻¹ m⁻³ under a light fluence rate of 1 W m⁻², 10⁵ cells killed per mole of oxygen consumed and a decay rate of about 1 h⁻¹ of living cells after irradiation, are in good agreement with the theoretical predictions and with previously published data.

Schur, C., et al. (2019). "When Fluorescence Is not a Particle: The Tissue Translocation of Microplastics in Daphnia magna Seems an Artifact." Environmental Toxicology & Chemistry **38**(7): 1495-1503.

Previous research reported the translocation of nano- and microplastics from the gastrointestinal tract to tissues in Daphnia magna, most prominently of fluorescent polystyrene beads to lipid droplets. For particles >300 nm, such transfer is biologically implausible as the peritrophic membrane retains these in the daphnid gut. We used confocal laser scanning microscopy to study tissue transfer applying the setup from a previous study (neonates exposed to 20 and 1000 nm polystyrene beads at 2 micro g L⁻¹ for 4 and 24 h), the same setup with a fructose-based clearing, and a setup with a 1000-fold higher concentration (2 mg L⁻¹). We used passive sampling to investigate whether the beads leach the fluorescent dye. Although the 1000 nm beads were visible in the gut at both exposure concentrations, the 20 nm beads were detectable at 2 mg L⁻¹ only. At this concentration, we observed fluorescence in lipid droplets in daphnids exposed to both particle types. However, this did not colocalize with the 1000 nm beads, which remained visible in the gut. We further confirmed the leaching of the fluorescent dye using a passive sampler, a method that can also be applied in future studies. In summary, we cannot replicate the original study but demonstrate that the fluorescence in the lipid droplets of D. magna results from leaching of the dye. Thus, the use of fluorescence as a surrogate for particles can lead to artifacts in uptake and translocation studies. This highlights the need to confirm the stability of the fluorescence label or to localize particles using alternative methods. Environ Toxicol Chem 2019;38:1495-1503. © 2019 SETAC OPEN PRACTICES: The present study has earned Open Data/Materials badges for making publicly available the digitally shareable data necessary to reproduce the reported results. Learn more about the Open Practices badges from the Center for Open Science: https://osf.io/tvyxz/wiki.

Schür, C., et al. (2019). "When Fluorescence Is not a Particle: The Tissue Translocation of Microplastics in <i>Daphnia magna</i> Seems an Artifact." Environmental Toxicology and Chemistry **38**(7): 1495-1503.

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fructose-based clearing, and a setup with a 1000-fold higher concentration (2 mg L–1). We used passive sampling to investigate whether the beads leach the fluorescent dye. Although the 1000 nm beads were visible in the gut at both exposure concentrations, the 20 nm beads were detectable at 2 mg L–1 only. At this concentration, we observed fluorescence in lipid droplets in daphnids exposed to both particle types. However, this did not colocalize with the 1000 nm beads, which remained visible in the gut. We further confirmed the leaching of the fluorescent dye using a passive sampler, a method that can also be applied in future studies. In summary, we cannot replicate the original study but demonstrate that the fluorescence in the lipid droplets of D. magna results from leaching of the dye. Thus, the use of fluorescence as a surrogate for particles can lead to artifacts in uptake and translocation studies. This highlights the need to confirm the stability of the fluorescence label or to localize particles using alternative methods. Environ Toxicol Chem 2019;38:1495–1503. © 2019 SETACOpen PracticesThe present study has earned Open Data/Materials badges for making publicly available the digitally shareable data necessary to reproduce the reported results. Learn more about the Open Practices badges from the Center for Open Science: https://osf.io/tvyxz/wiki.

Schussler, O., et al. (2015). "Collagen foam membranes colonized by human mesenchymal stromal cells efficiently inhibit allogenic T lymphocyte proliferation in vitro." Bone Marrow Transplantation **1)**: S322-S323.

Introduction: Human mesenchymal stromal cells (MSC) can be expanded in vitro from most vascularized tissues. These cells are able to differentiate in multiple lineages and to control various inflammatory processes, including steroidresistant graft versus host disease that may occur after grafting patients with allogenic hematopoietic stem cells. MSC thus represent a great hope as a therapeutic tool for either tissue reconstruction or anti-inflammatory therapies. In general MSC are injected as single cell suspensions and tend to vanish from the injection site when injected locally, and are very difficult to localize after systemic infusion. We therefore investigated in vitro whether MSC immobilized on a biocompatible scaffold retained their ability to inhibit allogenic T lymphocyte activation. Materials (or patients) and methods: MSC precursors were harvested from femoral head remains after informed consent of patients undertaking hip surgery, and amplified with platelet lysate (PL). Amplified MSC (1xE5 cells in 10 mul, passage 2 or 3) were seeded on 6 mm-diameter collagen foam membranes (CFM) (ultrafoam collagen hemostat, Bard Limited, UK) for 2 hours. The seeded CFM were transferred in new wells and cultured for 19 to 120 days in PL. Mean CFM surface was estimated using a square grid as reference. CFM were then either fixed for microscopic examination, disrupted with collagenase type II for cell count and phenotype determination by FACS, or cocultured with allogenic T lymphocytes stimulated with anti-CD3 and CD28 mAb immobilized on microbeads (A3-28) to determine their immunomodulatory potency. Result(s): MSC-seeded CFM transiently released cells during the first week of culture. From day 9 on CFM decreased in shape, increased in opacity and exhibited a much smoother surface than unseeded CFM. After 65 days the mean surface of the seeded CFM was half of the value prior to seeding (n=9, P<E- 4, t-test). In one case, the CFM totally dissolved and MSC formed an adherent layer in the dish. Microscopic examination of CFM slides stained with Goldner's dye obtained after 19 days of culture showed that MSC were localized both within CFM and on its surface where they formed a well-organized layer that was multicellular in some areas. Collagenase digestion of the membranes released viable cells in numbers corresponding to 50% of the seeded value. These cells were CD45-, CD105+, CD54+, CD73+, and CD106 and HLADRlow. MSC-seeded CFM prevented A3-28-induced allogenic T lymphocyte proliferation. T cell inhibition was effective even after 3 consecutive incubations of membranes with 3 different T lymphocyte preparations, whereas empty

membranes never inhibited T lymphocyte proliferation. Conclusion(s): These data show that MSC efficiently colonize CFMs, are long-lived in these structures and express similar markers than these observed in 2D-culture. Moreover MSC residing in CFM maintain their in vitro immunomodulatory properties, suggesting that MSC-loaded CFM could be used in vivo to control local inflammation. However before undertaking any clinical application several points require answers such as how cell colonization progresses in the membrane, whether MSC develop a proteolytic activity that could explain membrane shrinkage, and what is the cell cycle and differentiation status of cells in regard to their localization within the membrane. These issues are presently under investigation.

Schuyler, Q. A., et al. (2016). "Risk analysis reveals global hotspots for marine debris ingestion by sea turtles." Global Change Biology **22**(2): 567-576.

Plastic marine debris pollution is rapidly becoming one of the critical environmental concerns facing wildlife in the 21st century. Here we present a risk analysis for plastic ingestion by sea turtles on a global scale. We combined global marine plastic distributions based on ocean drifter data with sea turtle habitat maps to predict exposure levels to plastic pollution. Empirical data from necropsies of deceased animals were then utilised to assess the consequence of exposure to plastics. We modelled the risk (probability of debris ingestion) by incorporating exposure to debris and consequence of exposure, and included life history stage, species of sea turtle and date of stranding observation as possible additional explanatory factors. Life history stage is the best predictor of debris ingestion, but the best-fit model also incorporates encounter rates within a limited distance from stranding location, marine debris predictions specific to the date of the stranding study and turtle species. There is no difference in ingestion rates between stranded turtles vs. those caught as bycatch from fishing activity, suggesting that stranded animals are not a biased representation of debris ingestion rates in the background population. Oceanic life-stage sea turtles are at the highest risk of debris ingestion, and olive ridley turtles are the most at-risk species. The regions of highest risk to global sea turtle populations are off of the east coasts of the USA, Australia and South Africa; the east Indian Ocean, and Southeast Asia. Model results can be used to predict the number of sea turtles globally at risk of debris ingestion. Based on currently available data, initial calculations indicate that up to 52% of sea turtles may have ingested debris.

Schwabl, P., et al. (2019). "Detection of Various Microplastics in Human Stool: A Prospective Case Series." Annals of Internal Medicine **03**: 03.

Background: Microplastics are ubiquitous in natural environments. Ingestion of microplastics has been described in marine organisms, whereby particles may enter the food chain.

Objective: To examine human feces for the presence of microplastics to determine whether humans involuntarily ingest them.

Design: Prospective case series in which participants completed a food diary and sampled stool according to step-by-step instructions.

Setting: Europe and Asia.

Participants: Eight healthy volunteers aged 33 to 65 years.

Measurements: After chemical digestion, Fourier-transform infrared microspectroscopy was used to analyze the presence and shape of 10 common types of microplastic in stool samples.

Results: All 8 stool samples tested positive for microplastics. A median of 20 microplastics (50 to 500 micro m in size) per 10 g of human stool were identified. Overall, 9 plastic types were detected, with polypropylene and polyethylene terephthalate being the most abundant.

Limitations: There were few participants, and each provided only 1 sample. The origin and fate of

microplastics in the gastrointestinal tract were not investigated.

Conclusion: Various microplastics were detected in human stool, suggesting inadvertent ingestion from different sources. Further research on the extent of microplastic intake and the potential effect on human health is needed.

Primary Funding Source: None.

Schwabl, P., et al. (2018). "Assessment of microplastic concentrations in human stool-preliminary results of a prospective study." United European Gastroenterology Journal **6 (8 Supplement)**: A127.

Introduction: Microplastic is defined as plastic particles with a size of 5mm to 1mm. The world plastic production has been growing exponentially within the past years, reaching up to 300 megatons/year. Pollution causes plastic to accumulate in the sea, where it is ingested by sea animals, thus integrating plastic into the food chain. Significant amounts of microplastic have been detected in tuna, lobster and shrimp. Microplastic may harm via bioaccumulation (especially when the intestinal barrier is damaged) and can serve as a vector for toxic chemicals or pathogens. Moreover, ingested plastic may affect intestinal villi, nutritional uptake and can induce hepatic stress. Since human data is very scarce, we are the first to quantify and characterize microplastic in human stool. Aims and Methods: In this prospective pilot study, 8 healthy participants from Finland, Italy, Japan, the Netherlands, Poland, Russia, United Kingdom and Austria were included. Exclusion criteria were: gastrointestinal disease, recent dental treatment, medical diets, alcohol abuse and intake of drugs affecting stool frequency, consistency or resorption. The participants documented daily food intake for a week before sampling ~100g of stool. After clearing samples from liquids and natural organic solids (e.g., bacterial biomass, undigested plant matter, proteins, and fats), the remaining particles of 50-500 micrometer size were characterized using Fourier-transform infrared (FT-IR) micro-spectroscopy. The data analysis consisted of screening for 11 plastic types: PS, PU, PE, PP, PVC, PET, PA, PC, PMMA, POM and MF. Result(s): Exposure to plastic was frequent among the 8 participants (age 46+/-12 years; 37% male). In the week before sampling 21+/-12 dishes with plastic wrapping were consumed and daily 740+/-580ml water were drunk from plastic bottles (11% fizzy drinks). None was vegetarian and sea fish was consumed by 6 participants (2.6x/week). 3 participants used polyethylene glycol (PEG) containing tooth-paste. 5/8 samples have been analyzed so far. The analytical screening identified polystyrene (PS) and polyurethane (PU) plastics in 2 of 5 samples, while in the other samples no definite results are yet obtainable due to high residual cellulose and fat content masking the presence of microplastic. Conclusion(s): Increased plastic pollution can cause plastic contamination of foods, which may affect the GI-tract. We are the first to detect presence of polystyrene and polyurethane microparticles in human stool samples. Currently, we are optimizing the stool-sample separation technique of clearing non-plastic particles to further improve quantification and characterisation of microplastic load by FTIR micro-spectroscopy.

Schwaferts, C., et al. (2019). "Methods for the analysis of submicrometer- and nanoplastic particles in the environment." TrAC - Trends in Analytical Chemistry **112**: 52-65.

Nanoplastic is an emerging topic of relevance in environmental science. The analytical methods for microplastic have a particle size limit of a few micrometers so that new methods have to be developed to cover the nanometer range. This contribution reviews the progress in environmental nanoplastic analysis and critically evaluates which techniques from nanomaterial analysis may potentially be adapted to close the methodological gap. A roadmap is brought forward for the whole analytical process from sample treatment to particle characterization. This includes a critical review of (i) methods for analyte extraction and preconcentration from

various environmental matrices; (ii) methods for the separation of the nanoplastic into specific size fractions; (iii) light scattering techniques and various types of microscopy to characterize the particle fractions; (iv) chemical identification of particles to validate the obtained data. For these methods, we will discuss prospects and limitations to develop analytical protocols for specific sampling scenarios. Copyright © 2019 Elsevier B.V.

Schwartz, A., et al. (2002). "Quantitating Fluorescence Intensity from Fluorophore: The Definition of MESF Assignment." Journal of Research of the National Institute of Standards & Technology **107**(1): 83-91.

The quantitation of fluorescence radiance may at first suggest the need to obtain the number of fluorophore that are responsible for the measured fluorescence radiance. This goal is beset by many difficulties since the fluorescence radiance depends on three parameters 1) the probability of absorbing a photon (molar extinction), 2) the number of fluorophores, and 3) the probability of radiative decay of the excited state (quantum yield). If we use the same fluorophore in the reference solution and the analyte then, to a good approximation, the molar extinction drops out from the comparison of fluorescence radiance and we are left with the comparison of fluorescence yield which is defined as the product of fluorophore concentration and the molecular quantum yield. The equality of fluorescence yields from two solutions leads to the notion of equivalent number of fluorophores in the two solutions that is the basis for assignment of MESF (Molecules of Equivalent Soluble Fluorophore) values. We discuss how MESF values are assigned to labeled microbeads and by extension to labeled antibodies, and how these assignments can lead to the estimate of the number of bound antibodies in flow cytometer measurements.

Schwarz, A. E., et al. (2019). "Sources, transport, and accumulation of different types of plastic litter in aquatic environments: A review study." Marine Pollution Bulletin **143**: 92-100.

Types of plastic waste in different aquatic environments were assessed to obtain a global framework of plastic waste transport and accumulation, relevant for plastic pollution mitigation strategies in aquatic environments. Packaging and consumer products were the most encountered product categories in rivers, while fishery items dominated in the oceanic environment. Plastics from electronics, building and construction, and transport were barely observed. For polymers, polyethylene and polypropylene contributed most to pollution in all environments. The highest diversity in polymer composition was found in oceanic and freshwater sediments. It is therefore argued that a large fraction of plastic waste accumulates here. This confirms that plastic waste transport and accumulation patterns were most affected by the density, surface area, and size of plastics. Only thick-walled, larger plastic debris from low-density polymers are transported through currents from rivers to ocean, while the larger fraction of plastic litter is likely retained in sediments or beaches.

Schwarz, T., et al. (2015). "The antimicrobial peptide human beta-defensin 3 induces regulatory T cell." Journal of Investigative Dermatology **1)**: S89.

Antimicrobial peptides (AMPs) are responsible for antibacterial defense and released by a variety of cells including keratinocytes. AMPs exert additional activities beyond their antimicrobial capacities, e.g. influencing the adaptive immune system by modulating antigen presenting cells. We observed that the UV-inducible murine AMP beta-defensin 14 (mBD14) induces regulatory T cells (Treg). To clarify whether this applies also for the human system, we studied whether human beta-defensin 3 (hBD3), the human orthologue of mBD14, exerts similar features. Human peripheral blood mononuclear cells were separated into

CD4⁺CD25⁺ (Treg) and CD4⁺CD25⁻ T cells by magnetobead separation. The non-regulatory CD4⁺CD25⁻ fraction was incubated with hBD3. FACS analysis revealed significant upregulation of the Treg characteristic molecules Foxp3, neuropilin, CTLA-4 and GARP. To address the functional relevance, CD4⁺CD25⁻ T cells were treated with hBD3 for 48 hours and cocultured with CD4⁺CD25⁻ responder T cells in the presence of anti-CD2-, anti-CD3- and anti-CD28-loaded microbeads. hBD3-treated CD4⁺CD25⁻ T cells significantly suppressed the antibody triggered proliferation of the responder cells, indicating induction of suppressive features of T cells upon incubation with hBD3. These data provide evidence that hBD3 similar to its murine analogue may change phenotypic and functional properties of non-regulatory T cells towards suppressive Treg. Through this ability, human AMP may protect the host from microbial attacks on the one hand, but tame T-cell-driven reactions on the other hand, thereby enabling an antimicrobial defense without collateral damage by the adaptive immune system.

Schymanski, D., et al. (2018). "Analysis of microplastics in water by micro-Raman spectroscopy: Release of plastic particles from different packaging into mineral water." Water Research **129**: 154-162.
Microplastics are anthropogenic contaminants which have been found in oceans, lakes and rivers. Investigations focusing on drinking water are rare and studies have mainly been using micro-Fourier Transform Infrared Spectroscopy (mu-FT-IR). A major limitation of this technique is its inability to detect particles smaller than 20 mum. However, micro-Raman spectroscopy is capable of detecting even smaller particle sizes. Therefore, we show that this technique, which was used in this study, is particularly useful in detecting microplastics in drinking water where particle sizes are in the low micrometer range. In our study, we compared the results from drinking water distributed in plastic bottles, glass bottles and beverage cartons. We tested the microplastic content of water from 22 different returnable and single-use plastic bottles, 3 beverage cartons and 9 glass bottles obtained from grocery stores in Germany. Small (-50-500 mum) and very small (1-50 mum) microplastic fragments were found in every type of water. Interestingly, almost 80% of all microplastic particles found had a particle size between 5 and 20 mum and were therefore not detectable by the analytical techniques used in previous studies. The average microplastics content was 118 +/- 88 particles/l in returnable, but only 14 +/- 14 particles/l in single-use plastic bottles. The microplastics content in the beverage cartons was only 11 +/- 8 particles/l. Contrary to our assumptions we found high amounts of plastic particles in some of the glass bottled waters (range 0-253 particles/l, mean 50 +/- 52 particles/l). A statistically significant difference from the blank value (14 +/- 13) to the investigated packaging types could only be shown comparing to the returnable bottles (p < 0.05). Most of the particles in water from returnable plastic bottles were identified as consisting of polyester (primary polyethylene terephthalate PET, 84%) and polypropylene (PP; 7%). This is not surprising since the bottles are made of PET and the caps are made of PP. In water from single-use plastic bottles only a few micro-PET-particles have been found. In the water from beverage cartons and also from glass bottles, microplastic particles other than PET were found, for example polyethylene or polyolefins. This can be explained by the fact that beverage cartons are coated with polyethylene foils and caps are treated with lubricants. Therefore, these findings indicate that the packaging itself may release microparticles. The main fraction of the microplastic particles identified are of very small size with dimensions less than 20 mum, which is not detectable with the mu-FT-IR technique used in previous studies.

Scopetani, C., et al. (2019). "Assessment of microplastic pollution: occurrence and characterisation in

Vesijarvi lake and Pikku Vesijarvi pond, Finland." Environmental Monitoring and Assessment **191 (11) (no pagination)**(652).

In the last few years, several studies have investigated microplastics (MPs) in marine ecosystems, but data monitoring and assessing the occurrence in freshwater environments are still scarce. The present study aims to investigate the occurrence, distribution, and chemical composition of MP pollution in Vesijarvi lake and Pikku Vesijarvi pond close to the city of Lahti (Finland) in winter. Sediment, snow, and ice core samples were collected near the shore of these two aquatic systems. MPs were analysed and identified by a non-destructive method using Fourier transform infrared spectroscopy (FTIR) 2D imaging. The mean concentrations of MPs detected in sediment, snow, and ice samples were 395.5 +/- 90.7 MPs/kg, 117.1 +/- 18.4 MPs/L, and 7.8 +/- 1.2 MPs/L, respectively. FTIR results showed the predominant abundance of microplastics, such as polyamides (up to 53.3%), polyethylene and polypropylene (up to 17.1%), and natural fragments such as cellulose (up to 45.8%) and wool (up 18.8%) in the same size range. The potential release of MPs arising from stormwaters and sport and recreational activities was evidenced. Copyright © 2019, The Author(s).

Scopetani, C., et al. (2018). "Ingested microplastic as a two-way transporter for PBDEs in Talitrus saltator." Environmental Research **167**: 411-417.

The presence and accumulation of plastic waste into the marine environment are well known environmental issues. Microplastics (MPs) end up in sea waters and, due to their hydrophobicity and high surface/volume ratio, POPs tend to sorb and accumulate to their surface. The supralittoral amphipod Talitrus saltator (T. saltator) was selected to study the role of MPs in the transfer of organic pollutants and to investigate if ingested MPs could either transfer contaminants to biota or clean it adsorbing pollutants taken from the diet. T. saltator is an established POPs (Persistent Organic Pollutants) biomonitor in coastal environments and it is able to swallow microplastics in natural condition. Two laboratory experiments were performed and T. saltator was exposed to a labelled polybrominated diphenyl ether (¹³C-labelled BDE-47) to investigate the opposite gradient role of MPs. X Ray Micro-CT (Micro-Computed Tomography) analyses were also performed on sandhopper samples to evaluate the uptake of MPs via digestive tract. The results showed that MPs ingestion could whether transfer and remove contaminants from T. saltator, indicating a partial balance among positive and negative effects. This study has underlined MP potential double role demonstrating that MP can act both as a carrier and scavenger for the bioaccumulation of organic pollutants (i.e. PBDEs), suggesting that chemicals leaching from MPs could have a limited impact to biota.

Scopetani, C., et al. (2020). "Self-contamination from clothing in microplastics research." Ecotoxicology & Environmental Safety **189**: 110036.

Self-contamination should not be underestimated when quantifying microplastics (MPs) in environmental matrices. Standardised and validated methodologies for MP sampling, extraction, and analysis are lacking. The various applications of plastics in our society have made them ubiquitous, even in clothing, rendering MP self-contamination inevitable. In the present study, we sampled lake sediment, snow, and ice, purposefully wearing red overalls composed of cotton; fibres from which we could quantify using Fourier-Transform Infrared Spectroscopy (FTIR), serving as an indication of possible self-contamination from clothes. The suitability of cotton as a representation of MP contamination was also evaluated. For all detected fibres, 25 +/- 1%, 20 +/- 7%, and 8 +/- 6% for snow, ice, and sediment, respectively, originated from sampling attire. These findings demonstrate that self-contamination can play a significant role when quantifying MP pollution, highlighting that sampling conducted to date might have

overestimated the presence of MP or even contaminated MP-free samples.

Scott, I. C., et al. (2013). "Large-scale isolation of human skeletal muscle satellite cells from post-mortem tissue and development of quantitative assays to evaluate modulators of myogenesis." Journal of Cachexia, Sarcopenia and Muscle **4**(2): 157-169.

BACKGROUND: During aging, there is a decreased ability to maintain skeletal muscle mass and function (sarcopenia). Such changes in skeletal muscle are also co-morbidities of diseases including cancer, congestive heart failure and chronic obstructive pulmonary disease. The loss of muscle mass results in decreased strength and exercise tolerance and reduced ability to perform daily activities. Pharmacological agents addressing these pathologies could have significant clinical impact, but their identification requires understanding of mechanisms driving myotube formation (myogenesis) and atrophy and provision of relevant assays. The aim of this study was to develop robust in vitro methods to study human myogenesis.

METHODS: Satellite cells were isolated by digestion of post-mortem skeletal muscle and selection using anti-CD56 MicroBeads. CD56(+) cell-derived myotubes were quantified by high content imaging of myosin heavy chains. TaqMan-polymerase chain reaction arrays were used to quantify expression of 41 selected genes during differentiation. The effects of activin receptor agonists and tumour necrosis factor alpha (TNFalpha) on myogenesis and gene expression were characterised.

RESULTS: Large-scale isolation of CD56(+) cells enabled development of a quantitative myogenesis assay with maximal myotube formation 3 days after initiating differentiation. Gene expression analysis demonstrated expression of 19 genes changed substantially during myogenesis. TNFalpha and activin receptor agonists inhibited myogenesis and downregulated gene expression of muscle transcription factors, structural components and markers of oxidative phenotype, but only TNFalpha increased expression of pro-inflammatory markers.

CONCLUSIONS: We have developed methods for large-scale isolation of satellite cells from muscle and quantitative assays for studying human myogenesis. These systems may prove useful as part of a screening cascade designed to identify therapeutic agents for improving muscle function.

Scott, N., et al. (2019). "Particle characteristics of microplastics contaminating the mussel Mytilus edulis and their surrounding environments." Marine Pollution Bulletin **146**: 125-133.

We investigated the environmental partitioning and particle characteristics of macro-, meso- and microplastics and their uptake into the mussel, Mytilus edulis. Sediment samples, overlying seawater and mussels from 9 intertidal locations in the South West of England were analysed for abundance and type of microplastic. Micro- and mesoplastic-like particles were found in 88.5% of the 269 mussels sampled, ranging from 1.43 to 7.64 items per mussel. Of these plastic particles, 70.9% were identified as semi-synthetic (mainly modified-cellulose). Mussel microplastic abundance, but not polymer type, was correlated with that of their surrounding sediment, but not with sea-surface microplastic concentration or mussel size for our study sites. We found significant differences in the relative abundance of polymer types and particle sizes between seawater, sediment, and mussels, with mussels over-representing modified-cellulose fibre abundance but under-representing polyvinyl. Mussels contained significantly smaller plastic fragments than their surrounding sediment and shorter fibres than their overlying seawater.

Sears, P. R., et al. (2013). "A novel in vitro system for studying mucociliary clearance: Relationship between ciliary beat frequency and mucociliary transport." Pediatric Pulmonology **36)**: 235.

Objective: Mucociliary clearance (MCC) is an important innate defense mechanism that is impaired in cystic fibrosis and several other airway diseases. MCC is an integrated system that requires coordinated regulation of three major processes, i.e., salt and water transport, mucin synthesis and secretion, and ciliary beat frequency (CBF). While individual components of MCC (e.g., the regulation of CBF, the regulation of ion transport) have frequently been studied in vitro, studies of MCC have been more limited due to the challenges of performing in vivo assays. For example, while the effects of many agents on CBF have been documented in the literature, there are few, if any, studies of the direct effects of agents that stimulate CBF on the rate of MCC. The objective of the studies reported here was to develop an in vitro system that is suitable for detailed studies of mucociliary transport (MCT) and its regulation. Method(s): Early passage human airway epithelial (HAE) cells were cultured in a modified air/liquid interface culture system (mucociliary transport device, MCTD, patent pending) that encourages the spontaneous development of continuous, directional, MCT. The device consists of a narrow track of defined width that allows mucus to be transported in a continuous path over the surface of the culture. HAE cells were cultured until fully differentiated (6-8 weeks) and monitored for the development of MCT. High speed videos were recorded from the central region of the MCTD track. Ciliary beat frequency was measured by phase contrast microscopy utilizing the SAVA system and the mucociliary transport rate was measured by recording the movement of endogenous mucous particles/debris. Alternatively, fluorescent micro-beads could be added to the airway surface liquid to visualize and quantify MCT. Ciliary beat frequency was modulated by varying the temperature or by treating the cultures with test agents and the corresponding change in MCT was determined. Result(s): In these experiments, HAE cells cultured at the air/liquid interface in the MCTD regularly developed continuous MCT that was maintained for several weeks. This simple culture system allowed for the simultaneous measurement of both CBF and MCT in the same culture under different conditions. Changes in temperature (~0-40degreeC) were used to alter CBF and the resulting change in MCT was measured. From these studies, it was determined that the rate of MCT increases linearly with increases in CBF over the range of 6-14 Hz and that the rate of MCT increased ~ 10 mum/s for every 1 Hz increase in CBF. CBF and MCT were also coordinately stimulated by treatment with the purinergic receptor agonist ATPgammaS. Conclusion(s):We have developed a novel in vitro method that allows for detailed studies of MCC using early passage HAE cells. Using this method we have systematically examined how changes in CBF directly affect the rate of MCT, and have shown that slight increases in CBF can lead to significant changes in MCT. Importantly, the system we describe will be used for in-depth studies of the integrated process of MCT and investigation of new therapeutic agents.

Sebastian Amar, G., et al. (2019). "Simulación y obtención de combustibles sintéticos a partir de la pirólisis de residuos plásticos." Ingeniería y Desarrollo **37**(2): 306-326.

The continuous demand for plastics has caused large accumulations of waste in landfills, contributing to environmental and public health problems. In Colombia, approximately 9.5 million tons of solid waste is generated annually, and 14% corresponds to plastic materials. Pyrolysis is a technique by which it is possible to remedy part of the problem, because energy and products are recovered in the form of liquid and gaseous fuel. This article presents the implementation and comparison of two models in Aspen Plus for the simulation of the pyrolysis process for the production of liquid fuels from different plastic waste. The models are based on the minimization of Gibbs free energy and reaction kinetic mechanisms. The simulation performed calculates the yields (% of weight) and the properties of each product flow according to the operating conditions. In comparison with data from the literature and experimental information collected in this research, the thermodynamic model showed deviations greater than 20%. The kinetic model presented good estimates obtaining errors ≤ 8%. According to the results obtained, the production of liquid fuel from plastic wastes is favored according to the raw material as follows: polystyrene > high density polyethylene ≈ low density polyethylene > polyethylene terephthalate.

Sebe, G., et al. (2019). "Cu²⁺-loaded cellulose micro-beads applied to the direct patterning of metallic surfaces using a fast and convenient process." Carbohydrate Polymers **207**: 492-501.

In this paper, we propose both a new application for cellulose micro-beads and a new concept in colloidal lithography to directly deposit and template a metal from ions transported by the organized colloidal particles, using the colloidal particles themselves. To do so, 5 mum-sized cellulose micro-beads (CmuBs) were first surface-functionalized by trimellitic anhydride to introduce carboxylate ligands before decorating them with Cu²⁺ ions by complexation of the carboxylate groups with a CuCl₂ solution. The Cu²⁺-loaded CmuBs, dispersed in an aqueous phase, were organized in compact monolayer at the vicinity of a planar electrode. The release of cupric ions and subsequent copper deposition were triggered by an electric field delivered by a tension generator. 2D non-close-packing arrays of copper dots assemblies displaying hexagonal symmetry were generated below or around the micro-beads - depending on the ions concentration in the aqueous phase - leading respectively to copper dots deposited circularly or concentrated in rings. The Cu²⁺-loaded cellulose beads allowed the covering of 2 cm2-surfaces by copper patterns in less than 45 min, using an easy and cheap process.

Sedlak, D. (2017). "Three Lessons for the Microplastics Voyage." Environmental Science and Technology **51**(14): 7747-7748.

Segretin, F., et al. (2017). "Bracing and physical therapy in adult scoliosis." Revue du Rhumatisme Monographies **84**(1): 39-45.

Objective To describe and assess the place of brace and physical therapy in the treatment of idiopathic and degenerative adult scoliosis. Methods A literature review in Medline without blackout dates or language identified a few studies with a high level of evidence. We reported their results in addition to our clinical experience. Results In adults, the goal of these treatments is primarily to relieve pain and improve function. If lumbar and thoracolumbar scoliosis progress (increase of 5degree between two X-rays), wearing a custom-molded rigid lumbar-sacral orthosis 6 hours per day may slow the progression rate. If scoliosis does not progress but is painful, customized lumbar support corset or rigid lumbar-sacral orthosis (plastic, resin or plaster) on demand should be sufficient. Physical therapy is essential if the patient is symptomatic. It is based on exercises to correct sagittal and coronal balance, including core strengthening, stretching, lumbar traction, and on functional rehabilitation. Aerobic physical activity is also recommended. Conclusion Bracing and physical therapy have an important place in the treatment of adult scoliosis, whether idiopathic or degenerative, progressive or not. They are determined after a thorough clinical examination and after evaluation of patient expectations. Copyright © 2016 Societe francaise de rhumatologie

Seidensticker, S., et al. (2018). "A combined experimental and modeling study to evaluate pH-dependent sorption of polar and non-polar compounds to polyethylene and polystyrene microplastics." Environmental Sciences Europe **30**(1): 30.

Background: The contamination of aquatic ecosystems with both anthropogenic pollutants and particles in particular (microscopic) plastic debris items is of emerging concern. Since plastic

particles can accumulate contaminants and potentially facilitate their transport, it is important to properly investigate sorption mechanisms. This is especially required for a large variety of chemicals that can be charged under environmental conditions and for which interactions with particles may hence go beyond mere partitioning.

Results: In this study, sorption experiments with two types of microplastic particles (polyethylene and polystyrene) and 19 different contaminants (pesticides, pharmaceuticals, and personal care products) were performed at three different pH values. We could show that sorption to plastic particles is stronger for hydrophobic compounds and that neutral species usually contribute more to the overall sorption. Bulk partitioning coefficients were in the same order of magnitude for polyethylene and polystyrene. Furthermore, our results confirm that partition coefficients for polar compounds can only be accurately determined if the solid-to-liquid ratio in batch experiments is more than 6-7 orders of magnitude higher than any plastic concentration detected in the environment. Consequently, only a minor fraction of pollutants in water bodies is associated with microplastics.

Conclusions: Although neutral species primarily dominate the overall sorption, hydrophobic entities of ionic species cannot be neglected for some compounds. Notwithstanding, our results show that since microplastic concentrations as currently observed in the environment are very low, they are only a relevant sorbent for strongly hydrophobic but not for polar compounds.

Seidensticker, S., et al. (2017). "Shift in Mass Transfer of Wastewater Contaminants from Microplastics in the Presence of Dissolved Substances." Environmental Science & Technology **51**(21): 12254-12263.

In aqueous environments, hydrophobic organic contaminants are often associated with particles. Besides natural particles, microplastics have raised public concern. The release of pollutants from such particles depends on mass transfer, either in an aqueous boundary layer or by intrapartide diffusion. Which of these mechanisms controls the mass-transfer kinetics depends on partition coefficients, particle size, boundary conditions, and time. We have developed a semianalytical model accounting for both processes and performed batch experiments on the desorption kinetics of typical wastewater pollutants (phenanthrene, tonalide, and benzophenone) at different dissolved-organic-matter concentrations, which change the overall partitioning between microplastics and water. Initially, mass transfer is externally dominated, while finally, intrapartide diffusion controls release kinetics. Under boundary conditions typical for batch experiments (finitebath), desorption accelerates with increasing partition coefficients for intraparticle diffusion, while it becomes independent of partition coefficients if film diffusion prevails. On the contrary, under field conditions (infinite bath), the pollutant release controlled by intrapartide diffusion is not affected by partitioning of the compound while external mass transfer slows down with increasing sorption. Our results clearly demonstrate that sorption/desorption time scales observed in batch experiments may not be transferred to field conditions without an appropriate model accounting for both the mass-transfer mechanisms and the specific boundary conditions at hand. [ABSTRACT FROM AUTHOR]

Seidman, E. and S. Dionne (2016). "The influence of vitamin D on M1 and M2 macrophages in patients with Crohn's disease." Journal of Crohn's and Colitis **10 (Supplement 1)**: S123-S124.

Background: Macrophages play an important role in IBD possessing pro- and anti-inflammatory activities, depending on their phenotype. M1 polarised macrophages contribute to DSS colitis, whereas M2 macrophages attenuate colitis severity. Vitamin D is a potent modulator of both innate and adaptive immunity, but its effect on M1 and M2 macrophages in IBD has not been investigated. The aim of this study was to M1 and M2 macrophage function in CD and to determine the effect of 1,25D on monocyte-derived macrophages in CD patients. Method(s): PBMC were isolated from peripheral blood of 28 CD patients. Monocytes were isolated by negative selection or CD14 microbeads. Inflammatory M1 type macrophages were generated by culturing of monocytes in the presence of GM-CSF, whereas M-CSF with or without IL-4 was used to produce anti-inflammatory M2 macrophages. Cytokines were determined by ELISA following stimulation with 100 ng/ml LPS. Phagocytosis was determined by measuring uptake of FITC-latex beads using flow cytometry. Expression of M1 and M2 markers was determined by qPCR. Result(s): CD patients' M1 macrophages produced much more IL-12p40 compared with M2 macrophages (4 130 pg/ml vs 84.2 pg/ml production, $p < 0.0005$). There was a trend towards higher TNF-alpha in M1 macrophages compared with M2 macrophages ($p = 0.069$). CCL22 levels were very low in M2 cells generated with M-CSF alone, but were produced by M1 macrophages, as well as M2 macrophages generated in the presence of IL-4. M2 macrophages produced significantly higher amounts of IL-10 than M1 macrophages did (1 638 vs 152 pg/ml, $p < 0.005$). Preincubation with 1,25D greatly decreased IL-12p40 production by M1 macrophages (-68.2%, $p < 0.0005$), as well as that by M2 macrophages (-100%, $p < 0.05$). In addition,1,25D also inhibited TNF-alpha production by M1 macrophages (-36.0%, $p < 0.05$). IL-10 levels were decreased 32% by 1,25D ($p < 0.05$). CCL22 production was increased by 1,25D (+165%, $p < 0.05$). M2 macrophages displayed greater phagocytic activity compared with M1 macrophages (94.6% vs 81.1%). Phagocytosis was minimally enhanced when M1 macrophages were treated with 1,25D (84.4%). 1,25D decreased expression of M1 markers CCL7 and CD80 by 28-41% but had no effect on M2 markers CX3CR1 and CD206. Conclusion(s): M1 macrophages from CD patients displayed inflammatory activity/profiles with elevated production of the proinflammatory cytokines IL-12p40 and TNF-alpha, whereas enhanced anti-inflammatory IL-10 production characterised M2 macrophages. Moreover, 1,25D significantly inhibited pro-inflammatory cytokine production from M1 macrophages while increasing IL-10 production; 1,25D decreased M1 markers, enhanced phagocytosis, and CCL22 release, a chemokine that can promote tolerance.

Seif, S., et al. (2018). "Plastic and Non-plastic Debris Ingestion in Three Gull Species Feeding in an Urban Landfill Environment." Archives of Environmental Contamination & Toxicology **74**(3): 349-360.

Plastic debris is recognized as a widespread, common and problematic environmental pollutant. An important consequence of this pollution is the ingestion of plastic debris by wildlife. Assessing the degree to which different species ingest plastics, and the potential effects of these plastics on their health are important research needs for understanding the impacts of plastic pollution. We examined debris (plastic and other types) ingestion in three sympatric overwintering gull species (Herring gulls <italic>Larus smithsonianus</italic>, Great Black-backed Gulls <italic>Larus marinus</italic>, and Iceland Gulls <italic>Larus glaucoides</italic>) to understand how debris ingestion differs among species, age classes and sexes in gulls. We also assessed how plastic burdens were associated with body condition to investigate how gulls may be affected by debris ingestion. There were no differences among the species, age classes or sexes in the incidence of debris ingestion (plastic or otherwise), the mass or number of debris pieces ingested. We found no correlation between ingested plastics burdens and individual condition. Gulls ingested plastic debris, but also showed high levels of other debris types as well, including metal, glass and building materials, including a metal piece of debris found within an abscess in the stomach. Thus, when the health effects of debris ingestion on gulls, and other species that ingest debris, is of interest, either from a physical or chemical perspective, it may be necessary to consider all debris types and not just plastic burdens as is often currently done for seabirds. [ABSTRACT FROM AUTHOR]

Seigel, R. S., et al. (1982). "Potential complications in myelography: I. Technical considerations." AJR. American Journal of Roentgenology **138**(4): 705-708.

Scanning electron microscopy demonstrated starch powder contamination on the stylet tip from a spinal needle after it was lightly touched with nonwashed surgical gloves. A sterile solution of Pantopaque was injected through the spinal needle after the stylet was withdrawn and carried particulate contaminants to a 0.2 micrometer millipore filter. Using both scanning electron microscopy and energy dispersive x-ray analysis, particles of various sized (mostly 5-10 microns) and variable compositions, including starch, talc, and other elements, were identified. Also, glass particles from the Pantopaque vial and plastic particles from the plastic syringe and tubing used in drawing up the Pantopaque were seen. These observations indicate that strict attention to proper technique in myelography is essential in order to eliminate potential cerebrospinal fluid contamination.

Seitz, C., et al. (2016). "Transplantation of positive selected peripheral stem cells with add-back of T cells from unrelated donors in children: Favorable survival with low incidence of GvDH." Bone Marrow Transplantation **1)**: S260.

Introduction: Despite the use of ATG and pharmacological prophylaxis, there is still a significant risk for GvHD in transplantation of peripheral stem cells from matched unrelated donors. Especially in the case of young pediatric patients and adult donors, grafts with high numbers of stem cells but also extreme amounts of T cells can be obtained. T cell depletion does reduce the occurrence of GvHD but sets the patient at risk for graft failure, delayed immune reconstitution and consecutive increased risk for lifethreatening viral and fungal infections, lymphoproliferative disease and malignant relapse. Here we present long-term follow-up results on a clinical study for T cell reduced grafts in 22 patients receiving a clearly defined number of unselected T cell added back to their stem cell graft. Material (or patients) and methods: Positive selection of peripheral stem cells was performed using CD34 or CD133 coated magnetic microbeads and the CliniMACS device. Subsequently, an unselected aliquot of 10x10⁶/kg T cells was added to the purified stem cells resulting in a median T cell depletion of 2 log. The diagnoses were: acute lymphatic leukemia (n = 9; CR1 = 4, CR2 = 5), NHL (n = 1) acute (n=5; CR1 = 1, CR2 = 4), chronic myeloic leukemia (n = 3), MDS (n=3) and Wiskott-Aldrich (n = 1). Median age was 10 years (0.5-18). The donors were matched for HLA-A/B (medium resolution typing) and DRB1/DQB1 (high resolution). Sixteen patientdonor pairs were completely matched for HLA-A, -B, and -DRB1, and 6 were mismatched for 1 locus. A short course of MTX (2-3x10 mg/m²) and CSA (2-3 mg/kg, adjusted to blood levels) were given until day 100. Result(s): 21/22 patients had primary engraftment with a median time

to ANC >500 of 18 days (12-60). No G-CSF was given. One patient rejected his graft and was successfully retransplanted from another MUD. Platelet recovery was quick with a median time to reach independence from substitution of 20 days. Mean numbers of CD3+, CD3+CD4+ and CD3+CD8 + on day 180 (365) were 259/mul (868/mul), 98/mul (401/mul) and 146/mul (457/mul). 19/22 patients had GvHD grade 0-I (86%), one and two patients had grade II and III, (5%, 9%) respectively. Chronic GvHD occurred in only one patients (4,5%). 14/22 patients are alive with a median follow up of 9,8 years (range 5 to 11.5 years). Five year EFS was 64% (all patients), 50% (ALL/ NHL) and 73% (myeloic leukemias /MDS). Relapse probability at five years was 23%, probability of TRM at five years was 14%. Causes of death were relapse (n = 5) and infections (n = 3). Thus, stable and favorable survival rates with a low incidence of GvHD were achieved. Conclusion(s): The method allows the administration of clearly defined T cell numbers independent from the volume of the apheresis product. This may be of advantage in particular in small children and if the donor does not accept a bone marrow harvest. All available stem cells can be infused without the limitation of intolerable high T cell numbers.

Seligson, D. and L. Douglas (2010). "Experience with a large-frame, disposable external fixator." Orthopedics **33**(3).

External fixation is a temporizing measure that has a long history in the treatment of fractures. Thirty-eight newly designed large-frame external fixators were applied for acute lower-limb fractures and pelvis injuries in a level I trauma center. In 75% of cases, the frames were used for first-stage skeletal stabilization, followed by revision to plates or nails 1 to 2 weeks later. The external fixators remained in place from 4 to 28 days (median, 8 days). The fixator is composed of a low-cost plastic resin and uses modular, disposable components. The montage requires only 2 varieties of clamp, monotube rods, and fixation pins already in-house. The device is lighter than conventional fixators yet equal in rigidity. Cost analysis performed by our institution demonstrated cost savings of 20% to 25% compared to conventional external fixation. The new device is packaged sterilely and does not require autoclaving before application. Patient acceptance of the device was good. There were no complications or disadvantages associated with the use of this lower-cost device. Specifically, there were no pin tract infections, no loss of fixation, and no loosening or disassembly of the devices.

Selonen, S., et al. (2020). "Exploring the impacts of plastics in soil – The effects of polyester textile fibers on soil invertebrates." Science of the Total Environment **700**: N.PAG-N.PAG.

• The effects of polyester fibers on soil animals were studied for the first time. • Enchytraeid reproduction decreased up to 30% but only by long fibers in soil. • Isopod energy reserves and feeding activity were affected by fibers in soil. • Polyester fibers were not very harmful to soil invertebrates in 21–28-days exposure. • Polyester fibers can enter terrestrial food webs by ingestion by soil invertebrates. Polyester fiber is one of the most abundant types of microplastics in the environment. A major proportion of the fibers entering wastewater treatment plants end up in sewage sludge, which is used as a soil fertilizer in many countries. As their impacts in the terrestrial environment are still poorly understood, we studied the effects of polyester fibers on enchytraeids (Enchytraeus crypticus), springtails (Folsomia candida), isopods (Porcellio scaber) and oribatid mites (Oppia nitens), all playing an important role in soil decomposer food webs. We exposed these invertebrates in the laboratory to short (12 µm–2.87 mm) and long (4–24 mm) polyester fibers, spiked in soil or in food at five concentrations ranging from 0.02% to 1.5% (w/w) and using five replicates. Overall the effects of polyester fibers on the soil invertebrates were slight. Energy reserves of the isopods were slightly affected by both fiber types, and enchytraeid reproduction decreased up to 30% with increasing fiber concentration,

but only for long fibers in soil. The low ingestion of long fibers by the enchytraeids suggests that this negative impact arose from a physical harm outside the organism, or from indirect effects resulting from changes in environmental conditions. The short fibers were clearly ingested by enchytraeids and isopods, with the rate of ingestion positively related to fiber concentration in the soil. This study shows that polyester fibers are not very harmful to soil invertebrates upon short-term exposure. However, longer lasting, multigeneration studies with functional endpoints are needed to reveal the possible long-term effects on soil invertebrates and their role in the decomposition process. This study also shows that polyester fibers can enter terrestrial food web via ingestion of fibers by soil invertebrates. [ABSTRACT FROM AUTHOR]
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Seltenrich, N. (2015). "New link in the food chain? Marine plastic pollution and seafood safety." Environmental Health Perspectives **123**(2): A34-41.

Seltzer, J. L., et al. (1977). "Plastic particulate contaminants in the medicine cups of disposable non-spinal regional anesthesia sets." Anesthesiology **47**(4): 378-379.

The authors have identified plastic particulate contaminants in the medicine cups of disposable epidural and nerve block trays. It is felt that the presence of these particles represents a possible hazard if they are injected with the anesthetic agent. This hazard is not associated with disposable spinal trays, because they do not contain medicine cups. Because of these findings, it is suggested these medicine cups not be used, and that an alternate method of containing the local anesthetic agent be used.

Selukar, N. B. (2014). "PETROL FROM WASTE PLASTIC." Journal of Environmental Research and Development **8**(3A): 741.

Due to its non-biodegradable nature, the plastic waste contributes significantly to the problem of municipal waste management. Waste plastics are mostly land filled or incinerated; however, these methods are facing great social resistance because of environmental problems such as air pollution and soil contamination, as well as economical resistance due to their increase of space and disposal costs. A pyrolysis of waste plastic has been carried out in presence of hydrocarbon liquid bed without catalyst. At 300 degrees C-400 degrees C all waste plastic undergoes decomposition and get converted to fuel which get recovered with liquid bed. The petrol, liquid bed and diesel fractions were separated during recovery section itself. This technique able to convert 100 gm waste plastic into more than 100 ml liquid fuel (56.1 ml petrol and 45.9 ml diesel). It requires less decomposition temperature than the common pyrolysis technique and recovered liquid bed can be used again and again. Hence this liquid bed technique is efficient, economical and eco-friendly.

Selvam, S., et al. (2020). "Microplastic presence in commercial marine sea salts: A baseline study along Tuticorin Coastal salt pan stations, Gulf of Mannar, South India." Marine Pollution Bulletin **150**: 110675.

The present baseline research infers that the salts present in the sea may contain microplastics (MPs), as the seawater is contaminated due to a number of anthropogenic activities. Herein, 25 types of sea salt samples were collected from salt pans located in the Tuticorin coastal region.

The MPs present in the samples were separated and identified by various methods such as handpicking, visual classification, and micro-Fourier transform infrared spectroscopy (mu-FT-IR) and atomic force microscopy (AFM). The MPs that measured less than 100mum formed the major part of the salts, accounting to 60% of the MPs among the total pollutants. The MPs that were found in abundance in the sea salts were polypropylene, followed by polyethylene, nylon, and cellulose. This study was conducted in salt pan areas and demarcated the percentage of MPs present in sea salts. Table salt, which is a prime edible commodity, was found to be contaminated with MPs through polluted seawater, which poses a threat to public health.

Semernya, L., et al. (2017). "Waste management outlook for mountain regions: Sources and solutions." Waste Management & Research **35**(9): 935-939.

Following the release of the global waste management outlook in 2015, the United Nations Environment Programme (UN Environment), through its International Environmental Technology Centre, is elaborating a series of region-specific and thematic waste management outlooks that provide policy recommendations and solutions based on current practices in developing and developed countries. The Waste Management Outlook for Mountain Regions is the first report in this series. Mountain regions present unique challenges to waste management; while remoteness is often associated with costly and difficult transport of waste, the potential impact of waste pollutants is higher owing to the steep terrain and rivers transporting waste downstream. The Outlook shows that waste management in mountain regions is a cross-sectoral issue of global concern that deserves immediate attention. Noting that there is no 'one solution fits all', there is a need for a more landscape-type specific and regional research on waste management, the enhancement of policy and regulatory frameworks, and increased stakeholder engagement and awareness to achieve sustainable waste management in mountain areas. This short communication provides an overview of the key findings of the Outlook and highlights aspects that need further research. These are grouped per source of waste: Mountain communities, tourism, and mining. Issues such as waste crime, plastic pollution, and the linkages between exposure to natural disasters and waste are also presented.

Sendra, M., et al. (2019). "Nanoplastics: From tissue accumulation to cell translocation into Mytilus galloprovincialis hemocytes. resilience of immune cells exposed to nanoplastics and nanoplastics plus Vibrio splendidus combination." Journal of Hazardous Materials: 121788.

Plastic litter is an issue of global concern. In this work Mytilus galloprovincialis was used to study the distribution and effects of polystyrene nanoplastics (PS NPs) of different sizes (50nm, 100nm and 1mum) on immune cells. Internalization and translocation of NPs to hemolymph were carried out by in vivo experiments, while endocytic routes and effects of PS NPs on hemocytes were studied in vitro. The smallest PS NPs tested were detected in the digestive gland and muscle. A fast and size-dependent translocation of PS NPs to the hemolymph was recorded after 3h of exposure. The internalization rate of 50nm PS NPs was lower when caveolae and clathrin endocytosis pathways were inhibited. On the other hand, the internalization of larger particles decreased when phagocytosis was inhibited. The hemocytes exposed to NPs had changes in motility, apoptosis, ROS and phagocytic capacity. However, they showed resilience when were infected with bacteria after PS NP exposure being able to recover their phagocytic capacity although the expression of the antimicrobial peptide Myticin C was reduced. Our findings show for the first time the translocation of PS NPs into hemocytes and how their effects trigger the loss of its functional parameters.

Sendra, M., et al. (2020). "Ingestion and bioaccumulation of polystyrene nanoplastics and their effects on the microalgal feeding of Artemia franciscana." Ecotoxicology & Environmental Safety **188**: 109853.

Nanoplastics (NPs) have become one of the most serious environmental problems nowadays. The environmental issues linked to NPs are attributed to the effects after ingestion in marine organisms. Due to the incipient and controversial information about the effects of PS NPs on the feeding of organisms, the aim of this work is to assess (i) digestion dynamics of Artemia franciscana when exposed to PS NPs as the lowest concentration of PS NPs reported in toxicity test [0 (control), 0.006 and 0.6mg.L-1] and possible interferences in the ingestion of microalgae and (ii) the accumulation and depuration of PS NPs by A. franciscana. Artemia were subjected to ingestion experiments [24 h and 3.5 h], in which the organisms were exposed to PS NPs or to PS NPs + microalgae. Post-exposure feeding (24 h exposure and 2 h feeding) and depuration (24 h exposure and 24 h of depuration) were also carried out. More than 90% of the PS NPs were ingested by Artemia and bioaccumulated in the mandible, stomach, gut, tail gut and appendages after 24 h. The ingestion of microalgae was not affected by the presence of the PS NPs. Data of post-exposure feeding indicated that Artemia previously exposed to plastic and/or microalgae presented similar microalgal ingestion (around 70%); the highest microalgal consumption (around 90%) was recorded in the treatment in which Artemia were previously starved (no plastic and no microalgae). The presence of PS NPs in the gut after the depuration experiments indicates that 24 h was not enough to eliminate the PS NPs.

Sendra, M., et al. (2019). "Are the primary characteristics of polystyrene nanoplastics responsible for toxicity and ad/absorption in the marine diatom Phaeodactylum tricornutum?" Environmental Pollution **249**: 610-619.

Nowadays, the occurrence of a large volume of plastic litter in oceanic and coastal zones has increased concern about its impacts on marine organisms. The degradation of plastic polymers leads to the formation of smaller fragments at both micro and nano scale (<5mm and <1mum respectively). Nanoplastics (NPs), due to their smaller size and high specific surface area can establish colloidal interactions with marine microalgae, therefore potential toxicity can be led. . To assess this hypothesis, the aim of the present study is to examine the behaviour of polystyrene nanoparticles (PS NPs) of different sizes (50 and 100nm) in marine water and their possible effects at different physiological and cellular levels in the marine diatom Phaeodactylum tricornutum. Different biomarkers and stress responses in P. tricornutum were analysed when organisms were exposed to environmentally relevant PS NPs concentrations between 0.1 and 50mgL⁻¹. Our results showed significant differences between controls and exposure microalgae, indicating toxicity. After 24h, an increase in oxidative stress biomarkers, damage to the photosynthetic apparatus, DNA damage and depolarization of mitochondrial and cell membrane from 5mgL⁻¹ were observed. Further after 72h the inhibition of population growth and chlorophyll content were observed. Examining effects the effects related to PS NPs size, the smallest (50nm) induced greater effects at 24h while bigger PS NPs (100nm) at72h. This bigger particles (100nm) showed more stability (in size distribution and spherical form) in the different culture media assayed, when compared with the rest of particles used. Strong adsorption and/or internalization of PS NPs was confirmed through changes in cell complexity and cell size as well as the fluorescence of 100nm fluoresbrite PS NPs after washing cell surface.

Senrong, F., et al. (2017). "Trophodynamics of Organic Pollutants in Pelagic and Benthic Food Webs of Lake Dianchi: Importance of Ingested Sediment As Uptake Route." Environmental Science & Technology **51**(24): 14135-14143.

Habitat is of great importance in determining the trophic transfer of pollutants in freshwater ecosystems; however, the major factors influencing chemical trophodynamics in pelagic and benthic food webs remain unclear. This study investigated the levels of p,p'-dichlorodiphenyldichloroethylene (p,p'-DDE), polycyclic aromatic hydrocarbons (PAHs), and substituted PAHs (s-PAHs) in 2 plankton species, 6 invertebrate species, and 10 fish species collected from Lake Dianchi in southern China. Relatively high concentrations of PAHs and s-PAHs were detected with total concentrations of 11.4-1400 ng/g wet weight (ww) and 5.3-115 ng/g ww, respectively. Stable isotope analysis and stomach content analysis were applied to quantitatively determine the trophic level of individual organisms and discriminate between pelagic and benthic pathways, and the trophodynamics of the detected compounds in the two food webs were assessed. P,p'-DDE was found to exhibit relatively higher trophic magnification rate in the pelagic food web than in the benthic food web. In contrast, PAHs and s-PAHs exhibited greater dilution rates along the trophic levels in the pelagic food web. The lower species differences of pollutants accumulated in benthic organisms compared to pelagic organisms is attributable to extra uptake via ingested sediment in benthos. The average uptake proportions of PAHs and s-PAHs via ingested sediment in benthic biotas were estimated to be 31-77%, and that of p,p'-DDE was 46%. The uptake routes are of importance for assessing the trophic magnification potentials of organic pollutants, especially in eutrophic freshwater ecosystems. [ABSTRACT FROM AUTHOR]

Seoane, M., et al. (2019). "Polystyrene microbeads modulate the energy metabolism of the marine diatom Chaetoceros neogracile." Environmental Pollution **251**: 363-371.

Due to the growing concern about the presence of microplastics (MP) in the environment, the number of studies evaluating the toxicity of these small persistent particles on different marine species has increased in recent years. Few studies have addressed their impact on marine phytoplankton, a subject of great concern since they are primary producers of the aquatic food web. The aim of this study is to unravel the cytotoxicity of 2.5mugmL⁻¹ unlabelled amino-modified polystyrene beads of different sizes (0.5 and 2mum) on the marine diatom Chaetoceros neogracile. In addition to traditional growth and photosynthesis endpoints, several physiological and biochemical parameters were monitored every 24h in C. neogracile cells by flow cytometry during their exponential growth (72h). Dynamic Light Scattering measurements revealed the strong aggregation and the negative charge of the beads assayed in the culture medium, which seemed to minimize particle interaction with cells and potentially associated impacts. Indeed, MP were not attached to the microalgal cell wall, as evidenced by scanning electron micrographs. Cell growth, morphology, photosynthesis, reactive oxygen species levels and membrane potential remained unaltered. However, exposure to MP significantly decreased the cellular esterase activity and the neutral lipid content. Microalgal oil bodies could serve as an energy source for maintaining a healthy cellular status. Thus, MP-exposed cells modulate their energy metabolism to properly acclimate to the stress conditions.

Sequeiros, O. E. (2008). Bedload transport, self acceleration, downstream sorting, and flow dynamics of turbidity currents.

The four chapters presented in this dissertation are self contained, yet related to each other. The first chapter of this dissertation reports on the first set of experiments which focus on bedload transport of granular material by density underflows. These underflows include saline density flows, hybrid saline/turbidity currents and a pure turbidity current. The use of dissolved salt is a surrogate for suspended mud that is so fine that it does not settle out readily. Thus all the currents can be considered to be model turbidity currents. The data cover four bed conditions: plane bed, dunes, upstream-migrating antidunes and downstream-migrating antidunes. The bedload transport relation obtained from the data is very similar to those obtained for open channel flows, and in fact is fitted well by an existing relation determined for open channel flows. In the case of dunes and downstream-migrating antidunes, form drag falls in a range that is similar to that due to dunes in sand-bed rivers. The second chapter presents novel results of self-accelerating turbidity currents. This chapter documents experimental turbidity currents composed of lightweight plastic particles ranging from 20 mu m to 200 mu m with a specific density between 1.3 and 1.5. These particles were either non-cohesive, or slightly cohesive. The experiments were performed in a 15 m long flume with a bottom of slope of 0.05. Self-acceleration of the head of the flow was achieved in some of the tests reported here. Measurements of velocity and suspended sediment taken at different stages of head evolution document this self-acceleration. In addition, these measurements are in agreement with previous empirical studies relating head thickness, concentration, velocity, and water depth. Stratigraphie analysis of the deposit shows the key role bed material plays in determining whether a given turbidity current will or will not accelerate. This factor ties the dynamics of a self-accelerating current to the existence of deposits laid down by antecedent currents. The conditions of the present tests appear to fulfill previous autosuspension criteria relating flow velocity, particle settling velocity and bed slope. Densimetric Froude number similarity analysis is used to estimate equivalent parameters for field scale turbidity currents. The third chapter focuses on a numerical model of turbidity currents with reversing buoyancy, i.e. flows which are rendered heavier than the ambient water due to the presence of suspended sediment, but lighter than the ambient water due to a difference in temperature or salinity. The numerical model, which is based in the Kappa - epsilon closure for turbulence, is verified with a unique set of experimental data intended to model sediment sorting associated with turbidity currents created by explosive undersea eruptions. Both cases with non-reversing buoyancy and reversing buoyancy are considered. As such, the model not only provides a detailed description of flows with reversing buoyancy, but also provides a tool to aid sedimentologists in back-calculating the flow emplaced by turbidity currents from the downstream variation in the grain size distribution of the bed deposit. The last chapter is the first part of a joint paper about the formation of internal deltas, or sediment wedges, by turbidity currents in submarine minibasins. The experiments reported here are performed in configuration to test the concept of an internal delta. Dissolved salt is used as a surrogate for the finer phase, and lightweight plastic particles are used as a surrogate for the coarser phase. The plastic particles are carried mostly as bedload. Succession sustained flows are allowed to create a deposit behind a barrier that simulates the downstream end of a minibasin. The flows are introduced in the supercritical regime; the downstream barrier forces an internal hydraulic jump to the subcritical regime. This chapter concentrates on (a) the flow pattern created by the barrier and (b) the evolution of this flow pattern as the bed evolved morphodynamically. he documentation of the internal delta itself is given in a companion paper. (Abstract shortened by UMI.)

Serban, M. A., et al. (2014). "Cross-linked gelatin microspheres with continuously tunable degradation profiles for renal tissue regeneration." Biotechnology & Applied Biochemistry **61**(2): 75-81.

Collagen and gelatin-based biomaterials are widely used in tissue engineering applications. Various methods have been reported for the cross-linking of these macromolecules for the purpose of delaying their biodegradation to prolong their in vivo residence (in tissue engineering applications) or tailoring their drug releasing capacity (when used as drug carriers). In this study, a carbodiimide-based cross-linking method, also used in the production of United States Food and Drug Administration-approved products, was employed to obtain differentially cross-linked gelatin beads. The colorimetric determination of the in vitro enzymatic susceptibility of the beads indicated that the resistance to degradation linearly correlated with the concentration of carbodiimide used for the cross-linking reaction. This result was also confirmed in vivo by the histological evaluation of the residence time of orthotopically injected cell-seeded beads. These data would indicate that the production of gelatin-based microbeads with tunable degradation profiles might be applicable toward the development of products that catalyze regeneration of kidney and other solid organs.

Serive, B., et al. (2012). "Development and optimization of a metabolite extraction process for the high throughput screening of microalgal chimiodiversity." Planta Medica. Conference: 8th Joint Meeting of AFERP, ASP, GA, PSE and SIF. New York City, NY United States. Conference Publication: **78**(11).

Since a decade, using microalgae for biofuel has become a major challenge worldwide. Several studies have evidenced that potent bioactive molecules can be purified from microalgae for cosmetic or health applications (e.g. antioxidants, immunostimulants, anticancer and antiviral compounds) in order to upgrade biomass. In some species, extraction of bioactive metabolites is tricky for the presence of highly resistant cell walls (Phaeodactylum tricornutum) or exopolysaccharidic barriers surrounding the cell membrane (Porphyridium purpureum). It was therefore essential to develop a process that preserves sensitive molecules. We optimized an extraction grinding process, the Mix Mill process, based on the use of vibrating microbeads. The process efficiency was assessed in pigments extraction experiments. It gave excellent extraction yields, and combined fidelity (no modification of analytes), compatibility with HPLC and LC-MS analysis, accuracy, simplicity, rapidity and safety. Moreover, it allowed to simultaneously extract all pigments, whatever their polarity or the strength that linked them to the cell structures. As a conclusion, the Mix Mill process is a general process for the total extraction of microalgal metabolites thought for high throughput screening of the microalgal chimiodiversity.

Serrano, D., et al. (2010). "Acid sphingomyelinase and membrane composition in CAM-mediated endocytosis." Arteriosclerosis, Thrombosis, and Vascular Biology **30 (11)**: e255.

Intercellular adhesion molecule 1 (ICAM-1) is a transmembrane glycoprotein overexpressed by endothelial cells (ECs), functionally involved in many cardiovascular pathologies, including inflammation and thrombosis. Targeting ICAM-1 using polymer nano-and microbeads coated with multiple copies of anti-ICAM provides a means to deliver therapeutic agents to ECs for treatment of such maladies. Binding of multivalent anti-ICAM carriers to ECs induces actin reorganization into stress fibers and subsequent endocytosis, leading to intraendothelial drug delivery. Cell adhesion molecule (CAM) endocytosis mediated by ICAM-1 differs from classical macropinocytosis and phagocytosis, and also from caveoli-and clathrin-mediated endocytosis, most abundant in endothelial cells. Intraendothelial delivery of micrometer-sized carriers via ICAM-1, shown in animal models, must require high plasmalemma plasticity. Hydrolysis of sphingomyelin into ceramide by sphingomyelinases is a proposed mechanism leading to cytoskeletal rearrangement and increased plasmalemma plasticity. We evaluated the potential crosstalk between ICAM-1 and the sphingomyelin/ceramide pathway. For this purpose, we coated polystyrene nano-and microbeads with anti-ICAM, and used fluorescence microscopy to trace plasmalemma lipid domains and acid sphingomyelinase (ASM) distribution upon binding of beads to human umbilical vein ECs (HUVECs). ICAM-1 engagement by anti-ICAM beads occurred in areas enriched in lipid raft components cholesterol and sphingomyelin. Cholesterol removal by methyl-beta-cyclodextrin affected engulfment of beads. Areas of ICAM-1 engagement by beads also became enriched in ceramide. Ceramide enrichment was prevented by imipramine, an ASM inhibitor, which also affected endocytosis of anti-ICAM beads by HUVECs. Redistribution of ASM from internal compartments to areas of ICAM-1 engagement by anti-ICAM beads was detected by immunofluorescence. These results indicate that the sphingomyelin/ceramide pathway may regulate intraendothelial delivery of drug carriers via CAM-mediated endocytosis. This also suggests a crosstalk between ICAM-1 and ASM signaling cascades, which have been both associated to a number of relevant vascular pathologies.

Serrano-Ruiz, H., et al. (2018). "Application of an in vitro plant ecotoxicity test to unused biodegradable mulches." Polymer Degradation and Stability **158**: 102-110.

Biodegradable plastics have emerged as an encouraging alternative to reduce the production of plastic waste, especially for agricultural mulches. However, degradation of these plastics in the field may involve the release of products from the mulch into the soil, before and during the in-soil biodegradation. The present work aims to assess the potential effects on two agricultural plant species (Lactuca sativa L. - lettuce, and Lycopersicon esculentum Mill. - tomato) of extracts from biodegradable (BDMs: Mater-Bi, Bioplast-SP4 and SP-6, BioFilm, BioFlex, Ecovio, Mirel, Paper) and Polyethylene mulch films. A previously designed highly sensitive in vitro ecotoxicity test was used. Some of the extracts from the biodegradable plastics had effects on plant development. Germination was reduced by Bioplast films treatments, both in lettuce (B-SP4) and in tomato (B-SP4 and B-SP-6). In lettuce, root development was notably reduced by all treatments except for Paper and Polyethylene. Plant aerial growth was also limited with Bioplast and BioFlex, but enhanced with Paper extracts. At a whole, tomato plants showed higher sensitivity than lettuce in the test. Tomato aerial plant part and root growth were reduced by all treatments with the exception of BioFlex and Polyethylene. For both plant species, inhibitory effects on development were associated to proline increases, a physiological marker for some plant stresses. It can be concluded that the contact of unused biodegradable films with a water solution may result in changes in plant development that depend on the nature of the biodegradable film. The in vitro used test revealed to be a highly sensitive tool for ecotoxicity studies. These results are to contribute to design safe materials for agricultural applications.

Serranti, S. and G. Bonifazi (2010). "Post-Consumer Polyolefins (PP-PE) Recognition by Combined Spectroscopic Sensing Techniques." Open Waste Management Journal **3**: 35-45.

The efficient large-scale recycling of plastic waste is of increasing interest from an ecological and economic point of view, but it represents a goal that has yet to be achieved by the recycling industry. The possibility offered by different spectroscopic sensing techniques in order to identify different plastic particles to be recycled, with particular reference to polyolefins from complex wastes, has been investigated. Representative samples of polyolefins (polyethylene and polypropylene) have been collected and analyzed for laboratory set-up and testing by FT-IR spectroscopy, by Raman spectroscopy and by hyperspectral imaging in two different wavelength fields, 400-1000 and 1000-1700 nm, respectively. The spectral signature obtained by the different techniques of the two plastic typologies have been detected, analysed and compared. The main parameters that allow to perform the recognition of the polyethylene (PE) and polypropylene (PP) have been defined, with particular reference to the hyperspectral imaging innovative technique. The analytical strategies can be utilised to define sorting and/or control logics to be applied in " on-line " control architectures to directly act at industrial plant level.

Serranti, S., et al. (2011). "Characterization of post-consumer polyolefin wastes by hyperspectral imaging for quality control in recycling processes." Waste Management **31**(11): 2217-2227.
In this paper new analytical inspection strategies, based on hyperspectral imaging (HSI) in the VIS-NIR and NIR wavelength ranges (400-1000 and 1000-1700 nm, respectively), have been investigated and set up in order to define quality control logics that could be applied at industrial plant level for polyolefins recycling. The research was developed inside the European FP7 Project W2Plastics "Magnetic Sorting and Ultrasound Sensor Technologies for Production of High Purity Secondary Polyolefins from Waste". The main aim of the project is the separation of pure polyethylene and polypropylene adopting an innovative process, the magnetic density separation (MDS). Spectra of plastic particles and contaminants resulting from post-consumer complex wastes and of virgin polyolefins have been acquired by HSI and by Raman spectroscopy. The classification results obtained applying principal component analysis (PCA) on HSI data have been compared with those obtained by Raman spectroscopy, in order to validate the proposed innovative methodology.

Serrati, S., et al. (2015). "Cancer associated fibroblast in multiple myeloma: The urokinase receptor system in tumor growth regulation." Haematologica **3)**: 98-99.
Background:Multiple myeloma is a B-cell malignancy with terminally differentiated plasma cells (PC). It is known that tumor progression is allowed by a favorable tumor microenvironment (TME) and fibroblasts represent the principal cellular component in TME. Recent findings indicate that the urokinase plasminogen activator (uPA), and its receptor (uPAR) are critical in tumor progression. Method(s): BM mononuclear cells (BMMCs) were isolated from 12 patients with relapse/refractory MM, 10 patients with asymptomatic MM, 10 with remission MM, 15 with MGUS. Cancer Associated Fibroblasts (CAFs) were purified through anti-fibroblasts-microbeads and they were analyzed and identified by FSP1 and -smooth muscle actin (alpha-SMA) expression on gated CD45- population. Expression of alpha-SMA in BM CAFs was also demonstrated by immunofluorescence staining. CAFs were cultured in DMEM medium, fixed and permeabilized according to routine methods. The primary antibodies were anti-uPAR, and anti-alpha-SMA. Fibroblast nuclei were stained with DAPI. The relative quantity of uPA, uPAR, MMP-2 and alpha-SMA messenger RNA were determined by the comparative Ct method using 18S ribosomal RNA as the normalization gene. Result(s): Flow cytometry analysis showed that CAFs were increased in patients with relapse-MM compared to patients with asymptomatic, remission MM and MGUS suggesting that CAFs expansion is involved in MM progression. The increased frequency of alpha-SMA in CAFs of relapsed MM patients was demonstrated by the immunofluorescence analysis. Overall, these results suggest that MM activation is associated with the overexpression of uPAR. CAFs activation was also demonstrated by Real Time PCR and the figure shows the overexpression of activation molecules as well as proinvasive systems in CAF of relapsed MM in comparison of MGUS and asymptomatic MM. Conclusion(s): In MM developement and progression the BM niche appears to play an important role in differentiation, migration, proliferation, and drug resistance of the malignant PCs. The main goal of this proposal was to globally approach the expression of CAFs' activation and proinvasive systems in the initiation and progression of MM. For the first time, we demonstrate that an activation of the fibrinolytic system occurs in relapsed/refractory MM compared to less active stages of the disease. Modulating uPAR expression on CAF could be an important key to understand the mechanisms involved in the progression of MM.

Setala, O., et al. (2014). "Ingestion and transfer of microplastics in the planktonic food web." Environmental Pollution **185**: 77-83.

Experiments were carried out with different Baltic Sea zooplankton taxa to scan their potential to ingest plastics. Mysid shrimps, copepods, cladocerans, rotifers, polychaete larvae and ciliates were exposed to 10 micro m fluorescent polystyrene microspheres. These experiments showed ingestion of microspheres in all taxa studied. The highest percentage of individuals with ingested spheres was found in pelagic polychaete larvae, Marenzelleria spp. Experiments with the copepod Eurytemora affinis and the mysid shrimp Neomysis integer showed egestion of microspheres within 12 h. Food web transfer experiments were done by offering zooplankton labelled with ingested microspheres to mysid shrimps. Microscopy observations of mysid intestine showed the presence of zooplankton prey and microspheres after 3 h incubation. This study shows for the first time the potential of plastic microparticle transfer via planktonic organisms from one trophic level (mesozooplankton) to a higher level (macrozooplankton). The impacts of plastic transfer and possible accumulation in the food web need further investigations.

Setala, O., et al. (2016). "Distribution and abundance of surface water microlitter in the Baltic Sea: A comparison of two sampling methods." Marine Pollution Bulletin **110**(1): 177-183.

Two methods for marine microlitter sampling were compared in the Gulf of Finland, northern Baltic Sea: manta trawl (333mum) and a submersible pump (300 or 100mum). Concentrations of microlitter (microplastics, combustion particles, non-synthetic fibres) in the samples collected with both methods and filter sizes remained <10particlesm(-3). The pump with 100mum filter gave higher microlitter concentrations compared to manta trawl or pump with 300mum filter. Manta sampling covers larger areas, but is potentially subjected to contamination during sample processing and does not give precise volumetric values. Using a submerged pump allows method controls, use of different filter sizes and gives exact volumetric measures. Both devices need relatively calm weather for operation. The choice of the method in general depends on the aim of the study. For monitoring environmentally relevant size fractions of microlitter the use of 100mum or smaller mesh size is recommended for the Baltic Sea.

Setala, O., et al. (2016). "Feeding type affects microplastic ingestion in a coastal invertebrate community." Marine Pollution Bulletin **102**(1): 95-101.

Marine litter is one of the problems marine ecosystems face at present, coastal habitats and food webs being the most vulnerable as they are closest to the sources of litter. A range of animals (bivalves, free swimming crustaceans and benthic, deposit-feeding animals), of a coastal community of the northern Baltic Sea were exposed to relatively low concentrations of 10 micro m microbeads. The experiment was carried out as a small scale mesocosm study to mimic natural habitat. The beads were ingested by all animals in all experimental concentrations (5, 50 and 250 beads mL⁻¹). Bivalves (Mytilus trossulus, Macoma balthica) contained significantly higher amounts of beads compared with the other groups. Free-swimming crustaceans ingested more beads compared with the benthic animals that were feeding only on the sediment surface. Ingestion of the beads was concluded to be the result of particle concentration, feeding mode and the encounter rate in a patchy environment.

Seth, C. K. and A. Shriwastav (2018). "Contamination of Indian sea salts with microplastics and a potential prevention strategy." Environmental Science & Pollution Research **25**(30): 30122-30131.

This study reports the contamination of Indian sea salts with different microplastic particles, as a consequence of using contaminated sea water. Samples from all eight brands of investigated sea

salts were found contaminated, and concentrations of these particles ranged from 103 +/- 39 to 56 +/- 49 particles kg⁻¹ of salt. Both fibers and fragments were observed with large variation in size. Eighty percent of the extracted fibers and the fragments were smaller than 2000 mum and 500 mum respectively. Extracted particles were mostly polyesters, polyethylene terephthalate (PET), polyamide, polyethylene, and polystyrene. Their total mass concentration was also estimated as 63.76 mug kg⁻¹ of salt. These results are significant, since India is a leading producer and exporter of sea salts. A simple sand filtration of artificially contaminated sea water could effectively (> 85% removal by weight and > 90% removal by number) remove these microplastics and has the potential for preventing the transfer of microplastics into the salt from contaminated sea waters.

Sethi, N., et al. (2014). "Bone marrow micrometastases in head and neck squamous cell carcinoma: A pilot study." European Journal of Surgical Oncology **40 (11)**: S121-S122.

Background: The survival of patients with head and neck squamous cell carcinoma (HNSCC) is catastrophically affected by locoregional recurrence and distant metastases. Despite the appearance of adequately treated disease recurrence and metastases occur. Disseminated tumour cells (DTCs) may be the cause for this. Developing techniques to detect DTCs and establishing their significance could enable clinicians to identify patients who could benefit from additional systemic therapy. This study aimed to determine whether bone marrow micrometastases (BMM) could be identified by immunocytochemical methods and if there was any correlation, in this small group, with histological characteristics of the tumour. Material(s) and Method(s): After obtaining ethical approval, patients diagnosed with primary T2-T4 HNSCC were recruited. All patients underwent bone marrow aspiration whilst under general anaesthetic for surgical treatment of their primary tumour. The bone marrow specimens underwent immunomagnetic separation with MACS CD45 microbeads and subsequent immunostaining with Rabbit antimouse Ig, Streptavidin AB complex and Fast Red TR/Naphthol AS dye. Result(s): Fourteen patients were included in the study (10 male, 4 female). All patients underwent tumour resection and neck dissection as primary treatment. Four patients had evidence of BMM. We found a strongly suggestive correlation between nodal extracapsular spread (ECS) and BMM. All 4 patients with BMM also had nodal ECS. Only 1 patient had nodal ECS without the presence of BMM. Conclusion(s): The correlation between BMM and ECS in this pilot study suggests that BMM could be of significance. ECS is well established as a significant negative prognosticator in HNSCC. Further study is required with larger numbers of patients. Developing the identification of BMM could help guide chemotherapeutic therapies in patients at risk of recurrence and distant metastases.

Setty, C. M., et al. (2014). "Hydrolyzed polyacrylamide grafted maize starch based microbeads: application in pH responsive drug delivery." International Journal of Biological Macromolecules **70**: 1-9.

The present study details the synthesis, characterization and pharmaceutical application of hydrolysed polyacrylamide grafted maize starch (HPam-g-MS) as promising polymeric material for the development of pH responsive microbeads. Different grades of graft copolymer were synthesized by changing the net microwave irradiation time, while keeping all other factors constant. Acute oral toxicity study performed in rodents ensured the bio-safety of graft copolymer for clinical application. Various batches of aceclofenac loaded microbeads were prepared by ionic gelation method using synthesized graft copolymers and evaluated for formulation parameters. FTIR spectroscopy confirmed the chemical compatibility between drug and graft copolymer.

Seuront, L. (2018). "Microplastic leachates impair behavioural vigilance and predator avoidance in a temperate intertidal gastropod." Biology Letters **14**(11).

Microplastics are a ubiquitous source of contaminations in marine ecosystems, and have major implications for marine life. Much effort has been devoted to assessing the various effects of microplastics on marine life. No evidence exists, however, on the effects of microplastic leachates on chemically mediated predator-prey interactions and the ability of prey to detect and avoid its predator. This study shows that microplastic leachates have direct biological effects by disturbing the behavioural response of the intertidal gastropod Littorina littorea to the presence of Carcinus maenas chemical cues, hence increasing their vulnerability to predation. Leachates from virgin and beached pellets respectively impaired and inhibited L. littorea vigilance and antipredator behaviours. These results suggest that the biological effects from microplastic leachates may have major implications for marine ecosystems on taxa that rely on chemosensory cues to escape predation.

Seval, G. C., et al. (2019). "Next generation sequencing may be helpful in designing novel combinations among heavily pretreated myeloma patients, refractory to all available approved anti-myeloma drugs." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Introduction: Multiple genetic alterations that occur at diagnosis or relapse are not only prognostic characteristics of multiple myeloma (MM) but also provide evidence for clonal evolution. Uncovering and dissecting true driver events in MM might provide rational for new potential targets and therapeutic approaches. However, whereas genetic diagnostics in MM namely FISH and gene expression profiling are well-established prognostic tools, individual mutation profiling has not yet been adopted for this purpose. Herein, we aimed to analyze the Next Generation Sequencing (NGS) platform results investigating mutational profiling of patients with relapsed and refractory MM (RRMM). Also, the clinical results of those who had a targetable mutation and were treated "off label" will be presented. Material(s) and Method(s): A total of 14 consecutive patients with MM referred to our center between November 2018 and May 2019 were studied. Plasma cells were isolated from bone marrow samples using Selection Kit microbead specific for EasySepTM Human CD138 marker (StemCell Technologies). DNA extracted form magnetic bead enriched cells, bone marrow aspiration smears for bone marrow involved, from FFPE tissue samples for extramedullary-involved cases. NGS method was performed on llumina Miseq platform (USA) by using QIAseq targeted DNA panel (12)- Human myeloid neoplasm panel, covers all exons and exon-intron junctions of 141 target genes. For the data analysis QCI Analyze Universal 1,5.0 was performed. The PCL analysis was performed on CD138 and Ki67 double immune stained paraffin sections, and the quantification was done by using 3DHistech digital pathology platform. Result(s): We obtained 16 samples of DNA from 12 heavily pretreated and two newly diagnosed myeloma patients. Female/male: 5/9 with a median age of 57 years (range, 39-87) patients had received a median four lines (range; 1-13) of treatment. Out of a panel of 141 genes, 59 mutations in 26 genes were detected (Figure-1). Among these recurrent genomic abnormalities, concomitant missense protein coding alterations were detected in all patients. The PTEN mutation was the most frequently detected, followed by mutations of RAS/MAPK pathway genes. The hotspots of mutation in KRAS codon 61 and NRAS included codons 61 and 13 as well as codon 600 in BRAF. In addition, we detected novel ie myeloproliferative and myelodysplasia associated mutations previously undescribed in myeloma. A diverse range of recurrent gains and losses were detected in our cohort. Two patients at diagnosis also carried mutations of PTEN and KRAS. Based on these results three patients were able to obtain off-label approval for treatment with Everolimus (for PTEN)

(Patient-1) or Trametinib (for KRAS) (Patient 5 & 6) in combination with Pomalidomide (EvoPomDex) w/wo Daratumumab or Tra-PomDex. Patient-1 had extensive extramedullary disease (EMD) in the skin, which responded completely to Dara-EvoPomDex combination. Complete disappearance of initial lesions (presented in Figure-2) and VGPR duration was only two months. Subsequent refractoriness and appearance of new lesions lead to death of the patient, one year from the initiation of EMD. Patient-6, also presented with EMD, was treated with TraPomDex as the seventh treatment line. TraPomDex treatment was well tolerated, the most significant adverse event diarrhea, infections and pancytopenia. Her biochemical response was a transient VGPR, which was lost during interruption of treatment due to infection. She also died four months after initiation of TraPomDex. Patient-5, plasma cell leukemia, has been on Tra-PomDex for a month and his response is PR yet. Conclusion(s): The detection of mutations can improve our ability to treat multiple refractory patients who have ran out of all therapeutic options. Though the responses observed among such very heavily pretreated patients are not durable, they are highly promising. Also, of additional importance is detection of age-related cumulative mutations belonging to background bone marrow precursors. Detection of sub-clonal mutations is very helpful in depth analysis of clonal response to treatment and clonal evolution. In the coming years, the identification of actionable mutations in myeloma opens the way for targeted therapy. (Figure Presented).

Sevigne-Itoiz, E., et al. (2015). "Contribution of plastic waste recovery to greenhouse gas (GHG) savings in Spain." Waste Management **46**: 557-567.

This paper concentrates on the quantification of greenhouse gas (GHG) emissions of post-consumer plastic waste recovery (material or energy) by considering the influence of the plastic waste quality (high or low), the recycled plastic applications (virgin plastic substitution or non-plastic substitution) and the markets of recovered plastic (regional or global). The aim is to quantify the environmental consequences of different alternatives in order to evaluate opportunities and limitations to select the best and most feasible plastic waste recovery option to decrease the GHG emissions. The methodologies of material flow analysis (MFA) for a time period of thirteen years and consequential life cycle assessment (CLCA) have been integrated. The study focuses on Spain as a representative country for Europe. The results show that to improve resource efficiency and avoid more GHG emissions, the options for plastic waste management are dependent on the quality of the recovered plastic. The results also show that there is an increasing trend of exporting plastic waste for recycling, mainly to China, that reduces the GHG benefits from recycling, suggesting that a new focus should be introduced to take into account the split between local recycling and exporting.

Seymour, K., et al. (2000). "Extending the indications for curative liver resection by portal vein embolization." British Journal of Surgery **87**(3): 362-373.

AIMS: The aim of ipsilateral portal vein embolization is to induce hypertrophy of normal tissue when resection of a cancerous portion of the liver is contraindicated only by the volume of liver that would remain following surgery. This study reports its use in primary and metastatic liver tumours.

Sfriso, R., et al. (2016). "Growth hormone receptor knockout on porcine endothelial cells: Effect on complement and coagulation." Transplantation **100 (7 Supplement 1)**: S241.

Background: Growth hormone insensitivity (GHI) is a group of inherited disorders characterized by a reduction or absence of signaling triggered by growth hormone (GH). Laron syndrome - a classical example of GHI - is caused by mutations in the growth hormone receptor (GHR) gene

and it is characterized by dwarfism. GHR knockout (GHRKO) pigs have already been produced and due to the smaller size of their organs they might be suitable candidates for xenotransplantation. Furthermore, Laron syndrome affected people are protected from vascular diseases such as atherosclerosis and type II diabetes. For that reason this study aims to screen whether the GHRKO phenotype may help to prevent vascular disorders in the context of delayed xenograft rejection. Method(s): An immortalized porcine aortic endothelial cell line lacking alphaGal expression (PED GalTKO) was further modified by knocking out the GHR gene. The resulting cell line, PED GalTKO/GHRKO, was used in vitro to assess the effect of GHR deletion in a xenotransplantation setting. After transformation, cells were characterized by immunofluorescence (IF) for expression of endothelial cell markers such as CD31, VE-cadherin and von Willebrand Factor (vWF). Cell ELISA was carried out to screen the effect of the GHR deletion on deposition of complement (C3b/c and C4b/c) and immunoglobulins after incubation with pooled normal human serum. In order to evaluate whether GHRKO affects coagulation, a whole blood clotting assay was performed using endothelial cell-coated microcarriers. Result(s): PED GalTKO/GHRKO present a clear endothelial phenotype, undistinguishable from the original PED GalTKO. A strong expression of CD31, vWF, VE-cadherin, and heparan sulfate proteoglycans was observed by immunofluorescence. Cell ELISA after incubation with pooled normal human serum showed significantly lower IgM, IgG and C3b/c deposition compared to wild type porcine endothelial cells. Binding of immunoglobulins and complement were similar to the PED GalTKO cell line. Furthermore, PED GalTKO/GHRKO cells grown on microbeads significantly delayed the clotting time of freshly drawn, whole, non anticoagulated human blood as compared to wild type porcine endothelial cells (53 +/- 21 min vs. 19.8 +/- 7 min). These data are similar to the what was observed for the original PED GalTKO cell line (50 +/- 31.8 min). Conclusion(s): Our data show that GHR deficiency on porcine endothelial cells with GalTKO background preserved the endothelial phenotype. No differences in immunoglobulin binding, complement deposition or anticoagulant properties were observed as compared with the original PED GalTKO cell line. The used in vitro tests did not reveal a significant benefit of the growth hormone receptor knockout with respect to the anticoagulant properties of the endothelial cells and in vivo experiments may be needed to provide a better understanding of the long term effects of this phenotype on coagulation.

Sfriso, R., et al. (2016). "Activation of complement and coagulation in xenotransplantation: Effect of growth hormone receptor knockout on porcine aortic endothelial cells." Immunobiology **221 (10)**: 1174-1175.

Background: The phenotypic outcome of a mutation in the growth hormone receptor (GHR) gene - the Laron syndrome - is severe postnatal growth retardation and insulin-like growth factor-I deficiency despite high levels of serum GH. In the context of xenotransplantation the absence of GHR signaling might be beneficial because Laron pigs can be suitable donors due to their small organ sizes. In addition, people affected by the Laron syndrome have a reduced occurrence of cardiovascular diseases. This study therefore aimed at investigating whether the GHRKO phenotype may alter endothelial activation induced by pro-inflammatory stimuli in the context of delayed xenograft rejection. Method(s): Immortalized porcine aortic endothelial cells lacking alphaGal and GHR expression (PED GalTKO/GHRKO) were obtained after induction of a GHR gene mutation on the original PED GalTKO. The endothelial cell phenotype was assessed by immunofluorescence, assuring the expression of endothelial cell markers such as CD31, VE-cadherin and von Willebrand Factor (vWF). A cell ELISA was carried out in order to evaluate the effect of the GHR deletion on deposition of complement (C3b/c, C4b/c) and human antibodies (IgM, IgG) after incubation with pooled normal human serum. Effects on coagulation

were also assessed performing whole blood clotting assays using endothelial cell-coated microcarriers. Result(s): A strong expression of CD31, vWF, VE-cadherin, and heparan sulfate proteoglycans on PED GalTKO/GHRKO was observed by immunofluorescence. Significantly lower IgM, IgG, C3b/c and C4b/c deposition was observed on PED GalTKO and PED GalTKO/GHRKO compared to wild type porcine endothelial cells. Furthermore, growth hormone resistant cells grown on microbeads significantly delayed the clotting time of freshly drawn, whole, non anticoagulated human blood as compared to wild type porcine endothelial cells (53+/-21 min vs. 19.8+/-7 min). However, clotting times were not different from what was observed for the original PED GalTKO cell line (50+/-31.8 min). Conclusion(s): Our data show that the endothelial phenotype on GalTKO/GHRKO porcine aortic endothelial cells is preserved. So far the used in vitro tests did not reveal a significant benefit of the growth hormone receptor knockout with respect to the anticoagulant properties of the endothelial cells. Other experiments are ongoing in order to test the effect on endothelial activation induced by proinflammatory cytokines.

Sgier, L., et al. (2016). "Flow cytometry combined with viSNE for the analysis of microbial biofilms and detection of microplastics." Nature communications **7**: 11587.

Biofilms serve essential ecosystem functions and are used in different technical applications. Studies from stream ecology and waste-water treatment have shown that biofilm functionality depends to a great extent on community structure. Here we present a fast and easy-to-use method for individual cell-based analysis of stream biofilms, based on stain-free flow cytometry and visualization of the high-dimensional data by viSNE. The method allows the combined assessment of community structure, decay of phototrophic organisms and presence of abiotic particles. In laboratory experiments, it allows quantification of cellular decay and detection of survival of larger cells after temperature stress, while in the field it enables detection of community structure changes that correlate with known environmental drivers (flow conditions, dissolved organic carbon, calcium) and detection of microplastic contamination. The method can potentially be applied to other biofilm types, for example, for inferring community structure for environmental and industrial research and monitoring.

Shadfan, B., et al. (2013). "Multiplexed detection of early-stage ovarian cancer biomarkers using a microfluidic bead-based immunosensor." Cancer Research. Conference: 104th Annual Meeting of the American Association for Cancer Research, AACR **73**(8 SUPPL. 1).

The high mortality rate of ovarian cancer is directly related to the lack of an effective screening strategy, as up to 90% of cancers that have not metastasized beyond the ovaries can be treated effectively using current strategies. While the biomarker CA125 has been used with some success for detecting ovarian cancer, additional biomarkers can increase the sensitivity and specificity of an ovarian cancer diagnostic test. Here, a panel of 4 biomarkers, CA125, HE4, CA72-4 and MMP-7, has been multiplexed with the programmable Bio-Nano-Chip (p-BNC). A rapid, precise and multiplexable diagnostic system will more successfully validate these suspected biomarkers over traditional methods by utilizing less volume of precious clinical samples and significantly reducing assay times. Additionally, the p-BNC has potential to provide a method for the point-of-care analysis of patients' health, reducing costs and turn-around times for results. This system utilizes antibodies on nano-nets of agarose microbeads to capture protein biomarkers for a fluorescence-based sandwich immunoassay. By housing the microbeads in individual addressable wells that allow for the sample and reagents to pass through the porous agarose, multiple biomarkers can be analyzed in a single assay. The in-development disposable microfluidic card is utilized to control sample and reagent processing and allows the fluid to interact with the beads, as well as contains all biowaste for safer disposal.

Low limits of detection (LODs) and high precision have been achieved using the p-BNC with a short analysis time under an hour, confirming its ability to be used for measuring biomarker levels in the physiological rage. Dose response curves of the four individual biomarkers are performed on the p-BNC system and are compared to the multiplexed dose response curve to ensure minimal cross-reactivity between biomarker reagents. Additionally, all four biomarker assays are compared to EIA using late-stage clinical samples to validate the system's diagnostic value. Concurrently, samples from patients separated into blood, plasma and serum are being used to determine the feasibility of a finger-stick assay for the ovarian cancer biomarkers. A novel card for the p-BNC is now in development for analyzing finger-stick quantities of blood and is being demonstrated to work effectively with high concentrations as a proof of concept. The p-BNC shows strong promise to be an effective system capable of the multiplexed analysis of ovarian cancer biomarkers and now a retrospective trial in collaboration with MD Anderson and UKCTOCS is underway to create a risk of ovarian malignancy algorithm by utilizing pre-clinical sera from 50 patients destined to develop ovarian cancer.

Shah, A. A., et al. (2008). "Biological degradation of plastics: A comprehensive review." Biotechnology Advances **26**(3): 246-265.

Abstract: Lack of degradability and the closing of landfill sites as well as growing water and land pollution problems have led to concern about plastics. With the excessive use of plastics and increasing pressure being placed on capacities available for plastic waste disposal, the need for biodegradable plastics and biodegradation of plastic wastes has assumed increasing importance in the last few years. Awareness of the waste problem and its impact on the environment has awakened new interest in the area of degradable polymers. The interest in environmental issues is growing and there are increasing demands to develop material which do not burden the environment significantly. Biodegradation is necessary for water-soluble or water-immiscible polymers because they eventually enter streams which can neither be recycled nor incinerated. It is important to consider the microbial degradation of natural and synthetic polymers in order to understand what is necessary for biodegradation and the mechanisms involved. This requires understanding of the interactions between materials and microorganisms and the biochemical changes involved. Widespread studies on the biodegradation of plastics have been carried out in order to overcome the environmental problems associated with synthetic plastic waste. This paper reviews the current research on the biodegradation of biodegradable and also the conventional synthetic plastics and also use of various techniques for the analysis of degradation in vitro. [Copyright &y& Elsevier]

Shah, S. K., et al. (2016). "Oral control release microparticulate drug delivery study of aceclofenac using natural polymer." Asian Journal of Pharmaceutical and Clinical Research **9**(3).

Objective: The present study was to prepare controlled release microsphere of aceclofenac using sodium alginate as a natural polymer. Method(s): Microspheres of the Aceclofenac sodium by ionotropic gelation technique using sodium alginate as hydrophilic carrier and three different cross-linking agent in various proportions and different condition drying, and examines the influences of various process such as drugs polymer ratio, different concentration of cross

linkage agents, drying condition, and cross-linking time on physicochemical properties of drug loaded microbeads. Result(s): Formulated drug loaded microbeads were investigated for physicochemical properties and drug release potential. All investigated properties showed satisfactory results. While increasing in the concentration of sodium alginate, and barium chloride cross-linking time increased sphericity, size distribution, flow properties, mean particle size, swelling ratio, and drug entrapment efficiency. No significant effect of drug polymer interactions was observed in Fourier transform infrared studies. The drug entrapment efficiency obtained in the range of 97.59-99.88. The particle size of drug loaded formulations was measured by an optical microscope. The mean particle size of drug-loaded microbeads was found to be in the range 948.555+/-1.673 to 998.41+/-0.428. The shape and surface characteristics were determined by scanning electron microscopy using gold sputter technique. In-vitro drug release profile of aceclofenac sodium from microbeads was examined in simulated gastric fluid pH 1.2 for initial 2 hrs mixed phosphate buffer pH 6.8 up to 6 hrs and simulated intestinal pH 7.4 at the end of 24 hrs studies. The release of drug from the microbeads was pH dependent, showed negligible drug release in pH 1.2. Under pH 7.4 conditions the beads will swell, and the drug release depends on the swelling and erosion process resulting the optimum level of drug released in a sustained manner and exhibited zero-order kinetics. Conclusion(s): Result of studies this system was able to prolong the drug release, minimizing the drug-related adverse effects and improve bioavailability in different GI-tract conditions. Copyright © 2016, Innovare Academics Sciences Pvt. Ltd. All rights reserved.

Shahar, E., et al. (2010). "Targeted microbeads for attraction and induction of specific innate immune response in the tumor microenvironment." Vaccine **28**(45): 7279-7287.

Antitumor activity of molecules and cells of the innate immune system has been reported. Here we propose a method for targeting preferred innate immune cells and magnifying their tumoricidal effect at the tumor microenvironment, by modular multiple-component complexes (termed TILTAN). As a model, micro-scale complexes were assembled carrying monoclonal anti-HER2 antibodies, lipopolysaccharide and/or mannose. The complexes showed high binding capacity to HER2-positive cancer cells in vitro, high induction of interleukin-1 RNA transcription by the activated monocytes and ability to mediate monocytes' attachment to HER2-positive cells. TILTAN treatment was found safe in in vivo testing and induced change in interleukin-1 RNA transcription in tumors xenografts. We thus present a new vision of targeting a desired innate immune response to the tumor microenvironment.

Shahnawaz, M., et al. (2016). "Rhizosphere of Avicennia marina (Forsk.) Vierh. as a landmark for polythene degrading bacteria." Environmental Science & Pollution Research **23**(14): 14621-14635.

Due to high durability, cheap cost, and ease of manufacture, 311 million tons of plastic-based products are manufactured around the globe per annum. The slow/least rate of plastic degradation leads to generation of million tons of plastic waste per annum, which is of great environmental concern. Of the total plastic waste generated, polythene shared about 64 %. Various methods are available in the literature to tackle with the plastic waste, and biodegradation is considered as the most accepted, eco-friendly, and cost-effective method of polythene waste disposal. In the present study, an attempt has been made to isolate, screen, and characterize the most efficient polythene degrading bacteria by using rhizosphere soil of Avicennia marina as a landmark. From 12 localities along the west coast of India, a total of 123 bacterial isolates were recorded. Maximum percent weight loss (% WL; 21.87 +/- 6.37 %) was recorded with VASB14 at pH 3.5 after 2 months of shaking at room temperature. Maximum percent weight gain (13.87 +/- 3.6 %) was reported with MANGB5 at pH 7. Maximum percent

loss in tensile strength (% loss in TS; 87.50 +/- 4.8 %) was documented with VASB1 at pH 9.5. The results based on the % loss in TS were only reproducible. Further, the level of degradation was confirmed by scanning electron microscopic (SEM) and Fourier transform infrared spectroscopy (FTIR) analysis. In SEM analysis, scions/crakes were found on the surface of the degraded polythene, and mass of bacterial cell was also recorded on the weight-gained polythene strips. Maximum reduction in carbonyl index (4.14 %) was recorded in untreated polythene strip with Lysinibacillus fusiformis strain VASB14/WL. Based on 16S ribosomal RNA (rRNA) gene sequence homology, the most efficient polythene degrading bacteria were identified as L. fusiformis strainVASB14/WL and Bacillus cereus strain VASB1/TS.

Shahul Hamid, F., et al. (2018). "Worldwide distribution and abundance of microplastic: How dire is the situation?" Waste Management and Research **36**(10): 873-897.

The widespread occurrence of microplastic has invaded the environment to an extent that it appears to be present throughout the globe. This review investigated the global abundance and distribution of microplastics in marine and freshwater ecosystems. Furthermore, the issues and challenges have been addressed for better findings in microplastics studies. Findings revealed that the accumulation of microplastics varies geographically, with locations, hydrodynamic conditions, environmental pressure, and time. From this review, it is crucial that proper regulations are proposed and implemented in order to reduce the occurrence of microplastics in the aquatic environment. Without appropriate law and regulations, microplastic pollution will eventually threaten human livelihood. Copyright © The Author(s) 2018.

Shahzad, M. I., et al. (2010). "Plasmid based DNA vaccines against tuberculosis." International Journal of Infectious Diseases **2)**: S22-S23.

TB is a pre-historic disease and it is a significant cause of morbidity and mortality in human and cattle, in many parts of world. The problem has further exacerbated due to emergence of increasingly more resistant strains of M. tb and failure of BCG vaccine. By keeping in view, DNA vaccination which is more efficacious and cost effective way to protect against TB, six M. tb genes (hspx, cfp10, ag85a, ag85b, ag85c and esat6) were selected and used in this study. The genes were cloned in pcDNA3.1 Topo (Invitrogen, USA) vector with Kozak sequences upstream the ATG and finally ligated in pND-a mammalian expression vector. The cell line expression of the conscructs were checked by Western blots analyses. All of the M. tb gene constructs in pND gave good expression under in vitro conditions except esat6 gene. The endotoxin free pND-M. tb gene constructs were subjected to eight weeks old female Balb/c mice @ of 50 mg DNA/leg intramuscularly and 25 mg interdermally. The animals were divided into six groups including positive and negative control groups. Eight animals were used for hspx-pND vaccine, eight for cfp10-pND vaccine, two for esat6-pND vaccine and two for equally mixed (ag85a, b and c)-pND vaccines. Blood collection was done by tail bleeding and cardiac puncture. The antibodies were confirmed by Western blots and Multiplex Microbead Assay (MMA). The best humoral response was shown by hspx-pND vaccinated animals both on Western blots and MMA. Fairly positive response was obtained in animals vaccinated with esat6-pND14 and (ag85 a, b and c)-pND vaccines. Whereas undetectable level of antibodies from cfp10-pND vaccinated animals were produced. In general the results of this study are promising but need more animal studies before the constructs go to clinical trials.

Shahzad, M. I., et al. (2013). "Cloning, expression and genetic immunization studies of Mycobacterium tuberculosis gene esat6." Pakistan Journal of Zoology **45**(3): 749-757.

Early secreted antigenic target protein 6 (esat6) is one of the genes present on region of difference 1 (RD1) of Mycobacterium tuberculosis (M. tb) genome. This RD1 is a characteristic of virulent strains of M. tb and Mycobacterium bovis and this is one of the major differences between the disease causing strains and Bacillus-Calmat Guerin (BCG) vaccine strains. Studies have proved the presence of large number of memory T cells in M. tb infected individuals and these memory cells are reactive towards Esat6 antigen, which highlighted the importance of this gene especially in early infections. In this study, numbers of esat6 gene constructs were made in order to get a suitable construct to be used as good DNA vaccine. First esat6 gene construct was made in pND vector without Kozak sequence upstream the gene, second construct was made in pcDNA3.1 vector with Kozak sequence upstream the gene, third construct was made again in pND vector with Kozak sequence, fourth construct was made with Kozak sequence upstream and GGG downstream the ATG as a second codon of gene first in pcDNA3.1 and later in pND vectors respectively which was designated as construct five. Sixth construct was a fusion and in pcDNA3.1 vector with Kozak upstream the gene and epitope V and poly histidine tail sequence provided by vector down stream the gene through inframe cloning of esat6 gene with sequences provided by vector by removing stop codon through PCR based primers. Seventh and final construct was prepared in pND14 vector also as a fusion construct and gene was cloned under tissue plasminogen activator sequence in an in-frame through PCR based primers. All these constructs were subjected to 293T human embryonic kidney cell lines to evaluate their level of expression. Although none of the constructs gave detectable level of expression in cultured cells when tested through Western blots (WB) but tpa-esat6-pND14 construct was selected as potential DNA vaccine candidate to inject intramuscularly and interadermally to balb/c mice along with controls to obtain detectable response in vivo. Animals were tested nine weeks post vaccination and found positive against tpa-esat6-pND14 vaccine through WB and multiplex micro bead immunoassay (MMIA).

Shahzadi, K., et al. (2018). "Synthesis of Bupropion HCl Loaded Microspheres Using Microencapsulation Technique and Various Polymers and In Vitro Evaluation." Latin American Journal of Pharmacy **37**(8): 1541.

The aim of this study was to formulate and evaluate sustained release microspheres of bupropion HCl by using various polymers. Ionic gelation method was used for the preparation of microbeads. Eleven formulations were prepared by using different concentrations of polymers. Prepared microbeads were evaluated for FTIR, entrapment efficiency, SEM, % yield, flow properties and drug release studies. Rheological studies showed that microbeads exhibited good flow properties. FTIR spectra confirmed compatibility between drug and polymers. XRD analysis of bupropion HCl showed that drug was in amorphous state in microbeads. SEM results, %age yield and percentage entrapment efficiency of sodium alginate (NaAlg) microbeads and sodium alginate- guar gum (NaAlg-GG) beads was satisfactory. The swelling study indicated that microspheres initially swelled then swelling decreased with the passage of time. Release kinetics studies showed that bupropion HCl microspheres followed Korsmeyer-Peppas kinetic model and release mechanism of drug from microbeads was non fickian diffusion. Among different formulations, F9 formulation is the best formulation. This formulation contains NaAlg 3.5% w/v and GG 0.5% w/v. This formulation has better sustained release effect as compared to other formulations.Alternate abstract:El objetivo de este estudio fue formular y evaluar microesferas de liberación sostenida de bupropion HCl mediante el uso de varios polímeros. El método de gelificación iónica se usó para la preparación de microperlas. Se prepararon once formulaciones usando diferentes concentraciones de polímeros. Las microesferas preparadas se evaluaron por FTIR, eficiencia de atrapamiento, SEM,% de rendimiento, propiedades de flujo y estudios de liberación de fármacos. Los estudios reológicos mostraron que las microperlas exhibían buenas

propiedades de flujo. Los espectros FTIR confirmaron la compatibilidad entre el fármaco y los polímeros. El análisis por XRD de bupropion HCl mostró que el fármaco estaba en estado amorfo en las microperlas. Los resultados de SEM,% de rendimiento por edad y porcentaje de atrapamiento de microperlas alginato de sodio (NaAlg) y alginato de sodio-goma guar (NaAlg-GG) fueron satisfactorios. El estudio de hinchamiento indicó que las microesferas inicialmente se hincharon y luego la hinchazón disminuyó con el paso del tiempo. Los estudios de cinética de liberación mostraron que las microesferas de bupropión HCl seguían el modelo cinético de Korsmeyer-Peppas y que el mecanismo de liberación del fármaco de las microperlas era una difusión no fickiana. Entre las diferentes formulaciones, la formulación F9 es la mejor. Esta formulación contiene NaAlg- al 3,5% p/v y GG al 0,5% p/v. Esta formulación tiene un mejor efecto de liberación sostenida en comparación con otras formulaciones.

Shamsi, R., et al. (2019). "Hopes Beyond PET Recycling: Environmentally Clean and Engineeringly Applicable." Journal of Polymers & the Environment **27**(11): 2490-2508.

Disposal of plastics in the environment has become a core of anxiety in developing countries, while in the developed countries the focus has additionally been placed on design and manufacture of emerging products from plastic wastes—a somewhat vague yet promising horizon. Central to environmental concerns are poly(ethylene terephthalate) (PET) wastes, mainly from post-consumer bottles. Because of a considerable drop in molecular weight in the course of recycling, recycled PETs are not suitable for engineering uses. An efficient yet reasonably green synthesis route is employed here to convert PET wastes into polyurethane, and then carbon nanotubes (CNTs) was added at different levels to obtain nanocomposites with high mechanical properties. The effects of isocyanate (NCO)/hydroxyl (OH) molar ratio and CNTs content on the morphology, physical and mechanical properties were discussed. Chemical/physical crosslink density was calculated from initial slope of stress–strain curves, Mooney–Rivlin plots, strain-hardening modulus, rubbery-plateau storage modulus and swelling data. High tensile strength (300 MPa) and breaking elongation (160%) of polyurethane/CNTs nanocomposites born from PET wastes seemed promising. Microscopic analyses by AFM, SEM, and TEM gave useful information about distribution of CNTs in polyurethane. Lastly, structural changes were correlated to mechanical properties improvement. [ABSTRACT FROM AUTHOR]

Shan, J., et al. (2018). "A novel way to rapidly monitor microplastics in soil by hyperspectral imaging technology and chemometrics." Environmental Pollution **238**: 121-129.

Hyperspectral imaging technology has been investigated as a possible way to detect microplastics contamination in soil directly and efficiently in this study. Hyperspectral images with wavelength range between 400 and 1000nm were obtained from soil samples containing different materials including microplastics, fresh leaves, wilted leaves, rocks and dry branches. Supervised classification algorithms such as support vector machine (SVM), mahalanobis distance (MD) and maximum likelihood (ML) algorithms were used to identify microplastics from the other materials in hyperspectral images. To investigate the effect of particle size and color, white polyethylene (PE) and black PE particles extracted from soil with two different particle size ranges (1-5mm and 0.5-1mm) were studied in this work. The results showed that SVM was the

most applicable method for detecting white PE in soil, with the precision of 84% and 77% for PE particles in size ranges of 1-5mm and 0.5-1mm respectively. The precision of black PE detection achieved by SVM were 58% and 76% for particles of 1-5mm and 0.5-1mm respectively. Six kinds of household polymers including drink bottle, bottle cap, rubber, packing bag, clothes hanger and plastic clip were used to validate the developed method, and the classification precision of polymers were obtained from 79% to 100% and 86%-99% for microplastics particle 1-5mm and 0.5-1mm respectively. The results indicate that hyperspectral imaging technology is a potential technique to determine and visualize the microplastics with particle size from 0.5 to 5mm on soil surface directly.

Shang, X., et al. (2019). "Microplastic (1 and 5 mum) exposure disturbs lifespan and intestine function in the nematode Caenorhabditis elegans." Science of the Total Environment **705**: 135837.

As an emerging environmental pollutant, microplastics (MPs) are increasingly viewed as a serious health concern to terrestrial and aquatic ecosystems. However, previous toxicological studies examining MPs on freshwater and terrestrial organisms provide contradictory results, possibly due to few investigations at environmentally relevant concentrations. Here, the nematode Caenorhabditis elegans (C. elegans), a model organisms with both aquatic and terrestrial free-living forms, was employed to investigate the effects of 1 and 5 mum MPs (10⁷-10¹⁰ particles/m²) on the intake, lifespan, defecation rhythm, defecation-related neurons and transcriptional expression of related genes (skn-1, mkk-4, pmk-1, cpr-1 and itr-1). We demonstrated that the percentage of MP-contaminated nematodes increased with increasing exposure concentrations and duration. The lifespan of nematodes in the lower concentration exposure groups (2.4 x 10⁷ and 2.4 x 10⁸ particles/m²) decreased more prominently than that of higher concentration groups (2.4 x 10⁹ and 2.4 x 10¹⁰ particles/m²) after a 72-h exposure period. Concomitantly, expression of the skn-1 gene, involved in detoxification and lifespan regulation, was significantly altered at lower MP concentrations. Physiologically, the defecation rhythm after a 72-h exposure period was most strongly affected by 1 mum MPs at 2.4 x 10⁸ particles/m². The significant up-regulation of related genes by 1 mum MPs appears responsible for the shortened defecation interval.

Shanks, K., et al. (2019). "An experimental analysis of the optical, thermal and power to weight performance of plastic and glass optics with AR coatings for embedded CPV windows." Solar Energy Materials & Solar Cells **200**: 110027-110027.

A low concentrator photovoltaic is presented and the optical losses within a double glazed window assembly are described. The use of plastic instead of glass is analyzed for its reduced weight and hence greater power to weight ratios. Although the transmittance of glass is higher, the power to weight ratio of the plastic devices was almost double that of the glass counterparts and even higher than the original non concentrating silicon cell. The plastic Topas material was found to be the best performing material overall. Crystal Clear, a plastic resin, had a higher average transmittance but had a lower optical efficiency due to the cold cast manufacturing process in comparison to injection moulding of the other materials. This proves the importance of considering both the materials and their associated manufacturing quality. External quantum efficiencies, optical properties, silicon cell temperatures and performance is analyzed for concentrating photovoltaic devices made of varying optical materials. The measurement methods for optical analysis are given in an attempt to separate the optical losses experimentally. The Silicon cells were found to gain higher temperatures due to the insulating plastic optics in comparison to glass but these effects are eliminated during vertical window orientation where instead the encapsulate dominates the insulation of the cell. The results presented here prove plastic optics to be a worthwhile alternative to glass for use in low concentration photovoltaic systems and have the significant effect of reversing the weight disadvantage concentrator photovoltaic technology has compared to standard flat plate solar panels. • New options for plastic materials, manufacturing processes and antireflection coatings are presented. • Practical methods for ascertaining the optical losses of manufactured optics are described. • Topas is the most suitable plastic material for refractive LCPV optics and gave the highest performance. • The Topas CPV prototype had a higher power to weight ratio than the flat plate Silicon cells used for comparison. [ABSTRACT FROM AUTHOR]

Shantha Kumara, M. C., et al. (2013). "Microarray analysis of T-lymphocyte gene expression after colorectal resection." Gastroenterology **1)**: S1134.

Introduction: Previous studies have established that surgical trauma is associated with significant transient alterations in cell-mediated immune function. Surgery-related immunosuppression may impact the patient's ability to deal with infection. Also, tumor growth has been shown in murine studies to be increased after surgical trauma. Cell-mediated immunosuppression after resection of a primary tumor may impair the host's ability to eradicate or contain residual tumors cells. This microarray study of perioperative T-lymphocyte (TLC) gene expression was undertaken in an effort to better understand the impact of colorectal resection (CR) on cell-mediated immune function. Method(s): Patients who underwent elective laparoscopic right hemicolectomy (RHC) for benign colonic disease (BCD) who had enrolled in an IRB approved blood/data bank for whom frozen pre- and postoperative TLC's were available were eligible for this study. Benign pathology patients were chosen in order to determine the impact of surgical trauma alone, independent of the potential effects of a cancer on immune function. Preoperative (PreOp) and postoperative day1 (POD1) blood samples were utilized. TLC's were isolated from the blood using a combination of gradient centrifugation and magnetic micro-bead separation. TLC's were subsequently lysed and total RNA extracted. cRNA was made from RNA hybridized to HG-U133APLUS oligonucleotide array. PreOp vs POD1 expression data was analyzed via Limma paired analysis to find differently expressed genes. (p>0.05 significant) and consistency of significance was analyzed via Empirical Bayes statistics (B>0 Sig.). Clinical data is presented as mean +/- SD. Result(s): Nineteen patients (12 males/7 female, mean age 65.8+/- 12.8 years) met the entry criteria. The mean incision length was 7.8+/- 3.5cm and mean length of stay was 6.3+/-2.6 days. All TLC expression data met the affymetrix data QC standards. A total of 39 genes showed significant changes on POD1; 21were up-regulated and 18 were down regulated (B=0.05- 5.3). The expression changes of 7 genes in this group were strongly significant (ABCG-1, TMEM49, FAM100B and PIM1 were upregulated and IFI44L, STAT1 and UCP2 were down regulated; P =0.02 and B =4.1-5.3). Enrichment analysis confirmed that these gene changes were likely to have significant effects on 7 signaling pathways and 3 functional categories i.e.; cell proliferation, hematological function and immune response. Conclusion(s): Surgical trauma affected gene expression of circulating TLC's in the immediate postoperative period. Altered gene expression may impact TLC growth and proliferation as well as immune

function. These changes must be validated at the protein level and additional patients studied. Also, the duration of these changes, after surgery, must be determined. Finally, a similar study in cancer patients is also needed.

Shao, F., et al. (2012). "Evaporative micro-particle self assembly influenced by capillary evacuation." Journal of Colloid & Interface Science **377**(1): 421-429.

As evaporation does not incur energy introduction, the droplet coffee-stain patterning approach is attractive for biochemical tests conducted in the field or in third world environments. A practical strategy uses chemically functionalized microbeads for the coffee stain deposition process. From an application perspective, it will be necessary to minimize the coffee stain deposition time, as evaporation, depending on the volume of the droplet, can be a slow process. The introduction of a porous media will generate a capillary flow (or wicking) that removes any remnant liquid in the droplet, thus permitting it to be done inexpensively and in the field. Using optical profilometry, we were able to establish that polystyrene microspheres developed more copious and defined single ring coffee depositions than silica of the same size and concentration in a suspension. In analyzing the droplet capillary evacuation process with a porous media, we found the liquid bridge formed during the later stages to rupture and leave behind some liquid material for a second stage evaporation process. This was responsible for a two ring structure that was more visible with silica microspheres. A high degree of hysteresis of the contact angle was found to develop at the contact line in which values below 5degree could be achieved. Dynamic observations showed the copious and dense packing of polystyrene particles to be more resistant to ring break up from the evacuation flow. Nevertheless, erosion of the back array portions of the ring was evident notwithstanding either type of microsphere used.

Shao, F., et al. (2012). "Bioparticles assembled using low frequency vibration immune to evacuation drifts." Review of Scientific Instruments **83**(8): 085115.

The use of low frequency vibration on suspensions of glass beads in a droplet has been shown to develop a strong degree of patterning (to a ring) due to the manner with which the surface waves are modified. Functionalized glass beads that serve as bioparticles permit for sensitive readings when concentrated at specific locations. However, a time controlled exposure with analytes is desirable. The replacement of the liquid medium with analyte through extraction is needed to conserve time. Nevertheless, we show here that extraction with a porous media, which is simple and useable in the field, will strongly displace the patterned beads. The liquid removal was found to be dependent on two mechanisms that affect the shape of the droplet, one of contact hysteresis due to the outer edge pinning, and the other of liquid being drawn into the porous media. From this, we developed and demonstrated a modified well structure that prevented micro-bead displacement during evacuation. An added strong advantage with this approach lies with its ability to require only analytes to be dispensed at the location of aggregated particles, which minimizes analyte usage. This was analytically established here.

Shao, H., et al. (2019). "Identification of signaling cascade in the insulin signaling pathway in response to nanopolystyrene particles." Nanotoxicology **13**(2): 174-188.

The molecular response of animals to nanoplastic particles is still largely unclear. In this study, we employed a modified prolonged exposure system to investigate the molecular response of Caenorhabditis elegans to nanopolystyrene particles. Exposure to nanopolystyrene particles (1 mug/L) significantly decreased expressions of daf-2 encoding an insulin receptor, age-1 encoding a PI3K, and akt-1 encoding an Akt/PKB, and increased expression of daf-16 encoding a FOXO transcriptional factor in insulin signaling pathway. Among these genes, mutation of daf-2, age-1,

or akt-1 induced a resistance to toxicity of nanopolystyrene particles, whereas mutation of daf-16 induced a susceptibility to the toxicity of nanopolystyrene particles. RNAi knockdown of daf-16 could further suppress the resistance of daf-2, age-1, or akt-1 mutant to the toxicity of nanopolystyrene particles. The insulin signaling pathway acted in intestinal cells to regulate the toxicity of nanopolystyrene particles. Moreover, sod-3 encoding a manganese superoxide dismutase, mtl-1 encoding a metallothionein, and gpd-2 encoding a glyceraldehyde-3-phosphate dehydrogenase were identified as downstream targeted genes for daf-16 in the regulation of toxicity of nanopolystyrene particles. Therefore, a signaling cascade of DAF-2-AGE-1-AKT-1-DAF-16-SOD-3/MTL-1/GPD-2 was identified in response to nanopolystyrene particles in nematodes. Additionally, this signaling cascade in the insulin signaling pathway may mediate a protective response for nematodes against the adverse effects from nanopolystyrene particles.

Shao, Z., et al. (2011). "Calcium-activated potassium channel KCa3.1 and chloride channels are involved in dendritic cell migration to lymph nodes." Journal of Allergy and Clinical Immunology **1)**: AB259.

RATIONALE: The role of ion channels is largely unknown in chemokineinduced migration in non-excitable cells such as dendritic cells (DC). In this study, the role of KCa3.1 and chloride channels was examined in DC migration to lymphatic chemokines. METHOD(S): Mouse CD11c-high and CD11c-low DCs were isolated from OVA-sensitized mouse lungs. Human DCs were obtained from peripheral blood mononuclear cells (PBMC) using anti-BDCA1 microbeads and AutoMACS, or derived from PBMC. KCa3.1 and CCR7 expression was determined using immunofluorescence and western blot. Labeled antigen was introduced into mouse lungs intranasally. Intracellular calcium was measured using flow cytometry. Chemotaxis in response to CCL19 and CCL21 was measured using Trans Well in the presence/absence of KCa3.1 blockers, TRAM-34 and charybdotoxin, or chloride channel blockers, NPPB and DIDS. RESULT(S): Mouse lung DC, human myeloid DC, and monocyte-derived DC expressed KCa3.1 protein. CCL19, CCL21, and KCa3.1 activator, 1-EBIO induced an increase in intracellular calcium. EBIO-induced calcium increase was abolished by TRAM-34 in mouse lung DCs. Ag-carrying lung DCs expressed significantly higher CCR7 than non-Ag-carrying DCs but KCa3.1 expression were similar. However, lung DCs from OVA-sensitized mouse expressed significantly higher KCa3.1 than those from non-sensitized mice. Blockade of KCa3.1 with TRAM-34 and/or charybdotoxin impaired CCL19/CCL21-induced transmigration with no toxicity observed. DIDS and NPPB impaired DC chemotaxis at a greater degree than KCa3.1 blockers but possibly caused remarkable changes in cell physiology. CONCLUSION(S): KCa3.1 is involved in DC migration through regulating membrane potential and calcium flux. Chloride channels regulate DC migration and may be predominantly involved in a broad range of cell functions.

Shao, Z., et al. (2013). "Increased population of myeloid-derived suppressor cells in patients with myelodysplastic syndromes overexpress ARG1 and mediate CD8+ T cell inhibition." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Objective To investigate the proportion and activation of myeloid- derived suppressor cells (MDSC) in bone marrow from patients with myelodysplastic syndromes (MDS). Methods The proportion of MDSC (Lin-HLA-DR-CD33+) in bone marrow of 30 MDS patients and 19 normal controls were measured by flow cytometry assay(FCM). MDSC and CD8+ T cell were isolated from bone marrow of 14 MDS patients and 14 normal controls among them by FCM and microbeads. The expressions of arginase 1(ARG1) and inducible nitric oxide synthase (iNOS) were analyzed by qPCR and western bolting. Co-cultures with CD8+ T cell were proved the MDSC-mediated inhibition of CD8+ T cell. Results MDS patient's median MDSC were 7.29%

which was higher than that of controls (2.91%). The expression of ARG1 and iNOS mRNA in MDSC of high-risk MDS patients was higher than that of low-risk MDS patients. But the protein of ARG1 was overexpressed rather than that of iNOS. After co-cultured, the apoptosis ratio of CD8+ T cells of MDS((64.17+/-4.86) %) was increased compared to pure CD8+ T cells ((54.58+/-9.95)%). Further more, the production of IFN-gammasecreted by CD8+ T cells co-cultured with MDSC ((551.94+/-47.39) pg/ml)was lower than that of pure CD8+ T cells ((586.04+/-46.65) pg/ml) There was no significant difference in level of TNF-betabetween co-cultured with MDSC and pure CD8+ cells. Conclusion The proportion of MDSC in bone marrow was increased significantly in MDS. MDSC overexpressed ARG1 in patients with MDS and correlated to the malignant degree of this disease. Further more, MDSC can increased the apoptosis ratio of CD8+ T cell, and inhibited the secretion of IFN-gamma. These findings suggested MDSC mediated the response of immunosuppression in MDS.

Sharifi, M., et al. (2017). "Identification and quantification of phthalate pollution in Holothuria atra: a sea cucumber from the Persian Gulf (Iran)." Jundishapur Journal of Natural Pharmaceutical Products **12**(4).

In recent years, microplastics have accumulated in oceans and sediments worldwide. Due to their small size, microplastics may be ingested by low trophic fauna, with uncertain consequences for the health of the organism. Sea cucumbers are one of the major echinoderms from the class Holothuroidea that ingest plasticizers in their mouth and filter the water. Regarding the recent interests on probable pollution of medicinal plants and other natural medicines, like marine organisms to phthalates, in this study a phthalate ester was isolated from Holothuria atra of Persian coasts for the first time. The structure of the compound was elucidated using spectroscopic data (IR, NMR and MS) and the compound was used as a standard for quantification of microplastic in H. atra, a marker of pollutant in the Persian Gulf. Quantification was done by high performance thin layer chromatography and the amount of bis (2-ethylhexyl) phthalate (BEHP) was 0.15+or-0.08 mg/g.

Sharma, H. K., et al. (2010). "Preparation and in vitro evaluation of enteric controlled release pantoprazole loaded microbeads using natural mucoadhesive substance from Dillenia indica L." International Journal of PharmTech Research **2**(1): 542-551.

Pantoprazole is a proton pump inhibitor prodrug used in the treatment of gastric ulcers and gastroesophageal disease. Pantoprazole must be absorbed in the gastrointestinal tract and because it is unstable under acidic conditions, enteric delivery systems are required. The purpose of this study was to prepare Pantoprazole loaded microbeads by ionotropic gelation technique using sodium alginate and natural Mucoadhesive substance from the fruit of Dillenia indica followed by a coating with Eudragit L100-55. The microspheres have been characterized in terms of their morphology, particle size, encapsulation efficiency, swelling ratio, mucoadhesivity and ability of stabilizing Pantoprazole in acidic media. Different formulation variables like polymer-polymer ratio, drug-polymer ratio and coating concentration were considered. Almost spherical microbeads were obtained with sufficient swelling, Mucoadhesive property and acid resistance. Dissolution study was followed at phosphate buffer (pH 7.4) for 8 hr.

Sharma, P. K. and R. Malviya (2015). "Effect of Calcium Chloride on Release Behavior of Babul (Acacia nilotica) gum Microbeads." Polimery W Medycynie **45**(2): 67-72.

BACKGROUND: Oral delivery of drugs is the most common method, but due to the inability of drugs to restrain and localize in the gastro-intestinal tract, oral administration of drugs in

conventional dosage forms have short-term limitations. Carrier technology may provide many approaches for the delivery of drugs by coupling the drug to a carrier particle, such as Microspheres, nanoparticles and liposomes, which modulate the release and absorption characteristics of the drug.

OBJECTIVES: The aim of this study was to prepare Diclofenac sodium microspheres using a natural polymer and show the effect of calcium chloride on the release behavior of microspheres. The microspheres of Diclofenac sodium were successfully developed by ionic gelation technique using natural polymer babul gum with sodium alginate.

MATERIAL AND METHODS: Diclofenac Sodium was received as a gift sample from Aegis Pharmaceuticals Pvt. Ltd., Roorkee. Acacia nilotica gum was purchased from Ghaziabad and purification was done in the laboratory. All other excipients used analytical grade method. The microspheres of diclofenac sodium were prepared by Ionic gelation method using a natural polimer, i.e. Acacia nilotica. Calcium chloride (5% solution) was used as a cross-linking agent. In this research article all the data was presented as averages and standard deviations.

RESULTS: Five formulations were successfully prepared, i.e. F1, F2, F3, F4 and F5. All the formulations were evaluated for micromeritic properties, particle size analysis, percentage yield, drug content, drug entrapment efficacy, percent moisture loss, swelling index and in vitro dissolution studies. The size of the microspheres varied between 14.55 +/- 0.29 to 20.18 +/- 0.15 mum and as high as 81.51 +/- 0.14% entrapment efficiency for babul gum was obtained.

CONCLUSIONS: Batch F1 and F5 was found to release the drug 91.35% and 75.48% respectively for 6 hrs. The formulations were found to be effective in providing controlled release of drug for a prolonged period of time.

Sharma, R. K., et al. (2010). "Bevacizumab therapy normalizes the pathological intraocular environment beyond neutralizing VEGF." Molecular Vision **16**: 2175-2184.

PURPOSE: Vascular endothelial growth factor (VEGF) plays a key role in neovascularization by stimulating the proliferation and migration of vascular endothelial cells. The anti-VEGF therapy bevacizumab acts by binding to VEGF and preventing its effects. However, this linear interaction represents only a partial view of the pathobiology of neovascular diseases and the anti-VEGF treatment. To obtain an integrated view of the processes involved in VEGF-related ocular pathologies, we applied a systems approach and investigated whether intravitreal bevacizumab injections have a global effect in normalizing the ocular physiology perturbed by the disease.

METHODS: We analyzed 90 analytes representing various pathophysiological processes in aqueous humor. The samples were obtained from eight patients receiving intravitreal bevacizumab injections for various ocular VEGF-related conditions. The samples were obtained before and after the injection and were analyzed using microbead technology developed by Luminex xMAP.

RESULTS: Forty-three analytes were detected above the sensitivity of the assay both in pre- and post-injection samples. Of these, normal values of 41 analytes were known and these analytes were further analyzed. The detected analytes included relevant markers such as VEGF, C reactive protein, glutathione, and cytokines. We identified 24 markers that were perturbed more than 1.5 fold in diseased samples (pre-injection) compared to normal levels. The levels of perturbed analytes were compared in post-treatment samples. The results demonstrated an unequivocal trend toward normalization in post-treatment samples.

CONCLUSIONS: Our results show intraocular bevacizumab injections change the perturbed physiologic environment of the eye toward normalization. Its effects reached beyond neutralizing VEGF. The results also demonstrate that large-scale analysis of the aqueous, using a systems approach, could provide useful insight regarding ocular diseases, their pathophysiologies, and treatment responses.

Sharma, S. and S. Chatterjee (2017). "Microplastic pollution, a threat to marine ecosystem and human health: a short review." Environmental Science & Pollution Research **24**(27): 21530-21547.

Human populations are using oceans as their household dustbins, and microplastic is one of the components which are not only polluting shorelines but also freshwater bodies globally. Microplastics are generally referred to particles with a size lower than 5 mm. These microplastics are tiny plastic granules and used as scrubbers in cosmetics, hand cleansers, air-blasting. These contaminants are omnipresent within almost all marine environments at present. The durability of plastics makes it highly resistant to degradation and through indiscriminate disposal they enter in the aquatic environment. Today, it is an issue of increasing scientific concern because these microparticles due to their small size are easily accessible to a wide range of aquatic organisms and ultimately transferred along food web. The chronic biological effects in marine organisms results due to accumulation of microplastics in their cells and tissues. The potential hazardous effects on humans by alternate ingestion of microparticles can cause alteration in chromosomes which lead to infertility, obesity, and cancer. Because of the recent threat of microplastics to marine biota as well as on human health, it is important to control excessive use of plastic additives and to introduce certain legislations and policies to regulate the sources of plastic litter. By setup various plastic recycling process or promoting plastic awareness programmes through different social and information media, we will be able to clean our sea dustbin in future.

Sharma, S., et al. (2014). "Role of neutrophils in visceral leishmaniasis in India." Allergy: European Journal of Allergy and Clinical Immunology **99)**: 38.

Background: Visceral leishmaniasis (VL), also know as Kala-azar, is a disease caused by Leishmania donovani in India. In this form of leishmaniasis the parasite spreads to visceral organs, and disease is fatal if left untreated. Isolated PBMCs from patients with VL lack antigen specific immune responses. Whether they play regulatory roles has yet to be unveiled. We found that PBMCs isolated from VL patients contained a distinct subset of low density granulocytes staining for neutrophil markers. Surprisingly, these cells stained for MHC II expression, and MHC II staining was more intense in cells from VL patients than cells from Endemic Healthy Controls (EHC). Method(s): Flow Cytometry was performed using BD Facs Calibur and analysed using FlowJO software (Treestar). Gene Expression: Human neutrophils were isolated from whole blood after RBC lysis using Militenyi CD66abce microbead kit to get highly pure neutrophils (>97%). Result(s): Neutrophils from patients with VL were examined for activation. A minimal increase CD11b high CD62L low neutrophils was observed in whole blood of VL patients than in EHC. Total blood neutrophils from patients with VL contain a subset of HLA DR expressing cells that stain as neutrophils. Low density granulocytes that co-purified with PBMCs contained a population expressing MHC II and CD66b (neutrophil marker). These cells were more abundant in VL patients than EHC. PMN in the RBC pellet separated by migration through the ficoll layer behave as 'classical neutrophils' and do not show appreciable MHC II expression in both VL patients and Endemic healthy groups.Differences were observed in expression of cytokine and chemokine mRNAs in the same subjects during active VL and after treatment. Conclusion(s): We observed a unique population of neutrophils like cells expressing MHC II in chronic VL. We need to determine if these cells are supressive as reported by Abebe et al. or function in antigen presentation.

Sharp, N. A., et al. (1998). "Hydrodynamic and mass transfer studies in an external-loop air-lift bioreactor for immobilized animal cell culture." Applied Biochemistry and Biotechnology - Part A Enzyme

Engineering and Biotechnology **73**(1): 59-77.

Air-lift bioreactors containing suspended or immobilized animal cells have been used for the production of a variety of high-value biologicals. In the bioprocessing industry, there is a need to study and quantify the relationships between bioreactor-system properties such as mixing, flow, mass transfer, and cell processes. In the present study, the performance of a 1-L external-loop air-lift bioreactor was investigated by studying gas-liquid oxygen transfer, mixing time, liquid velocity and gas hold-up at various aeration rates. These studies were performed over a range (0-25%) of loadings of small (500-800 mum) calcium alginate beads to investigate the effect of using various concentrations of cell immobilization matrices on the physical properties of the system. At an aeration rate of 0.5 vvm, the mixing time was decreased by 50%, from 75 s at 0% bead loading to 38 s at 10% bead loading. A minimum liquid velocity of 10 cm/s was required to keep the alginate beads in suspension. As bead loading increased, flow within the reactor went from turbulent conditions to the transition zone. At all bead loadings tested, the gas hold-up increased by only 2% with an increase in aeration rate from 0.1 to 1.0 vvm, regardless of whether the total reactor volume (i.e., liquid and beads) or the liquid volume was used in calculating the hold-up. A mathematical correlation was developed for expressing the dependence of the volumetric mass-transfer coefficient, k<inf>1</inf>a, on aeration rate (vvm) and microbead loading. With this equation it was possible to predict, within 20%, the k<inf>1</inf>a knowing the gas-flow rate and the volume percentage of microbeads present in the bioreactor. A theoretical study was also performed to calculate the oxygen transfer from the bulk liquid to the center of microcapsules containing animal cells using experimental k<inf>1</inf>a data. The results suggest that whereas there is no oxygen limitation at 10 to 15% microcapsule loading, there is a potential mass-transfer problem at 25% loading if the bioreactor is operated at an aeration rate of less than 1.06 vvm.

Sharuddin, S. D. A., et al. (2016). "A review on pyrolysis of plastic wastes." Energy Conversion & Management **115**: 308-326.

The global plastic production increased over years due to the vast applications of plastics in many sectors. The continuous demand of plastics caused the plastic wastes accumulation in the landfill consumed a lot of spaces that contributed to the environmental problem. The rising in plastics demand led to the depletion of petroleum as part of non-renewable fossil fuel since plastics were the petroleum-based material. Some alternatives that have been developed to manage plastic wastes were recycling and energy recovery method. However, there were some drawbacks of the recycling method as it required high labor cost for the separation process and caused water contamination that reduced the process sustainability. Due to these drawbacks, the researchers have diverted their attentions to the energy recovery method to compensate the high energy demand. Through extensive research and technology development, the plastic waste conversion to energy was developed. As petroleum was the main source of plastic manufacturing, the recovery of plastic to liquid oil through pyrolysis process had a great potential since the oil produced had high calorific value comparable with the commercial fuel. This paper reviewed the pyrolysis process for each type of plastics and the main process parameters that influenced the final end product such as oil, gaseous and char. The key parameters that were reviewed in this paper included temperatures, type of reactors, residence time, pressure, catalysts, type of fluidizing gas and its flow rate. In addition, several viewpoints to optimize the liquid oil production for each plastic were also discussed in this paper.

Shaw, D. G. and R. H. Day (1994). "Colour- and form-dependent loss of plastic micro-debris from the North Pacific Ocean." Marine Pollution Bulletin **28**(1): 39-43.

Floating plastic was collected with a neuston sampler at 27 locations in the North Pacific Ocean in 1987 and 1988. The plastic particles obtained were sorted according to size, physical form (e.g. pellet, line, fragment), and colour. Comparison of the size distribution of plastic observed with that predicted by a simple physical fragmentation model indicated that some forms, colours, and size fractions were significantly under-represented. We consider four possible explanations of these results and conclude that it is likely that marine organisms selectively remove plastic particles whose size, shape, and colour allow them to be mistaken for prey items. We further conclude that ingestion of small plastic objects by marine organisms occurs in substantial quantities.

Sheema, M., et al. (2011). "Rational use of antibiotics in gynaecology." Pharma Research **5**(1): 107-115.

Data was studied for evaluating rational use of antibiotics in gynaecology department and compare the data of public Vs private hospital on all the aspects, after so many efforts done by Delhi Society of promoting rational use of drugs (DSPRUD). The concurrent study was conducted in a 1276 bedded medical college hospital in Pt. B. D. Sharma University of Health Sciences, Rohtak and Shiv Hospital, Rohtak. The study was conducted on 100 outpatients from public and private hospital on equal population. Data was analyzed by applying statistical tools. A concurrent analysis on 100 patient's prescription was done in two groups and found that 41 (41%) prescriptions were probably appropriate, 18 (18%) prescriptions were inappropriate and 41 (41%) prescriptions were empirical. Inappropriate antibiotic therapy was due to inappropriate choice of antibiotics, having no efficacy for treatment and the cost inappropriate for the therapy prescribed, i.e. $p = 0.41 > 0.05$ (significant difference). Cost is the major factor for rational use of antibiotics. Cost comparison in two groups showed significant difference i.e. $p = 0.778 > 0.05$. The study concluded that 27% of the prescriptions were irrational and 73% of the prescriptions were empirical. Irrational use of antibiotics showed significant difference, $p = 0.27 > 0.05$. Comparing the two groups shows a significant difference i.e. $p = 0.61053$ (Chi-square test). The study was highly empirical and private practioners are giving completely empirical Vs public practioners. There are more chances of inappropriate prescriptions due to unavailability of investigation. © 2011 by Sudarshan Publication.

Sheikhi, A., et al. (2019). "Microfluidic-enabled bottom-up hydrogels from annealable naturally-derived protein microbeads." Biomaterials **192**: 560-568.

Naturally-derived proteins, such as collagen, elastin, fibroin, and gelatin (denatured collagen) hold a remarkable promise for tissue engineering and regenerative medicine. Gelatin methacryloyl (GelMA), synthesized from the methacryloyl modification of gelatin, mimicking the structure of extracellular matrix, has widely been used as a universal multi-responsive scaffold for a broad spectrum of applications, spanning from cell therapy to bioprinting and organoid development. Despite the widespread applications of GelMA, coupled stiffness and porosity has inhibited its applications in 3D cellular engineering wherein a stiff scaffold with large pores is demanded (e.g., at concentrations >10wt%). Taking advantage of the orthogonal thermo-chemical responsivity of GelMA, we have developed microfluidic-assisted annealable GelMA beads, that are first stabilized by temperature-mediated physical crosslinking, flowed to form a scaffold structure, and then chemically annealed using light to fabricate novel bead-based 3D GelMA scaffolds with high mechanical resilience. We show how beaded GelMA (B-GelMA) provides a self-standing microporous environment with an orthogonal void fraction and stiffness, promoting cell adhesion, proliferation, and rapid 3D seeding at a high polymer concentration (~20wt%) that would otherwise be impossible for bulk GelMA. B-GelMA, decorated with methacryloyl and arginylglycylaspartic acid (RGD) peptide motifs, does not

require additional functionalization for annealing and cell adhesion, providing a versatile biorthogonal platform with orthogonal stiffness and porosity for a myriad of biomedical applications. This technology provides a universal method to convert polymeric materials with orthogonal physico-chemical responsivity to modular platforms, opening a new horizon for converting bulk hydrogels to beaded hydrogels (B-hydrogels) with decoupled porosity and stiffness.

Shen, C., et al. (2015). "Neuroprotective effect of epigallocatechin-3-gallate in a mouse model of chronic glaucoma." Neuroscience Letters **600**: 132-136.

Epigallocatechin-3-gallate (EGCG) is a powerful antioxidant with suggested neuroprotective action. This study investigated the protective effects of EGCG against retinal ganglion cells (RGCs) degeneration in an animal model of glaucoma. C57BL/6J mice (n=54) were divided randomly into four groups: normal control group (group A, n=12); EGCG control group with EGCG in drinking water (group B, n=12); microbeads control group with anterior chamber microbeads injection to induce elevation in intraocular pressure (IOP) plus normal drinking water (group C, n=18); and EGCG study group receiving an anterior chamber microbeads injection plus EGCG in drinking water (group D, n=12). Animals were treated orally with either vehicle or EGCG (50 mg/kg x d). IOP was measured and animals were sacrificed at days 15 and 27. Neurons were retrograde-labeled by fluorogold and immnunolabeled by class III beta -tubulin to quantify RGCs in the retinal ganglion cell layer on flat mounts histologically and compared. All mice that received microbeads injections (groups C and D) developed IOP elevation higher than un-injected control mice. At days 15 and 27, progressive loss of RGCs was observed after microbeads injection in group C (P<0.01). In contrast, the fluorogold-labeled RGC density and class III beta -tubulin-positive RGC density were significantly higher in group D as compared to group C (P<0.01) but significantly lower than group B (P<0.01). These parameters did not differ significantly between groups A and B (P>0.05). The findings suggest the consumption of EGCG plays a neuroprotective role on RGCs in a mouse model of elevated IOP.

Shen, K., et al. (2014). "Microcavity substrates casted from self-assembled microsphere monolayers for spheroid cell culture." Biomedical Microdevices **16**(4): 609-615.

Multicellular spheroids are an important 3-dimensional cell culture model that reflects many key aspects of in vivo microenvironments. This paper presents a scalable, self-assembly based approach for fabricating microcavity substrates for multicellular spheroid cell culture. Hydrophobic glass microbeads were self-assembled into a tightly packed monolayer through the combined actions of surface tension, gravity, and lateral capillary forces at the water-air interface of a polymer solution. The packed bead monolayer was subsequently embedded in the dried polymer layer. The surface was used as a template for replicating microcavity substrates with perfect spherical shapes. We demonstrated the use of the substrate in monitoring the formation process of tumor spheroids, a proof-of-concept scale-up fabrication procedure into standard microplate formats, and its application in testing cancer drug responses in the context of bone marrow stromal cells. The presented technique offers a simple and effective way of forming high-density uniformly-sized spheroids without microfabrication equipment for biological and drug screening applications.

Shen, M., et al. (2020). "Can microplastics pose a threat to ocean carbon sequestration?" Marine Pollution Bulletin **150**: 110712.

Global climate change has attracted worldwide attention. The ocean is the largest active carbon pool on the planet and plays an important role in global climate change. However, marine

plastic pollution is getting increasingly serious due to the large consumption and mismanagement of global plastics. The impact of marine plastics on ecosystem responsible for the gas exchange and circulation of marine CO₂ may cause more greenhouse gas emissions. Consequently, in this paper, threats of marine microplastics to ocean carbon sequestration are discussed. Marine microplastics can 1) affect phytoplankton photosynthesis and growth; 2) have toxic effects on zooplankton and affect their development and reproduction; 3) affect marine biological pump; and 4) affect ocean carbon stock. Phytoplankton and zooplankton are the most important producer and consumer of the ocean. As such, clearly, further research should be needed to explore the potential scale and scope of this impact, and its underlying mechanisms.

Shen, M., et al. (2019). "Recent advances in toxicological research of nanoplastics in the environment: A review." Environmental Pollution **252**(Pt A): 511-521.

Nanoplastics have attracted increasing attention in recent years due to their widespread existence in the environment and the potential adverse effects on living organisms. In this paper, the toxic effects of nanoplastics on organisms were systematically reviewed. The translocation and absorption of nanoplastics, as well as the release of additives and contaminants adsorbed on nanoplastics in the organism body were discussed, and the potential adverse effects of nanoplastics on human health were evaluated. Nanoplastics can be ingested by organisms, be accumulated in their body and be transferred along the food chains. Nanoplastics showed effects on the growth, development and reproduction of organisms, and disturbing the normal metabolism. The toxic effects on living organisms mainly depended on the surface chemical properties and the particle size of nanoplastics. Positively charged nanoplastics showed more significant effects on the normal physiological activity of cells than negatively charged nanoplastics, and smaller particle sized nanoplastics could more easily penetrate the cell membranes, hence, accumulated in tissues and cells. Additionally, the release of additives and contaminants adsorbed on nanoplastics in organism body poses more significant threats to organisms than nanoplastics themselves. However, there are still knowledge gaps in the determination and quantification of nanoplastics, as well as their contaminant release mechanisms, degradation rates and process from large plastics to nanoplastics, and the transportation of nanoplastics along food chains. These challenges would hinder the risk assessment of nanoplastics in the environment. It is necessary to further develop the risk assessment of nanoplastics and deeply investigate its toxicological effects.

Shen, M., et al. (2019). "Micro(nano)plastics: unignorable vectors for organisms." Marine Pollution Bulletin **139**: 328-331.

Micro(nano)plastics, as emerging contaminants, have attracted worldwide attention. Nowadays, the environmental distribution, sources, and analysis methods and technologies of micro(nano)plastics have been well studied and recognized. Nevertheless, the role of micro(nano)plastic particles as vectors for attaching organisms is not fully understood. In this paper, the role of micro(nano)plastics as vectors, and their potential effects on the ecology are introduced. Micro(nano)plastics could (1) accelerate the diffusion of organisms in the environment, which may result in biological invasion; (2) increase the gene exchange between attached biofilm communities, causing the transfer of pathogenic and antibiotic resistance genes; (3) enhance the rate of energy, material and information flow in the environment. Accordingly, the role of microplastics as vectors for organisms should be further evaluated in the future research.

Shen, W., et al. (2018). "Fluorometric determination of zinc(II) by using DNAzyme-modified magnetic microbeads." Mikrochimica Acta **185**(10): 447.

A fluorometric assay for zinc ion is described that relies (a) on the use of an isothermal cycle to amplify the fluorescence signal, and (b) of magnetic beads (MBs) to completely remove unreacted DNA detection probes. Biotin and fluorophore-labeled substrate (Zn-Sub) strands acting as detection probes were first assembled on MBs. Next, Zn(II)-specific DNAzyme (Zn-Enz) strands were hybridized with the Zn-Sub strands. In the presence of Zn(II), the Zn-Sub strands are cleaved. This results in the release of the shorter DNA fragments (containing fluorescent label) and in the dissociation of Zn-Enz strands. The dissociated Zn-Enz strands then hybridize with the residual Zn-Sub strands and cleave them in a similar fashion. This leads to a target recycling amplification mechanism and in a cumulative signal amplification process. A strongly amplified signal is thus obtained in the presence of Zn(II). The use of MBs warrants that unreacted Zn-Sub strands can be magnetically separated from the solution. The method has a detection limit as low as 33 fM at a signal-to-noise ratio of 3 and a linear response in the 100 fM to 11 nM Zn(II) concentration range. It was applied to the determination of Zn(II) in spiked tap water and seawater samples, and the results compared well with data obtained by ICP-MS analysis. The method was also applied to the determination of Zn(II) in infant milk powder and breast milk. Graphical abstract Magnetic beads (MBs) carrying fluorescein-labeled substrate (Zn-Sub) strands were hybridized with Zn(II)-specific DNAzyme (Zn-Enz) and cleaved in the presence of Zn(II). After recycling, the unreacted Zn-Sub strands were removed with MBs and the released fluorescein tags are measured.

Shen, X. C., et al. (2018). "The effects of environmental conditions on the enrichment of antibiotics on microplastics in simulated natural water column." Environmental Research **166**: 377-383.

Concerns regarding the release of microplastics (MPs) into the environment led us to explore the relationship between the different environmental factors and physicochemical properties of MPs, as well as the change of interaction between MPs and organic pollutants. In this study, the effects of environmental factors (ageing conditions), such as pH, temperature, ionic strength, ageing time, and humic acid (HA) concentration, on the characteristics of MPs and their adsorption toward tetracycline (TC) were systematically investigated. The results showed that ageing factors such as pH, ionic strength, and temperature were found to have little impact on the adsorptive capacity of MPs for TC. However, MPs aged in HA solution exhibited a significant decreased adsorptive capacity for TC. HA, which has numerous functional groups, can cover the surface of MPs and change their hydrophobicity, thereby reducing the adsorption affinity to TC. The electrostatic repulsion between adsorbed HA and TC molecules may also decrease the adsorption of TC. In addition, the competing effect of HA for adsorption sites on the surface of MPs further reduces the adsorption of TC. The data presented in this work provide useful information for understanding the transfer of antibiotics by aged MPs, which is of fundamental importance to assess the environmental impact of MPs.

Shen, Y., et al. (2012). "Inhibitory effect of dendritic cell subsets from mice infected with Schistosoma japonicum on pulmonary inflammation and CCL2 levels in asthma." Zhongguo Bingyuan Shengwuxue Zazhi / Journal of Pathogen Biology **7**(3): 177-180.

Objective: To study the inhibition of allergic asthma by adoptive transfer of dendritic cell (DC) subsets from mice infected with Schistosoma japonicum.

Shen, Y., et al. (2008). "Inhibitory effect on asthma by dendritic cells of Schistosoma japonicum-infected mice." Zhongguo Bingyuan Shengwuxue Zazhi / Journal of Pathogen Biology **3**(11): 832-834.

Objective: To study the inhibition of allergic asthma by adoptive transfer of dendritic cells (DC) from Schistosoma japonicum-infected mice and its mechanisms.

Shete, P. B., et al. (2017). "Evaluation of antibody responses to panels of M. tuberculosis antigens as a screening tool for active tuberculosis in Uganda." PLoS ONE [Electronic Resource] **12**(8): e0180122.

BACKGROUND: Improved systematic screening of high-risk groups is a key component of the tuberculosis (TB) elimination strategy endorsed by the World Health Organization (WHO). We used a multiplex microbead immunoassay to measure antibody responses to 28 M. tuberculosis (M.tb) antigens, and assessed whether combinations of antibody responses achieve accuracy thresholds required for a TB screening test.

METHODS: A random selection of plasma samples obtained from consecutive HIV-negative adults who were admitted to Mulago Hospital in Kampala, Uganda with cough >=2 weeks' but <6 months' duration were analyzed for serological response to 28 M.tb antigens using an in-house multiplex microbead immunoassay. We compared the median difference of the antibody response to each antigen between patients with and without culture-confirmed TB, ranked each antigen according to variable importance (VIM), and assessed the sensitivity and specificity of combinations of antibody responses using an advanced classification algorithm, SuperLearner.

RESULTS: Among the 237 patients included in the analysis, 119 (50%) were female, median age was 32 years (IQR 25, 46), and 113 (48%) had TB. Median antibody levels to eight antigens were significantly different between patients with and without TB. A panel including eight of the top ranked antigens had a sensitivity of 90.6% (95% CI 89.4, 93.8) and a specificity of 88.6% (95% CI 78.2, 97.6) (Ag85B, Ag85A, Ag85C, Rv0934-P38, Rv3881, BfrB, Rv3873, and Rv2878c). With sensitivity constrained to be >90%, specificity remained close to 70% with as few as 3 antigens included in the panels.

CONCLUSIONS: Measuring antibody responses to combinations of antigens could facilitate TB screening and should be further evaluated in populations being targeted for systematic screening.

Shetye, S. S., et al. (2019). "Anthropogenic spherules in Zuari estuary, south west coast of India." Marine Pollution Bulletin **143**: 1-5.

In this study we report silica rich anthropogenic spherules from the marine environment. We found spherical, dumbbell, teardrop and fused spherules in Zuari estuary (near the Dona paula jetty), south west coast of India. The spherules were composed of SiO<inf>2</inf> (69.8%), Na<inf>2</inf>O (13.2%), CaO (8.8%), MgO (3.8%), and traces of Al<inf>2</inf>O<inf>3</inf>, and FeO. Their high Na and Ca contents rules out the possibility of being an impact spherule or microtektite, or anthropogenic spherules coming from fly ash. Their elemental composition suggests that these are glass micro beads that have many applications including production of road and pavement marking materials, such as traffic paints. Considering that the glass micro beads are known to have high concentrations of Pb, As, and Sb that can leach into the marine environment, this study also raises questions regarding the impact of such spherules on marine biota, and highlights the need for further detailed study. Copyright © 2019 Elsevier Ltd

Sheu, M. T., et al. (1986). "Entrapment of bioactive compounds within native albumin beads: II. Effects of rate and extent of crosslinking on microbead properties." Journal of Parenteral Science and Technology **40**(6): 253-258.

The rate of crosslinking of serum albumin is affected by several parameters such as pH, buffer concentration, and the ratio of serum albumin to glutaraldehyde concentration. Selection of experimentally controllable variables makes it possible to control crosslinking rate at room temperature to form a serum albumin microbead with an appropriate extent of crosslinking that

provides both structural integrity and biodegradability. It was confirmed that serum albumin concentrations of 200 mg/ml of sodium phosphate buffer solution (pH = 7.5, 10 mM) and 1% glutaraldehyde is a very favorable combination using a mixing time of around 20 sec before adding to oil phase to form an emulsion. A curing time of around 30 min is then used. Drug loading efficiency is crosslink rate-controlled. Mixing time also affects drug loading efficiency since it fixes the time for potential partitioning of drug out of the aqueous phase. The biodegradable character of the microbeads has been shown and it appears to be a function of the amount of serum albumin and glutaraldehyde used.

Shey, J., et al. (2006). "Properties of baked starch foam with natural rubber latex." Industrial Crops and Products **24**(1): 34-40.

Petroleum-based synthetic plastics used for making consumer articles constitute the largest non-renewable source of municipal solid waste in the United States. Containers and packaging products represent the largest group within plastic waste in municipal landfills. Efforts are being made worldwide to search for renewable and biodegradable substitutes for non-biodegradable plastics. Starch from surplus commodity crops has been investigated as a possible replacement, but it does have some disadvantages such as its susceptibility to water owing to its highly hydrophilic nature. To improve the water resistance of starch-based products, we incorporated natural rubber latex into baked starch foams based on wheat, potato, and waxy corn starches. While latex increases the density of the foam, it also improves the flexibility of the product. Stabilization of the latex with non-ionic additives helped prevent irregularities in the foam product. The flexural properties of these foams are comparable with commercial products and can be 'tuned' by varying the starch type and adjusting the latex concentration. Latex also decreases the equilibrium moisture content and decreases the effect of higher humidity on the foam products.

Shi, F., et al. (2014). "Heterogeneous solution NMR signal amplification by reversible exchange." Angewandte Chemie. International Ed. in English **53**(29): 7495-7498.

A novel variant of an iridium-based organometallic catalyst was synthesized and used to enhance the NMR signals of pyridine in a heterogeneous phase by immobilization on polymer microbead solid supports. Upon administration of parahydrogen (pH2) gas to a methanol mixture containing the HET-SABRE catalyst particles and the pyridine, up to fivefold enhancements were observed in the (1)H NMR spectra after sample transfer to high field (9.4 T). Importantly, enhancements were not due to any residual catalyst molecules in solution, thus supporting the true heterogeneity of the SABRE process. Further significant improvements may be expected by systematic optimization of experimental parameters. Moreover, the heterogeneous catalyst is easy to separate and recycle, thus opening a door to future potential applications varying from spectroscopic studies of catalysis, to imaging metabolites in the body without concern of contamination from expensive and potentially toxic metal catalysts or accompanying organic molecules.

Shibata, E., et al. (2012). "Investigation for the effect of the environmental contaminants exposure on the placental amino acid transport activity." Reproductive Sciences **1)**: 380A-381A.

Background Recent studies indicate that maternal exposure to environmental contaminants may decrease infant birth-weight. However, underlying mechanisms of fetal growth restriction caused by environmental contaminants is not understood. The aim of this study is to investigate in vivo levels of environmental contaminants in the mother and infant, and to clarify how those chemicals decreases the infant birth-weight. (Subjects and Methods) We measured in vivo levels of heavy metals including Lead, Arsenic, Cadmium, Mercury, and various pesticides in maternal and cord blood, and maternal urine of the time of delivery. Furthermore, we exposed villous fragments, and BeWo cell to Arsenic, Cadmium, Mercury, plastic resin; toluene diisocyanate, aldehyde analog; glutaraldehyde, acetaldehyde, and formaldehyde to mesure the placental system A transport activity, and system A and L amino acid transporter protein expression. (Result) In vivo experiments (n=9); All of environmental contaminants were under the Japanese environmental criteria. Total Mercury level was higher in cord blood than in maternal blood. Cadmium was detected in maternal specimens but not in the cord blood. In vitro experiments (n=6); Methyl-Mercury (0.5muM), Arsenic (5muM), Cadmium (20muM) were all found to decreased system A amino acid transport activity by 30 to 40% (P<0.001). Toluene diisocyanate and glutaraldehyde decreased system A amino acid transport activity significantly in a dose-dependent manner (1, 10, 100muM: P<0.001), but acetaldehyde (2.3, 23, 230muM) and formaldehyde (3.3, 33, 330muM) did not. Toluene diisocyanate and glutaraldehyde did not change expression of System A or L amino acid transporter protein in the cultured villous fragments or the BeWo cell line. All environmental contaminants tested did not increase the lactase dehydrogenase release into the culture media. (Conclusion) We suggest that the high concentration of Methyl-Mercury, Arsenic, and Cadmium decrease system A amino acid transport activity. Toluene diisocyanate and glutaraldehyde are thought to be environmental contaminants which may cause fetal growth restriction by decreasing placental system A amino acid transport activity.

Shibata, H., et al. (2010). "Injectable hydrogel microbeads for fluorescence-based in vivo continuous glucose monitoring." Proceedings of the National Academy of Sciences of the United States of America **107**(42): 17894-17898.

Fluorescent microbeads hold great promise for in vivo continuous glucose monitoring with wireless transdermal transmission and long-lasting activity. The full potential of fluorescent microbeads has yet to be realized due to insufficient intensity for transdermal transmission and material toxicity. This paper illustrates the highly-sensitive, biostable, long-lasting, and injectable fluorescent microbeads for in vivo continuous glucose monitoring. We synthesized a fluorescent monomer composed of glucose-recognition sites, a fluorogenic site, spacers, and polymerization sites. The spacers are designed to be long and hydrophilic for increasing opportunities to bind glucose molecules; consequently, the fluorescent monomers enable high-intensive responsiveness to glucose. We then fabricated injectable-sized fluorescent polyacrylamide hydrogel beads with high uniformity and high throughput. We found that our fluorescent beads provide sufficient intensity to transdermally monitor glucose concentrations in vivo. The fluorescence intensity successfully traced the blood glucose concentration fluctuation, indicating our method has potential uses in highly-sensitive and minimally invasive continuous blood glucose monitoring.

Shiber, J. G. (1989). "Plastic particle and tar pollution on beaches of Kuwait." Environmental Pollution **57**(4): 341.

Shifu, C. and C. Gengyu (2005). "Study on the Photocatalytic Reduction of Dichromate and Photocatalytic Oxidation of Dichlorvos." Chemosphere **60**(9): 1308.

Dichromate and dichlorvos were used as model inorganic and organic pollutants, respectively, to investigate photocatalytic treatment involving titanium dioxide. Various operational parameters were considered in terms of their influence on the photocatalytic reduction of dichromate and the photocatalytic oxidation of dichlorvos, including the amount of

photocatalyst, the hydrogen peroxide concentration, pH, and the presence of metal ions, anions, and organic compounds. Titanium dioxide was supported on hollow glass microbeads. Results showed that both photoreduction and photooxidation efficiency increased rapidly with increasing TiO sub(2) concentration up to a limit of 6.0 g/dm super(3). Photoreduction efficiency decreased with increasing solution pH, while the opposite was observed for photooxidation. The photoreduction efficiency decreased gradually with an increase in the H sub(2)O sub(2) concentration, while the opposite was observed for photooxidation. Both reactions were accelerated in the presence of small amounts of trivalent iron or divalent copper. The presence of other anions did not influence the processes, but when toluene or methanol were added, the photoreduction efficiency was increased, while the photooxidation efficiency was decreased.

Shim, W. J. and R. C. Thomposon (2015). "Microplastics in the Ocean." Archives of Environmental Contamination & Toxicology **69**(3): 265-268.

Since their ubiquity in the ocean and marine organisms was first revealed, global concern about microplastics has grown considerably. The North Pacific Ocean and the adjacent marginal seas have high levels of microplastic contamination compared with the global average. This special issue on microplastics was organized by the North Pacific Marine Science Organization to share information on microplastic pollution in the North Pacific region. The special issue highlights high levels of contamination in the North Pacific both on shorelines and at the sea surface. Particularly high levels of contamination were reported on the western and southern coasts of Korea. Sources, including sewage discharge, aquaculture, and shipyards, were implicated. With the direction and energy of surface winds and currents have an important influence on shoreline patterns of distribution. The special issue also demonstrates potential for ingestion of microplastic by small planktonic organisms at the base of the food chain. A wide range of chemicals are associated with plastic debris and concerns are expressed about the potential for these chemicals to transfer to biota upon ingestion. As an introduction to the topic, this paper provides a brief background on microplastic contamination, highlights some key research gaps, and summarizes findings from the articles published in this issue.

Shima, Z., et al. (2018). "Environmentally relevant concentrations of polyethylene microplastics negatively impact the survival, growth and emergence of sediment-dwelling invertebrates." Environmental Pollution **236**: 425-431.

Microplastics are a widespread environmental pollutant in aquatic ecosystems and have the potential to eventually sink to the sediment, where they may pose a risk to sediment-dwelling organisms. While the impacts of exposure to microplastics have been widely reported for marine biota, the effects of microplastics on freshwater organisms at environmentally realistic concentrations are largely unknown, especially for benthic organisms. Here we examined the effects of a realistic concentration of polyethylene microplastics in sediment on the growth and emergence of a freshwater organism Chironomus tepperi. We also assessed the influence of microplastic size by exposing C. tepperi larvae to four different size ranges of polyethylene microplastics (1-4, 10-27, 43-54 and 100-126 micro m). Exposure to an environmentally relevant concentration of microplastics, 500 particles/kg_{sediment}, negatively affected the survival, growth (i.e. body length and head capsule) and emergence of C. tepperi. The observed effects were strongly dependent on microplastic size with exposure to particles in the size range of 10-27 micro m inducing more pronounced effects. While growth and survival of C. tepperi were not affected by the larger microplastics (100-126 micro m), a significant reduction in the number of emerged adults was observed after exposure to the largest microplastics, with the delayed emergence attributed to exposure to a stressor. While scanning electron microscopy

showed a significant reduction in the size of the head capsule and antenna of C. tepperi exposed to microplastics in the 10-27 micro m size range, no deformities to the external structure of the antenna and mouth parts in organisms exposed to the same size range of microplastics were observed. These results indicate that environmentally relevant concentrations of microplastics in sediment induce harmful effects on the development and emergence of C. tepperi, with effects greatly dependent on particle size.

Shimony, N., et al. (2006). "Fibrin microbeads (FMB) as a 3D platform for kidney gene and cell therapy." Kidney International **69**(3): 625-633.

Cell and gene therapy may alter the outcome of renal diseases, such as hereditary nephropathies, acute and chronic glomerulonephritis and allograft nephropathy. However, owing to blockade of many viral and cellular vehicles by the complex glomerular architecture, the exact nature of gene and cell delivery into specific renal compartments remains currently unknown. To study the interaction of viral vectors with a variety of renal cells and mesenchymal stem cells (MSCs), we employed a novel biological three-dimensional (3D) matrix comprised of fibrin microbeads (FMB) in comparison to monolayer cell culture. Our studies showed that renal cells of both established and primary lines can grow efficiently on FMB and differentiate into epithelial structures, as shown by electron microscopy. Gene delivery into renal cells in 3D was observed for several viral vectors and growth in 3D on FMB conferred resistance to renal cancer cells in the context of oncolytic adenoviruses. Finally, MSCs from various rodent species attached to FMB, grew robustly, survived for several weeks and could efficiently be transduced on FMB. Thus, on the basis of growth, differentiation and transduction of renal cells in 3D, FMB emerge as a novel 3D cellular microenvironment that differs substantially from monolayer cell cultures.

Shin, C. I., et al. (2019). "Delivery of Niacinamide to the Skin Using Microneedle-Like Particles." Pharmaceutics **11**(7): 11.

The stratum corneum is the outermost skin layer that obstructs the delivery of active ingredients found in cosmeceutical products. Chemical peels and microbeads have been used to overcome this layer, but these methods can cause side effects and are not environmentally friendly. While microneedles do not share the dangers mentioned above, they are currently only available as patches, which makes them unsuitable to be used with products that are usually applied onto a large area of the skin surface. Therefore, the aim of this study was to develop microneedle-like particles (MLP) whose needles would disrupt the skin during the rubbing process. A modified approach taken from conventional micromolding techniques was used to make the MLPs. The experimental results show that the fabricated structures had the required mechanical strength. Furthermore, after the application of the MLPs, the permeability of two fluorescent dyes, fluorescein sodium salt and sulforhodamine B increased to 217.6% +/- 25.6% and 251.7% +/- 12.8% respectively. Additionally, the permeability of a model drug, niacinamide, was shown to have increased to 193.8% +/- 29.9%. Cryosectioned porcine slices also confirmed the ability of MLPs to enhance skin permeability by revealing a deeper penetration of the applied fluorescent dye. Altogether, the results demonstrate the potential of MLPs to be used as safe skin permeability enhancers that can be applied all over the skin.

Shin, H. Y., et al. (2012). "Fluid Pressure Is a Magnitude-Dependent Modulator of Early Endothelial Tubulogenic Activity: Implications Related to a Potential Tissue-Engineering Control Parameter." Tissue Engineering, Part A: Tissue Engineering **18**(23-24): 2590-2600.

A significant barrier to the success of engineered tissues is the inadequate transport of nutrients

and gases to, and waste away from, cells within the constructs, after implantation. Generation of microtubular networks by endothelial cells in engineered constructs to mimic the in vivo transport scheme is essential for facilitating tissue survival by promoting the in vitro formation of microvessels that integrate with host microvasculature, after implantation. Previously, we reported that select pressures stimulate endothelial proliferation involving protubulogenic molecules such as fibroblast growth factor-2 (FGF-2) and vascular endothelial growth factor-C (VEGF-C). Based on this, we investigated fluid pressure as a selective modulator of early tubulogenic activity with the intent of assessing the potential utility of this mechanical stimulus as a tissue-engineering control parameter. For this purpose, we used a custom pressure system to expose two-dimensional (2D) and three-dimensional (3D) cultures of endothelial cells to static pressures of 0 (controls), 20, or 40mmHg for 3 days. Compared to controls, 2D endothelial cultures exposed to 20, but not 40 mmHg, exhibited significantly ($p < 0.05$) enhanced cell growth that depended on VEGF receptor-3 (VEGFR-3), a receptor for VEGF-C. Moreover, endothelial cells grown on microbeads and suspended in 3D collagen gels under 20 mmHg, but not 40 mmHg, displayed significantly ($p < 0.05$) increased sprout formation. Interestingly, pressure-dependent proliferation and sprout formation occurred in parallel with pressure-sensitive upregulation of VEGF-C and VEGFR-3 expression and were sensitive to local FGF-2 levels. Collectively, the results of the present study provided evidence that early endothelial-related tubulogenic activity depends on local hydrostatic pressure levels in the context of local growth factor conditions. In addition to relevance to microvascular diseases associated with interstitial hypertension (e.g., cancer and glaucoma), these findings provided first insight into the potential utility of hydrostatic pressure as a fine-tune control parameter to optimize microvascularization of tissue-engineering constructs in the in vitro setting before their implantation.

Shin, J., et al. (2013). "The proteomic profiling of TSLP-activated iNKT cells." Journal of Investigative Dermatology **1)**: S203.

In AD, innate immune mechanisms such as pattern recognition receptors and antimicrobial peptides have been investigated in detail, but recently, epidermis-derived cytokines, namely thymic stromal lymphopoietin (TSLP), IL-25 and IL-33, were shown to participate in innate immune reactions independently of adaptive immunity. In addition to conventional innate cells, such as mast cells, basophils and eosinophils, Th2 cytokine-producing invariant natural killer T (iNKT) cells, can participate in innate immune modulation in AD. To understand the role of iNKT cells in atopic dermatitis in the view of innate immunity, we used comparative approaches to analyze proteomic profiling of iNKT cells with and without stimulation of TSLP. In our study, iNKT cells were isolated from human PBMCs using the anti-iNKT MicroBeads (Microbeads conjugated to monoclonal anti-human Valpha24-Jalpha18 antibodies), a LS Column, and a Midi MACSTMSeparator. We used a quantitative mass spectrometry-based proteomics experiments with stable-isotope-containing isobaric tags (TMT), which produce differentially labeled peptide ions that are indistinguishable in full mass spectra. Initially, we identified about one thousand and four hundred proteins in TSLP-treated and TSLP-nontreated iNKT cells. Then we attempted to identify proteins that either increased or decreased depending on time after stimulation with TSLP. Finally, we identified 28 proteins for further investigation. We found 26 down regulated proteins and 2 up regulated proteins including chemokine receptors and others. Our method allows the quantitative comparison of biologically distinct data sets with high confidence and this can be utilized for differential protein expression analysis in the newly developing research field of innate immune system in atopic dermatitis.

Shirae, K., et al. (2016). "Microencapsulated rabbit adipose stem cells can initiate ectopic bone formation." Journal of Orthopaedic Research. Conference **34**(Supplement 1).

INTRODUCTION: Cell based therapies using adipose-derived stem cells (ASCs) provide one possible form of treatment for fractures or non-unions because they are multipotent (1), easily isolated, and readily available (2). Previously, we observed that when microbeads containing rat ASCs were pre-treated with chondrogenic media and implanted in a critical size chondral defect, new cartilage was formed (3). However, ectopic bone was observed following the implantation of microencapsulated rabbit ASCs (rbASCs) pretreated with chondrogenic media and implanted in a defect in rabbit ear cartilage. To begin to determine if this difference in outcome was due to inherent species differences, we investigated the multipotency of rbASCs and their ability to induce ectopic bone formation in rabbits following microencapsulation. Method(s): ASCs were isolated from inguinal fat pads of White New Zealand rabbits under an Institutional Animal Care and Use Committee (IACUC) approved protocol. To investigate the multipotency of rbASCs, cells were plated at 5000 cells/cm² and cultured in mesenchymal stem cell growth medium (GM) until confluent. rbASCs were treated with GM, osteogenic differentiation medium (OM), chondrogenic differentiation medium (CM) and adipogenic differentiation medium (AM) for 18 days. GM, OM, and AM were from Lonza; CM was made according to Lee et al. (3). mRNA levels were analyzed for ACAN, COL2, COL10, PPAR-y, LEPR RUNX2, and OCN. Statistical significance was determined by multi-way ANOVA with post hoc analysis by Bonferroni's correction to Student's t-test (n=6, per variable). First passage rbASCs were microencapsulated in low viscosity, high mannuronate (LVM) alginate in 75mM calcium crosslinker solution containing glucose at lxlO⁷ cells/ml alginate using a 6kV electrostatic potential (4,5). This method maintains viability of the encapsulated cells, reduces the amount of bound Ca++ and prevents dystrophic calcification of the alginate in vivo. Microencapsulated rbASCs were cultured in GM or OM for 7 days and ELISAs were used to analyze soluble factors in the conditioned media. To investigate the ability of microbeads containing rbASCs to induce bone formation, rbASCs were plated at 5000 cells/cm² and at confluence, cells were treated with GM or OM for 7 days then microencapsulated. rbASCs were also microencapsulated in degradable alginate microbeads, which were made by combining equal volumes of LVM alginate and alginate-lyase solution, resulting 0.22 U alginate lyase/g alginate. lOOul of microencapsulated cells were delivered in gelatin capsules into the gastrocenemius and rectus femoris of both legs for 6 weeks. As a positive control human demineralized bone matrix (DBM) was also implanted in gelatin capsules at the same location. MicroCT and histology were done to assess the amount of bone formed. Statistical significance was determined by Unpaired t-test (n=7, per variable). Result(s): rbASCs were multipotent: CM for 18 days caused higher COL2, ACAN, and COL10 mRNAs; OM increased RUNX2 and OCN mRNAs; AM increased LEPR but did not change PPAR-y mRNA. Microencapsulated rbASCs secreted comparable levels of VEGF and BMP2 regardless of pre-treatment. However, when implanted intramuscularly, pretreatment with OM caused a marked increase in new bone volume compared to rbASCs cultured in GM or compared to DBM. This stimulatory effect was reduced when rbASCs were encapsulated in degradable microbeads (FigureslA B). MicroCT analysis showed the formation of bone at the end of 6 weeks. Ectopic bone formation was observed in all samples; however the samples that were cultured in OM produced more bone (Figure 1C). Discussion(s): Our results show that rbASCs are able to differentiate along the osteogenic, adipogenic, and chondrogenic lineages based on mRNA expression. Increased expression of COL10 suggests CM induces endochondral differentiation. The rbASCs have also shown the ability to produce osteogenic growth factors after microencapsulation. As a result, ectopic bone formation was observed in all samples but amounts were greatest following pre-treatment with OM. This was not due to upregulation of VEGF or BMP2, however. Reduced ectopic bone following implantation of degradable beads may be due to reduced alginate Ca++, although the microbead processing technology prevents dystrophc calcification. SIGNIFICANCE: These microencapsulated rbASCs can induce ectopic bone formation in rabbits, and CM-treated rbASCs may not be suitable for regenerating hyaline cartilage.

Shivani, et al. (2019). "Seasonal variation, source apportionment and source attributed health risk of fine carbonaceous aerosols over National Capital Region, India." Chemosphere **237**: N.PAG-N.PAG.

Deteriorating air quality with high levels of fine particulate matter (PM 2.5) over National Capital Region (NCR) of India is one of the serious environmental and scientific issues. In this paper, PM 2.5 samples were collected for 24 h twice or thrice a week during December 2016–December 2017 at three sites [Delhi (IG), Modinagar (MN) and Mahendragarh (HR)] over NCR to analyse the carbonaceous aerosols. Source apportionment of PM 2.5 was attempted using Principal Component analysis (PCA) and Positive Matrix Factorization (PMF) based on the analysed carbonaceous fractions [Organic carbon, Elemental carbon, Secondary organic carbon (SOC)]. Organic compounds: alkanes, hopanes, steranes, polycyclic aromatic hydrocarbons (PAHs), phthalates, levoglucosan and n-alkanoic acids were analysed to distinguish the emission sources. Total Carbonaceous Aerosols (TCA) contributed significantly (∼26%) to PM 2.5 which revealed their importance in source apportionment. Estimated SOC contributed 43.2%, 42.2% and 58.2% to OC and 5.4%, 5.3% and 7.8% to PM 2.5 at IG, MN and HR sites respectively. PCA and PMF apportion five emission sources i.e., vehicular emissions (34.6%), biomass burning (26.8%), cooking emissions (15.7%), plastic and waste burning (13.5%) and secondary organic carbon (9.5%) for PM 2.5. Source attributed health risk has also been calculated in terms of Lung cancer risk (LCR) associated with PAHs exposure and concluded that vehicular emissions (40.3%), biomass burning (38.1%), secondary organic carbon (12.8%) contributed higher to LCR (503.2×10^{-5}; ∼503 cases in 1,00,000). Health risk assessment combined with source apportionment inferences signifies the immediate implementation of emissions reduction strategies with special target on transport sector and biomass burning over the NCR of India. • Carbonaceous aerosols contributed 26% to PM 2.5 over NCR of India. • Secondary organic carbon contributed 40–58% to Organic Carbon. • Source apportionment was performed to identify emission sources of PM 2.5 over NCR. • Source attributed health risk associated with PAHs was calculated. [ABSTRACT FROM AUTHOR]

Shivarov, M., et al. (2010). "Detection of mutations associated with chronic myeloproliferative disorders using bead-based liquid assay." Haematologica **2)**: 602.

Background: The JAK2 V617F mutation has recently been reported to be associated with the pathogenesis of chronic myeloproliferative disorders (CMPDs). Several techniques such as restriction fragment length polymorphism, direct sequencing analysis, pyrosequencing, real-time AS-PCR and a denaturing high-performance liquid chromatography have been developed for the detection of this kind of mutation. Aims. We aimed at the establishment and validation of a novel rapid, costeffective and moderate-throughput method for JAK2 V617F mutation identification using a multiplexed bead-based suspension array platform -

LuminexRxMAPTM. Method(s): A 354 bp region of spanning exon 14 of the human JAK2 gene was amplified using biotinylated primers and genotyping was performed by direct hybridization with 2 oligonucleotide probes, specific for the wild type and mutant alleles. The probes were synthesized with 5' amino group and 20 bases spacer oligonucleotides to allow covalent binding to carboxylated microbeads (Luminex Corp). Result(s): The method was validated by testing on different proportion mixtures of artificial plasmid construct harboring either the wild type and mutant JAK2 allele and a panel of DNA samples from patients with known CMPDs, genotyped by direct DNA sequencing. The sensitivity of this novel assay was approximately 5% mutant DNA in a wild-type Background: No discrepancies between the novel Luninex-based method and sequencing were observed. Conclusion(s): Our novel method could be successfully implemented in the diagnostic work-up for CMPDs. Additionally, the assay allows quantification of the JAK2 mutant allele burden and therefore is applicable for assessment of minimal residual disease in patients undergoing JAK2 targeted therapy or alloHSCT. Furthermore, this system would allow the design of multiplex assays for simultaneous testing for the presence of various mutations associated with CMPDs.

Shivarov, V., et al. (2013). "Novel Multiplex Bead-Based Assay for Detection of IDH1 and IDH2 Mutations in Myeloid Malignancies." PLoS ONE **8 (9) (no pagination)**(e76944).

Isocitrate dehydrogenase 1 and 2 (IDH) mutations are frequently found in various cancer types such as gliomas, chondrosarcomas and myeloid malignancies. Their molecular detection has recently gained wide recognition in the diagnosis and prognosis of these neoplasms. For that purpose various molecular approaches have been used but a universally accepted method is still lacking. In this study we aimed to develop a novel bead-based liquid assay using Locked nucleic acids (LNA)-modified oligonucleotide probes for multiplexed detection of the most frequent IDH1 (p.R132C, p.R132G, p.R132H, p.R132L, p.R132S) and IDH2 (p.R140Q, p.R172K) mutations. The method includes four steps: 1) PCR amplification of the targeted fragments with biotinylated primers; 2) Direct hybridization to barcoded microbeads with specific LNA-modified oligonucleotide probes; 3) Incubation with phycoerythrin coupled streptavidin; 4) Acquisition of fluorescent intensities of each set of beads on a flow platform (LuminexCorp., USA). We tested the performance of the assay on both artificial plasmid constructs and on clinical samples from 114 patients with known or suspected myeloid malignancies. The method appeared to be superior to direct sequencing having a much higher sensitivity of 2.5% mutant alleles. Applying this method to patients' samples we identified a total of 9 mutations (one IDH1 p.R132C, seven IDH2 p.R140Q and one IDH2 p.R172K). In conclusion, this method could be successfully implemented in the diagnostic work-up for various tumors known to harbor IDH1/2 mutations (e.g. myeloid malignancies, gliomas, etc.). International initiatives are needed to validate the different existing methods for detection of IDH1/2 mutations in clinical settings. © 2013 Shivarov et al.

Shojaei-Zadeh, S., et al. (2011). "Highly crosslinked poly(dimethylsiloxane) microbeads with uniformly dispersed quantum dot nanocrystals." Journal of Colloid & Interface Science **363**(1): 25-33.

This study demonstrates how luminescent semiconductor nanocrystals (quantum dots or QDs) can be dispersed uniformly in a poly(dimethylsiloxane) (PDMS) matrix by polymerizing a mixture of the prepolymer oligomers and the nanocrystals with a relatively large concentration of crosslinking molecules. A microfluidic device is used to fabricate PDMS microbeads embedded with the QDs by using flow focusing to first form monodisperse droplets of the prepolymer/crosslinker/nanocrystal mixture in a continuous aqueous phase. The droplets are subsequently collected, and heated to polymerize them into solid microbead composites. The degree of aggregation of the nanocrystals in the matrix is studied by measuring the nonradiative resonance energy transfer (RET) between the nanocrystals. For this purpose, two quantum dots are used with maxima in their luminescence emission spectrum at 560 nm and 620 nm. When the nanocrystals are within the Forster radius (approximately 10 nm) of each other, exciton energy cascades from the QDs which emit at the shorter wavelength to the QDs which emit at the longer wavelength. This energy transfer is quantified, for two concentration ratios of the prepolmer to the crosslinker, by measuring the deviation of the microbead luminescence spectrum from a reference spectrum obtained by dispersing the QD mixture in a solvent (toluene) in which the nanocrystals do not aggregate. For a low concentration of crosslinking molecules relative to the prepolymer (5:1 by weight prepolymer to crosslinker), strong RET is observed as the emission of the 620 nm QDs is increased and the 560 nm QDs is decreased relative to the reference. In the emission spectrum for a higher concentration of crosslinkers (2:1 by weight prepolymer to crosslinker), the resonance energy transfer is less relative to the case of the low concentration of crosslinkers, and the spectrum more closely resembles the reference. This result indicates that the increase in the crosslinker concentration has reduced the nanocrystal aggregation in the cured polymer. The use of crosslinking can serve as a general paradigm for forming, from a prepolymer/nanoparticle mixture, a composite in which the particles are not aggregated. Under the usual conditions the entropic cost to a linearly growing polymer chain of surrounding nanoparticles forces them to aggregate; crosslinking kinetically entraps the particles and circumvents this aggregation driving force. The QD/polymer composite microbeads fabricated in this study find applications in bead-based platforms for high-throughput, multiplexed screening, where the emission spectrum of the QD luminescence can be used as a spectral barcode to label the beads. For microbeads in which the nanocrystals are uniformly dispersed, this barcode is undistorted by energy transfer, and is easily read.

Shoji, K. and R. Kawano (2019). "Osmotic-engine-driven liposomes in microfluidic channels." Lab on a Chip **19**(20): 3472-3480.

Self-propelled underwater microrobots that locomote without external sources of energy have potential application as drug carriers and probes in narrow spaces. In this study, we focused on an osmotic engine model, which is a migration mechanism, and applied it as a negative chemotaxis mechanism to induce liposome displacement. First, we confirmed the osmotic flow across the lipid bilayer and calculated the osmotic flow velocity to be 8.5 fL min-1 mum-2 when a salt concentration difference was applied to the lipid bilayer. Next, we designed and fabricated a microchannel that can trap a giant liposome and apply a salt concentration difference to the front and rear of the liposome. Then, we demonstrated the movement of the liposome by flowing it to the microchannel. The liposome successfully moved in the direction of the lower ion concentration at a speed of 0.6 mum min-1 owing to the osmotic pressure difference. Finally, we visualized the inner flow in the liposome by encapsulating microbeads in the liposome and observed the movement of the microbeads to verify that an osmotic flow was generated on the liposome. As a result, we observed the circulation of the microbeads in the liposome when the concentration difference was applied to the front and rear of the liposome, suggesting that the movement of the liposome was driven by the osmotic flow generated by the osmotic pressure difference. These results indicate that the osmotic-pressure-based migration mechanism has the potential to be utilized as the actuator of molecular robots.

Shorie, M., et al. (2019). "Graphitic carbon nitride QDs impregnated biocompatible agarose cartridge for removal of heavy metals from contaminated water samples." Journal of Hazardous Materials **367**: 629-638.

Highly fluorescent, water-stable graphitic carbon nitride quantum dots (gCN QDs) synthesized by microwave assisted solvo-thermal technique and characterized via optical spectroscopy, XRD, HR-TEM, Fluorescence spectroscopy, FT-IR and Raman spectroscopy. Synthesized gCN were used for the removal of mercury ions from polluted water samples in a microcartridge format. Density functional theory (DFT) calculations revealed a possible interaction of mercury atoms, and embedment of mercury atom onto synthesized gCN surface lead to moderate structural distortion, reduced band gap and altered dielectric response. Experimentally, the excitation dependent fluorescence of QDs is highly compromised in presence of mercuric (Hg²⁺) and other ions, validating the theoretical findings, and establishing their use as metal sensor probes. Hg²⁺ binding ability with gCN QDs was further utilized in developing bioinspired micro-cartridge via covalent conjugation to Agarose microbeads. Micro-cartridge can remove heavy metal contamination from polluted water with a binding efficiency of 24.63 mg HgCl₂ for 10 mg of Agarose-gCN conjugate.

Shruti, V. C., et al. (2019). "Microplastics in freshwater sediments of Atoyac River basin, Puebla City, Mexico." Science of the Total Environment **654**: 154-163.

Microplastics (MPs) are contaminants of emerging concern in aquatic environments. The abundance, distribution and characteristics (color, morphology, texture) of MPs from Atoyac River basin, a highly urbanized river system located in Central Mexico were investigated in this study. The sediment samples were collected from 29 different sites along the Atoyac River basin in four different zones: Zahuapan River, Atoyac River, Confluence zone and Valsequillo dam and processed for MPs extraction using ZnCl₂ density separation method. The total number of MPs in Zahuapan River, Atoyac River, Confluence zone and Valsequillo dam was 1633.34+/-202.56, 1133.33+/-72.76, 833.33+/-80.79 and 900+/-346.12itemskg⁻¹ respectively. It was found that the concentration of MPs is higher in the downstream section of the river (confluence zone: 833.33+/-80.79 & Valsequillo dam: 900+/-346.12itemskg⁻¹), revealing significant impacts of dense population and industrial complex of Puebla City. Colored MPs were predominant accounting for 51% and white MPs for 49% of the total MPs. Films (25.9%) and fragments (22.2%) were the most abundant type followed by fibers (14.8%). Scanning electron microscope images revealed varying disintegration features and energy-dispersive X-ray spectra demonstrated the presence of different metal elements on the surface of MPs. The results highlighted the widespread distribution of MPs in the sediments of Atoyac River basin, Mexico.

Shyma, K. P., et al. (2011). "Latex agglutination test for detection of trypanosomosis in equines." Journal of Veterinary Parasitology **25**(2): 132-134.

A study was conducted to screen some horses in Haryana for trypanosomosis by monoclonal antibody based latex agglutination test (MAb-LAT). The latex reagent used in the present study contained suspension of latex microbeads, coated with anti-Trypanosoma evansi murine monoclonal antibody. Seventy one horse blood samples were screened initially by wet blood film (WBF) and their corresponding serum samples were subjected to MAb-LAT. Some of these samples (n=16) were also examined by microhaematocrit centrifugation technique (MHCT). None of the blood samples showed the presence of T. evansi by WBF, whereas MHCT could detect 1 (6.25%) sample positive. However, 33 samples (46.48%) were found positive by MAb-LAT. This study has revealed that MAb-LAT is more sensitive than the conventional parasitological examination for detection of trypanosomosis in horses. Moreover MAb-LAT is simple to perform, rapid, cost-effective and does not require sophisticated equipment for reading the results and hence can be used as a field-level test.

Si, L., et al. (2009). "Calcium pectinate gel bead intended for oral protein delivery: preparation improvement and formulation development." Chemical & Pharmaceutical Bulletin **57**(7): 663-667.

Calcium pectinate gel (CPG) micrometer-sized beads (microbeads) containing insulin, as a model amphoteric protein, were prepared by ionotropic gelation technique together with an air compressor. The influences of phosphate buffer, pH as well as calcium and pectin concentrations of cross-linking solution on the characteristics and release profiles of microbeads were investigated. With the aid of compressed air flow, the mean diameters of beads were successfully decreased to micron-sized. The results showed that all the factors investigated greatly affected the entrapment efficiencies and release profiles of the microbeads. Suitable formulation concentrations should be considered and great care should be taken to maintain the pH of working solutions at or close to isoelectric point of protein loaded during the whole preparation process. Hence, CPG microbeads of perfect spherical shape, uniform sizes, enhanced mechanical strength, good entrapment efficiencies and delayed release profiles were prepared for a load of amphoteric protein and peptide drugs, without any use of organic solvents or harsh ingredients. Therefore, CPG microbeads could be a promising carrier for oral controlled-release systems of amphoteric protein and peptide drugs.

Siddiqui, K. F., et al. (2011). "Understanding the biology of 16 kDa antigen of Mycobacterium tuberculosis: Scope in diagnosis, vaccine design and therapy." Critical Reviews in Microbiology **37**(4): 349-357.

Heat shock proteins (HSPs) are conserved and ubiquitous house keeping entities that act as molecular chaperones, which protect the cell from damage during stress. One such HSP, the 16kDa antigen, from Mycobacterium tuberculosis (Mtb) has received considerable attention due to its importance in tuberculosis latency and immunodominant property. In this article, we discuss about the potential role of 16kDa antigen of Mtb in latency, its expression, regulation, and implication in host immune response. We also highlight the scope of employing 16kDa in early diagnosis, development of vaccine and as a potential drug target. © 2011 Informa Healthcare USA, Inc.

Siddiqui, M. N., et al. (2009). "Determination of trace metals using laser induced breakdown spectroscopy in insoluble organic materials obtained from pyrolysis of plastics waste." Bulletin of environmental contamination and toxicology **83**(1): 141-145.

Laser induced breakdown spectroscopy (LIBS) was applied for the detection of trace elements in non-degradable part of plastics known as insoluble organic material, obtained from thermal and catalytic degradation of plastics. LIBS signal intensity for each metal measured in the test sample was unique and different. The capability of this technique is demonstrated by analyzing various trace metals present inside plastics and also compared with ICP results. The metal concentration (ppm) measured with LIBS and verified by ICP for Ag (901), Al (522), Fe (231), Co (628), V (275), Ni (558), Pb (325), Mn (167) and Cd (378) are higher than permissible safe limits. © 2009 Springer Science+Business Media, LLC.

Siddiqui, M. N., et al. (2008). "Identification of different type of polymers in plastics waste." Journal of Environmental Science & Health Part A-Toxic/Hazardous Substances & Environmental Engineering **43**(11): 1303-1310.

The main goal of this work was to develop and test advanced techniques for the instant identification of different type of polymers in post-consumer plastics. In order to accomplish this task, infrared (IR), X-ray diffraction (XRD), differential scanning calorimetric (DSC) and laser

induced breakdown spectroscopic (LIBS) techniques were applied. The following six model plastics were identified in this study. Low-density polyethylene (LDPE), High-density polyethylene (HDPE), Polypropylenes (PP), Polystyrene (PS), Polyethylene terephthalate (PET) and Polyvinyl chloride (PVC) along with few randomly selected plastics waste such as water bottle and cap, water cups, yogurt container and coke bottle were studied. IR has shown the fingerprinting of polymer types present in plastics waste. The XRD analysis helps to provide characteristic spectral lines whose intensities vary with the type of each constituent polymer. The DSC method provided the different crystalline melting temperature, glass transition, and onset temperature for the peaks and the percent crystallinity data single out different polymers. The ratio of LIBS signals intensities of carbon and hydrogen atoms were employed for the finger printing of the different family of plastics. The combined use of IR, XRD, DSC and LIBS techniques yielded very useful and effective results for plastic waste management.

Sieber, R., et al. (2020). "Dynamic probabilistic material flow analysis of rubber release from tires into the environment." Environmental Pollution **258 (no pagination)**(113573).

The release of rubber to the environment was quantified by dynamic probabilistic material flow analysis and proportions ending up in roadsides, water and soils were obtained. The presence of microplastics in the environment is currently receiving a lot of attention. Rubber particles from tire wear have been estimated in several mass emission inventories to be a major contributor to the total microplastic release. This work used dynamic probabilistic material flow analysis to quantify the flows of rubber particles from tires to roads and further onto soils and surface waters of Switzerland. The model considered the whole life-cycle of tires from import over the use phase to the end-of-life and the re-use of scrap tires. Uncertainties of model parameters and data variability were considered by using a probabilistic approach. Mass flows onto soils and through road drainage by both uncontrolled dispersal and engineered systems are considered. In addition, the release of rubber from artificial turfs was included. The accumulation of rubber particles in the environment was quantified over the time frame from 1988 to 2018. The results show that in 2018, 1.29 +/- 0.45 kg/capita of rubber was emitted from tire wear (97%) and rubber granules (3%). Street cleaning and waste water treatment removed around 26% of this rubber mass before finally reaching the receiving environmental compartment, resulting in an effective input of 0.96 +/- 0.35 kg/capita of rubber in 2018 into the natural environment. Most of this mass (74%) was deposited on roadside soils (up to 5 m distance from road), 22% flowed into surface waters and the remaining part (4%) was emitted to soils. The dynamic modeling showed an increase of the input into the environment by about 10% from 1990 to 2018. The ban of sewage sludge application on soils resulted in a marked decrease in the amount transferred to soils after the year 2000. In total, 219 +/- 22 ktonnes of rubber particles have accumulated in the environment since 1988 in Switzerland. Copyright © 2019 Elsevier Ltd

Siegel, C., et al. (2012). "Selective factor XIIa inhibition attenuates silent brain ischemia." Molecular Imaging and Biology **1)**: S861.

Objective - Silent brain ischemia (SBI) can be observed in up to 45% of patients who undergo invasive vascular procedures. Unlike acute stroke, the diffuse nature of SBI and its less tangible clinical symptoms make this disease difficult to diagnose and treat. Hence, there is a need to better understand the pathophysiology of SBI to a) improve its detection and b) explore therapeutic targets. Methods and Results - Here we use a murine model of SBI induced by injection of 500 microbeads of 43 mum diameter or 10 muL of fluorescently labeled fractionated clot (~10 mum size). Using sensitive molecular imaging, we found abnormal activation of the coagulation cascade (SPECT-CT of factor XIII activity) and inflammation (T1 weighted MRI of

myeloperoxidase activity) close to where emboli lodge in the brain. Injection of microbeads induced more MPO activity when compared to thromboemboli (contrast-to-noise-ratio, CNR, microbeads: 36 +/- 1, thromboemboli: 23 +/- 2, p<0.05) and larger lesions (number of MPO-Gd+ voxels in the brain, microbeads: 3162 +/- 1435, thromboemboli: 548 +/- 207; p = 0.05). A recombinant selective factor XIIa inhibitor derived from the hematophagous insect Triatoma infestans (rHA-Infestin-4) significantly reduced ischemic damage (54-66% reduction of TTC-negative area, p<0.05) and pathological coagulation (35-39% reduction of FXIII activity, p<0.05) without increasing hemorrhagic frequency. Ex vivo imaging and histopathology confirmed the in vivo data. Conclusion - Focal intracerebral clotting and inflammatory activity are part of the pathophysiology underlying SBI, and can be detected by SPECT-CT imaging of blood coagulation factor XII activity, as well as MPO-activated Gd compounds on MRI. Inhibiting factor XIIa with rHA-Infestin-4 may present a safe and effective treatment to decrease the morbidity from SBI.

Siegfried, M., et al. (2017). "Export of microplastics from land to sea. A modelling approach." Water Research **127**: 249-257.

Quantifying the transport of plastic debris from river to sea is crucial for assessing the risks of plastic debris to human health and the environment. We present a global modelling approach to analyse the composition and quantity of point-source microplastic fluxes from European rivers to the sea. The model accounts for different types and sources of microplastics entering river systems via point sources. We combine information on these sources with information on sewage management and plastic retention during river transport for the largest European rivers. Sources of microplastics include personal care products, laundry, household dust and tyre and road wear particles (TRWP). Most of the modelled microplastics exported by rivers to seas are synthetic polymers from TRWP (42%) and plastic-based textiles abraded during laundry (29%). Smaller sources are synthetic polymers and plastic fibres in household dust (19%) and microbeads in personal care products (10%). Microplastic export differs largely among European rivers, as a result of differences in socio-economic development and technological status of sewage treatment facilities. About two-thirds of the microplastics modelled in this study flow into the Mediterranean and Black Sea. This can be explained by the relatively low microplastic removal efficiency of sewage treatment plants in the river basins draining into these two seas. Sewage treatment is generally more efficient in river basins draining into the North Sea, the Baltic Sea and the Atlantic Ocean. We use our model to explore future trends up to the year 2050. Our scenarios indicate that in the future river export of microplastics may increase in some river basins, but decrease in others. Remarkably, for many basins we calculate a reduction in river export of microplastics from point-sources, mainly due to an anticipated improvement in sewage treatment.

Sierra, I., et al. (2019). "Identification of microplastics in wastewater samples by means of polarized light optical microscopy." Environmental Science & Pollution Research **28**: 28.

Many reports state the potential hazards of microplastics (MPs) and their implications to wildlife and human health. The presence of MP in the aquatic environment is related to several origins but particularly associated to their occurrence in wastewater effluents. The determination of MP in these complex samples is a challenge. Current analytical procedures for MP monitoring are based on separation and counting by visual observation or mediated with some type of microscopy with further identification by techniques such as Raman or Fourier-transform infrared (FTIR) spectroscopy. In this work, a simple alternative for the separation, counting and identification of MP in wastewater samples is reported. The presented sample preparation technique with further polarized light optical microscopy (PLOM) observation positively identified the vast majority of MP particles occurring in wastewater samples of Montevideo, Uruguay, in the 70-600 mum range. MPs with different shapes and chemical composition were identified by PLOM and confirmed by confocal Raman microscopy. Rapid identification of polyethylene (PE), polypropylene (PP) and polyethylene terephthalate (PET) were evidenced. A major limitation was found in the identification of MP from non-birefringent polymers such as PVC (polyvinylchloride). The proposed procedure for MP analysis in wastewater is easy to be implemented at any analytical laboratory. A pilot monitoring of Montevideo WWTP effluents was carried out over 3-month period identifying MP from different chemical identities in the range 5.3-8.2 x 10³ MP items/m³.

Sievert, W., et al. (2014). "Adhesion Molecule Expression and Function of Primary Endothelial Cells in Benign and Malignant Tissues Correlates with Proliferation." PLoS ONE **9**(3).

Background Comparative analysis of the cellular biology of the microvasculature in different tissues requires the availability of viable primary endothelial cells (ECs). This study describes a novel method to isolate primary ECs from healthy organs, repair blastemas and tumors as examples of non-proliferating and proliferating benign and malignant tissues and their functional characterization. Methodology/Principal Findings Single cell suspensions from hearts, lungs, repair blastemas and tumors were incubated consecutively with an anti-CD31 antibody and magnetic micro-beads, coupled to a derivative of biotin and streptavidin, respectively. Following magnetic bead separation, CD31-positive ECs were released by biotin-streptavidin competition. In the absence of micro-beads, ECs became adherent to plastic surfaces. ECs from proliferating repair blastemas and tumors were larger and exhibited higher expression densities of CD31, CD105 and CD102 compared to those from non-proliferating normal tissues such as heart and lung. The expression density of CD34 was particularly high in tumor-derived ECs, and that of CD54 and CD144 in ECs of repair blastemas. Functionally, ECs of non-proliferating and proliferating tissues differed in their capacity to form tubes in matrigel and to align under flow conditions. Conclusions/Significance This method provides a powerful tool to generate high yields of viable, primary ECs of different origins. The results suggest that an altered expression of adhesion molecules on ECs in proliferating tissues contribute to loss of EC function that might cause a chaotic tumor vasculature.

Sighicelli, M., et al. (2018). "Microplastic pollution in the surface waters of Italian Subalpine Lakes." Environmental Pollution **236**: 645-651.

Plastic debris incidence in marine environment was already highlighted in the early 1970s. Over the last decade, microplastic pollution in the environment has received increasing attention and is now an emerging research area. Many studies have focused on quantifying microplastic abundance in the marine environment, while there are relatively few data on microplastic occurrence in freshwater environment. Recent studies have reported high concentrations of microplastics in lakes and rivers, although the understanding of several factors influencing source, transport and fate is still limited. This study compares different lakes and the common factors, which could influence the occurrence and distribution of microplastics. The three subalpine lakes monitored include Lake Maggiore, Iseo and Garda. The selected sampling transects reflect the hydrologic conditions, the morphometric characteristics of these lakes, and other factors influencing the release of plastics debris in lakes. Particles of microplastics (<5 mm) were found in all sampled surfaces. The particles collected were classified depending on their number, shape and composition. The shape distribution showed the dominating occurrence of fragments (73.7%). The chemical composition of all examined samples clearly shows dominating

presence of polyethylene (45%), polystyrene (18%) and polypropylene (15%). The results provide significant relations among the different contribution of direct and diffuse sources to the quantity of microplastics, highlighting the importance of understanding the spatial distribution dynamics of microplastics within a lake system that acts as a sink and source of plastic particles. The significant presence of microplastics in Italian freshwater systems and the spatial variation in microplastic concentration confirm the importance of the input sources. Copyright © 2018

Sigle, J. P., et al. (2013). "Anti-leucocyte antibodies in platelet apheresis donors with and without prior immunizing events: implications for TRALI prevention." Vox Sanguinis **105**(3): 244-252.

BACKGROUND AND OBJECTIVES: Transfusion-related acute lung injury (TRALI) prevention strategies in platelet (PLT) apheresis donors focus on identifying antileucocyte antibody-positive donors. The use of microbead based assays for screening purposes is hampered by the lack of a consensus cut-off for TRALI prevention and the undefined role of anti-leucocyte antibodies in never-alloexposed donors. This study evaluated anti-leucocyte antibody assays in PLT apheresis donors with and without prior immunizing events with special focus on microbead assay cut-offs, antibody specificities and their potential significance in never-alloexposed donors.

MATERIAL AND METHODS: Blood samples of male and female PLT apheresis donors with and without history of prior immunization were tested for anti-leucocyte antibodies.

RESULTS: Of 262 female and 118 male PLT apheresis donors, 37.4% had prior immunizing events. Fifty-eight of 238 (24.4%) donors without prior immunizing event had anti-HLA antibodies confirmed in microbead single antigen assay (mean fluorescence intensity (MFI) >500). Even with a cut-off MFI >3000, anti-HLA antibodies were detected in 10.6% of female and 4.3% of male donors without history of immunization. Of the antibody specificities found, 6 of 17 (35.3%) anti-HLA-A, 4 of 8 (50.0%) anti-HLA-B and 4 of 6 (66.6%) anti-HLA class II antibodies have been detected in donors associated with TRALI cases in the literature.

CONCLUSION: Platelet apheresis donors without history of immunization have anti-leucocyte antibodies that potentially can cause TRALI. In our opinion, this cohort should be included in screening strategies for TRALI prevention. As references and consensus cut-offs have not yet been established, it is premature to use microbead assays as standard for donor screening.

Sigler, M. (2014). "The effects of plastic pollution on aquatic wildlife: current situations and future solutions." Water, Air, and Soil Pollution **225**(11).

The majority of consumer products used today are comprised of some form of plastic. Worldwide, almost 280 million t of plastic materials are produced annually, much of which ends up in landfills or the oceans (Shaw and Sahni Journal of Mechanical and Civil Engineering 46-48, 2014). While plastics are lightweight, inexpensive, and durable, these same qualities can make them very harmful to wildlife, especially once they become waterborne. Once seaborne, plastics are most likely found circulating in one of five major ocean gyres: two in the Pacific, one in the Indian, and two in the Atlantic. These ocean garbage patches are not solid islands of plastic; instead, they are a turbid mix of plastics (Kostigen 2008; Livingeco 2011). Recent research conducted on the surfaces of the Great Lakes has identified similar problems (Erikson et al. Marine Pollution Bulletin, 77(1), 177-182, 2013). A growing concern is that once plastics reach the wild, they may cause entanglement, death from ingestion, and carry invasive species. Several cutting edge technologies have been piloted to monitor or gather the plastics already in our environments and convert them back into oil with hopes to reduce the damage plastics are causing to our ecosystems.

Silkenstedt, E., et al. (2019). "Interaction of mantle cell lymphoma with the microenvironment induces phospho AKT-mediated resistance against BTK inhibition and can be overcome by co-treatment with a specific AKT inhibitor (MK-2206)." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Mantle cell lymphoma (MCL) is a distinct lymphoma subtype representing 6-8% of non-Hodgkin's lymphoma (NHL). Although with current standard therapy high initial response rates can be achieved, early relapses and rapid disease progression determine the clinical course of most MCL patients. Recently, Bruton's tyrosine Kinase (BTK) inhibitors have been introduced with highly promising clinical activity. Nevertheless, interindividual responsiveness is heterogenous and primary and secondary resistance has been reported. However, molecular mechanisms driving resistance to BTK inhibition are not well understood yet. Among other factors, interactions between the tumor and its microenvironment have been proposed to play an important role in response to targeted therapy. In this study, we investigated the influence of tumor cell interaction with its microenvironment on sensitivity to the BTK inhibitor CC292 in vitro. MCL cell lines JeKo-1, Z-138 and Granta-519 were treated with 5 muM of CC292 alone or in co-culture with human bone marrow stromal cells (HS-5) and cell death induction and proliferation were assessed. Expression of proteins involved in BCR signaling and other tumor-promoting pathways was analyzed by Western Blot. Co-cultured MCL cells settled within the stromal cell layer were separated using MACS Feeder removal microbeads prior to Western Blot analysis. In all cell lines, direct interaction with the microenvironment markedly reduced sensitivity towards CC292 treatment (by 22% (JeKo-1), 33% (Granta) and 64 % (Z-138)). Importantly, cell-cell contact was shown to play a crucial role for mediating resistance to CC292 as only those MCL cells settled within the stromal cell layer proved to be significantly less vulnerable to the inhibitor compared to MCL cells co-cultured with HS-5 but separated by a transwell insert. Western Blot analysis showed a reduction of protein levels of phBTK upon treatment with CC292 in both, mono- and co-cultured cells. Interestingly, direct interaction of MCL cells with the microenvironment strongly induced protein expression of phAkt. Accordingly, phosphorylation (inactivation) of the pro-apoptotic FoxO1, a downstream-target of phAkt, was increased and its translocation to the nucleus was decreased in those cells. We could show that the effect of microenvironment interaction on sensitivity towards CC292 is mediated by Akt as knockdown of Akt using siRNA restored sensitivity to the drug. Furthermore, co-treatment of MCL cells with CC292 and the specific Akt inhibitor MK-2206 hampered upregluation of phAkt in co-cultivated cells and prevented Akt-mediated sequestration of FoxO1 in the cytoplasm, resulting in translocation of FoxO1 to the nucleus. Thus, combination with MK-2206 could significantly overcome microenvironment-mediated protection from growth inhibition and apoptosis induction upon CC292 treatment. Moreover, combination of the BTK inhibitor CC292 and the Akt inhibitor MK-2206 proved to act synergistically in MCL cells in all dose combinations tested (Combination index 0,73-0,93 in Z-138; 0,47-0,78 in JeKo-1). Taken together, cell-cell-interaction of MCL cells with their microenvironment protected them from CC292-induced cell death. This effect was mediated by increased phAkt expression resulting in inhibition of pro-apoptotic signaling and could effectively be overcome by combination with the specific Akt inhibitor MK-2206. Furthermore, CC292 and MK-2206 acted synergistically in MCL cells. Our results indicate that co-targeting the PI3K/Akt-pathway might be a promising strategy to overcome resistance to BTK inhibition mediated by interaction with the microenvironment.

Sillanpaa, M. and P. Sainio (2017). "Release of polyester and cotton fibers from textiles in machine washings." Environmental Science & Pollution Research **24**(23): 19313-19321.

Microplastics are widely spread in the environment, which along with still increasing production

have aroused concern of their impacts on environmental health. The objective of this study is to quantify the number and mass of two most common textile fibers discharged from sequential machine washings to sewers. The number and mass of microfibers released from polyester and cotton textiles in the first wash varied in the range 2.1 x 10⁵ to 1.3 x 10⁷ and 0.12 to 0.33% w/w, respectively. Amounts of released microfibers showed a decreasing trend in sequential washes. The annual emission of polyester and cotton microfibers from household washing machines was estimated to be 154,000 (1.0 x 10¹⁴) and 411,000 kg (4.9 x 10¹⁴) in Finland (population 5.5 x 10⁶). Due to the high emission values and sorption capacities, the polyester and cotton microfibers may play an important role in the transport and fate of chemical pollutants in the aquatic environment.

Silva, C. J. M., et al. (2019). "Ingestion of small-sized and irregularly shaped polyethylene microplastics affect Chironomus riparius life-history traits." Science of the Total Environment **672**: 862-868.

Microplastics (MPs) are emerging contaminants of freshwater ecosystems. Once in aquatic systems, most of these plastic particles undergo processes of fragmentation, biofouling, and sedimentation, resulting in increased concentrations of smaller sized and irregularly-shaped particles in the sediment. High levels of MPs in freshwater sediments can denote a potential threat to benthic and sediment-dwelling organisms such as dipteran larvae. This study evaluates the ecotoxicological effect of three pools of irregularly-shaped polyethylene (PE) microplastics (pools containing 90% of the particles within 32-63 micro m (size-class A), 63-250 micro m (size-class B) and 125-500 micro m (size-class C)), with concentrations ranging from 1.25 to 20 g Kg⁻¹ sediment, on the dipteran Chironomus riparius life-history traits. After ten days of exposure, larvae ingested PE particles typically in the 32-63 micro m range, even when 90% of the particles possessed higher size (i.e., in size-classes B and C) and the larvae mandible allowed the ingestion of such bigger-sized particles. Thus, the number of ingested particles was higher in size-class A, followed by B and C, and led to a significant reduction with similar magnitude on larval growth (Lowest Observed Effect Concentrations (LOEC)=2.5 g Kg⁻¹ sediment DW) and a significant delay on imagoes emergence (e.g., LOEC=1.5 g Kg⁻¹ sediment DW for females). The results from this study show that the ingestion and persistence of small-sized polyethylene microplastics caused significant impairments on life-history traits of C. riparius. Considering their role on freshwater food-webs and the potential persistence of small-sized PE particles in their larval gut, these results also point for the potential adverse effects of small-sized microplastics at the community and ecosystem level.

Silva, J. D. B., et al. (2018). "Use of resources and microplastic contamination throughout the life cycle of grunts (Haemulidae) in a tropical estuary." Environmental Pollution **242**(Part A): 1010-1021.

The distribution, feeding ecology and microplastic contamination were assessed in different ontogenetic phases of Haemulidae species inhabiting the Goiana Estuary, over a seasonal cycle. Pomadasys ramosus and Haemulopsis corvinaeformis are estuarine dependent species that use habitats with specific environmental conditions each season. Pomadasys ramosus was found in the upper and middle estuaries during the rainy season, when salinity showed the lowest values. Haemulopsis corvinaeformis was found in the lower estuary during the dry season, when salinity increased in the estuary. Juveniles of P. ramosus are zooplanktivores, feeding mainly on calanoid copepods. Sub-adults and adults are zoobenthivores, feeding on invertebrates associated to the bottom, mainly Polychaeta. Juveniles of H. corvinaeformis were not found in the main channel, but sub-adults and adults showed a zoobenthivore habit, feeding mainly on Anomalocardia flexuosa (Mollusca: Bivalvia). Dietary shifts along the life cycle and the spatio-temporal

relationship between their distribution and the availability of microplastics along the estuary seem to have a strong influence in the ingestion of microfilaments. The highest average ingestion of microfilaments by P. ramosus coincided with the peak of ingestion of Polychaeta by sub-adults in the upper estuary during the late rainy season. For H. corvinaeformis the highest ingestion of microfilaments coincided with the peak of ingestion of A. flexuosa by adults in the lower estuary during the late dry season. Such contamination might be attributed to the time when these phases shifted to a more diverse diet and began to forage on benthic invertebrates. Research on microplastic contamination must consider species-specific behaviour, since the intake of microplastics is dependent on patterns of distribution and trophic guild within fish assemblages.

Silva, J. S., et al. (2008). "Flag items as a tool for monitoring solid wastes from users on urban beaches." Journal of Coastal Research **24**(4): 890-898.

An experiment was designed to test if the contamination of intensely used beaches by solid wastes could be correlated to the presence of users. Profiles perpendicular to the water line were marked on Boa Viagem Beach, Recife City, Pernambuco, Brazilian Northeast. The solid waste items collected within these profiles at days of high user frequency revealed that some items might be used as flags for the presence (and contribution to the contamination) of users on the beach. Such items especially abundant were plastic cups and drinking straws. The contamination of the beach has the same qualitative character at all sites at all times. However, the amount of flag items changes according to the more intense use of the beach, especially during summer weekends and sociocultural events, when use reaches its maximum intensity.

Silva, K. C. G., et al. (2018). "Symbiotic microencapsulation to enhance Lactobacillus acidophilus survival." LWT Food Science and Technology **89**: 503-509.

Lactobacillus acidophilus was microencapsulated in alginate-gelatin (AG) and alginate-gelatin-fructooligosaccharides (AGF) microbeads by external gelation, with the purpose of increasing the viability of the probiotic culture when exposed to gastrointestinal tract (GIT) and during storage when added to yogurt. The microencapsulation provided greater protection of cells when exposed to simulated GIT. Moreover the addition of fructooligosaccharide (FOS) to the matrix promoted the formation of a more interconnected network, which contributed to better protection of cells and controlled delivery. Microencapsulation process proved to not affect cell viability. Microbeads AG and AGF improved probiotic survival during the storage in yogurt compared to free L. acidophilus (FLA). This study showed that symbiotic microencapsulation provided greater viability of L. acidophilus during the storage in yogurt and in GIT, as well as providing functional characteristics of yogurt with added of AGF microbeads.

Silva, M. M., et al. (2019). "Dispersal of potentially pathogenic bacteria by plastic debris in Guanabara Bay, RJ, Brazil." Marine Pollution Bulletin **141**: 561-568.

Analyses of thermotolerant coliform and heterotrophic bacteria as well as Escherichia coli and Vibrio species were carried out on plastic samples and in the surrounding waters of Guanabara Bay to evaluate plastic debris as vehicles of bacterial dispersal. Chemical characterizations of plastics were performed using Fourier transform infrared spectroscopy (FTIR). Plastic debris with high coliform contents were found, while their respective water samples had only low titers. No correlations were observed, however, between the amounts of bacteria and the chemical compositions of the plastic debris. Forty-four bacterial strains were PCR-confirmed as E. coli pathotypes, and 59 strains of Vibrio spp. (with 12 being identified as Vibrio cholerae [6], Vibrio vulnificus [5], and Vibrio mimicus [1]). These findings suggest these plastics can function as a

substrate for bacterial biofilms (including pathogens). These debris, in turn, can be dispersed in aquatic environments not otherwise showing recent fecal bacterial contamination. Copyright © 2019 Elsevier Ltd

Silva-Cavalcanti, J. S., et al. (2017). "Microplastics ingestion by a common tropical freshwater fishing resource." Environmental Pollution **221**: 218-226.

Microplastics pollution is widespread in marine ecosystems and a major threat to biodiversity. Nevertheless, our knowledge of the impacts of microplastics in freshwater environments and biota is still very limited. The interaction of microplastics with freshwater organisms and the risks associated with the human consumption of organisms that ingested microplastics remain major knowledge gaps. In this study, we assessed the ingestion of microplastics by Hoplosternum littorale, a common freshwater fish heavily consumed by humans in semi-arid regions of South America. We assessed the abundance and diversity of both plastic debris and other food items found in the gut of fishes caught by local fishermen. We observed that 83% of the fish had plastic debris inside the gut, the highest frequency reported for a fish species so far. Most of the plastic debris (88.6%) recovered from the guts of fish were microplastics (<5 mm), fibres being the most frequent type (46.6%). We observed that fish consumed more microplastics at the urbanized sections of the river, and that the ingestion of microplastics was negatively correlated with the diversity of other food items in the gut of individual fish. Nevertheless, microplastics ingestion appears to have a limited impact on H. littorale, and the consequences of human consumption of this fish were not assessed. Our results suggest freshwater biota are vulnerable to microplastics pollution and that urbanization is a major factor contributing to the pollution of freshwater environments with microplastics. We suggest the gut content of fish could be used as a tool for the qualitative assessment of microplastics pollution in freshwater ecosystems. Further research is needed to determine the processes responsible for the high incidence of microplastics ingestion by H. littorale, and to evaluate the risk posed to humans by the consumption of freshwater fish that ingested microplastics.

Silva-Cote, I., et al. (2019). "Strategy for the Generation of Engineered Bone Constructs Based on Umbilical Cord Mesenchymal Stromal Cells Expanded with Human Platelet Lysate." Stem Cells International **2019 (no pagination)**(7198215).

Umbilical cord mesenchymal stromal cells (UC-MSC) are promising candidates for cell therapy due to their potent multilineage differentiation, enhanced self-renewal capacity, and immediate availability for clinical use. Clinical experience has demonstrated satisfactory biosafety profiles and feasibility of UC-MSC application in the allogeneic setting. However, the use of UC-MSC for bone regeneration has not been fully established. A major challenge in the generation of successful therapeutic strategies for bone engineering lies on the combination of highly functional proosteogenic MSC populations and bioactive matrix scaffolds. To address that, in this study we proposed a new approach for the generation of bone-like constructs based on UC-MSC expanded in human platelet lysate (hPL) and evaluated its potential to induce bone structures in vivo. In order to obtain UC-MSC for potential clinical use, we first assessed parameters such as the isolation method, growth supplementation, microbiological monitoring, and cryopreservation and performed full characterization of the cell product including phenotype, growth performance, tree-lineage differentiation, and gene expression. Finally, we evaluated bone-like constructs based on the combination of stimulated UC-MSC and collagen microbeads for in vivo bone formation. UC-MSC were successfully cultured from 100% of processed UC donors, and efficient cell derivation was observed at day 14+/-3 by the explant method. UC-MSC maintained mesenchymal cell morphology, phenotype, high cell growth

performance, and probed multipotent differentiation capacity. No striking variations between donors were recorded. As expected, UC-MSC showed tree-lineage differentiation and gene expression profiles similar to bone marrow- and adipose-derived MSC. Importantly, upon osteogenic and endothelial induction, UC-MSC displayed strong proangiogenic and bone formation features. The combination of hPL-expanded MSC and collagen microbeads led to bone/vessel formation following implantation into an immune competent mouse model. Collectively, we developed a high-performance UC-MSC-based cell manufacturing bioprocess that fulfills the requirements for human application and triggers the potency and effectivity of cell-engineered scaffolds for bone regeneration. Copyright © 2019 Ingrid Silva-Cote et al.

Silvestris, E., et al. (2015). "Ovarian stem cells in perspective treatment of infertility: A preliminary isolation approach." Human Reproduction **1)**: i459.

Study question: Ovarian stem cells (OSC) have been detected in mice and postulated in human ovaries1. They typically expose Ddx-4 (DEAD box polypeptide 4), a stemness marker uniquely expressed by germ line cells as both OSCs and spermatogones. Thus, we tried to isolate OSCs from woman ovaries by immunoselection using anti-Ddx-4 antidodies. Summary answer: Although at low percentage, OSCs are located within the cortex of the human ovary and their isolation is possible by sorting with appropriate combined separation methodology. Once isolated, OSCs appear viable and can be further characterized and/or cultured for additional studies. What is known already: Despite the general opinion that postnatal mammalian ovaries of most species do not contain renewable germinal OSCs2, previous work by Tilly and co-workers showed the existence of OSCs in human ovaries since these cells were separated by Ddx-4 positive selection3. However, these finding were confuted for the major cytoplasmic expression of Ddx-4. The antigen, indeed, is expressed both on cell membrane and cytoplasm by OSCs, whereas mature oocytes contain only its cytoplasmic tale. Study design, size, duration: The study was aimed to verify the occurrence and tentatively separate the OSCs from a small number of human ovaries by using magnetic immunoselection and sorting with anti-Ddx-4 reagents and subsequent typing by flowcytometry with specific monoclonal antibodies (MoAb) to specific cell lineage markers. Participants/materials, setting, methods: Ovarian cortex fragments from three women undergoing ovariectomy in premenopausal age, were digested by collagenase, filtered, suspended in presence of rabbit anti-Ddx-4 antibody and then passed through a column including anti-rabbit IgG conjugated magnetic microbeads. The eluted cells were typed by flowcytometry and confocal microscopy to assess the Ddx-4 localization. Main results and the role of chance: Within the full cell suspension, we gated the putative OSC population in relation to the cell size and found that the double positive population including OCT4A+/Ddx-4+ cells, was poorly expressed, whereas a definite enrichment was observed after the immunomagnetic sorting. In fact, the enriched Ddx-4+ cell population was increased up to 24% from the original 2% value in the initial cortical suspension, with remarkable fluorescence intensity suggesting the high molecular expression of Ddx-4 molecule. By immunofluorescence under confocal microscopy, these cells appeared of small size with a large nucleus, few cytoplasm and highly FITC-fluorescent deposits on the cell membrane reflecting the consistent expression of Ddx-4 molecules. This result supports the suitability of the separation of OSCs by this simple methodology using the immunomagnetic cell sorting. Limitations, reason for caution: Major skepticism derives from using Ddx-4 as cell surface marker for the OSC sorting since its location in cytoplasm is still detectable in mature oocytes. However, only OSCs express the membrane associated Ddx-4 and further work investigating other membrane markers as OCT-4A and SSEA-4 may improve the OSC separation methods. Wider implications of the findings: The future applications of these findings to the infertility field will cover different and unrelated

conditions ranging from the endocrine defective ovarian reserve to the iatrogenic infertility associated to chemotherapy in cancer patients. On the other hand, besides the infertility treatment, OSCs can be further investigated in parallel studies aimed at restoring the woman endocrine physiology in postmeno-pausal age. However, this approach primarily requires animal experimental models to prove their efficacy in treating endocrine dysfunctions.

Silvia, A., et al. (2019). "Microplastic removal by Red Sea giant clam (Tridacna maxima)." Environmental Pollution **252**(Part B): 1257-1266.

This study assesses for the first time the ingestion of microplastics by giant clams and evaluates their importance as a sink for this pollutant. A total of 24 individuals of two size classes were collected from the Red Sea and then exposed for 12 days to 4 concentrations of polyethylene microbeads ranging from 53 to 500 micro m. Experiments revealed that clams actively take up microplastic from the water column and the average of beads retained inside the animal was ~7.55+or-1.89 beads individual ⁻¹ day ⁻¹ (5.76+or-1.16 MPs/g dw). However, the digestive tract itself cannot be considered the only sink of microbeads in Tridacnids. Indeed, shells play a key role as well. The abundance of microplastic adhering to the shells, which was estimated directly, was positively correlated to the concentration of beads found in the surrounding seawater. Therefore, clams' shells contribute to the removal of 66.03+or-2.50% of the microplastic present in the water column. Furthermore, stress responses to the exposure to polyethylene were investigated. Gross Primary Production:Respiration (GPP:R) ratio decreased throughout of the experiment, but no significant difference was found between treatments and controls.

Simon, J. C., et al. (1995). "Rapid purification of human Langerhans cells using paramagnetic microbeads." Experimental Dermatology **4**(3): 155-161.

Detailed studies on the biology of Langerhans cells (LC), which account for only 1-3% of all epidermal cells, require isolation from their cutaneous symbionts. Several techniques of LC isolation have been reported, including positive enrichment with mAb coupled to immunomagnetic beads. The disadvantage of this technique is the size of the beads (approximately 2-5 microns), which can interfere with subsequent phenotypic and functional analyses. This limitation prompted us to test whether paramagnetic microbeads (15 nm) employed by the MACS system could be used to purify LC from human skin. To isolate fresh LC (fLC), epidermal cell suspensions (EC) were stained with anti-CD1a mAb and with appropriate secondary reagents conjugated to microbeads and to FITC. They were then passed over a separation column and exposed to a strong magnetic field. Thereafter both CD1a-depleted and CD1a-enriched cells were collected. Cultured LC (cLC) were isolated by staining 72-h cultured EC with anti-HLA-DR mAb followed by the same isolation procedure. Using this technique, we could routinely isolate viable EC that were 45-88% CD1a+ or HLA-DR+ as determined by FACS. Two-color FACS analysis demonstrated the majority of MACS-purified cells to be CD1a+/HLA-DR+, indicating that they were indeed LC. By transmission electron microscopy (TEM), the MACS-purified CD1a+/HLA-DR+ cells showed typical ultrastructural characteristics of LC. Furthermore, MACS-purified fLC or cLC were functionally intact, because they stimulated the proliferation of alloreactive T cells in a primary, one-way, mixed epidermal cell leukocyte reaction (MECLR). We conclude that MACS-separation is an efficient and rapid method to isolate human fLC and cLC of high purity and unimpaired function.

Simon, M., et al. (2019). "Removal of >10 micro M microplastic particles from treated wastewater by a disc filter." Water **11**(9).

In this paper, we evaluate the performance of a disc filter that retains microplastic (MP) particles from treated wastewater. A focal plane array-based Fourier transform infrared imaging technique enabled MP quantification and an in-house-built software (MPhunter) facilitated automatic analysis of the obtained infrared spectra. The disc filter retained 89.7% of particles, and 75.6% of their mass. This removal efficiency is comparable to removal rates reported by previous studies. However, the presence of an unexpectedly large number of MP particles whose size substantially exceeded the pore size of the disc filter suggests that particles could either bypass or pass through the filter mesh, somewhat diminishing the performance of the filter. The concentration of MPs in the effluent was 3 MP/L, corresponding to an estimated mass concentration of 0.31 micro g/L. The annual MP discharge from the studied WWTP after the disc filter was estimated to be 1.1 kg in 2017. It was hence not a significant contributor to MP emissions in Denmark. Although the operation of the disc filter seems to have been disturbed, it nonetheless achieved a high MP removal rate. Therefore, we conclude that it is a suitable technology to decrease the concentration of discharged MPs in wastewater effluents.

Simon-Sanchez, L., et al. (2019). "River Deltas as hotspots of microplastic accumulation: the case study of the Ebro River (NW Mediterranean)." Science of the Total Environment **687**: 1186-1196.

Microplastics (MPs) are considered pollutants that are ubiquitously distributed in aquatic environments. One of the key hotspot areas to understand fluxes of MPs entering into the oceans are transitional systems, between fresh and marine waters, where river estuaries in particular play an important role. In this study we analyzed MPs occurrence in the Ebro River Delta, Northeastern Iberian Peninsula, one of the largest wetland areas in the NW Mediterranean Basin. Microplastic profile, abundance, distribution, and characteristics were screened across different environmental matrices. MPs were collected in sandy beaches on the northern edge of the delta, in estuarine benthic sediments, and in surface waters of the Ebro River, with a mean abundance of 422+or-119 MPs.kg⁻¹ DW, 2052+or-746 MPs.kg⁻¹ DW and 3.5+or-1.4 MPs.m⁻³, respectively. Fibers were found to be the largest class (70+or-22%) of the three different environmental matrices investigated. We estimated that the Ebro surface water represents an input of 2.14 x 10⁹ MPs.yr⁻¹ to the Mediterranean Sea. The main contribution of this study is a new insight on the distribution of MPs across different environmental matrices in river estuaries, where estuarine benthic sediments were identified as a potential important sink for MPs.

Simon-Sylvestre, G. and J. Chabannes (1975). "The effects of some cultural techniques on certain soil properties: effects on a maize crop." Annales Agronomiques **26**(1): 75-99.

In field trials in 1971-2, maize was given 1 application of 2.5 kg a.i. simazine/ha or was mulched with black plastic sheeting or was given a dark-coloured soil conditioner consisting of a suspension of plastic particles. Application of simazine did not significantly affect yield, growth or chemical composition of grain or vegetative organs. The plastic mulch increased growth and yield and increased N, P, K and S contents. The soil conditioner also increased yields and nutrient contents but the effect was less than that given by the plastic mulch.

Singh, N., et al. (2019). "Understanding the stability of nanoplastics in aqueous environments: effect of ionic strength, temperature, dissolved organic matter, clay, and heavy metals (Electronic supplementary information (ESI) available. See DOI: 10.1039/c9en00557a)." Environmental Science: Nano **6**(10): 2968-2976.

Nanoplastics (NPs) are one of the most dangerous fractions of plastics because of their possible eco-toxicological impacts. NP stability and transport are highly influenced by various

environmental factors, which warrants the necessity to understand their fate in ambient water systems. This study investigates the polystyrene (PS) NP stability under the effect of varying ionic strength, temperature, dissolved organic matter (DOM), inorganic soil colloids and heavy metal salts using the dynamic light scattering technique. Controlled studies were used to examine the aggregation of NPs in the presence of natural river water (RW), groundwater (GW), and seawater (SW). Results highlight that, at all studied temperatures, divalent cations had a greater influence on the aggregation rate of NPs as compared to monovalent cations whereas for the same salt, a drop in temperature tended to increase the stability. A rise in critical coagulation concentration (CCC) by 1.6 and 2.4 times for NaCl and CaCl2 was observed, respectively, at 15 °C as compared to 35 °C. Steric repulsion produced by DOM stabilizes NPs shifting the CCC value to a higher salt concentration for NaCl. However, faster aggregation with CaCl2 due to complexation was notable. The clay colloids participate in heteroaggregation with NPs under the influence of salts; this was confirmed using cryo-TEM. Heavy metal salts such as ZnCl2 and CdCl2 had interactions with PS NPs similar to that presented by CaCl2 but showed independent behaviour in the presence of HgCl2, due to metal speciation under different redox conditions. The concentration of salts and organic substances in the complex matrix of natural water results in the least stable NPs in SW > RW > GW. The results of this study contribute to the fundamental understanding of the fate of NPs in complex aquatic environments.

Singh, R. K., et al. (2019). "Thermal degradation of waste plastics under non-sweeping atmosphere: Part 1: Effect of temperature, product optimization, and degradation mechanism." Journal of Environmental Management **239**: 395-406.

Continuous generation of plastic waste has prompted substantial research efforts in its utilization as a feedstock for energy generation. Pyrolysis has emerged as one of the best waste management technique for energy extraction from the plastic waste. The objective of this work is to investigate the effect of operating temperature on the liquid product yields in the pyrolysis process by non-isothermal heating. Non-catalytic thermal pyrolysis of waste polyethylene (PE) [high density polyethylene (HDPE)], waste polypropene (PP), waste polystyrene (PS), waste polyethylene terephthalate (PET) and mixed plastic waste (MPW) was carried out in a non-sweeping atmosphere in a semi-batch reactor at four different temperatures 450, 500, 550, and 600 degreeC. The minimum degradation temperature of the mixed and individual plastics was obtained using a thermogravimetric apparatus (TGA) at a heating rate of 20^{degree}C/min. The TGA results show that all plastics degrade in a single step and the degradation temperatures of PS > PET > PP > HDPE, while mixed plastic degradation indicates two distinct degradation steps. Further, a waste polymer shows a lower degradation temperature than the virgin polymer. The degradation of HDPE is found to produce the maximum oil yield with minimum solid residue. The degradation of PET results in the highest amount of solid and benzoic acid as crystals and gas with no oil. Degradation of mixed plastic causes oil yield in the intermediate range of pyrolysis of individual plastic wastes. Overall, 500 degreeC is observed to be an optimum temperature for the recovery of low-density pyrolytic oil with the highest liquid yield. The degradation of PE and PP is found to be caused by random chain scission followed by inter and intramolecular hydrogen transfer. The degradation of PS occurs by side elimination or end chain scission followed by beta-scission mechanism. The degradation of mix plastics results from random chain scission followed by beta-scission mechanism. The effect of temperature on oil and gas recovery as well as recovery time was also assessed. Copyright © 2019 Elsevier Ltd

Singh, R. K., et al. (2020). "Waste plastic to pyrolytic oil and its utilization in CI engine: Performance

analysis and combustion characteristics." Fuel **262**: 1.

For application of pure plastic pyrolytic oil (PPO) several modifications in the engine is required which rejects the utilization of the existing engines while a blend of conventional fuel and PPO can be used with a slight change in engine without having a high impact on engine performance and hence the blends are preferred over the utilization of PPO as crude oil for diesel engines. In this study, the non-catalytic pyrolysis of mixed plastic waste at a temperature of 450 °C is done to obtain high-grade pyrolytic oil having a composition similar to petroleum fuels such as gasoline and diesel. Physical properties of the PPO were analysed, and the compound analysis was done with GC–MS. Further FTIR of PPO and diesel were analysed and compared. Five different ratios of 10, 20, 30, 40 and 50% PPO with diesel in blends were utilized as a fuel in a diesel engine to determine the engine performance and characteristics. The higher presence of PPO in blend increases the brake thermal efficiency (BTE) and reduces specific fuel consumption (SFC) with an increase in load as reported. The presence of PPO results in high heat release and delayed ignition resulting in high in-cylinder pressure. Further high amount of oxygenated compounds in PPO helps in reducing the emission from the combustion. The utilization of PPO with diesel upto 50% in the blend can be used in diesel engines with a slight increase in emission of CO at higher loads.

Singhal, U., et al. (2018). "Targeted gene expression profiling within circulating tumor cells in mCRPC." Journal of Urology **199 (4 Supplement 1)**: e1188.

INTRODUCTION AND OBJECTIVES: Moving from simple enumeration of circulating tumor cells (CTCs) to molecular characterization continues to be a critical need in order for CTC-based liquid biopsy approaches to move into the clinic. CTCs provide a unique avenue to assess tumor-specific RNA expression, and methods that replicate tissue-based approaches may help address key technical challenges. Tissue-based molecular risk classifiers, such as Prolaris and OncotypeDx, were previously developed by targeted expression profiling using the TaqMan Low Density Array (TLDA) platform. Here we describe the development of an approach to perform CTC-based, targeted gene expression profiling using the TLDA platform in patients with metastatic castrate resistant prostate cancer (mCRPC). METHOD(S): CTCs were isolated from 5 mL whole blood of mCRPC patients using an anti-EpCAM-microbead based protocol. Following cell lysis, mRNA from CTCs was captured using Oligo(dT)25 mRNA Dynabeads followed by reverse transcription. TLDA cards (Applied Biosystems) were used to perform simultaneous, singleplex qPCR detection of a custom panel of 48 prostate cancer related genes and controls, including AR, AR-V7, PCA3, PSMA, SChLAP1, TMPRSS2:ERG, and WNT5B. Blood processed from 22 healthy controls was used as a baseline referent to account for leukocyte contamination. Gene expression data from prostate cancer cells (VCaP, PC3, and LNCaP) spiked into normal control blood was used for CTC isolation assay development, and CTCs from 68 patients with mCRPC were subsequently evaluated. RESULT(S): CTC expression was assessed in 68 patients with mCRPC. We identified 46 (68%) that showed increased androgen signaling, including 27 (40%) with increased expression of AR and 19 (28%) with increased AR-V7, 27 (40%) with increased expression of KLK2, and 14 (21%) with increased TMPRSS2:ERG. Wnt signaling was upregulated in 29 (43%) patients, with increased expression of WNT5B in 21 (31%) and BMP7 in 14 (21%) patients. The prostate cancer specific long non-coding RNAs SChLAP1 and PCA3 were upregulated in 5 (7%) and 29 (43%) samples, respectively. 38 (56%) samples showed expression of epithelial-mesenchymal transition genes SOX2, SOX9, and TWIST1 and cell proliferation was upregulated in 51 (75%) as indicated by expression of GAS6, MDK, MET, and TSPAN8. CONCLUSION(S): CTC-based targeted gene expression profiling using TLDA cards allows RNA assessment on a platform that has shown analytic validity in the tissue-based setting. Additional

work will be required to assess the analytic and clinical validity of this approach when applied to CTCs. Further correlation of long-term, objective outcomes with CTC-based gene expression is ongoing and may inform prognosis in patients with advanced prostate cancer.

Singwe-Ngandeu, M., et al. (2010). "Diagnostic value of anti-cyclic citrullinated peptides and association with HLA-DRB1 shared epitope alleles in African rheumatoid arthritis patients." Arthritis Research & Therapy **12**(2): R36.

INTRODUCTION: The purpose of this study was to examine the diagnostic performance of autoantibodies against citrullinated peptides/proteins (ACPA) and to determine the prevalence of HLA-DRB1 shared epitope alleles (SE) in African patients with rheumatoid arthritis (RA).

METHODS: Serum levels of anti-cyclic citrullinated peptides antibodies (anti-CCP2, anti-CCP3), IgM and IgA rheumatoid factors (RF) were measured by enzyme-linked immunosorbent assay in the serum of 56 consecutive RA patients regularly followed in the Rheumatology Unit of the School of Medicine, University of Yaounde, Yaounde, Cameroon. Genotyping of HLA-DRB1 alleles was performed by polymerase chain reaction and hybridization with sequence-specific oligonucleotide probes on microbeads arrays. Fifty-one patients with other inflammatory rheumatic diseases and 50 healthy individuals were included as controls.

RESULTS: An anti-CCP2 assay showed the best diagnosis sensitivity (82%) and specificity (98%) with high positive predictive (PPV) (96%) and negative predictive values (NPV) (91%). Thirty percent of RA patients were carrying at least one copy of the HLA-DRB1 shared epitope (SE) compared to 10% and 14% of patients with other inflammatory rheumatic diseases and healthy individuals, respectively. The presence of the SE was associated with the production of ACPA.

CONCLUSIONS: Anti-CCP2 antibodies are useful markers of RA in African patients. In this cohort, the prevalence of the SE is higher in RA patients than in controls but lower than that reported in patient cohorts of European ancestry. The discrepancy between the high prevalence of ACPA-positive patients and the relatively low number of SE-positive cases suggest that, in addition to SE, other genetic factors control the development of ACPA in African RA patients.

Sintim, H. Y., et al. (2019). "Impacts of biodegradable plastic mulches on soil health." Agriculture, Ecosystems & Environment **273**: 36-49.

Plastic pollution in agricultural soils, caused by the incomplete removal of polyethylene mulch after usage, is a growing environmental concern. There has therefore been increased interest in biodegradable plastic mulches as alternative to polyethylene mulch; however, little is known about their impact on soil health. We evaluated the effects of four biodegradable plastic mulches on soil health at two sites (Knoxville, TN and Mount Vernon, WA) under pie pumpkin (Cucurbita pepo) production. Cellulosic paper, polyethylene, and no-mulch served as controls. Soil health was first assessed in May 2015, and then every six months until May 2017, by measuring 19 soil properties (physical, chemical, and biological). Soil properties were converted to index scores and aggregated into six soil health indicators and five soil functions. The results showed poor correlations and high spatial variations for most of the soil properties. We performed repeated measure analyses using raw values and change scores to account for the initial variations. The soil properties, soil health indicators, and soil functions were affected more by site and time than by the mulch treatments. Nonetheless, we did observe significant effects of some of the mulch treatments on six soil properties (aggregate stability, infiltration, soil pH, electrical conductivity, nitrate-N, and exchangeable potassium), four soil health indicators (hydraulic, biological, fertility, and salinity & sodicity), and one soil function (nutrient cycling). However, these effects were not consistent among all the biodegradable plastic mulches, across the two sites, and the sampling times. Overall, biodegradable plastic mulches

may be a viable alternative to polyethylene. However, evaluation under long-term studies is needed to better establish their effects on soil health.

Sintim, H. Y., et al. (2019). "Release of micro- and nanoparticles from biodegradable plastic during in situ composting." Science of the Total Environment **675**: 686-693.
Plastic is ubiquitous in modern life, but most conventional plastic is non-biodegradable and accumulates as waste after use. Biodegradable plastic is a promising alternative to conventional plastic. However, biodegradable plastics must be thoroughly evaluated to ensure that they undergo complete degradation and have no adverse impact on the environment. We evaluated the degradation of biodegradable plastics during 18-week full-scale composting, and determined whether additives from the plastics are released upon degradation. Two biodegradable plastic films—one containing polybutylene co-adipate co-terephthalate (PBAT) and the other containing polylactic acid/poly-hydroxy–alkanoate (PLA/PHA)—were placed into meshbags and buried in the compost. Degradation was assessed by image analysis, scanning electron microscopy, Fourier-transformed infrared spectroscopy, electrophoretic mobility, δ 13C isotope analyses, and single particle mass spectrometry of mulch fragments. The results showed >99% macroscopic degradation of PLA/PHA and 97% for PBAT film. Polymers in the biodegradable films degraded; however, micro- and nanoparticles, most likely carbon black, were observed on the meshbags. Overall, biodegradable plastics hold promise, but the release of micro- and nanoparticles from biodegradable plastic upon degradation warrants additional investigation and calls for longer field testing to ensure that either complete biodegradation occurs or that no long-term harm to the environment is caused. Unlabelled Image • Plastic pollution is a ubiquitous environmental problem. • Biodegradable plastic can help reduce plastic pollution. • Not all components in biodegradable plastics may degrade. • Non-biodegradable additives, such as carbon black, may be released upon degradation of plastic. [ABSTRACT FROM AUTHOR]

Sisavath, N., et al. (2015). "Taking Advantage of Electric Field Induced Bacterial Aggregation for the Study of Interactions between Bacteria and Macromolecules by Capillary Electrophoresis." Analytical Chemistry **87**(13): 6761-6768.
The quantification of interaction stoichiometry and binding constant between bacteria (or other microorganism) and (macro)molecules remains a challenging issue for which only a few adapted methods are available. In this paper, a new methodology was developed for the determination of the interaction stoichiometry and binding constant between bacteria and (macro)molecules. The originality of this work is to take advantage of the bacterial aggregation phenomenon to directly quantify the free ligand concentration in equilibrated bacteria-ligand mixtures using frontal analysis continuous capillary electrophoresis. The described methodology does not require any sample preparation such as filtration step or centrifugation. It was applied to the study of interactions between Erwinia carotovora and different generations of dendrigraft poly-L-lysines leading to quantitative information (i.e., stoichiometry and binding site constant). High stoichiometries in the order of 10(6)-10(7) were determined between nanometric dendrimer-like ligands and the rod-shaped micrometric bacteria. The effect of the dendrimer

generation on the binding constant and the stoichiometry is discussed. Stoichiometries were compared with those obtained by replacing the bacteria by polystyrene microbeads to demonstrate the internalization of the ligands inside the bacteria and the increase of the specific surface via the formation of vesicles.

Sitaram, J. and D. G. M. Purohit (2017). "Stabilization of bentonite soil with stone dust." International Journal for Research in Applied Science and Engineering Technology **5**(12): 1541-1545.

Bentonite soil has the tendency to swell or shrink depending on its water content variations. Due to such expansive characteristics of these soils, the structures constructed over this may develop some cracks in due course of time. It is there for essential to stabilize such soils, prior to any construction work carried out on this to improve its engineering properties. At present waste materials like stone dust from crushers, lime from industry and plastic waste are in abundance at various parts of our country. These wastes not only create health problems but also its disposal is a great problem for our society. This paper deals with a feasibility study carried out to find the suitability of using waste material i.e. stone dust as stabilizing material for improving the engineering properties of bentonite soil. Various tests like CBR, Standard Proctor Test and DFS were performed on the soil samples prepared by using stone dust (5%, 10%, 15% 20% and 25%) mixed with bentonite soil. On the basis of the results obtained from these tests, it may be concluded that the strength of bentonite soil can be substantially improved by mixing with stone dust as stabilized materials.

Situ, E., et al. (2010). "Influence of imatinib mesylate on bone marrow-derived dendritic cells." Journal of Investigative Medicine **58 (1)**: 193.

Purpose of Study: Primarily described as initiators and regulators of immune responses, dendritic cells (DC) may also be endowed with the capacity of directly triggering tumor cell death. This cytotoxic function is an atypical novel feature of these cells that may be used effectively in cancer immunotherapy. Imatinib mesylate has become the drug of choice for the majority of BCR-ABL+ leukemia patients. Although the direct effects of imatinib on cancer cells are well documented, the potential of imatinib to modulate anti-tumor immune responses remains poorly understood. The goal of this study was to evaluate whether imatinib may modulate the killing activity of dendritic cells. Methods Used: DC were generated from Balb/c mouse bone marrow cultured in complete RPMI medium (Gibco/BRL) with GM-CSF and IL-4 (10 ng/ml each). On day 6, DC were selected by Magnetic Activated Cell Sorting (MACS, Miltenyi) using anti-CD11c antibody conjugated with microbeads and subcultured. Imatinib (10⁻⁵M and 10⁻⁶M) was added to the culture on day 0, 6 or 7. On day 8, DC were collected and co-cultured with 4+/-1 breast cancer cells (tumor cell:DC ratio = 1:5) and with LPS, which triggers DC killing activity. Tumor cell killing was then assessed by crystal violet assays. Summary of Results: Exposure of DC to imatinib from day 7-8 does not affect their killing potential. Interestingly, reduced killing activity was observed when DC were pre-treated with imatinib (10⁻⁵M and 10⁻⁶M) from day 6 to day 8, resulting in a significant impairment of their tumoricidal activity. In addition, the presence of imatinib from day 0 and during the entire culture period resulted in the complete loss of DC killing potential. Conclusion(s): Imatinib may modulate DC killing potential in a dose- and time-dependent manner and may affect the differentiation of DC from bone marrow precursors, rendering them ineffective in eliminating tumor cells. Further studies are required to elucidate the molecular mechanisms underlying the modulation of DC by this drug and the possible significance of these findings in vivo as it relates to the promotion or inhibition of tumor growth.

Sivakumar, G., et al. (2015). "Formulation and evaluation of alginate microbeads of ondansetron by ionotropic gelation technique." International Journal of Research in Pharmaceutical Sciences **6**(3): 242-247.

Ondansetron is an anti emetic agent for the treatment of nasia and vomiting and also used chemotheraphy in cancer. Ondansetron drug is 5ht3 receptor antagonist. it has shorter biological half-life (3 - 4 hrs) necessitates that it to be administered in frequent doses of 4mg. The main objective of this study was to develop suitable micro particulate system of ondansetron for controlled release delivery system by varying the alginate, CaCl2 and HPMC concentrations. In the present work ondansetron microbeads were formulated using sodium alginate by ionotropic gelation technique. Prepared beads were evaluated for granulometric studies, micromeretic, scanning electron microscopy, drug entrapment efficiency and in-vitro dissolution studies etc. The prepared beads were free flowing and white in colour. The drug loaded beads showed 84.6-98.2 % drug entrapment, which was found to increase with increase in sodium alginate concentration. Scanning electron microscopy revealed that the beads were spherical and rough in structure. In vitro drug release study of these microbeads indicated controlled release for ondansetron 85.54 - 97.2 % released. Hence the observation of all results of the different batches third and fourth showed controlled release action and improved drug availability. The release of ondansetron was found to be affected by both concentration of polymers such as sodium alginate and HPMC. By the observation of accelerated stability studies second batch formulation was found to be best formulation. From this study, it could be concluded that the spherical and free flowing microbeads of ondansetron could be successfully prepared by ionotropic gelation technique with high entrapment efficiency and prolonged release characteristics. Copyright © JK Welfare & Pharmascope Foundation.

Sivakumar, R., et al. (2011). "Design of mucoadhesive hydropilic beads entrapped with ketoprofen for delivery into small intestine." Research Journal of Pharmaceutical, Biological and Chemical Sciences **2**(1): 706-713.

The purpose of this study was to develop and evaluate pH dependent multiparticles of ketoprofen loaded mucoadhesive beads to target the small intestine. The hydrogel beads were prepared by inotropic gelation method using sodium alginate, pectin and xanthan gum as polymers. The prepared gel beads were coated with 1 % chitosan. The obtained beads were filled into hard gelatin capsules and enteric coated with Eudragit L100. The beads were evaluated for particle size, morphology, encapsulation efficiency, in vitro release, and mucoadhesion. The size of microbeads ranged from 1mm to 2mm and the encapsulation of ketoprofen beads was between 60 to 70%. The release of ketoprofen from the gel beads at pH 6.8 was initially fast followed by a slower and more controlled release. The drug release from the beads was found to follow case II transport mechanism (n>0.85) and was independent of time, which corresponds with zero-order kinetics.

Sivan, A. (2011). "New perspectives in plastic biodegradation." Current Opinion in Biotechnology **22**(3): 422-426.

During the past 50 years new plastic materials, in various applications, have gradually replaced the traditional metal, wood, leather materials. Ironically, the most preferred property of plastics - durability - exerts also the major environmental threat. Recycling has practically failed to provide a safe solution for disposal of plastic waste (only 5% out of 1 trillion plastic bags, annually produced in the US alone, are being recycled). Since the most utilized plastic is polyethylene (PE; ca. 140 million tons/year), any reduction in the accumulation of PE waste alone would have a major impact on the overall reduction of the plastic waste in the

environment. Since PE is considered to be practically inert, efforts were made to isolate unique microorganisms capable of utilizing synthetic polymers. Recent data showed that biodegradation of plastic waste with selected microbial strains became a viable solution. © 2011 Elsevier Ltd.

Six, M., et al. (2016). "Different platelet concentrations impact on DC maturation." Transfusion Medicine and Hemotherapy **43 (Supplement 1)**: 75-76.

Introduction: This study shows the influence of platelets on the differentiation and maturation of dentritic cells (DCs) derived from monocytes, focusing on the influence of different platelet concentrations in the mononuclear cell culture. Method(s): Mononuclear cells (MNCs) were obtained by leukapheresis and CD14 positive monocytes were isolated with CD14 MicroBeads. The MNCs were cultivated in a culture medium with IL-4, GM-CSF and TNF-alpha (starting on day 4). The following culture preparations were performed supplementing platelets in different concentrations: Control without platelets added (baseline), TH10 with addition of 1.0 x 10e7 platelets, TH50 (5.0 x 10e7 platelets), TH150 (1.5 x 10e8 platelets) and TH250 (2.50 x 10e8 platelets). The different cell culture preparations were analyzed by flow cytometer on days 1 to 4 and on day 7. Result(s): On day 7, high platelets concentrations TH150 (24.0 +/- 10.9) and TH250 (24.3 +/- 14,0) showed a significantly (p = 0.036) lower ratio of CD1a positive cells than in the baseline (51.8 +/- 21.3%). The ratio of CD83 positive cells was significantly (p = 0.028) lower on day 1 for TH250 (4.5 +/- 4.1%) compared to baseline (9.3 +/- 7.1%). No significant difference (p = 0.139) could be found on day 7 between baseline (42.0 +/- 17.4) and TH250 (55.4 +/- 23.6). The difference between the baseline (42.0 +/- 17.4) and TH10 (52.0 +/- 12.6) was significant (p = 0.007). Regarding the measurement of cell viability, there was a significant correlation between the ratio of live cells and the platelets concentration analyzed (day 1: p = 0.021; day 2-7: p values < 0.001). On day 7, there was a significantly (p < 0.001) lower ratio of vital cells in the baseline (29.0 +/- 24.5) compared to TH250 (73.8 +/- 22.6). Negative correlations were seen between the ratio of dead cells and the platelets concentration regarding all days (p values < 0.001). Conclusion(s): Platelets show an inhibitory effect on premature DCs (CD1a positive cells) and apparently, in the further process, a boosting effect on the maturing process of DCs (CD83 positive cells) derived from monocytes. In addition, the part of Annexin V and 7AAD positive cells depends on platelet concentration. The higher the platelet concentration, the lower was the ratio of dead cells.

Sjollema, S. B., et al. (2016). "Do plastic particles affect microalgal photosynthesis and growth?" Aquatic Toxicology **170**: 259-261.

The unbridled increase in plastic pollution of the world's oceans raises concerns about potential effects these materials may have on microalgae, which are primary producers at the basis of the food chain and a major global source of oxygen. Our current understanding about the potential modes and mechanisms of toxic action that plastic particles exert on microalgae is extremely limited. How effects might vary with particle size and the physico-chemical properties of the specific plastic material in question are equally unelucidated, but may hold clues to how toxicity, if observed, is exerted. In this study we selected polystyrene particles, both negatively charged and uncharged, and three different sizes (0.05, 0.5 and 6mum) for testing the effects of size and material properties. Microalgae were exposed to different polystyrene particle sizes and surface charges for 72h. Effects on microalgal photosynthesis and growth were determined by pulse amplitude modulation fluorometry and flow cytometry, respectively. None of the treatments tested in these experiments had an effect on microalgal photosynthesis. Microalgal growth was negatively affected (up to 45%) by uncharged polystyrene particles, but only at high

concentrations (250mg/L). Additionally, these adverse effects were demonstrated to increase with decreasing particle size.

Sjöqvist, M. and A. Boldizar (2011). "Molecular Modification and Compatibilization of Collected Polyethylene." Journal of Polymers & the Environment **19**(2): 335-340.

The increasing use of plastics in packaging materials leads to growing amounts of plastic waste. Recycling material is generally regarded as advantageous. But in fact very few products are made from plastic waste, partly this can be explained by that little is known about the recycling process and the properties of collected materials. There is a need for injection moulding grades of recycled polyethylene, while large amounts of extrusion grades are available from packaging waste. A controlled way of de-branching or partly degrading PE would be desirable. Peroxides are commonly used to crosslink polyolefins, but under certain conditions a chain scission reaction occur. Another problem encountered with recycling of polyethylene are the poor miscibility of low amounts contaminations, i. e. polypropylene. A compatibilizer can improve properties of such polymer blends, in this work EPDM is used as compatibilzer. Studies of mechanical properties and viscosity measurements show that it is possible to partly degrade PE with peroxide exposing it to high temperature and oxygen. The properties of PE/PP blends were improved with EPDM as compatibilizer. [ABSTRACT FROM AUTHOR]

Skariyachan, S., et al. (2015). "Selection and screening of microbial consortia for efficient and ecofriendly degradation of plastic garbage collected from urban and rural areas of Bangalore, India." Environmental Monitoring & Assessment **187**(1): 4174.

Industrialization and urbanization have led to massive accumulation of plastic garbage all over India. The persistence of plastic in soil and aquatic environment has become ecological threat to the metropolitan city such as Bangalore, India. Present study investigates an ecofriendly, efficient and cost-effective approach for plastic waste management by the screening of novel microbial consortia which are capable of degrading plastic polymers. Plastic-contaminated soil and water samples were collected from six hot spots of urban and rural areas of Bangalore. The plastic-degrading bacteria were enriched, and degradation ability was determined by zone of clearance method. The percentage of polymer degradation was initially monitored by weight loss method, and the main isolates were characterized by standard microbiology protocols. These isolates were used to form microbial consortia, and the degradation efficiency of the consortia was compared with individual isolate and known strains obtained from the Microbial Type Culture Collection (MTCC) and Gene Bank, India. One of the main enzymes responsible for polymer degradation was identified, and the biodegradation mechanism was hypothesized by bioinformatics studies. From this study, it is evident that the bacteria utilized the plastic polymer as a sole source of carbon and showed 20-50% weight reduction over a period of 120 days. The two main bacteria responsible for the degradation were microbiologically characterized to be Pseudomonas spp. These bacteria could grow optimally at 37 degreeC in pH 9.0 and showed 35-40% of plastic weight reduction over 120 days. These isolates were showed better degradation ability than known strains from MTCC. The current study further revealed that the microbial consortia formulated by combining Psuedomonas spp. showed 40 plastic weight reduction over a period of 90 days. Further, extracellular lipase, one of the main enzymes responsible for polymer degradation, was identified. The computational docking studies suggested that polyethylene glycol and polystyrene present in the plastics might have good interaction towards the microbial lipase with stable binding and interacting forces which probably could be one of the reasons for the degradative mechanisms.

Skira, I. J. (1986). "Food of the short-tailed shearwater, Puffinus tenuirostris, in Tasmania." Australian Wildlife Research **13**(3): 481-488.

Food from stomachs of 396 short-tailed shearwaters collected at 3 colonies was analysed. The main food items found were the euphausiid (Nyctiphanes australis) and arrow squid (Notodarus sloani gouldi) with fish, other crustaceans and squids forming a minor part of the diet. Plastic particles were common particularly at the beginning of the breeding season but gradually decreased in frequency as the season progressed.

Skjermo, J. and O. Bergh (2004). "High-M alginate immunostimulation of Atlantic halibut (Hippoglossus hippoglossus L.) larvae using Artemia for delivery, increases resistance against vibriosis." Aquaculture **238**(1/4): 107-113.

A strategy for microbial management in marine juvenile production should include nonspecific immunostimulation to reduce losses caused by infectious diseases. Halibut (Hippoglossus hippoglossus L.) larvae (250 day degrees) were distributed into first-feeding tanks of 10.000 l, at a Norwegian halibut juvenile farm. Immunomodulatory high-M alginate was bioencapsulated in Artemia by use of alginate microbeads (2-30 micro m), and administered to halibut larvae at three stages during the first feeding period (days 7-9, 20-22 and 41-43). A fourth treatment was run after weaning, 5-3 days prior to a challenge test with two different doses of Vibrio anguillarum O2 that was started at day 90 after first feeding. After 15 days, the mortality at the highest dose was 45+or-1% in the control and 28+or-8% in the stimulated group, corresponding to 38% reduction in mortality, whereas no significant differences were measured at the low dose. It is concluded that feeding immunostimulants to halibut larvae for four short periods during 3 months enhanced resistance against vibriosis, and that high-M alginates are suitable as immunostimulants for marine larvae during first feeding and weaning.

Skolnick, A. and J. Johnson (2015). "sailing the plastic seas." Rodale's Organic Life **1**(3): 82-87.

The article reports on a voyage to the North Atlantic conducted by nonprofit the Surfrider Foundation that reveals the impact of trash on human health and the health of the oceans. Topics include the plastic smog that infests the bluest water in the North Atlantic Gyre, how the plastics end up in oceans like the Atlantic, and the two types of plastic waste that make up most of the plastic found at sea including polyethylene and polypropylene.

Skorupskaite, V. and G. Denafas (2004). "Investigation of particles size distribution and form of bottom and volant ash." Environmental Research, Engineering and Management **3**: 21-28.

A study was conducted to investigate the particle size distribution and form of volant ash of wood and peat bottom, ash of medical waste combustion and bottom ash of plastic waste and used lubricants combustion. The particle size distribution of the ash was determined by laser diffraction analysis and analysis of sieves, while the form of the particles was determined by scanning electron microscope. The laboratory investigations were performed in the Clausthal Technical University in Germany. Results showed that the greatest amount of small particles that can cause damage in airway was found in the bottom ash of plastic waste and used lubricants combustion. The bottom ash of medical waste combustion has the widest particle size distribution based on diameter. All kinds of ash particles, especially small particles, have relatively large surface area and high porosity resulting to increased absorption capacity.

Slater, N., et al. (2017). "Cardiac iron burden is correlated with innate immune markers, body mass index and labile plasma iron in seta-thalassemia major patients undergoing combined chelation therapy." American Journal of Hematology **92 (8)**: E380.

Introduction: beta-thalassemia major (TM) is an inherited anemia that is characterized by severe transfusion dependence which can lead to hepatic and extra-hepatic cardiac iron overload, causing cardiomyopathy, the leading cause of death. Despite improved chelation therapies, TM patients still endure cardiomyopathy as well as chronic inflammation, organ failure and infection. Innate immune cells are central to iron trafficking and response to organ injury. To travel to areas of iron-induced tissue injury, innate immune cells must extravasate from the vasculature using surface presentation of ligands such as LewisX (aka CD15). LewisX is a trisaccharide adhesion molecule, used by granulocytes to mediate endothelial attachment and phagocytosis. In this study, TM granulocyte LewisX expression was compared to iron-burden markers (such as cardiac T2*) and body mass index when undergoing combined chelation therapy with deferoxamine and deferasirox. A comparative healthy control group of subjects were also studied. LewisX surface presentation was also quantified on cultured THP-1 cells exposed to exogenous iron. Patients and Methods: TM patients were investigated at baseline and after 6 months and a year of combined chelation therapy with deferasirox and deferoxamine and analyzed for the expression of LewisX on peripheral-blood granulocytes. Eighteen transfusion dependent thalassemia patients (11 - 29 yrs old) participating in the combination trial of deferasirox and deferoxamine (Novartis sponsored CICL670AUS24T) were enrolled in a substudy investigating innate immunology (Novartis sponsored CICL670AUS42T). Fasting blood samples were obtained i) at baseline after a 72 hr. washout of chelator, and ii) at 6 and 12 months on study. Fourteen healthy controls (10 - 35 yrs old) were also enrolled. Peripheral blood mononuclear cells (PBMCs) were isolated from blood samples and granulocytes were separated from dilute blood using ficoll. Granulocytes were purified using antibody-linked magnetic microbeads (Miltenyi Biotec Inc). Highly enriched populations of LewisX+ (CD15+) granulocytes were verified by flow cytometry. The expression level of LewisX on purified granulocytes was determined and reported as the median fluorescent intensity (MFI). Result(s): A 5% decrease in LewisX positive granulocytes was observed in TM compared to healthy age and ethnically matched controls (TM = 90.19 +/- 7.14, control = 96.6 +/- 1.90, p = 0.034). LewisX expression was also decreased on THP-1 monocytic cells exposed to iron-citrate for greater than six weeks in vitro (p=0.04). In TM, LewisX expression correlated with labile plasma iron (r = -0.47 and p=0.015), T2* (myocardial iron, r= 0.69 and p=0.001), left ventricular ejection fraction (r = 0.49 and p=0.030) and body mass-index (r = -0.78 and p=0.002). Multiple regression analysis revealed that myocardial iron was best predicted by LewisX independently (r = 0.66, p = 0.001), whereas, LewisX expression was best predicted by BMI (r = 0.76, p = 0.002). 52 weeks of combined chelation therapy successfully restored TM expression of LewisX to the level of healthy controls (baseline = 90.19+/-7.14, 26 weeks = 96.10+/-3.44, 52 weeks = 96.61+/-3.10, p= 0.011). Conclusion(s): We found significant evidence that granulocyte LewisX surface presentation may be decreased in response to LPI and is predicted by BMI. Furthermore, LewisX and BMI appear to be predictive of cardiac iron loading and function, providing potential novel indicators for the leading cause of mortality in TM.

Sleight, V. A., et al. (2017). "Assessment of microplastic-sorbed contaminant bioavailability through analysis of biomarker gene expression in larval zebrafish." Marine Pollution Bulletin **116**(1/2): 291-297.

Microplastics (MPs) are prevalent in marine ecosystems. Because toxicants (termed here "co-contaminants") can sorb to MPs, there is potential for MPs to alter co-contaminant bioavailability. Our objective was to demonstrate sorption of two co-contaminants with different physicochemistries [phenanthrene (Phe), log₁₀K_{ow}=4.57; and 17 alpha -ethinylestradiol (EE2), log₁₀K_{ow}=3.67] to MPs; and assess whether co-contaminant bioavailability was increased after MP settlement. Bioavailability was indicated by gene expression in larval zebrafish. Both Phe and EE2 sorbed to MPs, which reduced bioavailability by a maximum of 33% and 48% respectively. Sorption occurred, but was not consistent with predictions based on co-contaminant physicochemistry (Phe having higher log₁₀K_{ow} was expected to have higher sorption). Contaminated MPs settled to the bottom of the exposures did not lead to increased bioavailability of Phe or EE2. Phe was 48% more bioavailable than predicted by a linear sorption model, organism-based measurements therefore contribute unique insight into MP co-contaminant bioavailability.

Sloane, H. S., et al. (2016). "Hybridization-Induced Aggregation Technology for Practical Clinical Testing: KRAS Mutation Detection in Lung and Colorectal Tumors." Journal of Molecular Diagnostics **18**(4): 546-553.

KRAS mutations have emerged as powerful predictors of response to targeted therapies in the treatment of lung and colorectal cancers; thus, prospective KRAS genotyping is essential for appropriate treatment stratification. Conventional mutation testing technologies are not ideal for routine clinical screening, as they often involve complex, time-consuming processes and/or costly instrumentation. In response, we recently introduced a unique analytical strategy for revealing KRAS mutations, based on the allele-specific hybridization-induced aggregation (HIA) of oligonucleotide probe-conjugated microbeads. Using simple, inexpensive instrumentation, this approach allows for the detection of any common KRAS mutation in <10 minutes after PCR. Here, we evaluate the clinical utility of the HIA method for mutation detection (HIAMD). In the analysis of 20 lung and colon tumor pathology specimens, we observed a 100% correlation between the KRAS mutation statuses determined by HIAMD and sequencing. In addition, we were able to detect KRAS mutations in a background of 75% wild-type DNA-a finding consistent with that reported for sequencing. With this, we show that HIAMD allows for the rapid and cost-effective detection of KRAS mutations, without compromising analytical performance. These results indicate the validity of HIAMD as a mutation-testing technology suitable for practical clinical testing. Further expansion of this platform may involve the detection of mutations in other key oncogenic pathways.

Slootmaekers, B., et al. (2019). "Microplastic contamination in gudgeons (Gobio gobio) from Flemish rivers (Belgium)." Environmental Pollution **244**: 675-684.

Plastic pollution is continuously growing on a global scale and emerging as a major environmental hazard. Smaller-sized plastics, so-called microplastics (<5 mm), are considered as being omnipresent throughout the aquatic environment, yet freshwater ecosystems have received little attention so far and are still largely unstudied. Present study aims to expand the current knowledge on microplastics in freshwater systems by documenting the occurrence in the digestive system of fish from 15 rivers at 17 locations in Flanders, Belgium. To increase inter-study comparability and identification accuracy, a more standardized protocol was combined with a conservative approach towards acceptance of microplastic particles. Four rivers were found to have fish containing microplastics. However, no significant differences could be established between the sampling sites. In total 78 specimens of gudgeon (Gobio

gobio) have been investigated, 9% of which had ingested at least one microplastic item, thus showing that contamination appears to be limited. Microscopic and spectroscopic analysis showed the microplastics to be from various sources with a diverse range of physical characteristics. Out of the eight items identified as microplastics, seven different polymer types were identified. Although further detailed research is necessary, this preliminary study shows that gudgeons from several Flemish rivers are contaminated with microplastics.

Smedes, F., et al. (2017). "Partitioning of hydrophobic organic contaminants between polymer and lipids for two silicones and low density polyethylene." Chemosphere **186**: 948-957.

Polymers are increasingly used for passive sampling of neutral hydrophobic organic substances (HOC) in environmental media including water, air, soil, sediment and even biological tissue. The equilibrium concentration of HOC in the polymer can be measured and then converted into equilibrium concentrations in other (defined) media, which however requires appropriate polymer to media partition coefficients. We determined thus polymer-lipid partition coefficients (K_{PL}) of various PCB, PAH and organochlorine pesticides by equilibration of two silicones and low density polyethylene (LDPE) with fish oil and Triolein at 4 degreeC and 20 degreeC. We observed (i) that K_{PL} was largely independent of lipid type and temperature, (ii) that lipid diffusion rates in the polymers were higher compared to predictions based on their molecular volume, (iii) that silicones showed higher lipid diffusion and lower lipid sorption compared to LDPE and (iv) that absorbed lipid behaved like a co-solute and did not affect the partitioning of HOC at least for the smaller molecular size HOC. The obtained K_{PL} can convert measured equilibrium concentrations in passive sampling polymers into equilibrium concentrations in lipid, which then can be used (1) for environmental quality monitoring and assessment, (2) for thermodynamic exposure assessment and (3) for assessing the linkage between passive sampling and the traditionally measured lipid-normalized concentrations in biota. LDPE-lipid partition coefficients may also be of use for a thermodynamically sound risk assessment of HOC contained in microplastics.

Smirnova, S., et al. (2017). "CD8+ T-cell clones persistent in bone marrow and peripherial blood during course of CD4+ angioimmunoblastic lymphoma." Haematologica **102 (Supplement 2)**: 575-576.

Background: Angioimmunoblastic T-cell lymphoma (AITL) - peripheral T-cell lymphoma, characterized by polymorphous infiltration of the lymph nodes, proliferation of high endothelial venules (HEV) and follicular dendritic cells (FDC). In addition to the lymph nodes, AITL affects spleen, liver, skin and bone marrow. The disease is almost always associated with Epstein-Barr virus (EBV), suggesting its role in the etiology of AITL. Neoplastic T cells in most cases are CD4+ and express pan T-cell antigens CD3, CD2, CD5, markers of normal follicular Thelper cells - CD10, CXCL13, PD-1. To confirm the diagnosis and assess disease dissemination combined morphological, immunohistochemical and molecular studies of affected tissues are being used. We have found that T-cell clones detected in the tissue of the lymph node (LN), often differ in T-cell receptor gene rearrangements from those detected in the bone marrow (BM), peripheral blood (PB) and other tissues. T-cell clonality testing itself may not distinguish between neoplastic or reactive lymphoproliferation in the BM and PB. Therefore, T-cell clonality of CD4+ and CD8+ populations of peripheral blood lymphocytes in patients with AITL had been tested during the course of disease. Aim(s): To determine immunological characteristics of persisting in the PB and BM T-cell clones in AITL patients. (Figure presented). Method(s): The study included 26 patients (15 males and 11 females; age 36-92, median 67) with the diagnosis of AITL established on the basis of WHO 2008 diagnostic criteria. LN, BM and peripheral blood lymphocytes were tested for Tcell clonality according to BIOMED-2 protocol with subsequent fragments analysis on ABI PRISM 3130 (Applied Biosystems). The material was examined at the diagnosis and at various stages of patient's treatment. In 5 patients selection of CD8+ and CD4+ populations of PB lypmphocytes was performed with MidiMACS and MiniMACS Separators using CD4+, CD8+ MicroBeads (Miltenyi Biotec). Result(s): Clonal TCRG and TCRB gene rearrangements in the LN of all AITL patients were found. In 6 of the 26 patients (23%) clonal products found in LN matched those from PB and BM. In 8 patients (30%) at least one of the clonal products isolated from the BM and/or PB mismatched the clonal products isolated from LN. In 12 patients (46%) clonal rearrangements found in the PB and BM were completely different from those identified for LN. Thus, at the diagnosis 20 patients (76%) had PB and BM T-cell clones distinct from LN T-cell clones. In 14 of 20 patients T-cell clones of PB and BM were tested repeatedly during the course of disease treatment. In 7 of 14 patients (50%) clonal products persisted for a long time and do not disappear upon reaching the remission of the disease. The observation period averaged 12 months (1 to 44 months). No correlation of T-cell clones persistence and the activity of EBV infection in the PB was found. Selection of CD4+ and ?D8+ T-lymphocyte populations was performed for 4 patients in remission with persistent T-cell clones. In all cases, clonal products, which were originally identified in the BM and PB were shown to belong to the CD8+ population of cells (Fig.). In one case BM and PB derived- CD4+ cells also shared a clonal product with LN cells tested at at the diagnosis. In one case CD4+ population selected from PB cells at the diagnosis carried clonal rearrangements, fully consistent with that of LN. Summary/Conclusions: One may conclude that CD8+ T-cell clones identified in BM and PB, do not match those identified in LN for the majority of patients with AITL (76%). These clones can persist for a long time (the period of observation from 1 to 40 months), may not disappear in remission and probably have reactive nature. Therefore exclusive T-cell clonality in PB and/or BM should not be threated as minimal disease or relapse in AITL.

Smiroldo, G., et al. (2019). "Anthropogenically altered trophic webs: alien catfish and microplastics in the diet of Eurasian otters." Mammal Research **64**(2): 165-174.

With the aim of examining how Eurasian otters (Lutra lutra) face human-mediated environmental alterations, we assessed their diet by spraint analysis on the River Ticino (NW Italy), where this mustelid has been reintroduced in 1997. From March 2016 to March 2017, a total of 101 spraints was found in 50% of 32 sampling stations (mean length+or-SD=567+or-263 m). Fish formed the bulk of otter diet (95% of the estimated mean percent volume, mV%). Cyprinids were the most preyed fish (mV%=44.9), followed by European catfish Silurus glanis (mV%=24.9%) and eel Anguilla anguilla (mV%=8.5). Introduced European catfish is an invasive species, which can deeply alter the composition and structure of local fish communities and accumulate large amounts of metals and pollutants through the trophic chain. We also recorded for the first time microplastic particles (<5 mm) in otter spraints. Suspected particles were analysed by Fourier transform infrared (FTIR) spectroscopy and two polymer types were identified: polyethylene terephthalate (PET) and polyamide (PA). Although otters showed to be able to adapt to anthropogenic changes, these results point out new potential threats to otter conservation and ask for further studies.

Smith, D., et al. (2014). "Cohort analysis of FISH testing of CD138+ cells in relapsed multiple myeloma: Implications for prognosis and choice of therapy." Blood. Conference: 56th Annual Meeting of the American Society of Hematology, ASH **124**(21).

Introduction: Interphase FISH on CD138-selected bone marrow cells enables genetic risk stratification in newly diagnosed multiple myeloma (MM), however as MM remains incurable, most centres still treat newly diagnosed MM uniformly, utilising the most active regimens available. At relapse an increasing choice of regimens, coupled with co-morbidities and treatment-emergent toxicities, means no uniform approach is possible. Instead, therapy is tailored to disease and patient related risk factors. In this setting, FISH testing may be particularly useful if not done at diagnosis and to identify progression events that may alter prognosis. Aim(s): To evaluate the outcome of FISH analysis in consecutive patients with relapsed MM undertaken at our centre: success rate, frequency of abnormalities, incidence of progression events and correlation of FISH abnormalities with treatment outcomes. Method(s): FISH analysis was performed on 192 samples from 154 relapsed patients (2012-13). Plasma cells were selected using magnetic CD138 MicroBeads and interphase FISH carried out using probes as recommended by the EMN (Ross et al, 2012). If patients had no prior results, a full FISH MM panel was performed, using probes for t(4;14), t(14;16), t(11;14), deletion 17p (17p-), Chr 1 abnormalities (1p-/1q+) and deletion 13q (13q-). If patients had been previously tested for an IgH translocation (Tx), a progression event panel was used: 1p-/1q+, 17p- and 13q-. Patients underwent FISH testing prior to starting the next line of therapy. Result(s): 79% of samples were successfully analysed, with analysis limited in 16% and failed in 5%. Common reasons for failure were poor quality/aged slides, insufficient material and poor hybridisation. 17% of patients had no cytogenetic abnormality. The most common abnormality was 13q- (43.1%), followed by 1q+ (41.4%), t(11;14) (18.3%), t(4;14) (12.4%), 17p- (12.0%) 1p- (8.9%), and t(14;16) (5.6%) Progression events were more common in t(14;16) and t(4;14) groups. All patients with t(14;16) and 82% with t(4;14) had an additional genetic lesion. Only 21% of patients with t(11;14) and 54% with no IgH Tx had an additional event. 80 patients (51.3%) had prior FISH results and 13 (16.3%) had developed a new abnormality on the later test. In 9 cases the progression event was 17p-, in 2 it was 1q+ and 2 cases developed 17p- and 1q+. The patients developing 1q+ were previously standard risk, so repeat testing altered risk group. Acquisition of 17p- indicates especially poor outcome, thus in all 13 cases repeat FISH analysis altered risk. Among patients with progression events none harboured t(11;14), 8 (64%) had no IgH Tx, 3 had t(14;16) and 2 had t(4;14). FISH results were correlated with clinical outcome. Patients were stratified as having high risk genetics [t(4;14), t(14,16), 17p- in >=50% cells, 1p-/1q+] or standard risk [t(11;14), normal cytogenetics]. 63 (41%) patients were high risk, 83 (54%) standard risk, with no information available for 8 (5%). Both groups had received a median of 2 prior lines of therapy. Response rates (>=PR) to the next line of therapy were similar (60.4% standard risk vs 56.0% high risk). PFS from time of FISH was significantly longer in the standard risk group (9.8 months vs 5.9, p<0.01) as was OS (not reached vs 17.1 months, p<0.01, Fig. 1). In the high risk group, PFS was significantly longer in patients receiving a proteasome inhibitor (PI) as the next line of treatment versus those receiving other therapies (9.6 months vs 4.6, p=0.01) as was OS (not reached vs 9.7 months, p<0.01, Fig. 2). In the standard risk group, PFS was similar if patients received PI or not (9.5 months PI vs 9.8 other) as was OS (not reached both groups, Fig. 2). Conclusion(s): FISH analysis on MM patients at relapse was achievable. 74/154 patients had no prior results and a further 13 developed new poor prognostic markers, thus FISH at relapse provided new information in 56% of patients. Progression events were more common in patients harbouring t(4;14) or t(14;16). FISH at relapse was prognostic with high risk abnormalities associated with significantly shorter PFS and OS. The use of PI appeared to abrogate this poor prognosis, suggesting FISH at relapse could be a predictive and prognostic marker. Given the availability of second generation PI and the option of bortezomib re-treatment, results of FISH testing at relapse could directly influence clinical practice.

Smith, D. H., et al. (1999). "Comparisons of the effects of different long-acting delivery systems on the pharmacokinetics and pharmacodynamics of diltiazem." American Journal of Hypertension **12**(10 Pt 1):

1030-1037.

The benzothiazepine calcium channel antagonist diltiazem is a short-acting drug. To achieve effective 24-h blood pressure control with once-daily dosing, it relies on various extended drug-delivery systems that have grown in importance as a result of the recent reports relating the use of short-acting calcium channel antagonists to increased cardiovascular morbidity. This study examines the pharmacokinetics and resulting pharmacodynamics of two different delivery systems, each loaded with 240 mg of diltiazem and administered to 40 moderately hypertensive patients in a randomized, double-blind crossover trial. After a 4-week, single-blind placebo lead-in, patients with a clinical diastolic blood pressure of > or =100 mm Hg were randomized to either the single or dual microbead diltiazem delivery system for a 4-week period. At the end of this period, each subject was evaluated with 24-h ambulatory blood pressure monitoring and subjected to 24-h inpatient pharmacokinetic analysis on separate days. This was followed by a similar 4-week period in which each subject was treated with the alternative delivery system. For diltiazem, the area under the curve for plasma concentration versus time and the maximum plasma concentration attained by the single microbead system exceeded the values achieved by the dual bead system by 15% and 25%, respectively. These differences were greatest from the 3rd through the 13th h after dosing. During this period, both systolic and diastolic ambulatory blood pressure was significantly lower when the single microbead system was used. When compared with baseline blood pressure, blood pressure reductions achieved with the single microbead system exceeded reductions achieved with the dual microbead system by at least 2 mm Hg for 10 of the 24 postdose hours. Heart rates were slightly reduced but not significantly different. This improved blood pressure control at higher plasma levels of diltiazem suggests that a more efficient delivery system could provide better blood pressure control for identical doses of diltiazem.

Smith, E., et al. (2019). "Microplastics: what drinking water utilities need to know." Journal American Water Works Association **111**(11): 26-37.

Consumers are becoming more concerned with microplastics in water, so utilities should start thinking about methods to identify and address them. Although there is a lot of research on microplastics in marine environments, there isn't much research yet with drinking water. To address microplastics, utilities should establish sampling and analytical techniques, identify treatment methods, and implement communications strategies.

Smith, J., et al. (2010). "Measurement of multiple drugs in urine, water, and on surfaces using fluorescence covalent microbead immunosorbent assay." Toxicology Mechanisms & Methods **20**(9): 587-593.

There are a range of applications that require the measurement of multiple drugs such as urine analysis, drug determination in water, and screening for drug contamination on surfaces. Some of the procedures used such as enzyme-linked immunosorbent assay (ELISA) are simple but can only determine one drug at a time, and others such as GC-MS or LC-MS are complex, time-consuming, and expensive. In this study, fluorescence covalent microbead immunosorbent assay (FCMIA) was investigated as a simple method for the measurement of multiple drugs simultaneously in three matrices: diluted urine, water, and on surfaces. Five different drugs of abuse or their metabolites (methamphetamine, caffeine, benzoylecgonine (a metabolite of cocaine), tetrahydrocannabinol (THC), the active ingredient in marijuana, and oxycodone) were studied over the range 0-15 ng/ml. There was no measureable cross-reactivity among the drugs at the concentrations studied. Urine dilutions from 1/50 to 1/2.5 were studied and dilutions less than 1/20 had a significant effect on the methamphetamine assay but limited effects on the benzoylecgonine and oxycodone assays and almost no effect on the THC assay. For assays performed in 1/20 urine dilution, water, and diluted surface sampling buffer, least detectable doses (LDD) were 1 ng/ml or less for the drugs. Surfaces spiked with drugs were sampled with swabs wetted with surface sampling buffer and recoveries were linear over the range 0-100 ng/100 cm(2) surface loading for all drugs. FCMIA has potential to be used for the measurement of multiple drugs in the matrices studied.

Smith, J. P., et al. (2016). "Detection and measurement of surface contamination by multiple antineoplastic drugs using multiplex bead assay." Journal of Oncology Pharmacy Practice **22**(1): 60-67.

OBJECTIVES: Contamination of workplace surfaces by antineoplastic drugs presents an exposure risk for healthcare workers. Traditional instrumental methods to detect contamination such as liquid chromatography-mass spectrometry/mass spectrometry (LC-MS/MS) are sensitive and accurate but expensive. Since immunochemical methods may be cheaper and faster than instrumental methods, we wanted to explore their use for routine drug residue detection for preventing worker exposure.

METHODS: In this study we examined the feasibility of using fluorescence covalent microbead immunosorbent assay (FCMIA) for simultaneous detection and semi-quantitative measurement of three antineoplastic drugs (5-fluorouracil, paclitaxel, and doxorubicin). The concentration ranges for the assay were 0-1000 ng/ml for 5-fluorouracil, 0-100 ng/ml for paclitaxel, and 0-2 ng/ml for doxorubicin. The surface sampling technique involved wiping a loaded surface with a swab wetted with wash buffer, extracting the swab in storage/blocking buffer, and measuring drugs in the extract using FCMIA.

RESULTS: There was no significant cross-reactivity between these drugs at the ranges studied indicated by a lack of response in the assay to cross analytes. The limit of detection (LOD) for 5-fluorouracil on the surface studied was 0.93 ng/cm(2) with a limit of quantitation (LOQ) of 2.8 ng/cm(2), the LOD for paclitaxel was 0.57 ng/cm(2) with an LOQ of 2.06 ng/cm(2), and the LOD for doxorubicin was 0.0036 ng/cm(2) with an LOQ of 0.013 ng/cm(2).

CONCLUSION: The use of FCMIA with a simple sampling technique has potential for low cost simultaneous detection and semi-quantitative measurement of surface contamination from multiple antineoplastic drugs.

Smith, L. D. and P. Sainsbury (2007). "UK needs to better realise value from recovered plastics." Materials Recycling Week **190**(23): 8-8.

The article focuses on the report "Realising the value of recovered plastics" from the Waste & Resources Action Programme (WRAP) in Great Britain. The report analyzes the opportunities and risks for the country’s recovered plastics market as recycling demand grows from consumers. It states that a key challenge facing the recovered plastics sector is how to maintain quality, as a larger proportion of the material is being recovered from post-consumer rather than post-industrial sources. It also mentions that the demand from households for mixed plastics collections is a big challenge but represents a major opportunity to increase plastic recycling rates.

Smith, L. E. (2018). "Plastic ingestion by Scyliorhinus canicula trawl captured in the North Sea." Marine Pollution Bulletin **130**: 6-7.

The ingestion of plastic debris by marine organisms has been documented across a variety of taxa including; marine mammals, sea birds, sea turtles and some fish species. Fewer reports have described ingestion by sharks, in this study the gastrointestinal tracts of 20 small spotted catsharks (Scyliorhinus canicula) trawl captured in the North Sea were investigated.

Macroplastics (>20 mm) were found in 2 individuals and microplastic (<5 mm) was found in one other individual, this is the first time that plastic ingestion has been reported in this species. These observations suggest that gastrointestinal analysis of commonly landed elasmobranch species is worthwhile, to further understanding on the organisms and habitats impacted by plastic pollution. Copyright © 2018 Elsevier Ltd

Smith, M. (2013). "Baling Plastics -- density or throughput, what matters more?" Local Authority Waste & Recycling **21**(12): 21-21.

The article discusses the challenges in plastic polymers recycling. In Great Britain, some 5 million tonnes of waste plastics are produced every year and 2.4 million tonnes of it are related to packaging waste. The author cites monitoring bale weight as an essential part in overcoming the challenges in plastic polymers recycling as well as machine choice and bale size.

Smith, M. and J. Blackburn (2015). "Identifying novel cancer antigens using immunoproteomics." Annals of Oncology **8)**: viii9.

Aim: The Blackburn lab has developed a highly sensitive and selective native cancer-antigen (CT100+) microarray, housing 123 tumour-specific antigens (TSA), for cancer diagnosis using patient blood. Although technically advanced, the microarray has biological limitations as we observed a random antibody response in 10-20% of patients. Our aim is therefore to use immunoproteomics to identify TSAs which can reproducibly be used for cancer diagnosis and prognosis. Method(s): We have an archive of 67 cancer and normal tissues, with corresponding autologous sera, from patients with colorectal cancer (CRC) (Groote Schuur Hospital, South Africa) for identifying novel TSAs. For each patient, we have a range of clinical information including their MSI status, inflammation status, cancer stage, family CRC history, etc. We have, thus far, developed an immuno-pulldown assay, in which Protein A and Protein G magnetic microbeads are used to selectively capture antibodies from the patient sera. The Ig-bound microbeads were incubated with native cancer and control tissue lysates to capture antigens. After performing an on-bead tryptic digestion, the peptides were eluted and proteins were identified by mass spectrometry, using a QExactive mass analyser. Result(s): In total, 1276 proteins were identified of which 360 were unique to cancer. Eight of the 360 cancer-unique proteins were matched to the Tantigen database, a data source and analysis platform for cancer vaccine target discovery focusing on human tumour antigens that contain HLA ligands and T cell epitopes. Furthermore, we found the most abundant cancer-specific protein to be elongation factor 2, a protein previously reported in CRC patients to result in an antibody response, supporting evidence that the IP assay developed captured cancer antigens. Conclusion(s): In conclusion, we have optimised an immuno-pulldown assay to capture and identify cancer antigens from CRC tissues using autologous sera. Our next step is to assay the remaining samples to identify additional TSAs associated with disease diagnosis and prognosis. The newly identified TSAs will then be fabricated on the CT100+ microarray, and validated with patient sera to confirm the presence of cancer-specific antibody response.

Smith, M. and J. M. Blackburn (2017). "Identifying serum biomarkers for colorectal cancer using immunoproteomics." Cancer Research. Conference **77**(22 Supplement 1).

The Blackburn lab has developed a highly sensitive and selective native cancer-antigen (CT100+) microarray, which has been used to detect autoantibodies in the blood samples of cancer patients. Although technically advanced, the microarray has biological limitations as we observe a random antibody response in 10-20% of patients with various cancer-types. Our aim is therefore to use immunoproteomics to identify tumor specific antigens (TSAs) which can

reproducibly be used for cancer diagnosis and prognosis. We have an archive of 67 cancer and paired normal tissues, with corresponding autologous blood plasma samples, from patients with colorectal cancer (CRC) (Groote Schuur Hospital, South Africa) for identifying novel TSAs. For each patient, we have a set of clinical information which can be used to identify cancer antigens associated with disease pathogenesis. To identify novel cancer antigens, we have developed an immuno-pulldown assay, in which Protein A and Protein G magnetic microbeads are used to selectively capture antibodies from the patient blood plasma. The Ig-bound microbeads were incubated with native cancer and control tissue lysates to capture antigens. After performing an on-bead tryptic digestion, the peptides were eluted and proteins were identified by mass spectrometry, using a Q-Exactive mass analyser. Using the MaxQuant proteomics software, we were able to identify a total of 1276 proteins, of which 360 were unique to the cancer samples. Eight of the 360 cancer-unique proteins were matched to the Tantigen database, a data source and analysis platform for cancer vaccine target discovery. Furthermore, 3 of the 8 proteins identified have been reported to induce antibody responses in cancer patients. In conclusion, we have developed an immuno-pulldown assay that captures and identifies proteins which are unique to cancer tissues, of which several have shown to induce a T- and B-cell response in cancer patients. Although we are able to identify protein candidates of interest, we observe several limitations with the assay, for which we are currently troubleshooting. Once the method is optimized, the newly identified TSAs will be fabricated on to the CT100+ microarray, and validated with patient sera to confirm the presence of cancer-specific antibody response.

Smith, M., et al. (2018). "Microplastics in Seafood and the Implications for Human Health." Current Environmental Health Reports **5**(3): 375-386.

PURPOSE OF REVIEW: We describe evidence regarding human exposure to microplastics via seafood and discuss potential health effects.

RECENT FINDINGS: Shellfish and other animals consumed whole pose particular concern for human exposure. If there is toxicity, it is likely dependent on dose, polymer type, size, surface chemistry, and hydrophobicity. Human activity has led to microplastic contamination throughout the marine environment. As a result of widespread contamination, microplastics are ingested by many species of wildlife including fish and shellfish. Because microplastics are associated with chemicals from manufacturing and that sorb from the surrounding environment, there is concern regarding physical and chemical toxicity. Evidence regarding microplastic toxicity and epidemiology is emerging. We characterize current knowledge and highlight gaps. We also recommend mitigation and adaptation strategies targeting the life cycle of microplastics and recommend future research to assess impacts of microplastics on humans. Addressing these research gaps is a critical priority due to the nutritional importance of seafood consumption.

Smith, S. and J. F. Parr (1972). "Chemical stability of DDT and related compounds in selected alkaline environments." Journal of Agricultural and Food Chemistry **20**(4): 839-841.

DDT was stable in soil treated with anhydrous ammonia (pH > 10.0) and in sterile, buffered, glass microbeads up to pH 124 The threshold pH for dehydrochlorination of DDT to DDE in microbeads was 12E, with extensive conversion (> 70%) at pH 13.0 where the amount of applied DDT unaccounted for increased from 2OV at 140 hr to approximately SOX after 30 days. suggesting the formation of intermediates that were lost during extraction or not detectable by electron capture. Applied DDE was relatively stable in microbeads even at pH 13.0 where nearly complete recovery was obtained after 7 days. However, extended incubation to 28 days allowed a gradual disappearance of DDE with only 88 and IVL accounted for at pH 10.0 and 13.0, respectively, suggesting a time dependent pH relationship for transformation under these conditions. Similar observations were observed in studying the effect of pH on the dehydrochlorination of DDD to DDMU. While DDD was stable for extended periods at pH 10.0, it converted rapidly to DDMU at pH 13.0 and then tended to disappear with time.

Smith, S. L., et al. (2019). "Life cycle analysis: end of life analysis of two contact lens replacement modalities." Contact Lens and Anterior Eye **42 (6 Supplement 1)**: e21.

Purpose: There is growing evidence of an increase in microplastic pollution of the aquatic environment, and wider environmental concerns regarding use and disposal of resources. This study examines the annualised waste produced by two representative contact lens systems and the end of life disposal of contact lenses and packaging. Method(s): Waste audits for a representative daily disposable system (somofilcon A) versus a reusable monthly replacement system (somofilcon A with MPS) were conducted to quantify and characterise the materials that would enter household waste or recycling during normal use. Calculations for the reusable system included all lens care products; 12 solution bottles and 12 lens cases. Once weighed (after dehydration, where appropriate) and categorised, annualised figures were calculated assuming compliant, full-time use, with lenses worn in both eyes. Result(s): Four categories of material were identified: liquid; paper and cardboard; metal; plastics (high-density polyethylene, polypropylene and hydrogel plastic). The reuseable system generated 0.8 kg of material solid waste (MSW) over a year, the daily disposable system 1.1 kg. Plastics accounted for the most significant proportion of MSW by mass for both systems. The annualised mass of somofilcon A was 0.3 g and 10 g for reusable and daily disposable lenses respectively. 89 % by mass of MSW generated by the monthly replacement system could be recycled, compared to 35 % of the daily disposable system. Polypropylene trays generated 700 g of waste over a year for the daily disposable system; such material is not commonly accepted for household recycling. Conclusion(s): In the UK, household waste generated per person is approximately 390 kg per year. Contact lens use accounts for only a small percentage of household waste, 0.2-0.3 % and a significant proportion of this can be recycled. Contact lens wearers should be encouraged to dispose of worn lenses in the bin, rather than the sink or lavatory to avoid microplastic contamination of the marine environment. Copyright © 2019

Smits, A. I., et al. (2012). "A mesofluidics-based test platform for systematic development of scaffolds for in situ cardiovascular tissue engineering." Tissue Engineering - Part C: Methods **18**(6): 475-485.

Recently, in situ tissue engineering has emerged as a new approach to obtain autologous, living replacement tissues with off-the-shelf availability. The method is based on the use of an instructive biodegradable scaffold that is capable of repopulation with host cells in situ and subsequent tissue formation. This approach imposes high demands on scaffold properties. For cardiovascular grafts, the repopulation with endogenous cells from the circulation is further hypothesized to be influenced by the hemodynamic environment of the scaffold. To systematically study the effect of scaffold properties on the response of circulating cells, we aimed to develop a mesofluidics-based in vitro test platform that enables on-stage investigation of the interaction of circulating cells with three-dimensional (3D) synthetic scaffolds under physiologic hemodynamic conditions. The test platform consists of a custom-developed cross-flow chamber that houses small-scale 3D scaffolds. The cross-flow chamber is incorporated into a flow-loop to drive a cell suspension along the scaffold with physiological wall shear stress and perfusion pressure. The fluidics system is validated numerically and experimentally using a computational fluid dynamics model and real-time microbead tracing studies, demonstrating a fully developed flow profile with a homogeneous shear stress

distribution over the scaffold. Wall shear stresses and pressure can be controlled independently, well within the target physiological range (0-8 Pa and 0-100 mmHg, respectively). Bench-top evaluation is performed using electrospun poly(e-caprolactone) scaffolds with varying fiber diameter, exposed to a suspension of human peripheral blood mononuclear cells in pulsatile flow for 72 h. Cell adhesion and infiltration are monitored using time-lapsed confocal laser scanning microscopy. In conclusion, we have successfully developed a mesofluidics platform to study cell-scaffold interactions under hemodynamic conditions in vitro. This platform not only enables us to systematically screen and develop potential scaffolds for future in situ cardiovascular tissue engineering approaches, but also acts as a tool to further elucidate processes as observed in vivo.

Smol, T., et al. (2016). "Combination of t(4;14), del(17p13), del(1p32) and 1q21 gain fish probes identifies clonal heterogeneity and enhances detection of adverse cytogenetic profiles in 233 newly diagnosed multiple myeloma." Haematologica **101 (Supplement 1)**: 514.

Background: Cytogenetic analyses play a leading part in the risk stratification of MM due to the prognostic and therapeutic impacts of cytogenetic abnormalities. However, with a metaphase cytogenetic approach only 35% of patients present abnormal karyotypes, often associated with an advanced stage of the disease. Practice guidelines now recommend interphase fluorescence in-situ hybridization (FISH) on isolated CD138-expressing plasma cells (PC) as the initial cytogenetic analysis for MM. The most pertinent markers target the deletion of 17p13 (TP53 deletion) and the t(4;14)(p16;q32) FGFR3-IGH translocation, and partial aneuploidies of chromosome 1 (1q21 gain and 1p32 deletion) are retained as more relevant additional markers. Aim(s): Our aim was to fix the FISH combination of del(17p13), t(4;14), 1q21 gain and del(1p32) in a prospective study of 233 newly diagnosed MM with an analysis of the association between abnormalities and the number of clones. Method(s): Between January 2013 and August 2015, 233 BM samples were collected from 233 patients during diagnostic at the Cytogenetic Laboratories in Valenciennes General Hospital, and Versailles General Hospital. The institutional ethics committee approved the study. PC were enriched from BM mononuclear cells, using a magnetic cell sorting CD138 MicroBeads kit (Miltenyi Biotec; BergischGlabach, Germany). The FISH panel included TP53/CEP17 probe (Amplitech, Compiegne, France), 1p32/CDKN2C-FAF1-1q21/CKS1B probe (Amplitech), t(4;14)(p16;q32) probe (MetaSystems, Altlussheim, Germany), and IGH break-apart probe (MetaSystems). Technical thresholds were determined for each probe using isolated CD138-expressing PC from patients without MM, on the basis of the same method as patients with MM. Thresholds were assessed after counting 200 cells for each negative sample, and established by "mean+3 DS" calculation. Result(s): Cytogenetic abnormalities were identified in 79.0% of cases, with one or more adverse abnormalities in 51.9%. We observed a del(17p13) in 15.0%, a t(4;14) translocation in 11.5%, a 1q21 gain in 37.8%, and a del(1p32) in 8.7% of patients with statistically significant associations between 1q21 gain and t(4;14) (p=0.001), and del(1p32) and del(17p13) (p=0.01). Adding 1p32/1q21 FISH probe has enabled us to identify one or more adverse abnormalities in 39.0% of patients with absence of TP53 deletion or t(4;14). Clonal heterogeneity was observed in 51.1% of cases. Adverse abnormalities were significantly more frequent when the number of clones was greater than or equal to 2, with a frequency of 85.1% against 45.6% when 1 single clone was identified (p<0.0001). We observed a greater number of MM with 1q21 gain when clonal heterogeneity was present (>=2 clones): 81.6% versus 18.4% when 1 single clone was identified (p<0.0001). In the case of marked clonal heterogeneity (>=3 clones), a higher involvement of del(1p32) was found with a frequency of 28.0% against 5.8% when only 2 related clones were present (p=0.002). In the subgroup t(4;14)+/1q21+ with 2 or more identified clones (n=14), 1q21 gain

was found to be significantly more often present in the minor clone compared to the clone with t(4;14) (10/14) (p=0.01). Summary/Conclusions: We were able to identify adverse abnormalities or derivative anomalies, and related clones or clonal evolution by FISH analysis. We confirm the presence of clonal heterogeneity and accumulation of adverse abnormalities in the first diagnostic analysis. The prognostic impact of these parameters should be evaluated, and could be included in cytogenetic classifications.

Snider, E. J., et al. (2020). "A flexible, robust microbead-based assay for quantification and normalization of target protein concentrations." Analytical Biochemistry **590**: 113510.

Although there are many methods for quantifying the concentration of specific proteins in samples, current techniques are technically challenging or do not easily lend themselves to normalization. Here, we describe a microbead-based assay for quantifying specific protein concentration(s) that is high-throughput, inexpensive, simple-to-use, and intrinsically incorporates normalization against the sample total protein content. This assay, termed the FRANC assay, exploits high affinity biotin-streptavidin binding to couple sample proteins to streptavidin-labelled magnetic microbeads. Proteins are then antibody-probed, followed by labeling of proteins on the microbead with fluorescent dye, and flow cytometry-based analysis. The FRANC assay demonstrates detection limits for target proteins in the femtogram range, with a linear range up to as much as 10 ng. Normalization of target protein concentrations resulted in an 80% reduction in variability as compared to non-normalized measurements. We conclude that the FRANC assay offers attractive advantages over current methods for quantifying specific protein(s) in samples.

Snow, D. D., et al. (2019). "Detection, occurrence, and fate of emerging contaminants in agricultural environments (2019)." Water Environment Research **91**(10): 1103-1113.

A review of 82 papers published in 2018 is presented. The topics ranged from detailed descriptions of analytical methods, to fate and occurrence studies, to ecological effects and sampling techniques for a wide variety of emerging contaminants likely to occur in agricultural environments. New methods and studies on veterinary pharmaceuticals, microplastics, and engineered nanomaterials in agricultural environments continue to expand our knowledge base on the occurrence and potential impacts of these compounds. This review is divided into the following sections: Introduction, Analytical Methods, Fate and Occurrence, Pharmaceutical Metabolites, Anthelmintics, Microplastics, and Engineered Nanomaterials. Practitioner points: New research describes innovative new techniques for emerging contaminant detection in agricultural settings. Newer classes of contaminants include human and veterinary pharmaceuticals. Research in microplastics and nanomaterials shows that these also occur in agricultural environments and will likely be topics of future work. Copyright © 2019 Water Environment Federation

So, W. K., et al. (2018). "Abundance of plastic microbeads in Hong Kong coastal water." Marine Pollution Bulletin **133**: 500-505.

To address the rising concern over the use of plastic microbeads in personal care and cosmetic products, countries worldwide have started taking legislative actions to ban microbeads. Yet, the degree of contamination of coastal waters by plastic microbeads is rarely reported. Surface manta trawls were conducted to investigate the presence of microbeads in the southern coastal waters of Hong Kong. Considering only the size fraction of 0.3 to 1mm, 60% of samples were found to contain microbeads. Microbeads accounted for 3.6% of the total microplastics collected and microbead abundance ranged from 0 to 380,129pcs/km². The shapes, sizes, colours, and composition of microbeads found in our samples were similar to those from tested facial scrubs, suggesting that pelagic microbeads collected in this study very likely originated from the cosmetic products available locally. Microbeads represent a non-negligible part of the microplastics found in surface coastal waters.

Soares, R. R. G., et al. (2019). "Silica bead-based microfluidic device with integrated photodiodes for the rapid capture and detection of rolling circle amplification products in the femtomolar range." Biosensors & Bioelectronics **128**: 68-75.

The rapid and sensitive detection of specific nucleic acid sequences at the point-of-care (PoC) is becoming increasingly in demand for a variety of emergent biomedical applications ranging from infectious disease diagnostics to the screening of antimicrobial resistance. To meet such demand, considerable efforts have been invested towards the development of portable and integrated analytical devices combining microfluidics with miniaturized signal transducers. Here, we demonstrate the combination of rolling circle amplification (RCA)-based nucleic acid amplification with an on-chip size-selective trapping of amplicons on silica beads (~8 nL capture chamber) coupled with a thin-film photodiode (200x200micro m area) fluorescence readout. Parameters such as the flow rate of the amplicon solution and trapping time were optimized as well as the photodiode measurement settings, providing minimum detection limits below 0.5 fM of targeted nucleic acids and requiring only 5muL of pre-amplified sample. Finally, we evaluated the analytical performance of our approach by benchmarking it against a commercial instrument for RCA product (RCP) quantification and further investigated the effect of the number of RCA cycles and elongation times (ranging from 10 to 120min). Moreover, we provide a demonstration of the application for diagnostic purposes by detecting RNA from influenza and Ebola viruses, thus highlighting its suitability for integrated PoC systems.

Sobhani, Z., et al. (2019). "Identification and visualisation of microplastics by Raman mapping." Analytica Chimica Acta **1077**: 191-199.

Recently, microplastics (MP) have emerged as global contaminants of serious concern to human and ecological health. However, identification and visualisation of MP are still a challenge, whether from wastewater, oceans, sediment or soil. Particularly when MP are mapped to visualise their distribution, the background signal from sediment and soil might be high and shield the MP signal from the analysis. Raman has recently received increasing attention, as the complementary spectrum of infrared (IR), because it can overcome the drawbacks of IR analysis including water interference, low lateral resolution and a complex spectrum. Here we show that Raman can identify and visualise MP from a soil/sand background, with almost no sample preparation, no dye, no destruction of the sample and no interference from water/organic matter/fluorescence background signals as well. By mapping image via their characteristic and fingerprint peaks, MP including polystyrene (PS), polyethylene terephthalate (PET), polyethylene (PE), polyvinyl chloride (PVC) and polypropylene (PP) can be individually identified and visualised. The lateral resolution along the focal plane is 1mum/pixel to catch small MP down to 1mum.

Sobrova, P., et al. (2012). "Capillary electromigration based techniques in diagnostics of prion protein caused diseases." Electrophoresis **33**(24): 3644-3652.

Transmissible spongiform encephalopathies are a group of fatal neurodegenerative diseases with long incubation time. This group includes Creutzfeld-Jakob disease, kuru, scrapie, chronic wasting disease, and bovine spongiform encephalopathy. Sensitive and specific detection of abnormal prion protein as "a source agent" of the above-mentioned diseases in blood could provide a diagnostic test or a screening assay for animal and human prion protein diseases diagnostics. Therefore, diagnostic tests for prion protein diseases represent unique challenge requiring development of novel assays exploiting properties of prion protein complex. Presently, diagnostic methods such as protein misfolding cyclic amplification, conformation-dependent immunoassay, dissociation-enhanced lanthanide fluorescent immunoassay, fluorescence correlation spectroscopy, and/or flow microbead immunoassay are used for abnormal prion protein (PrP(Sc)) detection. On the other hand, using of CE for PrP(Sc) detection in body fluids is an attractive alternative; it has been already applied for the blood samples of infected sheep, elk, chimpanzee, as well as humans. In this review, assays for prion protein detection are summarized with special attention to capillary electromigration based techniques, such as CE, CIEF, and/or CGE. The potential of the miniaturized and integrated lab-on-chip devices is highlighted, emphasizing recent advances of this field in the proteomic analysis.

Sogancioglu, M., et al. (2019). "Behaviour of waste polypropylene pyrolysis char-based epoxy composite materials." Environmental science and pollution research international. **10**.

In this study, polypropylene (PP) plastic wastes were pyrolysed. Solid pyrolysis product (char) was used as filler material for the preparation of epoxy composite. 300, 400, 500, 600 and 700 degreeC were selected as final pyrolysis temperatures. Solid pyrolysis product (char) was analysed by elemental, FTIR, SEM, BET and TGA analysis. The epoxy composite samples were prepared with char obtained from pyrolysis. Mechanical properties of composites were analysed by hardness, tensile strength, elongation at break, electrical conductivity tests to explain the effects of pyrolysis temperature and char doses over composite properties. Thermogravimetric properties of composites were determined by TGA analyses. The water absorption behaviour of composite samples was determined by water adsorption test. Epoxy composite produced from PP char obtained under 300 degreeC showed the most ideal behaviour.

Soh, N., et al. (2004). "Chemiluminescence sequential injection immunoassay for vitellogenin using magnetic microbeads." Talanta **64**(5): 1160-1168.

A rapid and sensitive immunoassay for the determination of carp vitellogenin (Vg) is described. The method involves a sequential injection analysis (SIA) system equipped with a chemiluminescence detector and a samarium-cobalt magnet. An anti-Vg monoclonal antibody, immobilized on magnetic beads, was used as a solid support for the immunoassay. The introduction, trapping and release of the magnetic beads in the flow cell were controlled by a samarium-cobalt magnet and the flow of the carrier solution. The immunoassay was based on a sandwich immunoreaction of anti-Vg monoclonal antibody (primary antibody) on the magnetic beads, Vg, and the anti-Vg antibody labeled with horseradish peroxidase (HRP) (secondary antibody), and was based on a subsequent chemiluminescence reaction of HRP with hydrogen peroxide and p-iodophenol, in a luminol solution. The magnetic beads to which the primary antibody was immobilized were prepared by coupling the primary antibody with the magnetic beads after an agarose-layer on the surface of the magnetic beads was epoxidized. The primary antibody-immobilized magnetic beads were introduced, and trapped in the flow cell equipped with the samarium-cobalt magnet, a Vg sample solution, an HRP-labeled secondary antibody solution and the luminol solution were sequentially introduced into the flow cell based on an SIA programmed sequence. Chemiluminescence emission was monitored by means of a photomultiplier located at the upper side of the flow cell. The optimal incubation times both for the first and second immunoreactions were determined to be 20min. A concave calibration curve was obtained between Vg concentration and chemiluminescence intensity when various concentrations of standard Vg samples (2-100ngmL(-1)) were applied to the SIA system under optimal conditions. In spite of a narrow working range, the lower detection limit of the immunoassay was about 2ngmL(-1).

Soh, N., et al. (2002). "Spectrophotometric determination of carp vitellogenin using a sequential injection analysis technique equipped with a jet ring cell." Talanta **58**(6): 1123-1130.

A sequential injection analysis (SIA) technique, in which antibody-immobilized microbeads were transferred to a jet ring (JR) cell, was used in determination of carp vitellogenin (Vg). The determination is based on a sandwich immunoassay in which two types of reactions between anti carp Vg antibodies and carp Vg are used. Namely, the antibody for the first reaction step was immobilized on microbeads (Sephadex beads), and an antibody labeled with a horseradish peroxidase (HRP) was used in the second step of the reaction. A mixed solution of hydrogen peroxide and o-phenylenediamine (OPD) was used as the source of the chromophore in the reaction. The microbeads-immobilized antibody, Vg analyte, HRP-labeled anitbody and the color developing solution were introduced automatically into the JR cell of the SIA system in a programmed sequence, and the absorbance of the oxidized OPD product was used to determine the amount of Vg present. The optimal incubation times for the immuno-raction for the first and the second steps were determined at 120 and 60 min, respectively, taking into account the sensitivity to the Vg determination. Under these conditions, a good linear correlation was obtained between Vg concentration and the absorbance of the oxidized OPD. The lower detection limit for the determination of Vg was about 5 ng ml(-1) in this system. The method developed here represents a simple, accurate method for the determination method of Vg.

Sohail, A., et al. (2012). "Evaluation of Lactobacillus rhamnosus GG and Lactobacillus acidophilus NCFM encapsulated using a novel impinging aerosol method in fruit food products." International Journal of Food Microbiology **157**(2): 162-166.

This study investigated the effect of microencapsulation on the survival of Lactobacillus rhamnosus GG and Lactobacillus acidophilus NCFM and their acidification in orange juice at 25degreeC for nine days and at 4degreeC over thirty five days of storage. Alginate micro beads (10-40 mum) containing the probiotics were produced by a novel dual aerosol method of alginate and CaCl(2) cross linking solution. Unencapsulated L. rhamnosus GG was found to have excellent survivability in orange juice at both temperatures. However unencapsulated L. acidophilus NCFM showed significant reduction in viability. Encapsulation of these two bacteria did not significantly enhance survivability but did reduce acidification at 25degreeC and 4degreeC. In agreement with this, encapsulation of L. rhamnosus GG also reduced acidification in pear and peach fruit-based foods at 25degreeC, however at 4degreeC difference in pH was insignificant between free and encapsulated cells. In conclusion, L. rhamnosus GG showed excellent survival in orange juice and microencapsulation has potential in reducing acidification and possible negative sensory effects of probiotics in orange juice and other fruit-based products.

Sokka, L., et al. (2007). "Municipal solid waste production and composition in Finland—Changes in the period 1960–2002 and prospects until 2020." Resources, Conservation & Recycling **50**(4): 475-488.

Waste reduction was recognised as the main goal of waste management policy in the EU in the 1990s. Although knowledge of past waste generation is essential for effective waste reduction policy there are no comprehensive statistics on the past development of municipal solid waste (MSW) production. MSW management is currently under turmoil in many EU countries as the requirements of the EC landfill directive (1999/31/EC) are set into force. In this study, the production and composition of MSW in Finland between 1960 and 2002 is presented using historical data. The impact of population, affluence and technology on MSW production are analysed using the IPAT equation and three scenarios are constructed until year 2020. The results are compared with national future targets on MSW production. Production of MSW increased in Finland until 1990, declined to year 1997, increased to 2000 and then declined again. The share of organic and plastic waste increased over the study period while the share of paper and cardboard declined. The results suggest that so far national targets on MSW reduction have been set fairly low. Moreover, our scenarios depict a wide range of future MSW production, even though the time horizon is not longer than 15 years into the future. In order to narrow this range, continuous improvement of the statistics of MSW is essential. [Copyright &y& Elsevier]

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Sokmen, T. O., et al. (2019). "Polystyrene nanoplastics (20 nm) are able to bioaccumulate and cause oxidative DNA damages in the brain tissue of zebrafish embryo (Danio rerio)." Neurotoxicology **77**: 51-59.

Nano-sized plastic particles formed from both daily use plastics and its debris have become a potential health and environmental problem due to features such as transportation through food webs and maternal transfer. Although many studies on the toxicity of plastics exist more detailed and molecular studies are needed to evaluate and review the effects of plastics especially in nano-size range. For this purpose, we have microinjected polystyrene nanoplastics (PNP) (20 nm) to the zebrafish embryo, which is one of the best model organisms for developmental toxicity studies, to simulate intake with food or maternal. Survival, hatching and malformations evaluated during the experimental period (120 h). Moreover, we have aimed to put forth the presence of reactive oxygen species (ROS) and apoptosis signalling accumulation in the body in addition to bioaccumulation of PNP and immunochemical toxicity (8-OHdG) on the brain of zebrafish larvae at the 120th hour. According to results, it has been demonstrated that 20 nm diameter PNP can reach the brain and bioaccumulate there, moreover lead to oxidative DNA damage in the brain regions where it bioaccumulates. Here we have also imaged the PNP from a vertebrate brain via transmission electron microscopy (TEM) for the first time. As a result of these, it has been detected increasing mortality and prevailing abnormalities in addition to excessive ROS and apoptosis in especially the brain. As a conclusion, obtained data have suggested that precautions, on the use and contamination of the plastic product, to be taken during both pregnancy and baby care/feeding are important for the health of the baby in future.

Sola, C., et al. (2015). "High-Throughput CRISPR Typing of Mycobacterium tuberculosis Complex and Salmonella enterica Serotype Typhimurium." Methods in Molecular Biology **1311**: 91-109.

Spoligotyping was developed almost 18 years ago and still remains a popular first-lane genotyping technique to identify and subtype Mycobacterium tuberculosis complex (MTC) clinical isolates at a phylogeographic level. For other pathogens, such as Salmonella enterica, recent studies suggest that specifically designed spoligotyping techniques could be interesting for public health purposes. Spoligotyping was in its original format a reverse line-blot hybridization method using capture probes designed on "spacers" and attached to a membrane's surface and a PCR product obtained from clustered regularly interspaced short

palindromic repeats (CRISPRs). Cowan et al. and Fabre et al. were the first to propose a high-throughput Spoligotyping method based on microbeads for MTC and S. enterica serotype Typhimurium, respectively. The main advantages of the high-throughput Spoligotyping techniques we describe here are their low cost, their robustness, and the existence (at least for MTC) of very large databases that allow comparisons between spoligotypes from anywhere.

Soltner, E., et al. (2009). "Adenosine inhibits RANKL-induced osteoclastogenesis in vitro." Arthritis and Rheumatism **10)**: 1296.

Purpose: Adenosine is an endogenous purine nucleoside that modulates many physiological processes. Cellular signaling occurs through four known adenosine receptor subtypes (A1, A2a, A2b, and A3). Adenosine is believed to be an anti-inflammatory agent, implicated in many pathologies such as asthma or inflammatory joint disease. However, there is very few information in the literature on the role and expression of adenosine receptors in bone cells. We investigated therefore whether osteoclasts express adenosine receptors and how adenosine could regulate osteoclastogenesis. Method(s): Human peripheral blood mononuclear cells (PBMCs) were isolated by centrifugation over Ficoll gradient. CD14+ cells were magnetically labelled with CD14+ microbeads and positively selected by MACS technology. CD14+ cells were cultured with human M-CSF (25 ng/ml) and, after 3 days of culture, with or without hRANK-L (100 ng/ml). The formation of TRAP positive cells occurred around the 12th day of culture and was observed by TRAP staining. Expression of adenosine receptors was determined by RT-PCR and micro-array analysis of CD14+ cells and osteoclasts. Activity of the PI3K pathway, a key signaling protein downstream of adenosine receptors, was analysed by western blotting. TRAP staining was used to evaluate the effects of adenosine and 4 specific agonists of the adenosine receptors [CCPA (A1), CGS21680 (A2a), NECA (A2b), IB-MECA (A3)] on osteoclast differentiation. Result(s): The mRNA for all four adenosine receptors (A1, A2a, A2b, and A3), was detectable by RT-PCR in both CD14+ cells and osteoclasts. Microarray analysis showed a 2-fold increase in expression of the A3 receptor subtype in osteoclasts compared to CD14+ cells, whereas expression of the 3 other subtypes remained stable during differentiation. Western blot analysis showed a decreased phosphorylation of PI3K in CD14+ cells and osteoclasts stimulated with adenosine. TRAP staining demonstrated that adenosine inhibited RANKL-induced osteoclastogenesis. All four specific agonists of individual receptor subtypes inhibited osteoclastogenesis with comparable efficacies. Conclusion(s): Our work shows that osteoclasts and CD14+ cells express all four subtypes of adenosine receptor. Furthermore, phosphorylation of PI3K was decreased following stimulation with adenosine, confirming that these receptors are functional. We also demonstrated that adenosine has a potent inhibitory effect on RANKL-induced osteoclastogenesis in vitro, through its 4 receptor subtypes. We hypothesise that adenosine may be a regulator of osteoclastogenesis and contribute to the balance between bone formation and resorption in inflammatory conditions.

Some, Y. S. C., et al. (2016). "The determiners of the choice of the plastic containers in the production of plants in Ouagadougou (Burkina Faso): a contribution to the management of plastic waste." International Journal of Biological and Chemical Sciences **10**(6): 2637-2645.

Plastic waste contributes to the degradation of the environment and affects human and animal health. However, plastics are widely used as containers by Nursery men of the city of Ouagadougou, for the production plants intended for the reforestation. This work is interested in the explanatory factors of the choice of the types of containers. Its objective is to contribute to a better waste management of plastic containers stemming from the production of plants by a better knowledge of the criteria of choice of the containers of the nursery gardeners of

Ouagadougou to Burkina Faso. The methodology is based on geographic and social surveys and data analysis (analysis of variance and correlation test). This work allowed identifying two groups of plastic containers: that resulting from salvaged materials and that stemming from a specific industrial production. These plastic containers are polyethylene (high and low density) and polypropylenes (single and laminated). The main factors of choice of containers are: the price and the availability. The most used containers are the ones which are the most available and having the lowest costs. This work could be extended to other cities, to the ways of elimination of used containers and to the use of alternative containers.

Somleva, M. N., et al. (2008). "Production of polyhydroxybutyrate in switchgrass, a value-added co-product in an important lignocellulosic biomass crop." Plant Biotechnology Journal **6**(7): 663-678.

SUMMARY: Polyhydroxyalkanoate bio-based plastics made from renewable resources can reduce petroleum consumption and decrease plastic waste disposal issues as they are inherently biodegradable in soil, compost and marine environments. In this paper, the successful engineering of the biomass crop switchgrass (Panicum virgatum L.) for the synthesis of polyhydroxybutyrate (PHB) is reported. Polymer production was monitored in more than 400 primary transformants grown under in vitro and glasshouse conditions. Plants containing up to 3.72% dry weight of PHB in leaf tissues and 1.23% dry weight of PHB in whole tillers were obtained. Results from the analysis of the polymer distribution at the cellular and whole plant levels are presented, and target areas for the improvement of PHB production are highlighted. Polymer accumulation was also analysed in the T(1) generation obtained from controlled crosses of transgenic plants. This study presents the first successful expression of a functional multigene pathway in switchgrass, and demonstrates that this high-yielding biomass crop is amenable to the complex metabolic engineering strategies necessary to produce high-value biomaterials with lignocellulose-derived biofuels.

Somner, J. E., et al. (2010). "The precautionary principle: what is the risk of reusing disposable drops in routine ophthalmology consultations and what are the costs of reducing this risk to zero?" Eye **24**(2): 361-363.

BACKGROUND: Instilling eye drops is a ubiquitous procedure in eye clinics. This audit aimed to assess the risk of contamination of disposable droppers and to quantify the financial and waste implications of reducing this risk to zero by using disposable droppers only once.

METHODS: A total of 100 disposable Minims were used to place one drop in each eye of 70 patients. The dropper tip was then cultured for aerobic and anaerobic microbes.

RESULTS: Coagulase-negative staphylococcus was cultured from five samples. The contamination rate per drop application was 2.5%. The risk of cross-contamination with coagulase-negative staphylococcus would be between 1 : 400 and 1 : 80 if the bottle was reused once or six times. Reducing this risk to zero costs between pound2.75 and pound4.6 million per annum and generates between 6.85 and 11.42 more tonnes of paper waste and between 12.69 and 21.15 more tonnes of plastic waste than a strategy that reuses the disposable dropper.

CONCLUSION: Reducing the risk of dropper contamination and subsequent cross infection has financial and environmental costs. As exposure to coagulase-negative staphylococcus is not necessarily associated with infection, it would be useful to decide acceptable risk levels for a given cost to maximise both cost-effectiveness and patient safety.

Somo, S. I., et al. (2018). "Synthesis and evaluation of dual crosslinked alginate microbeads." Acta Biomaterialia **65**: 53.

Alginate hydrogels have been investigated for a broad variety of medical applications. The ability assemble hydrogels at neutral pH and mild temperatures makes alginate a popular choice for the encapsulation and delivery of cells and proteins. Alginate has been studied extensively for the delivery of islets as a treatment for type 1 diabetes. However, poor stability of the encapsulation systems after implantation remains a challenge. In this paper, alginate was modified with 2-aminoethyl methacrylat hydrochloride (AEMA) to introduce groups that can be photoactivated to generate covalent bonds. This enabled formation of dual crosslinked structure upon exposure to ultraviolet light following initial ionic crosslinking into bead structures. The degree of methacrylation was varied and in vitro stability, Ion term swelling, and cell viability examined. At low levels of the methaciylation, the beads could be forme by first ionic crosslinks followed by exposure to ultraviolet light to generate covalent bonds. The methacrylated alginate resulted in more stable beads and cells were viable following encapsulatior Alginate microbeads, ionic (unmodified) and dual crosslinked. were implanted into a rat omentum pouch model. Implantation was performed with a local injection of 100 µl of 50 pg/µl of Lipopolysaccharid (LPS) to stimulate a robust inflammatory challenge in viva. Implants were retrieved at 1 and 3 week for analysis. The unmodified alginate microbeads had all failed by week I, whereas the dual crosslinked alginate microbeads remained stable up through 3 weeks. The modified alginate microbead may provide a more stable alternative to current alginate-based systems for cell encapsulation.

Sompuram, S. R., et al. (2018). "Quantitative Assessment of Immunohistochemistry Laboratory Performance by Measuring Analytic Response Curves and Limits of Detection." Archives of Pathology & Laboratory Medicine **142**(7): 851-862.

Context.--Numerous studies highlight interlaboratory performance variability in diagnostic immunohistochemistry (IHC) testing. Despite substantial improvements over the years, the inability to quantitatively and objectively assess immunostain sensitivity complicates interlaboratory standardization. Objective.--To quantitatively and objectively assess the sensitivity of the immunohistochemical stains for human epidermal growth factor receptor type 2 (HER2), estrogen receptor (ER), and progesterone receptor (PR) across IHC laboratories in a proficiency testing format. We measure sensitivity with parameters that are new to the field of diagnostic IHC: analytic response curves and limits of detection. Design.--Thirty-nine diagnostic IHC laboratories stained a set of 3 slides, one each for HER2, ER, and PR. Each slide incorporated a positive tissue section and IHControls at 5 different concentrations. The IHControls comprise cell-sized clear microbeads coated with defined concentrations of analyte (HER2, ER, and/or PR). The laboratories identified the limits of detection and then mailed the slides for quantitative assessment. Results.--Each commercial immunostain demonstrated a characteristic analytic response curve, reflecting strong reproducibility among IHC laboratories using the same automation and reagents prepared per current Good Manufacturing Practices. However, when comparing different commercial vendors (using different reagents), the data reveal up to 100-fold differences in analytic sensitivity. For proficiency testing purposes, quantitative assessment using analytic response curves was superior to subjective interpretation of limits of detection. Conclusions.--Assessment of IHC laboratory performance by quantitative measurement of analytic response curves is a powerful, objective tool for identifying outlier IHC laboratories. It uniquely evaluates immunostain performance across a range of defined analyte concentrations.

Somwanshi, N. R., et al. (2019). "Biodegradation of synthetic polymer waste using bacteria isolated from soil." Biochemical and Cellular Archives **19**(1): 1737-1740.

Synthetic polymer wastes accumulating in the environment are posing an ever increasing

ecological threat. Plastics that are biodegradable can be considered environment friendly, they have an increasing range of potential application and are driven by the growing use of plastics in packaging. Present study envisages biodegradation of synthetic polyethylene using different strains of bacteria isolated from industrial plastic waste disposal site. Polyethylene strips of 50 micro m thickness were treated with three bacterial isolates for 42 days resulting in on an average 20.47% reduction of dry weight. This value is much higher than observed in other studies.

Sonawane, S. L. and S. K. Asha (2016). "Fluorescent Polystyrene Microbeads as Invisible Security Ink and Optical Vapor Sensor for 4-Nitrotoluene." Acs Applied Materials & Interfaces **8**(16): 10590-10599.

Color-tunable solid-state emitting polystyrene (PS) microbeads were developed by dispersion polymerization, which showed excellent fluorescent security ink characteristics along with sensitive detection of vapors of nitro aromatics like 4-nitro toluene (4-NT). The fluorophores pyrene and perylenebisimide were incorporated into the PS backbone as acrylate monomer and acrylate cross-linker, respectively. Solid state quantum yields of 94 and 20% were observed for the pyrene and perylenebisimide, respectively, in the PS/Py and PS/PBI polymers. The morphology and solid state fluorescence was measured by SEM, fluorescence microscopy, and absorbance and fluorescence spectroscopy techniques. The ethanol dispersion of the polymer could be used directly as a fluorescent security "invisible" ink, which became visible only under ultraviolet light. The color of the ink could be tuned depending on the amounts of the pyrene and perylenebisimide incorporated with blue and orange-green for pyrene alone or perylenebisimide alone beads respectively and various shades in between including pure white for beads incorporating both the fluorophores. More than 80% quenching of pyrene emission was observed upon exposure of the polymer in the form of powder or as spin-coated films to the vapors of 4-NT while the emission of perylenebisimide was unaffected. The limit of detection was estimated at 10(-5) moles (2.7 ppm) of 4-NT vapors. The ease of synthesis of the material along with its invisible ink characteristics and nitro aromatic vapor detection opens up new opportunities for exploring the application of these PS-based materials as optical sensors and fluorescent ink for security purposes.

Sonawane, Y. B., et al. (2017). "High Calorific Value Fuel from Household Plastic Waste by Catalytic Pyrolysis." Nature Environment and Pollution Technology **16**(3): 879-882.

Plastic waste pollution causes several impacts on the environment, so its proper disposal is very essential. On the other hand, petroleum resources are vanishing due to high demand of fuel for growing population and limited resources in India. So, there is a need to save existing resources and find an alternative source for fossil fuels. We can convert household plastic waste into petroleum products by pyrolysis method. In the present study, lab scale borosilicate pyrolysis reactor set up was designed for plastic waste treatment. Major components of household plastic waste are HDPE, LDPE and PP material, so were used in pyrolysis. Shredding, washing and drying of plastic waste was done manually. Pyrolysis experiments were carried out for 100g of HDPE, LDPE and PP waste with and without catalyst. Temperature and reaction time were optimized for each type of waste. Different catalysts like alumina, scolecite, dolomite, ceramic powder, white cement, sand and red brick powder were tried in the pyrolysis process. As dolomite yielded maximum liquid fuel and is cost effective, it has been used in pyrolysis experiments with different catalysts to feed ratios. Liquid fuel obtained for HDPE, LDPE and PP enhanced from 72%, 73% and 84% to 82%, 83% and 85% respectively, by using 10% dolomite. For mixed plastic waste, liquid fuel obtained was about 72.96% without catalyst and 82% with 10 % dolomite. Liquid fuel was characterized for GC-MS, FTIR and calorific values. Results

showed the presence of alkanes and alkenes in major quantity and increase in concentration of low molecular weight hydrocarbon fractions (C10-C25) in the liquid fuel. Liquid fuel obtained from HDPE, LDPE and PP by using 10% dolomite showed higher calorific values (43000-46000 kJ/kg) as compared to that of without catalyst (40000-42000 kJ/kg). This liquid fuel can be used as a fuel in different industrial sectors.

Sondergaard, C. S., et al. (2009). "Minimal engraftment of human CD34+ cells mobilized from healthy donors in the infarcted heart of athymic nude rats." Stem Cells & Development **18**(6): 845-856.

Cell-based regenerative therapy may be useful for treatment of acute myocardial infarction (AMI). Animal xenograft models are ideally suited for preclinical studies evaluating prospective treatment regimes, identifying candidate human cell populations, and gaining mechanistic insight. Here we address whether the athymic nude rat is suitable as a xenograft model for the study of human CD34+ mobilized peripheral blood stem cells (M-PBSCs) in the repair of AMI. We injected human donor cells into the infarct border of athymic nude rats with surgically induced AMI and evaluated engraftment and functional improvement. We found no human engraftment by immunofluorescence staining at 14 days after transplantation or functional improvement at days 2 and 14 compared to controls. The lack of long-term human engraftment was furthermore confirmed in a time series study analyzing animals at 0, 24, 48, 72, and 96 h after transplantation. Although we found fluorescent microbeads coinjected with human CD34+ M-PBSCs at all time points, the number of donor cells rapidly declined and became undetectable at 96 h. CD34+ M-PBSCs from the same donor used to treat athymic nude rat hearts engrafted the bone marrow of nonobese diabetic/severe combined immunodeficient mice 8-10 weeks after transplantation. In conclusion, human CD34+ M-PBSCs with confirmed hematopoietic engraftment potential rapidly disappeared from the site of injury following intramyocardial transplantation in the athymic nude rat AMI model.

Song, K., et al. (2014). "Preparation, Mass Diffusion, and Biocompatibility Analysis of Porous-Channel Controlled Calcium-Alginate-Gelatin Hybrid Microbeads for In Vitro Culture of NSCs." Applied Biochemistry and Biotechnology **173**(3): 838-850.

The Ca-alginate/gelatin (CAG) microbeads were prepared and evaluated through assays for their mechanical strength, permeability, and the feasibility as a cell carrier for in vitro culture of neural stem cells. The effects of different concentrations of sodium alginate, gelatin, and calcium chloride on the mechanical strength of CAG microbeads were determined using a self-made puncture force tester. Following this, the microbeads were immersed in DMEM media for a specified period to test its decay resistance. A diffusion model including a calculation formula of diffusion coefficient was built to investigate the diffusion of glucose and bovine serum albumin (BSA) through the wall of the microbeads. Furthermore, the feasibility of the microbeads for in vitro culture was identified using neural stem cells from Kunming mouse. Through a systematic approach and comprehensive analysis, the optimal gelatin conditions for microbead preparation were determined; the final combination of parameters of 1.5 % (wt%) sodium alginate (SA), 0.5 % (wt%) gelatin, and 4 % (wt%) CaCl sub(2) were the best conditions for NSC cultures. This experiment demonstrated that CAG microbeads had good cytocompatibility that made it suitable for the culture and successfully maintained stemness of neural stem cells.

Song, K., et al. (2015). "Preparation and detection of calcium alginate/bone powder hybrid microbeads for in vitro culture of ADSCs." Journal of Microencapsulation **32**(8): 811-819.

Calcium alginate microbeads have been widely used in tissue engineering application, due to their excellent biocompatibility, biodegradability, enhanced mechanical strength and toughness. Bone powder containing abundant hydroxylapatite, type I collagen and growth factors such as BMP2 and BMP4, possesses good osteoinductive activity. Herein, a hybrid calcium alginate/bone powder microbead was therefore prepared. Afterwards, different seeding density of adipose-derived stem cells (ADSCs) in these hybrid microbeads was discussed systematically for further in vitro expansion. Optimised microbeads suitable for in vitro expansion and differentiation of ADSCs were prepared using the droplet method under overall considering suitable concentrations of calcium alginate and calcium chloride as well as the density of bone powder through an orthogonal experiment. The results showed that the concentration of sodium alginate had the most influence on inside mass transfer and mechanical strength of the hybrid microbeads, secondly the calcium chloride, then the density of bone powder. The hybrid microbeads could be optimally performed while the concentrations of sodium alginate and calcium chloride were 2.5% and 4.5%, as well as 5.0 mg/mL bone powder, respectively. Live/Dead assay showed that the expanded ADSCs differentiated well with an initial embedding density of 5 x 10(6) cells/mL.

Song, K. D., et al. (2010). "Microencapsulated Osteoblasts Support Hematopoietic Stem/Progenitor Cell Expansion in Hypoxic Environment." Progress in Biochemistry and Biophysics **37**(7): 754-761.

Microencapsulated osteoblasts were cocultured with hematopoietic stem/progenitor cells (HSPCs) under hematopoietic niche oxygen concentration to investigate the promoting effort of hematopoietic microenvironment on the expansion of umbilical cord blood HSPCs. The osteobalsts were isolated from human iliac bone and cultured, the third passage of osteoblasts at a density of 8 x 10 super(5) cells/ml were encapsulated in gelatin-alginiate-chitosan (GAC) beads with a diameter of 0.5 mm by the polyelectrolyte-complexation method. Three groups of cells were cultured in 5% oxygen incubator, A' group with microencapsulated osteoblasts and hematopoietic cells, B' with only hematopoietic cells and C' with only microencapsulated osteoblasts. Meanwhile, the similarly grouped cells were cultured under 20% oxygen condition, named as A, B and C groups, respectively. The expansion of HSPCs was evaluated by flow cytometry analysis and colony-forming assays. And the concentrations of two kinds of cytokines, LIF and IL-6, were tested to investigate the mechanism of osteoblast's action. The results showed that human osteoblasts dispersed uniformly and grew well in microbeads. There were amount of micro holes in the beads for nutrients transmission. Lots of hematopoietic cells adhered weakly on the surface of microbeads. After 7 days of culture, the hematopoietic cell expansion folds were (49.0 plus or minus 4.6), (3.3 plus or minus 0.5), (17.7 plus or minus 1.2) and (1.9 plus or minus 0.2) respectively for group A', B', A and B. And CD34 super(+) cells in groups A', B' and A were expanded (87.6 plus or minus 8.3)-fold, (2.2 plus or minus 0.3)-fold and (14.9 plus or minus 1.0)-fold, but CD34 super(+) cells in group B descended. CFU-Cs expansion folds in group A', B', A and B were (9.8 plus or minus 0.8), (3.5 plus or minus 0.4), (6.9 plus or minus 0.7) and (2.6 plus or minus 0.2) respectively. It was indicated that Hypoxic co-culture system could promote HSPCs expansion much more than normoxic co-culture system and somatic cell-free culture system. IL-6 and LIF concentrations in A', B' and C' were significantly higher than those in groups A, B and C, which were consistent with their expansion results. Moreover, microencapsulated osteoblasts could support the expansion of umbilical cord blood HSPCs, especially in 5% oxygen condition. Osteoblasts lived in low oxygen condition could secrete more cytokines and thus regulate HSPCs expansion.

Song, N. S. and S. K. Kim (2016). "A pilot study to measure microplastics in wastewater treatment plant (WWTPs)." Toxicology and Environmental Health Sciences **8 (4)**: S36.

Plastic pollution in the marine/ocean is a global concern because their micro-sized plastics (MPs) can be transferred into marine foodweb through ingestion by organisms in various trophic levels and hazardous additives can be released into surrounding environment. So far, most of MP studies has focused on marine system and freshwater system has been rarely studies. Considering that most of plastic debris found in marine environment originate from the land and MP amount found in marine environment was too small than estimate for discharge from land to ocean, significant amounts of plastic debris is inferred to stay in the freshwater system. Particularly, wastewater treatment plant (WWTPs) in urban area can be a significant source and sinker because wastes produced from human activities are treated through drainage system. This study aimed to develop the analytical method for MPs in wastewaters and to screen the distribution characteristics of MPs in WWTP system. In this pilot study, two WWTPs with different treatment process (A2O/MBR vs. MLE) were investigated. Various shapes and polymers were observed with average total abundance of ~0.2 particles/L in effluents. Major polymer was different for two WWTPs: polyurethane vs. polyethylene. We are going to measure MPs in influent to calculate mass balance of MPs.

Song, S. Y., et al. (2011). "A fluoro-microbead guiding chip for simple and quantifiable immunoassay of cardiac troponin I (cTnI)." Biosensors & Bioelectronics **26**(9): 3818-3824.

We have developed a fluoro-microbead guiding chip (FMGC) to perform an optical immunoassay of cardiac troponin I (cTnI). The plasma marker protein cTnI is the currently preferred marker to use for a definitive diagnosis and prognosis of myocardial infarction. The FMGC has four immunoreaction regions on a silicon oxide substrate, with five gold patterns imprinted on each region for multiple simultaneous assays. The FMGC assay clearly distinguished immunospecific binding from nonspecific binding by comparing optical signals from inside and outside of the patterns. To detect cTnI, a sandwich immunoassay was performed using antibody-tagged fluoro-microbeads. The cTnI-specific capture antibody was conjugated to the FMGC surface by reaction with 3-3'-dithiobis-propionic acid N-hydroxysuccinimide ester to create a self-assembling antigen-sensing monolayer (DTSP SAM) on the chip. A sample containing cTnI was applied to the antigen-sensing monolayer and allowed to react. To generate a binding signal, a cTnI detection antibody-linked fluoro-microbead preparation was added. The cTnI concentration in a sample was determined by counting the number of biospecifically bound fluoro-microbeads on the corresponding five patterns on the FMGC. The optical signal showed a linear correlation with cTnI concentrations in plasma samples containing from 3.4 pM to 3.4 nM (0.1-100 ng/ml) cTnI. The sensitivity of cTnI detection could be increased by reducing the non-specific binding of the beads to the antigen-sensing surfaces of the chip. Optical detection and quantification of binding by fluorescence microscopy gave results that correlated well with results from a commercial ELISA for cTnI in human plasma. Based on these findings, we propose that the FMGC-based immunoassay system may be adapted to detect and quantify a variety of clinically important targets in human samples.

Song, Y., et al. (2019). "Uptake and adverse effects of polyethylene terephthalate microplastics fibers on terrestrial snails (Achatina fulica) after soil exposure." Environmental Pollution **250**: 447-455.

Recent studies have demonstrated the occurrence of microplastic fibers (MFs) in soil environments. To determine whether MFs are harmful for soil biota, we evaluated toxic effects on terrestrial snails (Achatina fulica) after 28 d exposure to polyethylene terephthalate MFs at concentrations of 0.01-0.71 g kg⁻¹ (dry soil weight). Digestion kinetics experiments on 24 snails showed that MFs can be ingested and excreted within 48 h. We found the appearance of cracks and deterioration on the surface of MFs after depuration by the digestive

system. Prolonged exposure to 40 snails showed that 0.14-0.71 g kg⁻¹ MFs caused an average reduction of 24.7-34.9% food intake and 46.6-69.7% excretion. 0.71 g kg⁻¹ MFs induced significant villi damage in the gastrointestinal walls of 40% snails, but did not influence the histology of the liver and kidney. Moreover, 0.71 g kg⁻¹ MFs exposure reduced glutathione peroxidase (59.3+or-13.8%) and total antioxidant capacity (36.7+or-8.5%), but elevated malondialdehyde level (58.0+or-6.4%) in the liver, which indicates oxidative stress is involved in the toxic mechanism. Our results suggest that MFs have adverse impacts on the fitness of soil organisms, and highlight the ecological risks of microplastic pollution in terrestrial ecosystems.

Song, Y. K., et al. (2017). "Combined Effects of UV Exposure Duration and Mechanical Abrasion on Microplastic Fragmentation by Polymer Type." Environmental Science & Technology **51**(8): 4368-4376.
It is important to understand the fragmentation processes and mechanisms of plastic litter to predict microplastic production in the marine environment. In this study, accelerated weathering experiments were performed in the laboratory, with ultraviolet (UV) exposure for up to 12 months followed by mechanical abrasion (MA) with sand for 2 months. Fragmentation of low-density polyethylene (PE), polypropylene (PP), and expanded polystyrene (EPS) was evaluated under conditions that simulated a beach environment. PE and PP were minimally fragmented by MA without photooxidation by UV (8.7 +/- 2.5 and 10.7 +/- 0.7 particles/pellet, respectively). The rate of fragmentation by UV exposure duration increased more for PP than PE. A 12-month UV exposure and 2-month MA of PP and PE produced 6084 +/- 1061 and 20 +/- 8.3 particles/pellet, respectively. EPS pellets were susceptible to MA alone (4220 +/- 33 particles/pellet), while the combination of 6 months of UV exposure followed by 2 months of MA produced 12,152 +/- 3276 particles/pellet. The number of fragmented polymer particles produced by UV exposure and mechanical abrasion increased with decreasing size in all polymer types. The size-normalized abundance of the fragmented PE, PP, and EPS particles according to particle size after UV exposure and MA was predictable. Up to 76.5% of the initial EPS volume was unaccounted for in the final volume of pellet produced particle fragments, indicating that a large proportion of the particles had fragmented into undetectable submicron particles.

Song, Y. K., et al. (2018). "Corrections to "Combined Effects of UV Exposure Duration and Mechanical Abrasion on Microplastic Fragmentation by Polymer Type"." Environmental Science & Technology **52**(6): 3831-3832.

Song, Y. K., et al. (2015). "Occurrence and Distribution of Microplastics in the Sea Surface Microlayer in Jinhae Bay, South Korea." Archives of Environmental Contamination & Toxicology **69**(3): 279-287.
Microplastic contamination of the marine environment is a worldwide concern. The abundance of microplastics was evaluated in the sea surface microlayer in Jinhae Bay, on the southern coast of Korea. The microplastics in this study are divided into paint resin particles and plastics by polymer type. The mean abundance of paint resin particles (94 +/- 68 particles/L) was comparable to that of plastics (88 +/- 68 particles/L). Fragmented microplastics, including paint resin particles, accounted for 75 % of total particles, followed by spherules (14 %), fibers (5.8 %), expanded polystyrene (4.6 %), and sheets (1.6 %). Alkyd (35 %) and poly(acrylate/styrene) (16 %) derived from ship paint resin were dominant, and the other microplastic samples consisted of polypropylene, polyethylene, phenoxy resin, polystyrene, polyester, synthetic rubber, and other polymers. The abundance of plastics was significantly (p < 0.05) higher in Jinhae Bay, which is surrounded by a coastal city, than along the east coast of Geoje, which is relatively open sea. The floating microplastic abundance in surface water was the highest reported worldwide.

Song, Z., et al. (2016). "Preparation of alumina nanoshell coated porous silica spheres for inorganic anions separation." Journal of Chromatography A **1433**: 85-89.

It had been reported that alumina nanoshell coating could be obtained on the external surface of various substrates in one-nanometer precision in aqueous solution. In this work, alumina nanoshell coated mesoporous silica microbeads (nanoAl<inf>2</inf>O<inf>3</inf>/mesoSiO<inf>2</inf>) were prepared with the similar method, and were successfully applied to inorganic anions separation. As the mass transfer speed is largely constrained in the mesopore compared with that on the open surface, it was found that a complete alumina nanoshell coating could be obtained within the mesopore until the five-time coating was carried out. After characterization by BET, SEM and FTIR, it was found that the obtained nanoAl<inf>2</inf>O<inf>3</inf>/mesoSiO<inf>2</inf> particles are smooth and well dispersed, and the mesopores are well reserved. In addition, the full coverage of nanoAl<inf>2</inf>O<inf>3</inf> shell in mesopores was also confirmed by the binding capacity experiments with berberine. Finally, the nanoAl<inf>2</inf>O<inf>3</inf>/mesoSiO<inf>2</inf> particles were packed in silica capillary for the separation of inorganic anions I⁻, SCN⁻, Br⁻, NO<inf>2</inf> ⁻ and NO<inf>3</inf> ⁻ with ion chromatography (IC), and a column efficiency of 3.8 x 10⁴ plates per meter was obtained for I⁻. Copyright © 2016 Published by Elsevier B.V.

Song, Z., et al. (2019). "Fate and transport of nanoplastics in complex natural aquifer media: Effect of particle size and surface functionalization." Science of the Total Environment **669**: 120-128.

Environmental processes of nanoplastics in heterogeneous natural groundwater systems remain unclear. In this study, the control of particle size and surface functional groups on the fate and transport of nanoplastics in an organic matter (OM) rich aquifer was explored using batch and column tests. The carboxyl-modified 200nm (200CNP), carboxyl-modified 50nm (50CNP), and amino-modified 50nm (50ANP) polystyrene latex beads were used as surrogates for nanoplastics of contrasting sizes and surface functional groups. Aquifer sand and natural groundwater sampled from an agriculture-impacted shallow sandy aquifer were processed to obtain granule beds with/out surface minerals and groundwater containing different-sized fractions of OM.

Sonkkila, C. (2019). "Biodegradable versus compostable - knowing your eco-plastics." Ecos(255): 1-4.

The article focuses on analysis by IHS Markit, which reveals rise in demand of for biodegradable plastics. It presents views of CSIRO environmental chemist Mike Williams on rise in demand due to consumer awareness of plastic waste. It states that biodegradable plastics encompass a broad range of plastics made from different materials but are defined by their ability to break down completely into natural substances.

Sonoda, K. H. (2008). "[Association of ocular inflammation and innate immune response]." Nippon Ganka Gakkai Zasshi - Acta Societatis Ophthalmologicae Japonicae **112**(3): 279-297; discussion 298.

Immune response has been divided into innate immunity and acquired immunity. We focused on the role of innate immunity during the formation of uveitis and choroidal neovascularization (CNV)-related diseases. To carry out a comprehensive analysis of ocular inflammatory responses in patients with uveitis, vitreous fluid was analyzed using a microbead-based multiplex ELIZA system. We found that cytokines which were related with innate immunity were elevated, but cytokines which were related with acquired immunity were not. We also found that the role of IL-17 was to produce Th17 cells in the chronic phase of experimental uveitis. Next, we investigated the role of the natural killer (NK) T cells which restrict CD1 and participate in the innate immune response in laser-induced experimental CNV. We studied the CNV formation in two independent NK T cell-deficient strains of mice, CD1 knockout (KO) mice and Jalpha18 KO mice, and found that both KO mice showed significant reduction of the effects of experimental CNV. After laser treatment, both CD1 KO mice and Jalpha18 KO mice showed a decrease in the expression of vascular endothelial growth factor (VEGF) expression in retina and choroid. Interestingly, intravitreous inoculation of a galactosylceramide (alphaGalCer), which is the ligand of NK Tcells, inhibited CNV in C57BL6 mice. Collectively, we conclude that NK T cells play an important role in forming CNV as one of the inducers of VEGS. Because NK T cells bear the potential to regulate immune response, alphaGalCer might activate NK T cells differently to produce angiostatic factors and have a therapeutic potential in vivo. During the clinical process of CNV-related diseases, not only CNV formation, but also subretinal scarring is thought to be another important step. We thus established the experimental model of subretinal scaring by injecting peritoneal exudating macrophases into the subretinal space. This scaring was inhibited by inoculation of anti-IL-6 antibody and micro bubbles into the vitreous cavity following low power ultrasound treatment through the cornea. [References: 47]

Sorensen, L., et al. (2019). "Sorption of PAHs to microplastic and their bioavailability and toxicity to marine copepods under co-exposure conditions." Environmental Pollution **258**: 113844.

Organic chemical pollutants associated with microplastic (MP) may represent an alternative exposure route for these chemicals to marine biota. However, the bioavailability of MP-sorbed organic pollutants under conditions where co-exposure occurs from the same compounds dissolved in the water phase has rarely been studied experimentally, especially where pollutant concentrations in the two phases are well characterized. Importantly, higher concentrations of organic pollutants on ingested MP may be less bioavailable to aquatic organisms than the same chemicals present in dissolved form in the surrounding water. In the current study, the sorption kinetics of two model polycyclic aromatic hydrocarbons (PAHs; fluoranthene and phenanthrene) to MP particles in natural seawater at 10 and 20 degreeC were studied and the bioavailability of MP-sorbed PAHs to marine copepods investigated. Polyethylene (PE) and polystyrene (PS) microbeads with mean diameters ranging from 10 to 200 mum were used to identify the role of MP polymer type and size on sorption mechanisms. Additionally, temperature dependence of sorption was investigated.

Sorokin, N. V., et al. (2006). "Kinetics of hybridization on surface oligonucleotide microchips: Theory, experiment, and comparison with hybridization on gel-based microchips." Journal of Biomolecular Structure and Dynamics **24**(1): 57-66.

The optimal design of oligonucleotide microchips and efficient discrimination between perfect and mismatch duplexes strongly depend on the external transport of target DNA to the cells with immobilized probes as well as on respective association and dissociation rates at the duplex formation. In this paper we present the relevant theory for hybridization of DNA fragments with oligonucleotide probes immobilized in the cells on flat substrate. With minor modifications, our theory also is applicable to reaction-diffusion hybridization kinetics for the probes immobilized on the surface of microbeads immersed in hybridization solution. The main theoretical predictions are verified with control experiments. Besides that, we compared the characteristics of the surface and gel-based oligonucleotide microchips. The comparison was performed for the chips printed with the same pin robot, for the signals measured with the same devices and processed by the same technique, and for the same hybridization conditions. The sets of probe oligonucleotides and the concentrations of probes in respective solutions used for immobilization on each platform were identical as well. We found that, despite the slower hybridization kinetics, the fluorescence signals and mutation discrimination efficiency appeared to be higher for the gel-based microchips with respect to their surface counterparts even for the relatively short hybridization time about 0.5-1 hour. Both the divergence between signals for perfects and the difference in mutation discrimination efficiency for the counterpart platforms rapidly grow with incubation time. In particular, for hybridization during 3 h the signals for gel-based microchips surpassed their surface counterparts in 5-20 times, while the ratios of signals for perfect-mismatch pairs for gel microchips exceeded the corresponding ratios for surface microchips in 2-4 times. These effects may be attributed to the better immobilization efficiency and to the higher thermodynamic association constants for duplex formation within gel pads. ©Adenine Press (2006).

Sosne, G., et al. (2002). "Thymosin beta 4 promotes corneal wound healing and decreases inflammation in vivo following alkali injury." Experimental Eye Research **74**(2): 293-299.

Previously, thymosin beta 4 (Tbeta(4)) was found to promote wound healing in full thickness skin wounds and heptanol debrided corneas. Here, the effect of Tbeta(4) was examined treatment on corneal wound healing and inflammation in vivo after alkali injury, a more severe wound of the eye. Corneas from 129 Sv mice were chemically burned with a 2 mm disc soaked in 1 N NaOH for 30 sec. Eyes were irrigated copiously with phosphate buffered saline (PBS) and then treated topically with either Tbeta(4) (5 microg/5 microl PBS) or 5 microl PBS twice daily. Animals were killed, the eyes were enucleated, fixed and embedded in plastic resin or prepared for mRNA analysis. Mouse corneas topically treated with 5 microg of Tbeta(4) twice daily after alkali injury demonstrated accelerated re-epithelialization at all time points and decreased polymorphonuclear leukocyte (PMN) infiltration at 7 days post injury (p.i.) when compared to PBS-treated controls. mRNA transcript levels were decreased several fold for interleukin (IL)-lbeta, and the chemokines macrophage inflammatory protein (MIP)-1alpha, MIP-1beta, MIP-2 and monocyte chemoattractant protein (MCP)-1 from 1 to 7 days after injury in the Tbeta(4)- vs. PBS-treated corneas. Thus, Tbeta(4) may provide a new clinical treatment for severe traumatic corneal wound disorders by promoting rapid corneal wound healing and decreasing both PMN infiltration and inflammatory cytokine and chemokine mRNA levels.

Soud, S. A. (2019). "Biodegradation of polyethylene LDPE plastic waste using locally isolated Streptomyces sp." Journal of Pharmaceutical Sciences and Research **11**(4): 1333-1339.

Plastics become widely spread in would wild, plastic are strong and flexible, light material that make be widely used in different field and different application in medical, agricultural and industrial and in food packaging, that resolve many of problems related with transport, and other things,as a result, plasticaccumulated in environment andcaused serial of environmental pollution, this pollution include all area in environment soil water and air, and the traditional way for pollution treatment are very difficultand highly cost and effect of human and animal health,there for, in this paper, we focused on pollution treatment by used microorganism's and Streptomycessp. as the bestmicroorganism s for their biodegradable ability for plastic waste and other pollution .in this paper different isolates of Streptomycessp. were screened for polyrthelene low densitypolyethylene(LDPE) biodegradation, the result showed that Streptomyces isolate (SSP2, SSP4, SSP 14) have best degradationefficiency for LDPEin different tests ; Measurement the dry weight loss of plastic stripes [polyethylene bags (g) and plastic cup(p)] after cultivation in ATCC medium and incubation at 25-30degreeC in shaker incubator at 120 rpm, Spectrophotometric assay and determination of Bioemulsifer production yield after one months of incubation, the result showed that the loss in dry weight in LDPE stripes by

Streptomyces isolate (SSP2, SSP4, SSP 14) are (6%, 9%, 15%) for (p) stripes and (8%, 11%, 19%) for (g) stripes respectively, and spectrophotometric assay recorded best results for LDPEdegradation, SSP2, recorded (0.08, 0.55),SSP4 (0.09, 0.65) and SSP 14 recorded (0.13, 0.70) for p and g respectively. Finally, the bioemulsifer production determination also recorded highest results that play important role in biodegradation process, the results recorded thatbioemulsifer production yield by (SSP2, SSP4, SSP 14) isolates are (5.74%, 7.24%, 11.84%) for (p) stripes, and (8.44%, 9.84%, 12.94%) for (g)stripes. from these result, the SSP14 isolates shed best result for LDPE degradation that prove that the Streptomyceshave best biodegradable efficiency for many pollutant, that agreed with manyresearch in microbiological environmental science. Copyright © 2019, Pharmainfo Publications. All rights reserved.

Southwell, A. L., et al. (2015). "Ultrasensitive measurement of huntingtin protein in cerebrospinal fluid demonstrates increase with Huntington disease stage and decrease following brain huntingtin suppression." Scientific Reports **5**: 12166.

Quantitation of huntingtin protein in the brain is needed, both as a marker of Huntington disease (HD) progression and for use in clinical gene silencing trials. Measurement of huntingtin in cerebrospinal fluid could be a biomarker of brain huntingtin, but traditional protein quantitation methods have failed to detect huntingtin in cerebrospinal fluid. Using micro-bead based immunoprecipitation and flow cytometry (IP-FCM), we have developed a highly sensitive mutant huntingtin detection assay. The sensitivity of huntingtin IP-FCM enables accurate detection of mutant huntingtin protein in the cerebrospinal fluid of HD patients and model mice, demonstrating that mutant huntingtin levels in cerebrospinal fluid reflect brain levels, increasing with disease stage and decreasing following brain huntingtin suppression. This technique has potential applications as a research tool and as a clinical biomarker.

Souza e Silva Pegado, T. d., et al. (2018). "First evidence of microplastic ingestion by fishes from the Amazon River estuary." Marine Pollution Bulletin **133**: 814-821.

This study investigated occurrence of microplastic particles in digestive tracts of fishes from the Amazon River estuary. A total of 189 fish specimens representing 46 species from 22 families was sampled from bycatch of the shrimp fishery. Microplastic particles removed from fish gastrointestinal tracts were identified using Attenuated Total Reflectance - Fourier Transform Infrared (ATR-FTIR). In total, 228 microplastic particles were removed from gastrointestinal tracts of 26 specimens representing 14 species (30% of those examined). Microplastic particles were categorized as pellets (97.4%), sheets (1.3%), fragments (0.4%) and threads (0.9%), with size ranging from 0.38 to 4.16 mm. There was a positive correlation between fish standard length and number of particles found in gastrointestinal tracts. The main polymers identified by ATR-FTIR were polyamide, rayon and polyethylene. These findings provide the first evidence of microplastic contamination of biota from the Amazon estuary and northern coast of Brazil.

Sowa, M., et al. (2014). "Simultaneous automated screening and confirmatory testing for vasculitis-specific ANCA." PLoS ONE [Electronic Resource] **9**(9): e107743.

Anti-neutrophil cytoplasmic antibodies (ANCA) are the serological hallmark of small vessel vasculitis, so called ANCA-associated vasculitis. The international consensus requires testing by indirect immunofluorescence (IIF) on human ethanol-fixed neutrophils (ethN) as screening followed by confirmation with enzyme-linked immunosorbent assays (ELISAs). This study evaluates the combination of cell- and microbead-based digital IIF analysis of ANCA in one reaction environment by the novel multiplexing CytoBead technology for simultaneous screening and confirmatory ANCA testing. Sera of 592 individuals including 118 patients with

ANCA-associated vasculitis, 133 with rheumatoid arthritis, 49 with infectious diseases, 77 with inflammatory bowel syndrome, 20 with autoimmune liver diseases, 70 with primary sclerosing cholangitis and 125 blood donors were tested for cytoplasmic ANCA (C-ANCA) and perinuclear ANCA (P-ANCA) by classical IIF and ANCA to proteinase 3 (PR3) and myeloperoxidase (MPO) by ELISA. These findings were compared to respective ANCA results determined by automated multiplex CytoBead technology using ethN and antigen-coated microbeads for microbead immunoassays. There was a good agreement for PR3- and MPO-ANCA and a very good one for P-ANCA and C-ANCA by classical and multiplex analysis (Cohen's kappa [kappa] = 0.775, 0.720, 0.876, 0.820, respectively). The differences between classical testing and CytoBead analysis were not significant for PR3-ANCA, P-ANCA, and C-ANCA ($p<0.05$, respectively). The prevalence of confirmed positive ANCA findings by classical testing (IIF and ELISA) compared with multiplex CytoBead analysis (IIF and microbead immunoassay positive) resulted in a very good agreement (kappa = 0.831) with no significant difference of both methods ($p = 0.735$). Automated endpoint-ANCA titer detection in one dilution demonstrated a very good agreement with classical analysis requiring dilution of samples (kappa = 0.985). Multiplexing by CytoBead technology can be employed for simultaneous screening and quantitative confirmation of ANCA. This novel technique provides fast and cost-effective ANCA analysis by automated digital IIF for the first time.

Sowa, M., et al. (2014). "Simultaneous screening and confirmation of ANCAs and detection of anti-GBM antibodies in case of emergency." Clinical Chemistry and Laboratory Medicine **52 (11)**: eA139-eA140.

The novel CytoBead technology combines autoantibody analysis by cell-based screening with corresponding confirmation by multiplex microbead technology using immunofluorescence technique in one well. CytoBead ANCA allows the simultaneous screening and confirmation of anti-neutrophil cytoplasmic antibodies (ANCA) on neutrophils, proteinase 3 (PR3) and myeloperoxidase (MPO) coated microbeads. Furthermore, the detection of anti-GBM antibodies for emergency diagnostic of rapid progressive glomerulonephritis is integrated. This assay is interpretable with a standard fluorescence microscope (FITC channel) for semi-quantitative and with Aklides system for quantitative analysis. Performance of the CytoBead ANCA assay was investigated using 666 human sera including 118 patients with ANCA-associated vasculitis, 162 healthy controls, 352 disease controls and 34 anti-GBM positive sera. Receiver operating characteristics and inter-rater agreements were used to compare the results of novel CytoBead ANCA assay with routine autoantibody investigation. The comparison of ANCA screening showed very good agreement for pANCA and cANCA patterns (kappa = 0.862, 0.868; respectively) and the results of anti-PR3, anti-MPO, and anti-GBM detection revealed good to very good agreement (0.78,0.72,0.87; respectively). Consequently, CytoBead ANCA assay is an alternative to classical time-consuming single parameter diagnostic and is therefore a clinical diagnostic tool for emergency situations.

Sowa, M., et al. (2014). "Simultaneous screening and confirmation of ancas and detection of Anti-GBM antibodies with cytobead ANCA assay." Clinical Chemistry and Laboratory Medicine **1)**: S305.

BACKGROUND: The novel CytoBead technology combines autoantibody analysis by cell-based screening with the confirmation of corresponding autoantigen reactivities by multiplex microbead technology using immunofluorescence technique (IFT) in one reaction environment. METHOD(S): CytoBead ANCA allows the simultaneous detection of anti-neutrophil cytoplasmic antibodies (ANCA) on ethanol-fixed neutrophils for screening and confirmation thereof using proteinase 3 (PR3) and myeloperoxidase (MPO) coated microbeads. Furthermore, the detection of anti-GBM antibodies is integrated by adding glomerular basement membrane (GBM) coated

microbeads. Anti-GBM autoantibodies occur in 10% of rapid progressive glomerulonephritis patients together with ANCA and are required for the differential serological diagnosis in routine diagnostics. This assay format can be interpreted with a standard fluorescence microscope (FITC channel) for semi-quantitative and with the automated interpretation system Aklides for quantitative analysis. The performance of the CytoBead ANCA assay was investigated using sera of 666 individuals including 118 patients with ANCA-associated vasculitis, 162 healthy controls, 352 disease controls and 34 anti-GBM positive sera. Receiver operating characteristics and inter-rater agreements (kappa) were used to compare the results of novel CytoBead ANCA assay with routine autoantibody investigation. RESULT(S): The comparison of classical ANCA screening with ANCA screening by the novel CytoBead ANCA assay showed very good agreement for pANCA and cANCA patterns (kappa= 0.862, 0.868; respectively). The results of anti-PR3, anti-MPO, and anti-GBM detection by this novel method compared to anti-PR3-, anti-MPO as well as anti-GBM by ELISA revealed good to very good agreement (0.78,0.72,0.87; respectively). CONCLUSION(S): Consequently, CytoBead ANCA assay is an attractive alternative to classical time-consuming single parameter ANCA and anti-GBM antibody detection and is therefore applicable as a clinical diagnostic tool for emergency situations.

Sowa, M., et al. (2017). "Next-Generation Autoantibody Testing by Combination of Screening and Confirmation-the CytoBead Technology." Clinical Reviews in Allergy & Immunology **53**(1): 87-104.

Occurrence of autoantibodies (autoAbs) is a hallmark of autoimmune diseases, and the analysis thereof is an essential part in the diagnosis of organ-specific autoimmune and systemic autoimmune rheumatic diseases (SARD), especially connective tissue diseases (CTDs). Due to the appearance of autoAb profiles in SARD patients and the complexity of the corresponding serological diagnosis, different diagnostic strategies have been suggested for appropriate autoAb testing. Thus, evolving assay techniques and the continuous discovery of novel autoantigens have greatly influenced the development of these strategies. Antinuclear antibody (ANA) analysis by indirect immunofluorescence (IIF) on tissue and later cellular substrates was one of the first tests introduced into clinical routine and is still an indispensable tool for CTD serology. Thus, screening for ANA by IIF is recommended to be followed by confirmatory testing of positive findings employing different assay techniques. Given the continuous growth in the demand for autoAb testing, IIF has been challenged as the standard method for ANA and other autoAb analyses due to lacking automation, standardization, modern data management, and human bias in IIF pattern interpretation. To address these limitations of autoAb testing, the CytoBead technique has been introduced recently which enables automated interpretation of cell-based IIF and quantitative autoAb multiplexing by addressable microbead immunoassays in one reaction environment. Thus, autoAb screening and confirmatory testing can be combined for the first time. The present review discusses the history of autoAb assay techniques in this context and gives an overview and outlook of the recent progress in emerging technologies.

Sowa, M., et al. (2016). "Simultaneous comprehensive multiplex autoantibody analysis for rapidly progressive glomerulonephritis." Medicine **95**(44): e5225.

Rapidly progressive glomerulonephritis (RPGN) is mainly caused by anti-glomerular basement membrane (GBM) antibody-mediated glomerulonephritis, immune-complex or anti-neutrophil cytoplasmic antibody (ANCA)-associated vasculitides and leads to rapid loss of renal function. Detection of ANCA and autoantibodies (autoAbs) to GBM and dsDNA enables early diagnosis and appropriate treatment of RPGN aiding in preventing end-stage renal disease.Determination of ANCA on neutrophils (ANCA) as well as autoAbs to myeloperoxidase (MPO-ANCA), proteinase 3 (PR3-ANCA), GBM, and dsDNA was performed by the novel multiplex CytoBead technology

combining cell- and microbead-based autoAb analyses by automated indirect immunofluorescence (IIF). Forty patients with granulomatosis with polyangiitis (GPA), 48 with microscopic polyangiitis (MPA), 2 with eosinophilic GPA, 42 with systemic lupus erythematosus (SLE), 43 with Goodpasture syndrome (GPS), 57 with infectious diseases (INF), and 55 healthy subjects (HS) were analyzed and findings compared with classical single testing.The CytoBead assay revealed for GPA, MPA, GPS, and SLE the following diagnostic sensitivities and for HS and INF the corresponding specificities: PR3-ANCA, 85.0% and 100.0%; MPO-ANCA, 77.1% and 99.1%; anti-GBM autoAb, 88.4% and 96.4%; anti-dsDNA autoAb, 83.3% and 97.3%; ANCA, 91.1% and 99.1%, respectively. Agreement with classical enzyme-linked immunosorbent assay and IIF was very good for anti-GBM autoAb, MPO-ANCA, PR3-ANCA, and ANCA, respectively. Anti-dsDNA autoAb comparative analysis demonstrated fair agreement only and a significant difference (P = 0.0001).The CytoBead technology provides a unique multiplex reaction environment for simultaneous RPGN-specific autoAb testing. CytoBead RPGN assay is a promising alternative to time-consuming single parameter analysis and, thus, is well suited for emergency situations.

Sowa, M., et al. (2015). "Unique technology for the simultaneous screening and confirmation of autoantibodies in emergency situations of rapidly progressive glomerulonephritis." Nephron **129 (Supplement 2)**: 118-119.

Background: Rapidly progressive glomerulonephritis (RPGN) is clinically characterized by a rapid loss of renal function. RPGN is mainly caused by anti-glomerular basement membrane (GBM) antibody-mediated, immune-complex or anti-neutrophil cytoplasmic antibody (ANCA)-associated diseases. Detection of the specifically associated autoantibodies (anti-GBM, anti-dsDNA, ANCA) allows early diagnosis and appropriate treatment starting, in order to avoid progression to end stage renal disease. Objective(s): The novel CytoBead technology combines autoantibody analysis by cell-based screening with corresponding confirmation by multiplex microbead technology using indirect immunofluorescence (IIF) in one reaction environment. The CytoBead RPGN assay employs as autoantigenic substrates for autoantibody detection GBM as well as dsDNA, coated on microbeads, for the diagnosis of Goodpastures'syndrome/antiGBM disease (GPS) and systemic lupus erythematodes (SLE) nephritis, respectively. Additionally, ethanol fixed granulocytes as well as proteinase 3 (PR3) and myeloperoxidase (MPO) coated microbeads are provided as targets by the assay for the simultaneous determination of vasculitis specific autoantibodies (i.e. ANCA), detectable in RPGN patients. Method(s): This IIF assay can be analyzed with a standard fluorescence microscope for semi-quantitative and with the Aklides system for quantitative interpretation with lot specific standard curves. The specially designed microscopic glass slide consists of triple parted reaction compartments with ethanol fixed granulocytes in the middle compartment, PR3 and MPO coated microbeads in the right compartment and GBM and dsDNA coated microbeads in the left one. Result(s): Results of 293 tested human sera (40 Granulomatosis with Polyangiitis [GPA], 38 Microscopic Polyangiitis [MPA], 10 ANCA associated vasculitis [AAV], 2 Eosinophilic granulomatosis with polyangiitis [EGPA], 48 SLE, 43 GPS, 55 negative human sera [NHS], 57 infectious diseases [INF]) were generated by automated read-out processed tests with Aklides system in 60 seconds per sample and showed good agreement with manually obtained cell and microbead based data. The automated read-out provides quantitative results in international units (IU/ml) for antibodies to PR3, MPO and in units (U/ml) for dsDNA and GBM. Diagnostic sensitivity and specificity were carried out by receiver operating characteristic (ROC) and revealed 85.4% and 97.6% for PR3 microbeads, 73.5% and 95.5% for MPO micro beads, 88.4% and 96.8% for GBM microbeads and 83.3% and 94.7% for dsDNA microbeads, respectively. Conclusion(s): The CytoBead technology provides a unique combination of screening and confirmatory RPGN-specific autoantibody testing. CytoBead RPGN assay is a very promising alternative to classical time-consuming single parameter testing and, therefore, can be used for emergency situations.

Soydan, L. C., et al. (2015). "Accuracy of Doppler echocardiographic estimates of pulmonary artery pressures in a canine model of pulmonary hypertension." Journal of Veterinary Cardiology **17**(1): 13-24.

Objectives: To compare noninvasive estimates of pulmonary artery pressure (PAP) obtained via echocardiography (ECHO) to invasive measurements of PAP obtained during right heart catheterization (RHC) across a range of PAP. To examine the accuracy of estimating right atrial pressure via ECHO (RAP_{ECHO}) compared to RAP measured by RHC (RAP_{RHC}), and determine if adding RAP_{ECHO} improves the accuracy of noninvasive PAP estimations. Animals: 14 healthy female beagle dogs.

Spear, L. B., et al. (1995). "Incidence of plastic in seabirds from the tropical Pacific, 1984-91: Relation with distribution of species, sex, age, season, year and body weight." Marine environmental research. London **40**(2): 123-146.

The incidence of plastic in seabirds was studied (number of individuals of a species containing plastic per number inspected, and number of particles per individual), in 1574 individuals representing 36 species of seabirds collected in the tropical Pacific, mostly between 110 and 150 degree W longitude, from 1984 to 1991. Incidence of plastic was lower in resident species compared to those which bred to the south or north but wintered in the region, and especially when compared to species that crossed the tropics in migration between the South and North Pacific. Seasonal and age-related patterns in incidence of plastic, number of particles, and particle type (pellets versus user-plastic) among a group of five Procellariiform species (each with > 5% of the individuals containing plastic and for which samples were > 20 birds) indicated that degradation for an individual particle in the gizzard required less than one year, and that little plastic was regurgitated by parents to chicks. Two patterns emerged from this data regarding body weight: (i) heavier birds (for a given species, age-class, season and year) were more likely to contain at least some plastic, from which we hypothesize that birds in better physical condition fed more often in areas where higher densities of plastic and food are found, such as fronts and convergences; and (ii) among individuals who contained plastic (grouped by species), there was a significant negative correlation between number of plastic particles and body weight. This is the first solid evidence for a negative relationship between plastic ingestion and physical condition in seabirds. The likelihood that higher quality individuals are more prone to ingest plastic has serious implications regarding health of some seabird populations.

Spear, S. (2012). "Globetrotter." Local Authority Waste & Recycling **20**(7): 46-46.

The article reports that Japan's 77% plastic recycling rate is one of the highest in the world and is due to technology and the cooperation of consumers and businesses in segregating plastic waste at the source since 1997.

Spears, M., et al. (2012). "Discriminant analysis of sputum supernatant cytokine profiles can differentiate smokers from former smokers with asthma." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **185**(MeetingAbstracts).

Rationale Smokers with asthma display a distinct clinical phenotype compared to never smokers with asthma but little is known about how smoking causes this altered behaviour and even less is known about the impact of prior smoking on asthma. Simultaneous measurement of multiple

cytokines has the potential to improve our understanding of the airway inflammatory response in both groups. Therefore we undertook discriminant function analysis of sputum cytokine data to detect the impact of current and former smoking on asthma. Methods 22 smokers, 10 ex-smokers and 21 never smokers with asthma performed spirometry, sputum induction and completed asthma control questionnaires (ACQ). All smokers were regular smokers (at least five cigarettes a day). Ex-smokers had a prior history of habitual smoking and had stopped at least two years before participation. Smoking history was confirmed by exhaled carbon monoxide and urinary cotinine. Sputum supernatant was assessed for 25 cytokines by a multiplex microbead system (Invitrogen, UK) using a Luminex platform. Discriminant function analysis was performed using MINITAB 16. Results The subjects were well matched except for higher ACQ scores and inhaled corticosteroid dose in smokers and ex-smokers with asthma (Table 1). Ex-smokers with asthma had stopped smoking for a median of 6.5 years (IQR 3.8, 12). A number of cytokines were significantly higher in smokers and ex-smokers with asthma when compared to non-smokers with asthma. Discriminant function analysis demonstrated that the majority of patients could be correctly allocated to their clinical group by sputum cytokine profiling (Table 2). Conclusions Current and former smokers with asthma are readily distinguishable by their sputum supernatant cytokine profiles and therefore each group may possess distinct airway inflammatory phenotypes. Further study of airway cytokine profiles in both groups may increase understanding of the role of cytokines in the development of corticosteroid resistant inflammation. (Table Presented).

Spears, M., et al. (2013). "Smoking in asthma is associated with elevated levels of corticosteroid resistant sputum cytokines-an exploratory study." PLoS ONE [Electronic Resource] **8**(8): e71460.

BACKGROUND: Current cigarette smoking is associated with reduced acute responses to corticosteroids and worse clinical outcomes in stable chronic asthma. The mechanism by which current smoking promotes this altered behavior is currently unclear. Whilst cytokines can induce corticosteroid insensitivity in-vitro, how current and former smoking affects airway cytokine concentrations and their responses to oral corticosteroids in stable chronic asthma is unclear.

OBJECTIVES: To examine blood and sputum cytokine concentrations in never, ex and current smokers with asthma before and after oral corticosteroids.

METHODS: Exploratory study utilizing two weeks of oral dexamethasone (equivalent to 40 mg/day prednisolone) in 22 current, 21 never and 10 ex-smokers with asthma. Induced sputum supernatant and plasma was obtained before and after oral dexamethasone. 25 cytokines were measured by multiplex microbead system (Invitrogen, UK) on a Luminex platform.

RESULTS: Smokers with asthma had elevated sputum cytokine interleukin (IL) -6, -7, and -12 concentrations compared to never smokers with asthma. Few sputum cytokine concentrations changed in response to dexamethasone IL-17 and IFNalpha increased in smokers, CCL4 increased in never smokers and CCL5 and CXCL10 reduced in ex-smokers with asthma. Ex-smokers with asthma appeared to have evidence of an ongoing corticosteroid resistant elevation of cytokines despite smoking cessation. Several plasma cytokines were lower in smokers with asthma compared to never smokers with asthma.

CONCLUSION: Cigarette smoking in asthma is associated with a corticosteroid insensitive increase in multiple airway cytokines. Distinct airway cytokine profiles are present in current smokers and never smokers with asthma and could provide an explanatory mechanism for the altered clinical behavior observed in smokers with asthma.

Spencer, S. J., et al. (2019). "High-fat diet worsens the impact of aging on microglial function and morphology in a region-specific manner." Neurobiology of Aging **74**: 121-134.

Hippocampal microglia are vulnerable to the effects of aging, displaying a primed phenotype and hyper-responsiveness to various stimuli. We have previously shown that short-term high-fat diet (HFD) significantly impairs hippocampal- and amygdala-based cognitive function in the aged without affecting it in the young. Here, we assessed if morphological and functional changes in microglia might be responsible for this. We analyzed hippocampus and amygdala from young and aging rats that had been given three days HFD, a treatment sufficient to cause both hippocampal- and amygdala-dependent cognitive and neuroinflammatory differences in the aged. Aging led to the expected priming of hippocampal microglia in that it increased microglial numbers and reduced branching in this region. Aging also increased microglial phagocytosis of microbeads in the hippocampus, but the only effect of HFD in this region was to increase the presence of enlarged synaptophysin boutons in the aged, indicative of neurodegeneration. In the amygdala, HFD exacerbated the effects of aging on microglial priming (morphology) and markedly suppressed phagocytosis without notably affecting synaptophysin. These data reveal that, like the hippocampus, the amygdala displays aging-related microglial priming. However, the microglia in this region are also uniquely vulnerable to the detrimental effects of short-term HFD in aging.

Sreekanth Reddy, O., et al. (2019). "Sodium alginate/gelatin microbeads-intercalated with kaolin nanoclay for emerging drug delivery in wilson's disease." International Journal of Applied Pharmaceutics **11**(5): 71-80.

Objective: The aim of the present study was to fabricate and evaluate the drug release studies using Sodium Alginate (SA) and Gelatin (GE) microbeads intercalated with Kaolin (KA) nanoclay for sustained release of D-Penicillamine (D-PA). Method(s): Sodium alginate/gelatin/Kaolin blend microbeads were prepared by an extrusion method by using glutaraldehyde (GA) as a crosslinker. The obtained microbeads were characterized by Fourier transform infrared (FTIR) spectroscopy, scanning electron microscopy (SEM) and X-ray diffraction (XRD). Drug release kinetics of the microbeads was investigated in simulated intestinal fluid (pH 7.4) at 37 degreeC. Result(s): Microbeads formation was confirmed by FTIR spectroscopy. X-RD reveals that the KA should be intercalated with the drug and also it confirms the molecular level dispersion of D-Penicillamine into microbeads. Scanning Electron Microscopy (SEM) studies reveal that the beads were in spherical shape with some wrinkled depressions on the surface. The in vitro release study indicates the D-Penicillamine released in a controlled manner. The in vitro release kinetics was assessed by Korsmeyer-Peppas equation and the 'n' value lies in between 0.557-0.693 indicates Non-Fickian diffusion process. Conclusion(s): The results suggest that the developed KA intercalated microbeads are good potential drug carrier for the controlled release of D-PA. Copyright © 2019 The Authors.

Sreelakshmi, K., et al. (2019). Capsule Neural Networks and Visualization for Segregation of Plastic and Non-Plastic Wastes. 2019 5th International Conference on Advanced Computing and Communication Systems, ICACCS 2019.

Building an image processing model for prediction or classification application has to overcome quite a lot of challenges. Convolutional neural network (CNN) is the pillar of image processing in deep learning perspective. In order to bring down the disadvantages and for improving the performance compared to the CNN, a new architecture of CNN had been devised which is known as Capsule neural network (Capsule-Net). By this paper we analyze Capsule-Net for solid waste management which is separation of plastic and non-plastic. This task is viewed as of at most significance in today's world due to volumes of waste generated and nonavailability of human labor for this work. The capsule-Net is evaluated using 2 different datasets. Dataset 1

represents materials collected from public places and Dataset 2 represents materials collected from private environment. The proposed architecture with capsule-Net gives an accuracy of 96.3% for Dataset 1 and 95.7% for Dataset 2. The necessary hardware setup has been developed and tested. This will be a grace to the society which faces unexplainable difficulty in disposing wastes. It is inexpensive labor free and harmless to health. © 2019 IEEE.

Srivastava, A., et al. (2010). "Assessment of Plastic Waste Generation and Inventorization of Plastic Manufacturing Units in Madhya Pradesh." Journal of Solid Waste Technology & Management **36**(1): 620-630.

Plastics have become an integral part of our daily life. The day begins with use of plastic and ends with plastic. Today the plastic industry is rapidly growing and has changed our life style. The usage of plastic in India has also increased and its average annual consumption is 3.8Kg per capita per annum. The consumption of plastic per capita in our country is far lower than the developed countries. After its use, plastic waste remains in the environment, for a long time because of its non degradable characteristics and on account posing several of environmental problems. Thus the quality of plastics being durable and non degradable is a big problem. In some cases, on burning it could release toxic fumes. Furthermore, it can be claimed that the use of plastics helps the environment by saving water, oil and forest. For instance, plastics make cars and other automobiles lighter, thus saving oil and reducing CO2 emissions. On the other hand, as waste, plastic created serious problem to the Environment. It is becoming major cause of the air, water and soil pollution. On burning at low temperature, harmful gases are released. Plastic recycling programs are common in the developed nations and elsewhere. Thermoplastics can be re-melted and reused, and thermoset plastics can be ground up and are used as fillers, though the purity of the material tends to degrad with each recycle. The disadvantage of the degradation of biodegradable plastics is that the carbon that is locked up in them is released into the atmosphere as carbon dioxide, a greenhouse gas. In India, plastic waste is can be seen all around as roadside litter. When such plastic waste material is dumped into landfills, they can become "mummified" and persist for decades even if they are to be biodegradable. In this regard, plastics are just like food or paper which also fails to degrade in landfills. Scientists are seeking cheaper alternatives to plastic. The most promising alternatives are graphene, carbon nanotube, and carbon nanofoam. All three of these are made of nanocarbons, products of the new nanotechnology. Nanocarbons are very cheap, 100 times stronger than steel, slicker than Teflon, lightweight, and can be made very thin, made to stretch, and built into any shape - all the things plastic can do. In addition, nanocarbon manufacturing is non-polluting in comparison to the production of plastic. Already bowling balls, golf balls, sports equipment, and water-proof cotton balls are being made of nanocarbons. Plastic waste is a part of municipal solid waste [MSW]. A study on quantification of plastic waste generation in Madhya Pradesh has been undertaken and it is observed that 4.5% of MSW can be classified into plastic waste. The total quantity of MSW generated from all the 10 regions of M.P. viz., Rewa, Ujjain, Gwalior, Sagar, Satna, Dhar, Indore, Jabalpur, Bhopal & Guna is about 4377.44 MT/day. Out of which about 195.5 MT/day is plastic waste. About 147.55 and 48.45 MT/day classified into recyclable and non recyclable plastic waste respectively. It is thus evident that 75% of the total plastic waste is recyclable and 25% is non recyclable. About 190 plastic manufacturing and recycling units are established in various locations with in the State. These units engaged in manufacturing toys, pipes, molded articles and carry bags. The M.P. Pollution Control Board [MPPCB] is a regulatory authority for enforcing plastic rules in regards to the manufacture of plastic, in the State. MPPCB put efforts in utilizing the non recyclable plastic waste as co- fuel in the cement kilns. The emissions from the kilns were also monitored which was observed with in the norms laid down for the Hazardous Waste Incinerators. Thus the generated information on the plastic waste can be very well utilized by concerning authorities for framing strategies, techniques and methodology for waste management in the State. [ABSTRACT FROM AUTHOR]

Sruthy, S. and E. V. Ramasamy (2017). "Microplastic pollution in Vembanad Lake, Kerala, India: the first report of microplastics in lake and estuarine sediments in India." Environmental Pollution **222**: 315-322.

We present the first study of microplastics in the sediments of Vembanad Lake, a Ramsar site in India. Microplastics are emerging pollutants of increasing environmental concern with a particle size of <5 mm, which originate from successive degradation of larger plastic debris or are manufactured as small granules and used in many applications. The impact of microplastics pollution on the environment and biota is not well known. Vast data exist in the literature on marine microplastics while reports on freshwater ecosystems are scarce. In this context, to examine the occurrence of microplastic particles (MPs) in the Vembanad Lake, samples were collected from ten sites and processed for microplastic extraction through density separation. Identification of the polymer components of MPs was done using micro Raman spectroscopy. MPs were recovered from all sediment samples, indicating their extensive distribution in the lake. The abundance of MPs recorded from the sediment samples is in the range of 96-496 particles m⁻² with a mean abundance of 252.80+or-25.76 particles m⁻². Low density polyethylene has been identified as the dominant type of polymer component of the MPs. As clams and fishes are the major source of protein to the local population, the presence of MPs in the lake becomes critically important, posing a severe threat of contaminating the food web of this lake. This study, being the first report from India on MPs in lake sediments, provide impetus for further research on the distribution and impact of this emerging pollutant on the biota of many aquatic systems spread across India.

Stadler, B. M., et al. (2019). "Hydrogenation of Polyesters to Polyether Polyols." ChemSusChem **12**(17): 4082-4087.

The amount of plastic waste is continuously increasing. Besides conventional recycling, one solution to deal with this problem could be to use this waste as a resource for novel materials. In this study, polyesters are hydrogenated to give polyether polyols by using in situ-generated Ru-Triphos catalysts in combination with Lewis acids. The choice of Lewis acid and its concentration relative to the ruthenium catalyst are found to determine the selectivity of the reaction. Monitoring of the molecular weight during the reaction confirms a sequential mechanism in which the diols that are formed by hydrogenation are etherified to the polyethers. To probe the applicability of this tandem hydrogenation etherification approach, a range of polyester substrates is investigated. The oligoether products that form in these reactions have the chain lengths that are appropriate for application in the adhesives and coatings industries. This strategy makes polyether polyols accessible that are otherwise difficult to obtain from conventional fossil-based feedstocks.

Stadtmauer, E., et al. (2013). "Adoptive immunotherapy with engineered t cells expressing a TCR targeting NY-ESO-1 and lage-1 antigens after ASCT for mm." Clinical Lymphoma, Myeloma and Leukemia

1): S155.

This clinical trial investigates T cells engineered with an HLA-A0201 restricted, affinity-enhanced TCR that recognizes an epitope expressed by the NY-ESO-1 and LAGE-1 cancer testis antigens; cells are infused two days following high-dose chemotherapy given prior to autologous stem cell transplant (ASCT) in patients with high risk or relapsed multiple myeloma (MM). Inclusion criteria are 1) eligibility for auto-SCT, 2) PS of 0-2, 3) high risk MM or relapse after prior therapy, 4) HLA-A0201 positivity, and 5) NY-ESO-1 and/or LAGE- 1 positive tumor by RT-PCR. T cells are activated and expanded using anti-CD3/28 antibody conjugated microbeads, and gene modified with a lentiviral vector. Disease response is evaluated in accordance with the IMWG criteria at 6 weeks, and 3 and 6 months post infusion. Patients are monitored for persistence of gene modified cells and marrow is monitored for NY-ESO-1 and LAGE-1 antigen. 21 pts have enrolled, 17 patients have been infused (50% HR cytogenetics, 20% prior ASCT) with an average of 2.7 x 109 gene modified cells. 3 mos post ASCT, 77% experienced a VGPR or better. Infusions were well tolerated. GI toxicity resulting from autologous GVHD occurred in a subset of patients, possibly at a higher frequency than previously reported with non-gene modified T cell infusion after ASCT. Gene modified cells persisted at 6-12 months at approximately 10-100 gene modified cells per uL of blood. Disease progression has occurred in 4 pts and has been accompanied by very low levels or loss of engineered T cells or absence of target antigen on tumor.

Staff, W. (2018). "Bacardi Limited Teams with Lonely Whale to Remove One Billion Single-use Plastic Straws by 2020." Waste360: N.PAG-N.PAG.

The article offers information on the partnership between spirits company Bacardi Ltd. and nonprofit organization Lonely Whale to develop ideas to protect health of the ocean. Topics discussed include Bacardi's plans to review its global supply chain; its aim to remove the usage of non-recyclable single-use plastic waste; and the views of Rick Wilson, senior vice president of corporate responsibility for Bacardi, on it.

Staff, W. (2018). "Corona Campaign Addresses Issue of Marine Plastic Pollution." Waste360: N.PAG-N.PAG.

The article reports that Corona, a brand of AB InBev, has taken up the issue of marine plastic pollution to the global stage by hijacking iconic symbols of paradise for World Oceans Day. It notes that around eight million metric tons of plastic waste are released into the ocean each year. It notes that the partnership is working with local communities in the Maldives, Dominican Republic and Chile, which will increase its efforts in several regions within the next year.

Staff, W. (2018). "European Commission Proposes Ban on Some Plastic Products." Waste360: N.PAG-N.PAG.

The article offers information on a proposed ban on single-use plastic products such as cutlery, plates, and straws by European Commission prevent plastic pollution and reduce carbon emissions. It discusses forcing members to reduce the use of plastic food containers and drink cups by preventing free-of-charge distribution. It mentions views of Jyrki Katainen, vice-president of European Commission, on the helping move towards sustainable alternatives.

Staff, W. (2018). "Hospitality Industry Works to Combat Plastic Waste." Waste360: N.PAG-N.PAG.

The article informs that hospitality industry has taken various initiatives to curb the crisis of plastic waste worldwide. It is noted that hotels, airlines, cruise lines and restaurants are minimizing the use of single-use plastic like straws, cups, bottles and laundry bags. It is noted that Hilton has committed to eliminate plastic straws from its hotels by removing plastic bottles from its conference and event spaces.

Staff, W. (2018). A Look at the Global Issue of Plastic Waste**:** N.PAG-N.PAG.

Staff, W. (2018). "OECD Urges Government to Encourage Better Recycling of Plastics." Waste360: N.PAG-N.PAG.

The article reports that the Organisation for Economic Co-operation and Development (OECD) urges government to encourage improved recycling of plastics. It mentions that low recovery rates of plastic waste, poor quality of recycled plastic and an absence of price incentives lead to the slow growth of secondary plastic markets. It focuses on rising public concern on plastic pollution.

Staff, W. (2018). "A Sea of Plastic: 65 Years in the Making." Waste360: N.PAG-N.PAG.

The article presents information on the impact of ban on plastics, highlighting the non-biodegradable nature of plastics, and the prevention of plastic disposal in the oceans. Topics include the durability of the products, use of polypropylene in plastic products, and the impact of plastic waste on the ocean ecology.

Staff, W. (2018). "Thailand Announces Ban on E-waste, Plastic Imports." Waste360: N.PAG-N.PAG.

The article reports that in an effort to stop amassing garbage in Thailand, the government has announced it plans to ban imports of plastic and electronic waste. Topics include the initiative comes after massive amounts of e-waste from the U.S., European Union, Hong Kong, China, Singapore and Japan had been shipped to Thailand and statement of environment minister Surasak Kanchanarat that Thailand will stop importing cheap electronic and plastic waste in order to alleviate ecological problems.

Staffieri, E., et al. (2019). "Pressure and impact of anthropogenic litter on marine and estuarine reptiles: an updated “blacklist” highlighting gaps of evidence." Environmental science and pollution research international **26**(2): 1238-1249.

We report an arrangement on the effect of anthropogenic litter on marine and estuarine reptiles, checking for evidence about different types of impact (ingestion vs. entanglement) and pressure (three size-based categories). From 1976 to 2018, we obtained a “blacklist” of 11 species impacted by marine litter (about 13% of 85 species of marine and estuarine reptiles), belonging to three orders (Testudines, Squamata, and Crocodilia). We obtained only occasional evidence of an impact for Squamata (Hidrophis elegans, Disteira major) and Crocodilia (Crocodylus porosus). Regarding the different types of pressure, the highest number of evidence has been obtained for macro-litter (10 species) and the lowest for micro-litter (4 species, all Chelonidae). Among Testudines, Lepidochelys kempii and Natator depressus evidenced a lack of data for micro-plastic. In Squamata, information is lacking for micro-plastic with only occasional references for meso-plastic (in Hydrophis elegans) and macro-plastic (Disteira major and Crocodylus porosus). We obtained a direct correlation between the research effort and the number of citations regarding different types of pressure and impact of marine litter: therefore, our blacklist of impacted species could be increased, carrying out further research focused on other poorly studied marine and estuarine reptiles. We suggest the use of a standardized nomenclature to reduce the amount of lost information.

Stalke, A., et al. (2013). "Metal responsive elements as a new point of view in the pathogenesis of

Wilson Disease." Medizinische Genetik **25 (1)**: 166.
Background: Wilson Disease (WD) is a monogenic autosomal recessive disorder leading to toxic copper accumulation mainly in liver tissue. It is caused by mutations in the ATP7B gene (OMIM#606882). Currently, more than 500 disease-related ATP7B mutations are known, providing a basis for molecular genetic diagnosis of WD. In patients who exhibit clinical WD symptoms but lack a detectable ATP7B mutation, differential diagnosis remains difficult. Our previous studies revealed a decrease in liver ATP7B mRNA expression in molecular genetically proven WD patients compared to controls. Decreased ATP7B mRNA expression was also observed in patients with typical WD symptoms but without an ATP7B mutation. Metal responsive elements (MREs) are likely to be linked to this downregulation. MREs (a, c, d and e) can be found in the ATP7B promoter region and modulate the promoter activity by binding transcription factors in a metal ion concentration-dependent mechanism. An interaction partner in the ATP7B gene is already known for MRE a. Ultimate aim of our study is to unveil and characterize further MRE-interacting proteins that might orchestrate the aberrant ATP7B mRNA expression in patients with or without genetically detectable WD. Method(s): Nuclear proteins were extracted from human hepatocellular carcinoma cell line cells (HLE). To screen for protein-DNA interactions, an electrophoretic mobility shift assay (EMSA) was performed by incubating the nuclear extract with biotin-labeled double-stranded 31 bp probe corresponding to ATP7B MRE c sequence. To confirm the specificity of protein-DNA binding and to narrow down the protein binding site, excessive amounts of wild-type and mutated unlabeled MRE c oligonucleotides were used as competitors. The protein-DNA complex was isolated by means of magnetic streptavidin microbeads. Eluted proteins were identified by MALDI-TOF/TOF mass spectrometry. Result(s): A highly specific protein binding on the MRE c probe was revealed by EMSA experiments. The use of mutated MRE c competitor oligonucleotides also indicated that not only nucleotides of the consensus MRE c sequence, but also up to six nucleotides downstream of the MRE c are involved in protein binding. Among the isolated proteins are proline- and glutamine-rich splicing factor (SFPQ) and poly(U)-binding-splicing factor (PUF60), which are not only involved in splicing, but also in regulation of transcription. Conclusion(s): Our findings demonstrate that the regulatory MRE c sequence of the ATP7B gene is specifically bound by at least one protein. Candidate binding partners are the two factors SFPQ and PUF60. Specific interactions with either of these proteins have to be confirmed by supershift assays and their effects on transcriptional activation will have to be elucidated by luciferase assays. In prospective studies, liver samples of WD patients and possible WD patients without an ATP7B mutation could then be analyzed regarding validated MRE c binding transcription factors. More precisely, expression and mutational analysis of the transcription factors as well as mutational analysis of the MRE c itself are of immediate interest. A downregulation of transcription factors or disturbed interaction between transcription factors and MRE c may explain the decreased ATP7B mRNA expression in WD. These findings could provide new insights into the pathogenesis of WD but most of all enhance WD diagnosis in patients with disease symptoms but without an ATP7B mutation.

Stanič, A. (2016). "THE MICROPLASTIC THREAT TO OUR OCEANS." Resurgence & Ecologist(296): 6-7.
The article reports on the women's eXXpedition mission to evaluate pollution from plastics, chemicals, endocrine disrupters in the tropical Atlantic. It highlights the threat of microplastics to the ocean that can cause disease in personal and global environment. The expedition also includes taking water from the ocean as sample to test the presence of micro-and nanoplastic and toxins.

Stanisavljevic, N. and P. H. Brunner (2019). "Quantity AND quality: New priorities for waste management." Waste Management and Research **37**(7): 665-666.

Staniszewska, M., et al. (2016). "The fate of bisphenol A, 4-tert-octylphenol and 4-nonylphenol leached from plastic debris into marine water – experimental studies on biodegradation and sorption on suspended particulate matter and nano-TiO2." Chemosphere **145**: 535-542.

Experiments were carried out, the aim of which was to determine the leaching rates for bisphenol A (4,4'-(propane-2,2-diyl)diphenol - BPA), 4- tert -octylphenol (OP), 4-nonylphenol (NP) from polycarbonate and recycled tyre granules into the seawater. Additionally biodegradation, sorption on marine suspended particulate matter and sorption on various types of nano-TiO 2 of BPA, OP, NP were studied. Experiments were carried out on plastics at various stages of degradation. The conducted experiment confirmed the flux of BPA, OP and NP from the studied plastics into seawater. The initial photodegradation of the plastic had a significant influence on the amount of the studied components released into water. During the first days of the experiment leaching was weaker from aged materials. After 60 days leaching of BPA and OP was higher for aged plastic compared to unaged. On average, suspension adsorbed OP, BPA and NP from seawater at respective levels of 37%, 75% and 100%. On the other hand, during biodegradation on average 25%, 9% and 2% of OP, BPA and NP respectively are removed from water. Nano-TiO 2 of 21 nm pore size diameter adsorbed all the compounds more strongly than nano-TiO 2 of 15 nm pores sized coated with Al and stearic acid. The strongest sorption (100%) on different types of nano-TiO 2 was that of the most hydrophobic and more linear structured NP with just one phenol group. The weakest sorption was observed in the case of BPA, which is the least hydrophobic, and characterized by higher compared to NP and OP steric hindrance and electrostatic repulsion. [ABSTRACT FROM AUTHOR]

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Stanton, T., et al. (2019). "Freshwater and airborne textile fibre populations are dominated by 'natural', not microplastic, fibres." Science of the Total Environment **666**: 377-389.

The potential role of natural textile fibres as environmental pollutants has been speculated upon by some environmental scientists, however, there is a general consensus that their biodegradability reduces their environmental threat. Whilst the risks that they pose remain poorly understood, their environmental prevalence has been noted in several recent microplastic pollution manuscripts. Here we highlight the extent to which natural textile fibres dominate fibre populations of upstream reaches of the River Trent, UK, as well as the atmospheric deposition within its catchment, over a twelve month microplastic sampling campaign. Across 223 samples, natural textile fibres represented 93.8% of the textile fibre population quantified. Moreover, though microplastic particles including synthetic fibres are known to be pervasive environmental pollutants, extruded textile fibres were absent from 82.8% of samples. Natural textile fibres were absent from just 9.7% of samples.

Stapleton, J. A. and J. R. Swartz (2010). "Development of an in vitro compartmentalization screen for high-throughput directed evolution of [FeFe] hydrogenases." PLoS ONE [Electronic Resource] **5**(12): e15275.

BACKGROUND: [FeFe] hydrogenase enzymes catalyze the formation and dissociation of molecular hydrogen with the help of a complex prosthetic group composed of common elements. The development of energy conversion technologies based on these renewable catalysts has been hindered by their extreme oxygen sensitivity. Attempts to improve the enzymes by directed evolution have failed for want of a screening platform capable of throughputs high enough to adequately sample heavily mutated DNA libraries. In vitro compartmentalization (IVC) is a powerful method capable of screening for multiple-turnover enzymatic activity at very high throughputs. Recent advances have allowed [FeFe] hydrogenases to be expressed and activated in the cell-free protein synthesis reactions on which IVC is based; however, IVC is a demanding technique with which many enzymes have proven incompatible.

METHODOLOGY/PRINCIPAL FINDINGS: Here we describe an extremely high-throughput IVC screen for oxygen-tolerant [FeFe] hydrogenases. We demonstrate that the [FeFe] hydrogenase CpI can be expressed and activated within emulsion droplets, and identify a fluorogenic substrate that links activity after oxygen exposure to the generation of a fluorescent signal. We present a screening protocol in which attachment of mutant genes and the proteins they encode to the surfaces of microbeads is followed by three separate emulsion steps for amplification, expression, and evaluation of hydrogenase mutants. We show that beads displaying active hydrogenase can be isolated by fluorescence-activated cell-sorting, and we use the method to enrich such beads from a mock library.

CONCLUSIONS/SIGNIFICANCE: [FeFe] hydrogenases are the most complex enzymes to be produced by cell-free protein synthesis, and the most challenging targets to which IVC has yet been applied. The technique described here is an enabling step towards the development of biocatalysts for a biological hydrogen economy.

Stapleton, P. A. (2019). "Toxicological considerations of nano-sized plastics." Aims Environmental Science **6**(5): 367-378.

Undoubtedly, plastics have changed human existence. These pervasive products are used in nearly every field to include technological, biomedical, and domestic applications. Post-consumer plastic waste disposal leading to plastic pollution in landfills, waterways, and oceans represents a worldwide environmental challenge. Accumulation and continued material fragmentation from micro- to nanoplastics has identified concerns pertaining to environmental and human exposures and toxicity. While many studies have focused on particle fate and identification, the toxicological considerations must focus on the biological relevance of particle deposition within a particular organism, compartment, organ, and tissue. Further, concerns exist regarding the physical and chemical properties of the plastic particles during their production and/or degradation. In this mini-review we will discuss (1) particle characterization and assessment, (2) environmental concerns, and (3) human toxicity.

Starr, D. (1990). "SHOPPERS, SHOPPERS, EVERYWHERE." Audubon **92**(2): 98-103.

Presents an overview of plastic use and disposal in Italy. Use of plastic shopping bags every year; Garbage disposal problems; Emphasis on how these plastics are deposited in rivers; Controversies surrounding the ban on the use of plastics in the country; Environmental effects of incineration.

Stasolla, G., et al. (2015). "On the diet of the invasive crab Charybdis longicollis Leene, 1938 (Brachyura: Portunidae) in the eastern Mediterranean Sea." Israel Journal of Ecology & Evolution **61**(3/4): 130-134.

We present the first results on the diet of the invasive portunid crab Charybdis longicollis in the eastern Mediterranean. No differences were found between sexes, seasons, class size or

infection by the rhizocephalan Heterosaccus dollfusi. Size differences were noted between crabs collected at different depths, with larger specimens at shallower sites, as well as significant interaction between sex and infection factors, with males more parasitized than females. Sex has had no bearing on food items. No significant impacts were observed of seasons, depth, class size, sex and infection on stomach fullness. Charybdis longicollis is benthophagic, with preference for infaunal and slow moving prey, as attested by the notable amount of sediment in their stomachs; the most frequent food items were molluscs, crustaceans and fish, similar to congeners. Microplastics were detected in a quarter of the specimens examined. Since the species is extremely abundant in the Levantine littoral and sublittoral, it is likely to impact the local biota.

Stastny, P., et al. (2007). "Antibodies against donor human leukocyte antigens and the outcome of cardiac allografts in adults and children." Transplantation **84**(6): 738-745.

BACKGROUND: Mismatched histocompatibility antigens between donor organ and host stimulate the immune response that causes allograft rejection. Antibodies against human leukocyte antigen (HLA) are known to appear in the serum of heart transplant recipients.

METHODS: We have tested stored sera with HLA bound to polystyrene microbeads in a retrospective analysis of heart recipients transplanted in our center to better understand the impact of antibodies against HLA on the posttransplant course. Our analysis included two groups of patients: 113 adults and 31 children who received consecutive heart transplants performed between 1996 and 2003.

RESULTS: Presence of HLA antibodies, especially when donor-specific, as determined with single HLA class I or class II beads, was associated with more frequent occurrence of acute rejection, development of transplant-related coronary artery disease and decreased graft survival. Recipients having antibodies only to HLA not in the transplant and those without any HLA antibodies had similar outcomes, suggesting that antibodies against antigens not present on the donor organ did not harm the graft.

CONCLUSION: The results showed that presence of antibodies against HLA of the donor correlated with graft loss and suggested that testing for these antibodies may help in the management of heart transplant patients.

Statache, G., et al. (2012). "Regulation of microrna 223 expression in a gouty arthritis." Arthritis and Rheumatism **10)**: S811.

Background/Purpose: Gout is an inflammatory chronic disease caused by deposition of uric acid crystals in the joint and connective tissues causing pain and disability. Current data suggest that gout is mediated by IL-1b that is produced due to the activation of the inflammasome pathway by uric acid crystals. In addition, neutrophil influx in the joint is the key initiator of a gout flare. miR-223 has been identified as a masterswitch molecule limiting neutrophil activation. In addition, we showed previously that this miR negatively regulates NLRP3 (an inflammasome component) and IL-1b production in human macrophages. To investigate miR-223 expression and regulation in monocytes and neutrophils of gout patients. Method(s): CD14+ cells and neutrophils were isolated from gout patients (n=10) and healthy donors (n=6) peripheral blood using CD14 microbeads and polylymphoprep gradient buffer, respectively. CD14+ from healthy donors were stimulated with LPS (10 ng/ml) IL-1beta (100-10ng/ml), IL-6 (100 ng/ml), TNF alpha (10-100ng/ml) or monosodium urate crystals MSU (1mg-1ug/ml) for different time points (24-72h). Cells were harvested and miRNA extracted. Expression of miR-223 and endogenous control snRNA U1 was assessed by qPCR. Result(s): miR-223 expression in peripheral blood monocytes of patients with chronic gout was lower compared to healthy controls. This suggest

that overproduction of IL-1b in chronic disease might be partially mediated by low levels of miR-223. In vitro studies revealed that MSU, IL-1b, TNFa and IL-6 significantly inhibited miR-223 expression in monocytes in all time points (24-72h). In contrast, IL-10 strongly increased miR-223 expression. Interestingly, the levels of miR-223 in peripheral blood neutrophils were higher in gout patients compared to healthy controls Conclusion(s): A decrease in miR-223 expression in monocytes of chronic gout patients may contribute to uric acid crystals induced inflammasome activation and chronicity of disease. Upregulation of miR-223 expression in gout neutrophils may reflect the activation of mechanisms that limits neutrophils activation and lead to the resolution of gout flares.

Staub, C. (2019). "Recycling leaders respond to plastic industry's $1B pledge." Resource Recycling **38**(2): 8-9.

The article reports on the response of recycling leaders on the pledge made by plastic industry in the U.S. The topics discussed include the plan of the organization the Alliance to End Plastic Waste to concentrate resources by creating waste collection infrastructure, cleaning of the plastics from the environment, and educating the consumers about the waste, and the remarks of the Association of Plastic Recyclers executive director Steve Alexander on their commitment to the effort.

Staudinger, M., et al. (2013). "Elimination of AML leukemic stem cells by CD96 antibody as a new strategy in stem cell transplantation." Onkologie **7)**: 208.

Introduction: Residual leukemic stem cells (LSC) may account for relapse frequently observed in AML patients despite being consolidated by stem cell transplantation. Therefore, clearance of LSC by targeted therapy represents a therapeutic goal. Here, strategies are described addressing CD96 - a marker antigen recently identified on LSC of AML patients - for engineering autologous stem cell grafts by magnetic cell sorting (MACS) as well as for in vivo killing of LSC by antibody dependent cellular cytotoxicity (ADCC). Method(s): The CD96 antibody TH111 raised in our laboratory was biotinylated and used for depletion of AML-LSC cells by MACS. Efficiency of the procedure and its influence on the viability and differentiation of healthy hematopoietic progenitor cells (HPC) were analyzed by flow cytometry and colony forming assays. Chimeric CD96 antibodies were generated by recombinant DNA technologies. Antibody-mediated effector functions were analyzed in 51Cr-release assays. Result(s): To evaluate purging of LSC, a stem cell containing graft was spiked with CD96 positive AML cells. Up to a 1000-fold depletion of targeted cells was achieved using biotinylated CD96 antibody and anti-Biotin- microbeads. Viability, cell count and the potential of HPC to proliferate and differentiate were not affected. To target CD96+ AML-LSC by ADCC, chimeric antibodies containing wild type or affinity maturated variable regions in combination with an optimized human IgG1 Fc were generated. Not only antigen binding affinity of the maturated antibody was enhanced (EC50 0.6mug/ml vs. 2mug/ml), but also NK cell mediated lytic properties against CD96-positive target cells were elevated (EC50: 0.02 mug/ml vs. 0.15 mug/ml). Conclusion(s): CD96 antibodies can be efficiently used to target and to deplete CD96 positive AML-LSC from mixed cell populations similar to autologous grafts, without affecting normal HPC viability, proliferation or differentiation properties. Moreover, a chimeric, affinity maturated and Fc engineered antibody targeting CD96 was able to recruit NK cells and displayed enhanced lytic activity against CD96 positive targets. In summary, these approaches may be beneficial for the development of graft-engineering strategies to avoid transplantation of AML-LSC and revitalize autologous stem cell transplantation in this indication. The in vivo application may possibly open additional therapeutic avenues in eliminating residual disease in autologous as well as allogeneic situations.

Staudinger, M., et al. (2014). "Depletion of leukemic AML stem cells from autografts by CD96 antibody TH111." Oncology Research and Treatment **5)**: 128.

Background: Residual leukemic stem cells (LSC) residing in patients or autologous hematopoietic stem cell transplants may lead to repopulation of the tumor cells after therapy. Therefore, addressing these LSC by targeted therapy should lead to better therapeutic results. Here, CD96-an antigen identified on acute myeloid leukemia (AML) LSC-was used to deplete AML LSC from autologous stem cell grafts by magnetic cell sorting (MACS). Moreover, elimination of these AML LSC in vivo by antibody-dependent killing (ADCC) may be of therapeutic use in other situations. Method(s): For MACS based separation of AML LSC from autologous grafts, the CD96 antibody TH111 raised in our laboratory was labeled with Biotin and used in combination with anti-Biotin-MicroBeads. Healthy hematopoietic progenitor cells (HPC) viability, their differentiation properties and the efficiency of depletion were analyzed by colony forming assays and by flow cytometry. Chimeric CD96 antibodies optimized for Fc-receptor interaction were analyzed for purity by SDS page and specific binding by flow cytometry. Antibody-mediated effector functions were measured in 51Cr-release assays. Result(s): Hematopoietic stem cell containing grafts were spiked with AML cells to evaluate the efficiency of antibody mediated LSC purging by MACS. The combination of anti-Biotin-MicroBeads and biotinylated CD96 antibody facilitated an up to 1000-fold depletion of targeted cells. Viable HPCs cell count as well as their potential to proliferate and differentiate were not affected by the purging procedure. Chimeric antibodies containing wild type or affinity maturated variable regions in combination with an ADCC optimized human IgG1 Fc were generated to recruit Fc-receptor bearing effector cells for lysis of CD96 positive AML LSC. The higher antigen binding affinity of the maturated antibody (EC50 of 0.6 vs. 2 mug/ml) should account for the enhanced NK cell mediated lytic properties against CD96-positive cells (EC50: 0.02 vs. 0.15 mug/ml; E:T ratio 2.5:1). Conclusion(s): The efficient elimination of AML-LSC by MACS may be beneficial for the development of graft-engineering strategies to avoid transplantation of AML-LSC and provide rationale for autologous stem cell transplantation in certain patients with AML. The in vivo application of optimized recombinant chimeric antibodies targeting AML LSC may possibly open additional therapeutic avenues in eliminating residual disease in autologous as well as allogeneic situations.

Staudinger, M., et al. (2015). "Graft engineering in acute myeloid leukemia : CD96 antibody TH-111 depletes leukemic stem cells from autografts." Transfusion Medicine and Hemotherapy **1)**: 3-4.

Introduction: Residual leukemic stem cells (LSC) may account for the high rate of relapse observed in patients suffering from acute myeloid leukemia (AML). Therefore, addressing these LSC residing in patients or autologous hematopoietic stem cell transplants by targeted therapy should lead to better therapeutic results. Here, CD96 - an antigen identified on AML-LSC - was used to deplete AML LSC from autologous stem cell grafts by magnetic cell sorting (MACS). Moreover, a chimeric Fc-optimized CD96 antibody was developed to eliminate these AML-LSC by antibody-dependent killing (ADCC) in vivo. Method(s): To evaluate the efficiency of LSC purging HPC containing grafts were spiked with AML cells (KG1a, n = 10 experiments). To deplete AML-LSC from autologous grafts by MACS, the Biotin-labeled CD96 antibody TH-111 raised in our laboratory was used in combination with anti-Biotin-MicroBeads. The efficiency of depletion was analyzed by flow cytometry. Colony assays were used to evaluate the differentiation and proliferation characteristics of hematopoietic progenitor cells (HPC). Chimeric CD96 antibodies optimized for Fc-receptor engagement were analyzed for purity by

SDS page and specific binding by flow cytometry. Antibody-mediated effector functions were measured in 51Cr-release assays or by flow cytometry. Result(s): Up to a 1000-fold depletion of target cells was achieved by MACS. The potential of HPC to proliferate and differentiate was not affected by the purging procedure. Chimeric CD96 antibodies combining a Fc optimized human IgG1Fc and wild type or affinity maturated variable regions were generated to recruit Fc-receptor bearing effector cells for lysis of CD96+ AML-LSC. The affinity maturated CD96 antibody efficiently recruited NK cell for lysis of CD96 positive target cells while HPCs' viability was not impaired. The higher antigen binding affinity of the maturated antibody (EC50 0.6 vs. 2 mug/ml) may account for the elevated target cell lysis (EC50 0.02 vs. 0.15 mug/ml; E:T ratio 2.5:1). Conclusion(s): The efficient elimination of AML-LSC by MACS may be beneficial for the development of graft-engineering strategies to avoid re-transplantation of AML-LSC and provide rationale for autologous stem cell transplantation in certain patients with AML. In autologous as well as allogeneic situations the in vivo application of an Fc-optimized chimeric CD96 antibody targeting AML-LSC may possibly open additional therapeutic avenues in eliminating residual disease.

Steen, R., et al. (2016). "Plastic mistaken for prey by a colony-breeding Eleonora's falcon (Falco eleonorae) in the Mediterranean Sea, revealed by camera-trap." Marine Pollution Bulletin **106**(1/2): 200-201.

Discarded plastic is known to be harmful for marine animals through ingestion and entanglement. Here we report the first documentation of Eleonora's falcons providing plastic waste to dependent nestlings. Eleonora's falcons breed colonially on sea cliffs and islets in areas of the Mediterranean Sea and the Canary Islands in which they normally feed their nestlings exclusively with small migratory birds.

Steensgaard, I. M., et al. (2017). "From macro- to microplastics - Analysis of EU regulation along the life cycle of plastic bags." Environmental Pollution **224**: 289-299.

Plastic pollution and its environmental effects has received global attention the recent years. However, limited attention has so far been directed towards how plastics are regulated in a life cycle perspective and how regulatory gaps can be addressed in order to limit and prevent environmental exposure and hazards of macro- and microplastics. In this paper, we map European regulation taking outset in the life cycle perspective of plastic carrier bags: from plastic bag production to when it enters the environment. Relevant regulatory frameworks, directives and authorities along the life cycle are identified and their role in regulation of plastics is discussed. Most important regulations were identified as: the EU chemical Regulation, the Packaging and Packaging Waste Directive including the amending Directive regarding regulation of the consumption of lightweight plastic carrier bags, the Waste Framework Directive and the Directive on the Landfill of Waste. The main gaps identified relate to lack of clear definitions of categories of polymers, unambitious recycling rates and lack of consideration of macro- and microplastics in key pieces of legislation. We recommend that polymers are categorized according to whether they are polymers with the same monomer constituents (homopolymers) or with different monomer constituents (copolymers) and that polymers are no longer exempt from registration and evaluation under REACH. Plastics should furthermore have the same high level of monitoring and reporting requirements as hazardous waste involving stricter requirements to labelling, recordkeeping, monitoring and control over the whole lifecycle. Finally, we recommend that more ambitious recycle and recovery targets are set across the EU. Regulation of the consumption of lightweight plastic carrier bags should also apply to heavyweight plastic carrier bags. Last, the Marine and Water Framework Directives should

specifically address plastic waste affecting water quality.

Steer, M., et al. (2017). "Microplastic ingestion in fish larvae in the western English Channel." Environmental Pollution **226**: 250-259.

Microplastics have been documented in marine environments worldwide, where they pose a potential risk to biota. Environmental interactions between microplastics and lower trophic organisms are poorly understood. Coastal shelf seas are rich in productivity but also experience high levels of microplastic pollution. In these habitats, fish have an important ecological and economic role. In their early life stages, planktonic fish larvae are vulnerable to pollution, environmental stress and predation. Here we assess the occurrence of microplastic ingestion in wild fish larvae. Fish larvae and water samples were taken across three sites (10, 19 and 35 km from shore) in the western English Channel from April to June 2016. We identified 2.9% of fish larvae (n=347) had ingested microplastics, of which 66% were blue fibres; ingested microfibers closely resembled those identified within water samples. With distance from the coast, larval fish density increased significantly (P<0.05), while waterborne microplastic concentrations (P<0.01) and incidence of ingestion decreased. This study provides baseline ecological data illustrating the correlation between waterborne microplastics and the incidence of ingestion in fish larvae.

Stegmann, R. (2017). "Global pollution....Time to act." Waste Management **66**: 1-2.

Steinberg, F., et al. (1992). "Activity testing of alveolar macrophages and changes in surfactant phospholipids after irradiation in bronchoalveolar lavage: Experimental and clinical data." Environmental Health Perspectives **97**: 171-175.

This study presents results of bronchoalvolar lavage (BAL) after irradiation to the lungs in mice as well as clinical data. The number of BAL cells, mainly macrophages, lymphocytes, and granulocytes, changed in a time- dependent manner. The phagocytic activity of the macrophages measured as the phagocytosis of microbeads and measured as the esterase activity also showed a strong time-dependent increase during the acute phase up to 21 days after irradiation. The contents of surfactant phospholipids (SF) and sphingomyelin (SPH; as a parameter for cell death) were quantified by HPLC. Both were significantly changed between day 2 and 21 after irradiation. Three BALs of a patient with idiopathic interstitial pneumonitis, who had received an allogenic bone marrow graft after total body irradiation with 10 Gy, showed similar effects in the cellular and surfactant parameters. These data indicate that there are positive interactions between the number of different BAL cells, macrophage activity, and SF and SPH content in the preclinical model of the mouse as well as in the clinical situation after lung irradiation.

Steinmetz, Z., et al. (2016). "Plastic mulching in agriculture. Trading short-term agronomic benefits for long-term soil degradation?" Science of the Total Environment **550**: 690-705.

Plastic mulching has become a globally applied agricultural practice for its instant economic benefits such as higher yields, earlier harvests, improved fruit quality and increased water-use efficiency. However, knowledge of the sustainability of plastic mulching remains vague in terms of both an environmental and agronomic perspective. This review critically discusses the current understanding of the environmental impact of plastic mulch use by linking knowledge of agricultural benefits and research on the life cycle of plastic mulches with direct and indirect implications for long-term soil quality and ecosystem services. Adverse effects may arise from plastic additives, enhanced pesticide runoff and plastic residues likely to fragment into

microplastics but remaining chemically intact and accumulating in soil where they can successively sorb agrochemicals. The quantification of microplastics in soil remains challenging due to the lack of appropriate analytical techniques. The cost and effort of recovering and recycling used mulching films may offset the aforementioned benefits in the long term. However, comparative and long-term agronomic assessments have not yet been conducted. Furthermore, plastic mulches have the potential to alter soil quality by shifting the edaphic biocoenosis (e.g. towards mycotoxigenic fungi), accelerate C/N metabolism eventually depleting soil organic matter stocks, increase soil water repellency and favour the release of greenhouse gases. A substantial process understanding of the interactions between the soil microclimate, water supply and biological activity under plastic mulches is still lacking but required to estimate potential risks for long-term soil quality. Currently, farmers mostly base their decision to apply plastic mulches rather on expected short-term benefits than on the consideration of long-term consequences. Future interdisciplinary research should therefore gain a deeper understanding of the incentives for farmers and public perception from both a psychological and economic perspective in order to develop new support strategies for the transition into a more environment-friendly food production.

Stelmaszczyk-Emmel, A., et al. (2012). "Identification, frequency, activation and function of CD4+ CD25 ^{high}FoxP3+ regulatory T cells in children with juvenile idiopathic arthritis." Rheumatology International **32**(5): 1147-1154.

The aim of the study was to test the frequency of CD4+ CD25 ^{high}FoxP3 regulatory T cells in JIA patients and to assess their activation status and functional activity. The study involved 12 children with JIA and 35 healthy control subjects. PBMC were stained with monoclonal antibodies (anti-CD25, anti-CD4, anti-CD127, anti-CD69, anti-CD71, and anti-FoxP3). The samples were evaluated using flow cytometer. CD4+ CD25-and CD4+ CD25+ cells were isolated by negative and positive selection with magnetic microbeads. CD4+ CD25+ and CD4+ CD25-cells were cultured separately and co-cultured (1:1) with or without PHA. The percentage of Tregs in JIA patients was significantly decreased in comparison with controls (median, 3.2 vs. 4.6; P = 0.042). Relative fluorescence intensities of FoxP3 were higher in JIA patients than in controls (median, 9.1 vs. 6.8). The percentage of activated Tregs (CD71+) was significantly higher in JIA patients in comparison with controls (median, 6.5 vs. 2.8; P = 0.00043). CD4+ CD25+ cells derived from JIA patients and controls were anergic upon PHA stimulation, while CD4+ CD25-cells showed intensive proliferative response. The proliferation rate of CD4+ CD25-cells stimulated by PHA was decreased in co-cultures. In JIA patients, the inhibition of proliferation of CD4+ CD25-cells by CD4+ CD25+ cells was 37.9%, whereas in controls it was significantly lower (55.7%, P = 0.046). JIA patients had statistically lower percentage of Tregs in peripheral blood compared to controls. CD4+ CD25+ cells sorted from peripheral blood of JIA patients had statistically lower ability to suppress CD4+ CD25-cell proliferation in comparison with cells obtained from controls. © 2011 Springer-Verlag.

Stemple, C. C., et al. (2014). "Smartphone-based optofluidic lab-on-a-chip for detecting pathogens from blood." Journal of Laboratory Automation **19**(1): 35-41.

A novel smartphone-based detection device was created to detect infectious pathogens directly from diluted (10%) human whole blood. The model pathogen was histidine-rich protein 2 (HRP-2), an antigen specific to Plasmodium falciparum (malaria). Anti-HRP-2-conjugated submicrobeads were mixed with HRP-2-infused 10% blood in a lab-on-a-chip device. The white LED flash and the digital camera of the smartphone were used as light source and detector, which delivered light to and from the bead and blood mixture via optofluidic channels in the

lab-on-a-chip. The optofluidic channels were angled at 45 degrees to capture the Mie scatter from the sample. Considering the absorption and scattering characteristics of blood (red/infrared preferred) and the Mie scatter simulations for microbead immunoagglutination (UV preferred), blue detection showed the best results. The detection limit was 1 pg/mL in 10% blood. The linear range was from 1 pg/mL to 10 ng/mL. A handheld device, easily attachable to a single smartphone, was finally designed and fabricated using optical mirrors and lenses and successfully detected the HRP-2 from 10% blood. The total assay time was approximately 10 min. The proposed device can potentially be used for detecting a wide range of blood infection with high sensitivity.

Stephen, M. (2013). "WHY you need to understand SOLIDS FLOW." Canadian Plastics **71**(5): 11.

Resins are usually handled with a pneumatic conveying system that typically consists of a system of pipes, manifolds, valves, and controls that are powered by a high velocity stream of air. All plastic materials have certain characteristics which govern the amount of power or velocity required to move them properly, and plastics processors who want to specify an optimal resin feeding and conveying system need to know what they are. Plastic resin, either in pellet or granular form, is susceptible to flow problems such as blocking, sticking, erratic flow, inconsistent discharge, poor mixing, and lack of first-in/first-out flow. Abrasive, glass-filled materials won't necessarily affect the handling system equipment design, the experts say, but they can determine what the system is built from. The key to efficient raw materials conveying is to design the system to the measured flow properties of the resins to be handled.

Stephens, A. (1987). "The Case for HDPE Recycling." Resource Recycling **6**(5): 18.

Plastics represent a growing proportion of the municipal solid waste stream. The solution to this growing problem is to face the challenge to recycle post-consumer plastics waste. At 2.2 billion lb/year, high density polyethylene (HDPE) is by far the largest plastic resin used within the blow molded container market. Nearly four times more HDPE is destined for landfills than is other plastic bottle resins. Eaglebrook Plastics Inc. of Chicago, IL, recycles over 1.5 million lb/month of industrial scrap polyethylene. It has developed a technology that enables the recycling of post-consumer polyethylene bottles that are contaminated with paper labels, dirt, and product residue. Efforts are underway to develop technology for the recycling of dairy bottles.

Sterenborg, J., et al. (2017). Model tests to assess wave and current loads on ocean cleanup's conceptual plastic capturing barrier. ASME 2017 36th International Conference on Ocean, Offshore and Arctic Engineering, OMAE 2017, June 25, 2017 - June 30, 2017, Trondheim, Norway, American Society of Mechanical Engineers (ASME).

Lot of plastics enters the ocean every day with negative effects on the environment, economy and health. A large portion of the floating plastics accumulate in so-called gyres, where currents converge. One of the aims of the Ocean Cleanup is to develop technologies to extract plastic pollution from the oceans. The idea is to install a flexible barrier in the ocean that is supposed to concentrate the plastic at the Great Pacific Garbage Patch. The design of the barrier is still in the conceptual phase and the model tests described in this report are conducted to assist in the development of the barrier. The model tests were carried out in MARIN's Offshore Basin and served two main goals: 1) provide loads and displacements for numerical model calibrations and 2) examine the 3D fluid-structure interactions and the barrier performance for three different design concepts. A 360m prototype length barrier was considered that consists of a floater with a diameter of 1.5m and a screen with a height of 2m. To model larger lengths of the barrier, various pretensions were applied at the ends of the barrier. For the secondary mooring concept the barrier was moored each 60m via the bottom of the screen to a submerged tension line. For the low mooring and high mooring concepts, the model was only moored at both ends of the bottom of the screen or bottom of the floater. In general mooring loads were found to be the largest for the low mooring configuration. For this same configuration the mooring loads increment with increasing current velocity was the largest. Mooring load fluctuations seemed to be not strongly influenced by the amount of applied pretension. Vertical screen orientations, which are expected to be beneficial for the plastic capturing efficiency, were mostly observed for the secondary mooring and high mooring configurations. For the low mooring concept the offsets along the flow direction were the largest and the screen was more tilted. Additional ballast for the high mooring concept promoted a more vertical orientation of the screen with as downside increasing mooring loads. Overtopping or bridging (air gap exists below the barrier) negatively impact the plastic capturing efficiency and are important to consider. Both events are most likely to happen for shorter wave conditions and higher current velocities. The number of occurrences of overtopping and bridging was the lowest for the secondary mooring and the high mooring setup with a low pretension. For increasing pretension the number of overtopping and bridging events increased. Copyright 2017 ASME.

Sterne, R. E. and T. H. McCarver (1980). "Formation of sporangia by Phytophthora cryptogea and P. parasitica in artificial and natural soils." Soil Biology & Biochemistry **12**(4): 441-442.

In artificial soils (glass microbeads; 1-500 mu m diameter) Phytophthora cryptogea formed sporangia only when soil extract or nutrient solution were added, while P. parasitica formed sporangia equally well in artificial soils amended with deionised water, soil extract or nutrient solution. In a coarse bead mixture or in a coarse sandy soil, sporangia formation by both species occurred at -5, -10 and -25 kPa matric potential, but not at OkPa. In a fine lead mixture or in a clay loam soil formation of sporangia did not occur at matric potentials above -25 kPa. Inhibition of sporangia formation is attributed to poor aeration.

Stiffel, C., et al. (1990). "Genetics of acute inflammation: Inflammatory reactions in inbred lines of mice and in their interline crosses." Experimental and Clinical Immunogenetics **7**(4): 221-233.

Acute inflammation is induced by the subcutaneous injection of swollen polyacrylamide microbeads, its intensity measured by the cell and protein concentration of the local exudates. A large and continuous range of responses is obtained in different inbred strains of mice, which suggests a polygenic control of the inflammatory response. The variable levels of the global dominance observed in F1 hybrids issued from several parental combinations indicated that the pattern of alleles controlling high or low response was different in each parental strain. Balanced intercrossing of the 8 inbred strains studied has provided a genetically heterogeneous F3 population, presenting a high variability of responses. The value of the genetic part of F3 phenotypic variance, the spread of the interstrain differences, as well as the polygenic nature of the regulation of inflammatory responses pointed out the possibility to perform a bidirectional genetic selection by using the F3 mice as the foundation population, and response to microbeads as the selective phenotypic character.

Stock, C., et al. (2005). "Migration of human melanoma cells depends on extracellular pH and Na+/H+ exchange." Journal of Physiology **567**(Pt 1): 225-238.

Their glycolytic metabolism imposes an increased acid load upon tumour cells. The surplus protons are extruded by the Na+/H+ exchanger (NHE) which causes an extracellular acidification. It is not yet known by what mechanism extracellular pH (pHe) and NHE activity affect tumour cell migration and thus metastasis. We studied the impact of pHe and NHE activity

on the motility of human melanoma (MV3) cells. Cells were seeded on/in collagen I matrices. Migration was monitored employing time lapse video microscopy and then quantified as the movement of the cell centre. Intracellular pH (pHi) was measured fluorometrically. Cell-matrix interactions were tested in cell adhesion assays and by the displacement of microbeads inside a collagen matrix. Migration depended on the integrin alpha2beta1. Cells reached their maximum motility at pHe approximately 7.0. They hardly migrated at pHe 6.6 or 7.5, when NHE was inhibited, or when NHE activity was stimulated by loading cells with propionic acid. These procedures also caused characteristic changes in cell morphology and pHi. The changes in pHi, however, did not account for the changes in morphology and migratory behaviour. Migration and morphology more likely correlate with the strength of cell-matrix interactions. Adhesion was the strongest at pHe 6.6. It weakened at basic pHe, upon NHE inhibition, or upon blockage of the integrin alpha2beta1. We propose that pHe and NHE activity affect migration of human melanoma cells by modulating cell-matrix interactions. Migration is hindered when the interaction is too strong (acidic pHe) or too weak (alkaline pHe or NHE inhibition).

Stock, V., et al. (2019). "Uptake and effects of orally ingested polystyrene microplastic particles in vitro and in vivo." Archives of Toxicology **93**(7): 1817-1833.

Evidence exists that humans are exposed to plastic microparticles via diet. Data on intestinal particle uptake and health-related effects resulting from microplastic exposure are scarce. Aim of the study was to analyze the uptake and effects of microplastic particles in human in vitro systems and in rodents in vivo. The gastrointestinal uptake of microplastics was studied in vitro using the human intestinal epithelial cell line Caco-2 and thereof-derived co-cultures mimicking intestinal M-cells and goblet cells. Different sizes of spherical fluorescent polystyrene (PS) particles (1, 4 and 10 micro m) were used to study particle uptake and transport. A 28-days in vivo feeding study was conducted to analyze transport at the intestinal epithelium and oxidative stress response as a potential consequence of microplastic exposure. Male reporter gene mice were treated three times per week by oral gavage with a mixture of 1 micro m (4.55 x 10⁷ particles), 4 micro m (4.55 x 10⁷ particles) and 10 micro m (1.49 x 10⁶ particles) microplastics at a volume of 10 mL/kg/bw. Effects of particles on macrophage polarization were investigated using the human cell line THP-1 to detect a possible impact on intestinal immune cells. Altogether, the results of the study demonstrate the cellular uptake of a minor fraction of particles. In vivo data show the absence of histologically detectable lesions and inflammatory responses. The particles did not interfere with the differentiation and activation of the human macrophage model. The present results suggest that oral exposure to PS microplastic particles under the chosen experimental conditions does not pose relevant acute health risks to mammals.

Stock, V., et al. (2020). "Impact of artificial digestion on the sizes and shapes of microplastic particles." Food & Chemical Toxicology **135**: 111010.

Current analyses show a widespread occurrence of microplastic particles in food products and raise the question of potential risks to human health. Plastic particles are widely considered to be inert due to their low chemical reactivity and therefore supposed to pose, if at all only minor hazards. However, variable physicochemical conditions during the passage of the gastrointestinal tract gain strong importance, as they may affect particle characteristics. This study aims to analyze the impact of the gastrointestinal passage on the physicochemical particle characteristics of the five most produced and thus environmentally relevant plastic materials polyethylene, polypropylene, polyvinyl chloride, polyethylene terephthalate and polystyrene. Scanning electron microscopy (SEM) and subsequent image analysis were employed to characterize microplastic particles. Our results demonstrate a high resistance of all plastic particles to the artificial digestive juices. The present results underline that the main stages of the human gastrointestinal tract do not decompose the particles. This allows a direct correlation between the physicochemical particle characteristics before and after digestion. Special attention must be paid to the adsorption of organic compounds like proteins, mucins and lipids on plastic particles since it could lead to misinterpretations of particle sizes and shapes.

Stojkovska, J., et al. (2010). "Evaluation of alginate hydrogels under in vivo-like bioreactor conditions for cartilage tissue engineering." Journal of Materials Science: Materials in Medicine **21**(10): 2869-2879.

Alginate hydrogels in forms of discs and packed beds of microbeads (~800 mum) were tested in a novel bioreactor at 10% strain using two regimes: at a loading rate of 337.5 mum/s and at sequential increments of 50 mum displacement every 30 min. Compressive strength increased with the increase in alginate concentration (1.5 vs. 2% w/w) and the content of guluronic residues (38.5 vs. 67%). Packed beds of microbeads exhibited significantly higher (~1.5-3.4 fold) compression moduli than the respective discs indicating the effects of gel form and entrapped water. Short-term cultivation of microbeads with immobilized bovine calf chondrocytes (1.5% w/w, 33 x 10⁶ cells/ml) under biomimetic conditions (dynamic compression: 1 h on/1 h off, 0.42 Hz, 10% strain) resulted in cell proliferation and bed compaction, so that the compression modulus slightly increased. Thus, the novel bioreactor demonstrated advantages in evaluation of biomaterial properties and cell-biomaterial interactions under in vivo-like settings. © 2010 Springer Science+Business Media, LLC.

Stojkovska, J., et al. (2014). "A comprehensive approach to in vitro functional evaluation of Ag/alginate nanocomposite hydrogels." Carbohydrate Polymers **111**: 305-314.

In this work, we present a comprehensive approach to evaluation of alginate microbeads with included silver nanoparticles (AgNPs) at the concentration range of 0.3-5mM for potential biomedical use by combining cytotoxicity, antibacterial activity, and silver release studies. The microbeads were investigated regarding drying and rehydration showing retention of ∼ 80-85% of the initial nanoparticles as determined by UV-vis and SEM analyses. Both wet and dry microbeads were shown to release AgNPs and/or ions inducing similar growth delays of Staphylococcus aureus and Escherichia coli at the total released silver concentrations of ∼ 10 μg/ml. On the other hand, these concentrations were highly toxic for bovine chondrocytes in conventional monolayer cultures while nontoxic when cultured in alginate microbeads under biomimetic conditions in 3D perfusion bioreactors. The applied approach outlined directions for further optimization studies demonstrating Ag/alginate microbeads as potentially attractive components of soft tissue implants as well as antimicrobial wound dressings.

Stojkovska, J., et al. (2019). "Novel nano-composite hydrogels with honey effective against multi-resistant clinical strains of Acinetobacter baumannii and Pseudomonas aeruginosa." Applied Microbiology & Biotechnology **103**(20): 8529-8543.

Novel alginate hydrogels with silver nanoparticles (AgNPs) and honey components were produced with the aim to target multidrug-resistant bacterial strains causing nosocomial wound infections. AgNP synthesis was optimized in highly concentrated honey solutions so that a 5-month stable, colloid solution with 50% of honey and ~ 8 nm AgNPs at neutral pH was obtained. The colloid solution was further used to produce nano-composite Ag/alginate hydrogels in different forms (microbeads, microfibers and discs) that retained all AgNPs and high fractions of honey components (40-60%) as determined by the phenol-sulfuric acid and Folin-Ciocalteu methods. The hydrogels were characterized by UV-Vis spectroscopy and

Fourier-transform infrared-attenuated total reflectance spectroscopy while the antibacterial activity was investigated against a broad spectrum of Gram-negative and Gram-positive bacteria, including 13 multi-resistant clinical strains of Acinetobacter baumannii, one clinical strain of Pseudomonas aeruginosa and one clinical strain of Staphylococcus aureus. At the total released silver concentration of ~ 9 mug/ml, the hydrogels exhibited strong bactericidal activity against standard and most of the investigated multi-resistant hospital strains with the exemption of 3 clinical strains of A. baumannii in which antibacterial effects were absent. These results reveal the need for further in-depth studies of bacterial resistance mechanisms and, in the same time, potentials of the novel Ag/alginate hydrogels with honey components to combat wound infections and enhance healing as non-sticky, antibacterial, and bioactive dressings.

Stokke, B. T. (2017). "Biomarker characterization and development of functional soft materials." Nano Biomedicine and Engineering **9**(4): 275.

Detection and quantification of biomarkers are essential in providing key information of potential hazardous entities or disease states. Analogously, there is increasing interest in miniaturization of technologies suitable for biological assays, environmental monitoring, model systems and other domains, due to need for more efficient analysis processes, sensitivity, possibilities to deploy in point of care settings and reduction of consumables. In the presentation we illustrate application of direct force unbinding for determination of interaction potential of a therapeutic molecule related to treatment of mucus hyperviscosity in patients suffering from Cystic fibrosis. The data show a dosedependent perturbation of the interaction profiles in the presence of oligoguluronates that are under development as an adjuvant. In the second main activity summarized in the presentation, we are using molecular design of hydrogels to transform generic responsive hydrogels to bioresponsive ones. Integrated at the end of an optical fiber interferometer supporting determination of changes in the optical lengths within the hydrogels at 2 nanometer resolution, these functional soft materials are attractive in biosensing. Examples of various implemented recognition schemes will be given. In addition, there is transformation from empirical correlations between molecular parameters of the various constituents and the net swelling response to scrutinize the fundamental, cascading processes and their interrelation. Lastly, an example of microfluidic assisted homogeneous gel bead synthesis will be presented. The microfluidic assisted structuring of soft materials yielded homogeneously sized populations of Ca-alginate gel beads in a biocompatible process supporting immobilization of living entities. The process is based on decoupling of the droplet generation of pregel solution in the microfluidic device and the Ca-induced crosslinking process. A novel strategy for controlling the kinetics of the gelation kinetics of internal Ca-source for the alginate gelation was developed. The micro devices thus support encapsulation of cells in alginate microbeads and fibers in a clog-free and cell friendly microfluidic operation. Copyright © Bjorn Torger Stokke.

Stoler, J. (2012). "Improved but unsustainable: accounting for sachet water in post-2015 goals for global safe water." Tropical Medicine & International Health **17**(12): 1506-1508.

The advent and rapid spread of sachet drinking water in West Africa presents a new challenge for providing sustainable access to global safe water. Sachet water has expanded drinking water access and is often of sufficient quality to serve as an improved water source for Millennium Development Goals (MDG) monitoring purposes, yet sachets are an unsustainable water delivery vehicle due to their overwhelming plastic waste burden. Monitoring of primary drinking water sources in West Africa generally ignores sachet water, despite its growing ubiquity. Sub-Saharan Africa as a region is unlikely to meet the MDG Target for drinking water provision, and post-2015 monitoring activities may depend upon rapid adaptability to local drinking water trends.

Stolte, A., et al. (2015). "Microplastic concentrations in beach sediments along the German Baltic coast." Marine Pollution Bulletin **99**(1-2): 216-229.
The contamination with microplastic particles and fibres was evaluated on beaches along the German Baltic coast. Sediments were sampled near the Warnow and Oder/Peene estuaries, on Rugen island and along the Rostock coast to derive possible entry pathways. Seasonal variations were monitored along the Rostock coast from March to July 2014. After density separation in saline solution, floating particles were found to be dominated by sand grains. Water surface tension is shown to be sufficient to explain floatation of grains with sizes less than 1.5mm. Selecting intensely coloured particles and fibres, we find lower limits of the microplastic concentrations of 0-7 particles/kg and 2-11 fibres/kg dry sediment. The largest microplastic contaminations are measured at the Peene outlet into the Baltic Sea and in the North Sea Jade Bay. City discharges, industrial production sites, fishing activity and tourism are the most likely sources for the highest microplastic concentrations.

Stoner, M. A., et al. (2014). "A robotic BG1Luc reporter assay to detect estrogen receptor agonists." Toxicology in Vitro **28**(5): 916-925.
Endocrine disrupting chemicals with estrogenic activity (EA) have been associated with various adverse health effects. US agencies (ICCVAM/NICEATM) tasked to assess in vitro transcription activation assays to detect estrogenic receptor (ER) agonists for EA have recently validated a BG1Luc assay in manual format, but prefer robotic formats. We have developed a robotic BG1Luc EA assay to detect EA that demonstrated 100% concordance with ICCVAM meta-analyses and ICCVAM BG1Luc results in manual format for 27 ICCVAM test substances, i.e. no false negatives or false positives. This robotic assay also consistently assessed other, more problematic ICCVAM test substances such as clomiphene citrate, L-thyroxin, and tamoxifen. Agonist responses using this robotic BG1Luc assay were consistently inhibited by the ER antagonist ICI 182,780, confirming that agonist responses were due to binding to ERs rather than to a non-specific agonist response. This robotic assay also detected EA in complex mixtures of substances such as extracts of personal care products, plastic resins or plastic consumer products. This robotic BG1Luc assay had at least as high accuracy and greater sensitivity and repeatability when compared to its manual version or to the other ICCVAM/OECD validated assays for EA (manual BG1Luc and CERI). © 2014 Elsevier Ltd.

Storz, I., et al. (2016). "Therapeutic potential of GPR64 specific CAR T cells in pediatric sarcomas." Cancer Immunology Research. Conference: AACR Special Conference on Tumor Immunology and Immunotherapy **5**(3 Supplement 1).
Ewing Sarcoma (ES) is the second most common bone malignancy in children and young adolescents with a high potential of dissemination into lung and bones. Patients with localized disease receiving current treatment, have an approximate long-term survival of >65%. Patients with disseminated disease into the bone have an approximate longterm survival rate of only 10%, compelling the search for new therapeutic treatment modalities like engineered T cell therapy. Here the therapeutic potential of chimeric antigen receptor (CAR) transgenic T cells directed against G-protein coupled receptor 64 (GPR64), an orphan receptor with normal expression restricted to human epididymis and significant overexpression in ES, was examined. Therefore, two different monoclonal antibodies (mAb) directed against the extracellular region of GPR64 were generated and characterized. Subsequently, retroviral constructs containing

second generation CARs together with the scFv fragments of the respective mAbs were designed. Primary lymphocytes were transduced and tested in vitro via flow cytometry, ELISpot and xCelligence assay. Antibodies specifically stained ES cells as determined by flow cytometry. The signal intensity was reduced after RNAi mediated down-regulation of GPR64 in ES cell lines confirming specificity of mAbs. Following sequence determination of those mAbs two different CAR constructs were designed. Retroviruses containing such CARs transduced primary lymphocytes with good efficiency. The CAR transgenic T cells could be enriched for CD8+CAR+ cells via microbead isolation and showed strong proliferative capacities in vitro. Furthermore, target structures were specifically recognized as determined by ELISpot and xCelligence assays. CAR transgenic T cells targeting GPR64 show a promising approach to transfer the success of CARs in hematological malignancies to solid tumors. The cells generated in this study show strong specificity towards GPR64 and are able to control tumor cell growth in vitro. Since GPR64 expression is not restricted to ES but also up-regulated in a number of carcinomas derived from prostate, kidney or lung, GPR64-specific CARs may also be a future treatment option for other tumor entities.

Storz, M. A. (2018). "A Practical Guide for Physicians and Health Care Workers to Reduce Their Carbon Footprint in Daily Clinical Work." Permanente Journal **22**(03): 12.

With Earth Overshoot Day having recently passed, there is no space for complacency regarding taking care of our planet. On August 2, 2017, humanity used nature's resource budget for the entire year. For decades, we have lived far beyond our means by overexploiting natural resources and spewing pollution, such as microplastics and industrial chemicals, into our environment. On the other hand, public awareness of human-induced climate change has also increased since the 1980s. The frequent media coverage about extreme weather conditions and natural disasters, such as Hurricane Irma in 2017, serves as an important reminder that anthropogenic climate change is happening now.Adverse health conditions associated with climate change include an increased prevalence of diseases and disorders. Although we all contribute to this development, as physicians we also have the privileged duty to protect global human health. Therefore, we should make every effort to cut down our own carbon footprint and adapt a more sustainable lifestyle.The aim of this commentary is to provide feasible tips and strategies to effectively reduce one's individual carbon footprint, with a special focus on daily clinical and hospital work. Not only are these strategies easy to implement in daily clinical routine, but most of them are associated with important health benefits.

Stoven, K., et al. (2015). "Microplastic: a selfmade environmental problem in the plastic age." Journal fur Kulturpflanzen **67**(7): 241-250.

Microplastic is weathered mainly mineral oil based synthetic polymer (<5 mm) called as plastic. The environmentalpollution with plastic starts with particles in micro m-size. The multitude of plastic products is toxic andinert, unable to microbial degradation they remaindecades and centuries in the environment. Plastic productsare solely defragmented by wind and sunlight. Microplasticsocialized usually with persistent organic pollutions (POPs) as Phenanthren and DDT are ingested by organisms mistakable as food in fresh and marine water.By this way pollution enters the foodweb. Effects ofmicroplastic are investigated superiorly in marine biosphere than for limbic and terrestrial habitats. Up to now standardized research methods to characterize miroplasticwaste are lacking. Also in legislature the keyword "microplastic" is not considered. Plastic products areresident in agri- and horticulture for a long time as agrofoil and styromull. The distribution and disposition of microplastic in soil is unexplored so far.

Strady, E., et al. (2020). "Temporal dynamic of anthropogenic fibers in a tropical river-estuarine system." Environmental Pollution **259 (no pagination)**(113897).

Anthropogenic fibers, gathering synthetic fibers, artificial fibers and natural fibers are ubiquitous in the natural environment. Tremendous concentrations of anthropogenic fibers were previously measured in the tropical Saigon River (Vietnam), i.e. a river impacted by textile and apparel industries. In the present study, we want to examine the role of contrasted seasonal variation (e.g., dry and rainy seasons), via the rainfall and monthly water discharges, and of water's physico-chemical conditions on the concentrations of anthropogenic fibers in the surface water. The one year and half monthly survey evidenced that concentrations of anthropogenic fibers varied from 22 to 251 items L⁻¹ and their variations were not related to rainfall, water discharge or abiotic factors. However, their color and length distribution varied monthly suggesting variations in sources and sinks. Based on the 2017 survey, we estimated an annual emission of anthropogenic fibers from the river to the downstream coastal zone of 115-164 x 10¹² items yr⁻¹. Anthropogenic fibers in the Saigon River varied from 22 to 251 items L⁻¹ over eighteen months and their variations were not related to rainfall, water discharge or abiotic factors. Copyright © 2020 Elsevier Ltd

Strasdat, B. and H. Bunjes (2015). "Development of a new approach to investigating the drug transfer from colloidal carrier systems applying lipid nanosuspension-containing alginate microbeads as acceptor." International Journal of Pharmaceutics **489**(1-2): 203-209.

Abstract As a new approach to analyzing the release behavior of lipophilic drugs from colloidal carriers, solid trimyristin nanoparticles were incorporated into differently sized (34-1363 mum) calcium alginate hydrogel microbeads to serve as acceptor in release studies. The microbeads were prepared by electrostatic droplet generation or by a spraying method. Trimyristin nanoemulsion samples loaded with the fluorescent drug model Nile red were mixed with the nanoparticle-containing microbeads to perform transfer studies. As a result of a rather large diffusion barrier a slow transfer (24-57 min) was observed using large acceptor beads (~330-1360 mum). In contrast, Nile red transferred quickly (~1.4 min) into smaller microbeads (<50 mum). This new experimental approach applying nanoparticle-containing hydrogel particles with a size below 50 mum as acceptor systems is a promising technique to investigate the release of lipophilic substances from lipid nanoparticles under close to realistic conditions. However, there is still room for technical improvement, e.g., with regard to the water loss from microbeads that was observed during sampling by centrifugation and filtration (required to separate the small sized alginate particles) which is expected to have had some effect on the dye content determined during these experiments. Copyright © 2015 Elsevier B.V.

Straub, S., et al. (2017). "Biodegradable and petroleum-based microplastics do not differ in their ingestion and excretion but in their biological effects in a freshwater invertebrate Gammarus fossarum." International Journal of Environmental Research and Public Health **14**(7).

Research on the uptake and effects of bioplastics by aquatic organisms is still in its infancy. Here, we aim to advance the field by comparing uptake and effects of microplastic particles (MPP) of a biodegradable bioMPP (polyhydroxybutyrate (PHB)) and petroleum-based MPP (polymethylmethacrylate (PMMA)) in the freshwater amphipod Gammarus fossarum. Ingestion of both MPP in different particle sizes (32-250 micro m) occurred after 24 h, with highest ingestion of particles in the range 32-63 micro m and almost complete egestion after 64 h. A four-week effect-experiment showed a significant decrease of the assimilation efficiency in amphipods exposed to the petroleum-based MPP from week two onwards. The petroleum-based PMMA affected assimilation efficiency significantly in contrast to the biodegradable PHB, but overall differences in direct comparison of MPP types were small. Both MPP types led to a significantly lower wet weight gain relative to the control treatments. After four weeks, differences between both MPP types and silica, used as a natural particle control, were detected. In summary, these results suggest that both MPP types provoke digestive constraints on the amphipods, which go beyond those of natural non-palatable particles. This highlights the need for more detailed research comparing environmental effects of biodegradable and petroleum-based MPP and testing those against naturally occurring particle loads.

Strifling, D. A. (2016). "THE MICROBEAD-FREE WATERS ACT OF 2015: MODEL FOR FUTURE ENVIRONMENTAL LEGISLATION, OR BLACK SWAN?" Journal of Land Use & Environmental Law **32**(1): 151-166.

Environmental law scholars have long lamented that it has become unthinkable--or at least exceedingly unlikely--for Congress to pass significant new environmental legislation. This is not uniformly the case, as shown by the recent enactment of Public Law 114-114, the Microbead-Free Waters Act of 2015 ("the Act"). Yet, more nuanced questions must be answered before the Act can be hailed as an important break in the legislative logjam. Was the Act insignificant, simply not worth the time and political currency necessary for opponents of environmental regulation to stop? Was it the fortuitous product of a unique confluence of circumstances, a "black swan"? Or could the circumstances surrounding its passage be instructive for future proponents of environmental legislation? This article asserts that the Act addressed a significant environmental issue, and that the strategic building blocks underlying the Act -- including an emphasis on public health issues and broad stakeholder support driven by industry concerns about unfair competition and opposition to local legislation--may provide innovative and useful foundations for future efforts to pass environmental legislation. [ABSTRACT FROM AUTHOR]

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Strong, B. (2018). "Plastic pollution and dentistry." Dental Nursing **14**(9): 428-429.

Dental nurse Bethan Strong considers the case for raising awareness

Strungaru, S. A., et al. (2019). "Micro- (nano) plastics in freshwater ecosystems: Abundance, toxicological impact and quantification methodology." TrAC - Trends in Analytical Chemistry **110**: 116-128.

Plastics entering the environment will persist and continue to degrade and fragment to smaller particles under the action of various environmental factors. These microplastics (MP) and nanoplastics (NP) are likely to pose a higher environmental impact, as well as they are more prone to adsorb organic contaminants and pathogens from the surrounding media, due to their higher surface area to volume ratio. Little known on their characteristics, fragmentation, distribution and impact on freshwater ecosystems. In order to respond to these open questions concerning the plastic particles dynamics and their environmental effects, detailed sampling strategies as well as an automated, rapid, cheap and reliable analytical technique suitable for routine analysis need to be developed. The review outlines the recent advances made on examination of the potential toxicological effects of MP and NP on freshwater biota, as well as the available analytical methods employed to identify and quantify them in environmental samples. Copyright © 2018 Elsevier B.V.

Su, F. Y., et al. (2007). "Simple and sensitive bacterial quantification by a flow-based kinetic exclusion fluorescence immunoassay." Biosensors & Bioelectronics **22**(11): 2500-2507.

A flow-based immunoassay system utilizing secondary-antibody coated microbeads and Cy5-secondary antibody for signal production was successfully developed to quantitate target bacteria with a kinetic exclusion assay (KinExA 3000 Instrument). It directly measured the concentration of unliganded antibody separated from the equilibrated mixture of antibody and bacteria through a 0.2 microm polyethersulfone membrane, enabling it to quantify the concentration of bacteria. The novel method demonstrated the qualities of rapidness, sensitivity, high accuracy and reproducibility, and ease to perform. Detection of Pseudomonas aeruginosa and Staphylococcus aureus was accomplished with low detection limits of 4.10 x 10(6) and 5.20 x l0(4)cells/mL, respectively, with an assay time of less than 15 min. The working ranges for quantification were 4.10 x l0(6) to 1.64 x l0(10)cells/mL for P. aeruginosa, and 5.20 x l0(4) to 1.04 x l0(9)cells/mL for S. aureus. It yielded an assay with at least 10-fold greater sensitivity than ELISA and could correctly assess the concentration of predominant bacterium spiked in the mixture of P. aeruginosa and S. aureus. With this reliable platform, the average amount of antibody bound by one cell in the maximum capability could be further provided: (1.6-2.5) x l0(5) antibodies for one P. aeruginosa cell and (2.2-2.7) x l0(8) antibodies for one S. aureus cell. The KinExA system is flexible to determine different kinds of bacteria conveniently by using anti-mouse IgG as the same immobilizing agent. However, a higher specificity of the antibodies to the target bacteria will be required for the use of this system with higher detection sensitivity.

Su, L., et al. (2018). "Using the Asian clam as an indicator of microplastic pollution in freshwater ecosystems." Environmental Pollution **234**: 347-355.

Bioindicators play an important role in understanding pollution levels, bioavailability and the ecological risks of contaminants. Several bioindicators have been suggested for understanding microplastic in the marine environment. A bioindicator for microplastics in the freshwater environment does not exist. In our previous studies, we found a high frequency of microplastic pollution in the Asian clam (Corbicula fluminea) in Taihu Lake, China. In the present study, we conducted a large-scale survey of microplastic pollution in Asian clams, water and sediment from 21 sites in the Middle-Lower Yangtze River Basin from August to October of 2016. The Asian clam was available in all sites, which included diverse freshwater systems such as lakes, rivers and estuaries. Microplastics were found at concentrations ranging from 0.3-4.9 items/g (or 0.4-5.0 items/individual) in clams, 0.5-3.1 items/L in water and 15-160 items/kg in sediment. Microfibers were the most dominant types of microplastics found, accounting for 60-100% in clams across all sampling sites. The size of microplastics ranged from 0.021-4.83 mm, and microplastics in the range of 0.25-1 mm were dominant. The abundance, size distribution and color patterns of microplastics in clams more closely resembled those in sediment than in water. Because microplastic pollution in the Asian clam reflected the variability of microplastic pollution in the freshwater environments, we demonstrated the Asian clam as an bioindicator of microplastic pollution in freshwater systems, particularly for sediments.

Su, L., et al. (2019). "The occurrence of microplastic in specific organs in commercially caught fishes from coast and estuary area of east China." Journal of Hazardous Materials **365**: 716-724.

It is important to understand where microplastics go in the body of organisms. They can readily affect target organs and transport microplastic-associated chemicals to humans via consumption. The plastics (>20 mum) in guts and gills of 13 species of fishes from coast estuary areas of China were examined for the presence of microplastics. Muscle and liver were analyzed from a commercial species, the Asian seabass (Lateolabrax maculatus), of which 73% of the suspected items were verified by micro-Fourier Transform Infrared Spectroscopy. We targeted the organ specific distribution of microplastics. Microplastics were detected in gut and gills in 22%-100% and 22%-89% of total individuals, respectively. Microplastics in gut varied from 0.3 to 5.3 items/ind. and varied from 0.3 to 2.6 items/ind in gill, respectively. The size of microplastics in gills were smaller than those found in the guts. No microplastics were detected in the liver or muscle tissue of L. maculatus, and several non-plastic items detected in muscles can be attributed to background contamination. Further research is required using a larger number of specimens and better quality control and quality assurance are required to assess the presence of small microplastics or nanoplastics in fishes internal organs and muscle.

Su, L., et al. (2019). "Microplastics biomonitoring in Australian urban wetlands using a common noxious fish (Gambusia holbrooki)." Chemosphere **228**: 65-74.

Biomonitoring microplastics in freshwater ecosystems has been insufficient in comparison with its practice in marine environments. It is an important first step to understand microplastic uptake in organisms when assessing risk in natural freshwater habitats. We conducted microplastic biomonitoring within the Greater Melbourne Area; where the microplastic baseline pollution in freshwater organisms was largely unknown. A common noxious fish species, Gambusia holbrooki, was targeted. Individuals (n=180) from nine wetlands were analyzed. Uptake pathway, size, weight and gender were examined in relation to microplastic uptake in the body (presumed uptake via gut) and head (presumed uptake via gills). On average, 19.4% of fish had microplastics present in their bodies with an abundance of 0.6 items per individual (items/ind) and 7.2% of fish had microplastics in their heads with an abundance of 0.1 items/ind. Polyester was the dominant plastic type and fibers were the most common shape. The amount of microplastics in Gambusia holbrooki in current study is relatively low in a global comparison. The bodies of fish contained more microplastics on average than heads, and the size of microplastics detected in heads were smaller than those found in bodies. Microplastic uptake was directly proportional to size and weight. Furthermore, female individuals showed a tendency to ingest more microplastics than males. Laboratory experiments under controlled conditions are suggested to further explore such relationships. Our findings are important to understanding the potential ecological risks posed by microplastics to organisms in freshwater environments and provide suitable methodologies to conduct biomonitoring in future investigations.

Su, L., et al. (2016). "Microplastics in Taihu Lake, China." Environmental Pollution **216**: 711-719.

In comparison with marine environments, the occurrence of microplastics in freshwater environments is less understood. In the present study, we investigated microplastic pollution levels during 2015 in Taihu Lake, the third largest Chinese lake located in one of the most developed areas of China. The abundance of microplastics reached 0.01x10⁶-6.8x10⁶ items/km² in plankton net samples, 3.4-25.8 items/L in surface water, 11.0-234.6 items/kg dw in sediments and 0.2-12.5 items/g ww in Asian clams (Corbicula fluminea). The average abundance of microplastics was the highest in plankton net samples from the southeast area of the lake and in the sediments from the northwest area of the lake. The northwest area of the lake was the most heavily contaminated

area of the lake, as indicated by chlorophyll- alpha and total phosphorus. The microplastics were dominated by fiber, 100-1000 micro m in size and cellophane in composition. To our best knowledge, the microplastic levels measured in plankton net samples collected from Taihu Lake were the highest found in freshwater lakes worldwide. The ratio of the microplastics in clams to each sediment sample ranged from 38 to 3810 and was negatively correlated to the microplastic level in sediments. In brief, our results strongly suggest that high levels of microplastics occurred not only in water but also in organisms in Taihu Lake.

Su, Y., et al. (2013). "Adenovirus conducted connective tissue growth factor on extracellular matrix in trabecular meshwork and its role on aqueous humor outflow facility." Molecular Biology Reports **40**(11): 6091-6096.

Deposition of extracellular matrix (ECM) in trabecular meshwork, such as fibronectin, collagen IV, elastin. leads to increased resistance of trabecular meshwork in primary open angle glaucoma (POAG). Connective tissue growth factor (CTGF) is known to regulate the ECM deposits. In this study, we detect the effect of adenovirus conducted CTGF (Adv-CTGF) transfection on either the expression of ECM components or aqueous humor outflow facility. Adv-CTGF was used to transfect rat trabecular meshwork cells in vivo and in vitro. Aqueous humor outflow facility was test by microbeads perfusion. Protein expression of CTGF, fibronectin, and collagen IV was determined using Western blot. In the Adv-CTGF group, the outflow facility displayed a significant decrease from baseline. It appears as though the transfection with Adv-CTGF significantly affects the aqueous humor outflow pattern. A negative correlation between IOP and PEFL indicated that a decrease in the area of bead deposition corresponded to an overall decrease of outflow, leading to an elevated IOP. Adv-CTGF can enhance the expression of CTGF, fibronectin and collagen IV. CTGF is the novel target for treatment of POAG. It is necessary to further study to test inhibition of CTGF expression for treatment of POAG.

Su, Y., et al. (2019). "Microplastic exposure represses the growth of endosymbiotic dinoflagellate Cladocopium goreaui in culture through affecting its apoptosis and metabolism." Chemosphere **244**: 125485.

Microplastics are widespread emerging marine pollutants that have been found in the coral reef ecosystem. In the present study, using Cladocopium goreaui as a symbiont representative, we investigated cytological, physiological, and molecular responses of a Symbiodiniaceae species to weeklong microplastic exposure (Polystyrene, diameter 1.0 mum, 9.0 x 10⁹ particles L⁻¹). The density and size of algal cells decreased significantly at 7 d and 6-7 d of microplastic exposure, respectively. Chlorophyll a content increased significantly at 7 d of exposure, whereas Fv/Fm did not change significantly during the entire exposure period. We observed significant increases in superoxide dismutase activity and caspase3 activation level, significant decrease in glutathione S-transferase activity, but no change in catalase activity during the whole exposure period. Transcriptomic analysis revealed 191 significantly upregulated and 71 significantly downregulated genes at 7 d after microplastic exposure. Fifteen GO terms were overrepresented for these significantly upregulated genes, which were grouped into four categories including transmembrane ion transport, substrate-specific transmembrane transporter activity, calcium ion binding, and calcium-dependent cysteine-type endopeptidase activity. Thirteen of the significantly upregulated genes encode metal ion transporter and ammonium transporter, and five light-harvesting protein genes were among the significantly downregulated genes. These results demonstrate that microplastics can act as an exogenous stressor, suppress detoxification activity, nutrient uptake, and photosynthesis, elevate oxidative

stress, and raise the apoptosis level through upregulating ion transport and apoptotic enzymes to repress the growth of C. goreaui. These effects have implications in negative impacts of microplastics on coral-Symbiodiniaceae symbiosis that involves C. goreaui.

Su, Y., et al. (2019). "Occurrence of microplastics in landfill systems and their fate with landfill age." Water Research **164**: 114968.

Microplastics (MPs) are emerging pollutants that have been extensively detected in marine and terrestrial environments. Landfills are receptacles for cumulative loading of plastic waste derived from industry and households, but data on MPs occurrences in landfill systems are lacking. In the current study, the occurrence, characteristics and distribution patterns of MPs in landfills (including leachate and refuse) of the megacity Shanghai were investigated in accordance with different landfill ages (3-20 years). The results revealed that the average abundances of MPs in leachate and refuse were 8 (±3) items/L and 62 (±23) items/g, respectively. The predominant shapes and polymer types of the detected MPs were fibers and cellophane in leachate, whereas they were fragments and polyethylene in refuse. The patterns of abundance and size distribution of MPs in refuse varied from different landfill age, and different polymer MPs exhibited various occurrence patterns with increasing landfill age. Further spectra analysis suggested the presence of oxidative degradation of polyethylene MPs in the landfill process, especially for the landfill time of more than 20 years, so the fates of MPs in landfills were determined by the increase consumptions of plastics products and the degradation process of MPs in landfills. This study firstly provided a systematic overview of MPs pollution characteristics in landfill systems, and the results will foster the understanding of MPs fates over a long time scale in the environments.

Su, Y., et al. (2020). "Microplastic exposure represses the growth of endosymbiotic dinoflagellate Cladocopium goreaui in culture through affecting its apoptosis and metabolism." Chemosphere **244**.

Microplastics are widespread emerging marine pollutants that have been found in the coral reef ecosystem. In the present study, using Cladocopium goreaui as a symbiont representative, we investigated cytological, physiological, and molecular responses of a Symbiodiniaceae species to weeklong microplastic exposure (Polystyrene, diameter 1.0 μm, 9.0 × 109 particles L−1). The density and size of algal cells decreased significantly at 7 d and 6–7 d of microplastic exposure, respectively. Chlorophyll a content increased significantly at 7 d of exposure, whereas Fv/Fm did not change significantly during the entire exposure period. We observed significant increases in superoxide dismutase activity and caspase3 activation level, significant decrease in glutathione S-transferase activity, but no change in catalase activity during the whole exposure period. Transcriptomic analysis revealed 191 significantly upregulated and 71 significantly downregulated genes at 7 d after microplastic exposure. Fifteen GO terms were overrepresented for these significantly upregulated genes, which were grouped into four categories including transmembrane ion transport, substrate-specific transmembrane transporter activity, calcium ion binding, and calcium-dependent cysteine-type endopeptidase activity. Thirteen of the significantly upregulated genes encode metal ion transporter and ammonium transporter, and five light-harvesting protein genes were among the significantly downregulated genes. These results demonstrate that microplastics can act as an exogenous stressor, suppress detoxification activity, nutrient uptake, and photosynthesis, elevate oxidative stress, and raise the apoptosis level through upregulating ion transport and apoptotic enzymes to repress the growth of C. goreaui. These effects have implications in negative impacts of microplastics on coral-Symbiodiniaceae symbiosis that involves C. goreaui.

Subash, R., et al. (2018). "Transport and fate of microplastics in wastewater treatment plants: implications to environmental health." Reviews in Environmental Science and Bio/Technology **17**(4): 637-653.

Global studies of microplastic (MP) pollution confirm wastewater treatment plants serve as pathways for microplastics entering terrestrial and aquatic ecosystems. The behaviour, transport and fate of microplastics in wastewater effluents remain mostly unknown, rendering wastewater-derived microplastics as a contaminant of significant concern. We critically examine the literature to understand the sources and fate of microplastics in wastewater treatment plants (WWTPs) and the implications of treated effluents admitted to soil and aquatic systems. The transport of chemical and biological contaminants is also discussed in detail, using fundamental principles of vector relationships. For the removal and reduction of microplastics, profound knowledge is required from source to solution. This review presents a comprehensive overview of the significance of microplastics as a vector of water-borne contaminants in WWTPs.

Subba-Rao, R. V. and M. Alexander (1982). "Effect of Sorption on Mineralization of Low Concentrations of Aromatic Compounds in Lake Water Samples." Applied and Environmental Microbiology Vol 44, No 3, p 659-668, September, 1982. 5 Fig, 4 Tab, 22 Ref.

The influence of montmorillonite, kaolinite, and glass microbeads on the mineralization of low concentrations of organic compounds in samples from a eutrophic lake was examined. Montmorillonite/benzylamine complexes were formed immediately on addition of amine to suspensions containing the clay. The extent of amine sorbed was a linear function of equilibrium amine concentration in lake water. A larger percentage of the chemical was released from the complex during mineralization in the presence of high clay concentrations than in the presence of low clay concentrations. Montmorillonite did not enhance mineralization rates at amine levels of 200 ng/ml or lower, but it was stimulatory at 20 micrograms/ml. Except at high amine and clay concentrations, mineralization was more rapid than desorption during the early periods of decomposition when the amine concentration in solution was relatively high. Relative to the microbial demand, desorption was more rapid during later periods of decompositon when the amine level in solution was very low. Mineralization of benzoate was not usually affected by montmorillonite, kaolinite, or glass beads. More than 90% of the carbon from benzylamine and benzoate was often mineralized when the substrate concentration was 250 ng/ml or less. The data suggest that clay may have a significant effect on the microbial decomposition of low concentrations of certain organic compounds. (Baker-FRC)

Sugana Rani, K. and P. V. V. Prasada Rao (2012). "Evaluation of biodegradation of plastics and polythene bags from various soils." Journal of Pure and Applied Microbiology **6**(1): 281-287.

Plastic pollution has emerged as one of the most challenging problems of the mankind, and can be satisfactorily addressed through Biodegradation. The present study is an attempt to explore the bio degradation of plastic cups and polythene bags (carry bags) using mangrove soils, petroleum soil, and molasses soil. Plastic cups and polythene bags were incubated for a period of 2,4,6,9, months in various soils using microbes like Pseudomonas species, Staphylococcus, Aspergillus niger and Aspergillus glaucus. Degradation of plastics was determined by the weight loss of the sample and bacterial activity in soil. The microbial counts were recorded as 45.68xlu³/g for total bacteria and 33.33x10²/g for fungi in mangrove soil, 26.70x10³/g for total bacteria and 20.22x10²/g for fungi in petroleum soil, and 23.49x10³/g for total bacteria and 22.33x10²/g for fungi in molasses soil, The present work reveals that the above soils have the potential to degrade plastic cups and polythene bags among which Mangrove soil has the high degradability rate.

Sugawara, K., et al. (2009). "Electrochemical monitoring of binding between wheat germ agglutinin and cellohexose-modified magnetic microbeads." Analytical & Bioanalytical Chemistry **395**(3): 767-772.

An electrochemical method that uses glucose labeled with an electroactive compound was developed to evaluate the binding of wheat germ agglutinin (WGA) to cellohexose-modified magnetic microbeads. Cellohexose was attached to amino groups on the magnetic bead surface via formation of a Schiff's base. The labeled glucose acts as an electrochemical probe to monitor binding events between WGA and the cellohexose-modified beads. For a known quantity of cellohexose-modified beads, binding of WGA with cellohexose-modified beads was evaluated based on changes in electrochemical response of the labeled glucose. In particular, the peak current decreased as the concentration of WGA increased. Furthermore, the binding affinities of WGA for beads modified with four different cello-oligosaccharides were systematically compared using a voltammetric method.

Sugaya, S., et al. (2013). "Microfluidic production of single micrometer-sized hydrogel beads utilizing droplet dissolution in a polar solvent." Biomicrofluidics **7**(5): 54120.

In this study, a microfluidic process is proposed for preparing monodisperse micrometer-sized hydrogel beads. This process utilizes non-equilibrium aqueous droplets formed in a polar organic solvent. The water-in-oil droplets of the hydrogel precursor rapidly shrunk owing to the dissolution of water molecules into the continuous phase. The shrunken and condensed droplets were then gelled, resulting in the formation of hydrogel microbeads with sizes significantly smaller than the initial droplet size. This study employed methyl acetate as the polar organic solvent, which can dissolve water at 8%. Two types of monodisperse hydrogel beads-Ca-alginate and chitosan-with sizes of 6-10 mum (coefficient of variation < 6%) were successfully produced. In addition, we obtained hydrogel beads with non-spherical morphologies by controlling the degree of droplet shrinkage at the time of gelation and by adjusting the concentration of the gelation agent. Furthermore, the encapsulation and concentration of DNA molecules within the hydrogel beads were demonstrated. The process presented in this study has great potential to produce small and highly concentrated hydrogel beads that are difficult to obtain by using conventional microfluidic processes.

Sugimoto, Y., et al. (2012). "A novel FOXP1-PDGFRA fusion gene in a case of chronic eosinophilic leukemia." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Introduction: Myeloid and lymphoid neoplasms with eosinophilia and abnormalities of PDGFRA, PDGFRB, or FGFR1 is a new major category in the 2008 WHO classification of myeloid malignancies. FIP1L1-PDGFRA fusion gene is currently the most common abnormality in this category, but there are some other fusion genes incorporating part of PDGFRA. In a case of myeloproliferative neoplasms (MPN) with eosinophilia and hepatosplenomegaly, karyotype by G-banding and fluorescence in situ hybridization (FISH) for 4q12 rearrangements indicated a PDGFRA rearrangement other than FIP1L1-PDGFRA, and a novel FOXP1-PDGFRA fusion gene was identified. Case presentation: A 44-year-old male visited a clinic because of wet cough for one year. His peripheral blood showed leukocytosis of 43.15 x 109 /L with eosinophilia up to 57.5%, mild erythrocytosis (Hb 17.3 g/dL), and thrombocytopenia of 86 x 109 /L. CT scan of the abdomen revealed hepatosplenomegaly. He was referred to our hospital and received oral PSL (1 mg/kg) first, because pulmonary eosinophilic infiltration was suspected by follow-up CT

findings. Pulmonary infiltration and his cough disappeared rapidly in a week, but his leukocytosis with eosinophilia was exacerbated again with PSL tapering. His bone marrow at the time of admission disclosed hypercellular marrow with myeloid hyperplasia and eosinophilia, of which karyotype was 46, XY, t(3:4)(p13;q12), inv(9)(p12q13) in all of 20 metaphases. FISH analysis with tricolor 4q12 rearrangement probe set indicated that PDGFRA was disrupted in 97.3% of his peripheral blood cells. These cytogenetic abnormalities of his bone marrow cells suggested involvement of PDGFRA fusion gene except for FIP1L1-PDGFRA and did not disappear after steroid administration for 2 weeks. After low-dose of imatinib (100 mg/day) was started, he achieved a hematological response within 5 days, and PSL could be gradually tapered off. 3 months after therapy, he obtained complete cytogenetic response (CCyR). He has been in CCyR and free of symptoms for more than 6 months with only low-dose imatinib. Methods and Results: Genomic DNA and total RNA were isolated from white blood cells in his peripheral blood at diagnosis. Complementary DNA was synthesized from total RNA. FIP1L1-PDGFRA fusion transcript was proved to be negative by RT-PCR. Molecular cloning with 5'-RACE-PCR revealed a novel mRNA in-frame fusion between exon 23 of FOXP1 and a truncated PDGFRA exon12. Reciprocal PDGFRA-FOXP1 transcripts were confirmed by RT-PCR analysis and FOXP1-PDGFRA genomic DNA sequence was determined with genomic PCR. As in the case with FIP1L1-PDGFRA, the breakpoint of PDGFRA in FOXP1-PDGFRA was located between the two tryptophan (W) residues of the putative WW-domain. Meanwhile, the other breakpoint was near inverted repeat in intron 23 of FOXP1, which is presumed to be very fragile site. By FISH analysis after magnetic cell sorting with MicroBeads, the 4q12 abnormality attributed to FOXP1-PDGFRA fusion gene was detected in granulocytes, but not in CD19-positive B or CD3-positive T cells. Discussion(s): In a case with chronic eosinophilia harboring 46, XY, t(3:4)(p13;q12), inv(9)(p12q13), novel FOXP1-PDGFRA fusion gene was identified. Similar karyotypic abnormality harboring t(3:4)(p13;q12) was reported in a case of MPN with chronic eosinophilia, but responsible fusion gene was not identified (Myint H, et al. Br J Haematol. 1995). FOXP1 is a transcription factor which is implicated in a variety of cellular processes and has a role in immune regulation and carcinogenesis (Wlodarska I, et al. Leukemia. 2005). As a fusion partner of FOXP1, PAX5 and ABL1 are reported in cases with acute lymphoblastic leukemia. Thus, this is a first report showing that FOXP1-PDGFRA fusion gene is involved in hematologic malignancy. It is likely that FOXP1-PDGFRA is constitutively activated tyrosine kinase, which does not depend on dimerization but on the disruption of an autoinhibitory juxtamembrane domain encoded by exon 12 of PDGFRA from its structure. Eosinophilia responded well to low dose of imatinib as observed in CEL with FIP1L1-PDGFRA. Conclusion(s): FOXP1-PDGFRA was identified in CEL for the first time. This is the eighth reported fusion gene associated with PDGFRA in CEL so far. Our patient with FOXP1-PDGFRA promptly responded to low-dose of imatinib as same as other cases with PDGFRA abnormalities. Further investigation is still in progress.

Suh, S. P., et al. (2013). "Whole blood cytokine profiles for improved diagnosis of tuberculosis and discrimination between active and latent tuberculosis." Clinical Chemistry **1)**: A72.

Background: Interferon gamma release assay (IGRA) cannot discriminate between active and latent tuberculosis (TB). In addition, IGRA show relatively low sensitivity in patients with active TB. To determine if cytokine profiles could discriminate between active and latent TB, and improve the detection of TB. Method(s): Twenty-nine cytokines were measured by multiplex microbead-based immunoassay in supernatant of QuantiFERON-TB Gold-In Tube (QFT) assay tubes (Cellestis, Australia) obtained from subjects with QFT-negative healthy household contacts (n=13), QFT-positive healthy household contacts (latent TB infection: LTBI, n=15), culture confirmed QFT-negative pulmonary TB (n=12), and culture confirmed QFT-positive pulmonary

TB (n=36). Cytokine<inf>[Nil]</inf> and cytokine<inf>[Ag-Nil]</inf> represent the cytokine concentration in a nil tube and the cytokine concentration in a TB antigen tube minus the cytokine concentration in a nil tube, respectively. Result(s): Among 29 cytokines, levels of IFN-gamma<inf>[Ag-Nil]</inf>, IL-2<inf>[Ag-Nil]</inf>, IL-1Ra<inf>[Ag-Nil]</inf>, IP-10<inf>[Ag-Nil]</inf>, GM-CSF<inf>[Ag-Nil]</inf>, IL-3<inf>[Ag-Nil]</inf>, IL-13<inf>[Ag-Nil]</inf>, and MIP-1beta<inf>[Ag-Nil]</inf> in Mycobacterium tuberculosis (Mtb)-infected subjects were significantly different from uninfected subjects. Combination of these cytokines detected 8 of 12 IGRA-negative TB subjects. Moreover, levels of EGF<inf>[Ag-Nil]</inf>, GM-CSF<inf>[Ag-Nil]</inf>, IL-5<inf>[Ag-Nil]</inf>, IL-10<inf>[Ag-Nil]</inf>, MIP- 1beta<inf>[Ag-Nil]</inf>, VEGF<inf>[Ag-Nil]</inf>, TNF-alpha<inf>[Nil]</inf>, and VEGF<inf>[Nil]</inf> showed significant differences between active and latent TB. Sensitvity, specificity, positive predictive value, and negative predictive value of hierachial cluster analysis using infection cytokine profiles between Mtb-infected and uninfected subjects are 93.7%, 100%, 100%, and 76.5%, respectively. Sensitvity, specificity, positive predictive value, and negative predictive value of hierachial cluster analysis using activity cytokine profiles between active TB and LTBI are 81.2%, 65.2%, 100%, and 65.2%, respectively. Conclusion(s): Whole blood cytokine profiles provide distinct signatures for differentiation of active TB from LTBI and increasing the detection of IGRA-negative active TB.

Sujathan, S., et al. (2017). "Heat and Bleach: A Cost-Efficient Method for Extracting Microplastics from Return Activated Sludge." Archives of Environmental Contamination & Toxicology **73**(4): 641-648.

The extraction of plastic microparticles, so-called microplastics, from sludge is a challenging task due to the complex, highly organic material often interspersed with other benign microparticles. The current procedures for microplastic extraction from sludge are time consuming and require expensive reagents for density separation as well as large volumes of oxidizing agents for organic removal, often resulting in tiny sample sizes and thus a disproportional risk of sample bias. In this work, we present an improved extraction method tested on return activated sludge (RAS). The treatment of 100 ml of RAS requires only 6% hydrogen peroxide (HO) for bleaching at 70 °C, followed by density separation with sodium nitrate/sodium thiosulfate (SNT) solution, and is completed within 24 h. Extracted particles of all sizes were chemically analyzed with confocal Raman microscopy. An extraction efficiency of 78 ± 8% for plastic particle sizes 20 µm and up was confirmed in a recovery experiment. However, glass shards with a diameter of less than 20 µm remained in the sample despite the density of glass exceeding the density of the separating SNT solution by 1.1 g/cm. This indicates that density separation may be unreliable for particle sizes in the lower micrometer range. [ABSTRACT FROM AUTHOR]

Sukhanova, A. and I. Nabiev (2008). "Fluorescent nanocrystal-encoded microbeads for multiplexed cancer imaging and diagnosis." Critical Reviews in Oncology/Hematology **68**(1): 39-59.

Bead-based assays on very large numbers of molecules in proteomics, genomics, drug screening and clinical diagnostics require encoding of each of the microbeads according to the particular ligand bound to its surface. The benefits of using optically encoded microbeads (instead of the solid-state two-dimensional arrays) are derived from the freedom of bead to move in three

dimensions. Polymeric beads optically encoded with organic dyes allow for a limited number of unique codes whereas the use of semiconductor nanocrystals as fluorescent tags improves the beads multiplexed imaging capabilities, photostability and sensitivity of the antigen detection. Additionally, an employment of the recently demonstrated Forster resonance energy transfer (FRET) from the microbeads nanocrystal codes to the nearby antibody dye label allows for the very specific detection of the interaction between the microbead and the antibody. This interaction turns the fluorescence signal from dye label off and on thus effectively discriminating between the occurrence and the non-occurrence of antibody binding. The absence of fluorescent background from non-interacting with the beads dye-labelled antibodies additionally increases the sensitivity of detection and further facilitates the multiplexing capabilities of nanocrystals-based detection and diagnostics. This paper reviews the state-of-the-art results of development of microbeads optically encoded with the fluorescent nanocrystals "quantum dots" and their applications to proteomics for cancer antigens and autoantibodies imaging and diagnosis. © 2008 Elsevier Ireland Ltd. All rights reserved.

Sukhanova, A., et al. (2007). "Nanocrystal-encoded fluorescent microbeads for proteomics: antibody profiling and diagnostics of autoimmune diseases." Nano Letters **7**(8): 2322-2327.

The first application of nanocrystal (NC)-encoded microbeads to clinical proteomics is demonstrated by multiplexed detection of circulating autoantibodies, markers of systemic sclerosis. Two-color complexes, consisting of NC-encoded, antigen-covered beads, anti-antigen antibody or clinical serum samples, and dye-tagged detecting antibodies, were observed using flow cytometry assays and on the surface of single beads. The results of flow cytometry assays correlated with the ELISA technique and provided clear discrimination between the sera samples of healthy donors and patients with autoimmune disease. Microbead fluorescence signals exhibited narrow distribution regardless of their surface antigen staining, without the need of any fluorescence compensation-a parameter determining the limit of sensitivity of flow cytometry assays. In single bead measurements, less than 30 dye-labeled antibodies interacting with the topoI-specific antibodies at the surface of a bead have been detected by the emission of dye excited through the FRET from NCs. In this format, the antibody-bead interaction reaction turns specifically the fluorescence signal from dye label off and on, additionally increasing autoantibody detection sensitivity.

Sul, J. A. I. d., et al. (2011). "Plastic pollution at a sea turtle conservation area in NE Brazil: contrasting developed and undeveloped beaches." Estuaries and Coasts **34**(4): 814-823.

Sea turtles are highly susceptible to plastic ingestion and entanglement. Beach debris were surveyed along the most important sea turtle nesting beaches in Brazil (Costa dos Coqueiros, Bahia State). No significant differences among developed and undeveloped beaches were observed in terms of total number of items. Local sources (tourism activities) represented 70% of debris on developed beaches, where cigarette butts, straws, paper fragments, soft plastic fragments, and food packaging were the most abundant items. Non-local sources (domestic and fishing activities) accounted for about 70% of debris on undeveloped beaches, where the most abundant items were rigid plastic fragments, ropes, soft plastic fragments, caps, and polystyrene. The projected surface area of beach debris did not vary among developed and undeveloped beaches. Overseas containers accounted for about 25% of regional plastic pollution, implying that international pollution prevention agreements are not being respected off the Brazilian coast.

Sulochanan, B., et al. (2019). "Temporal and spatial variability of beach litter in Mangaluru, India."

Marine Pollution Bulletin **149 (no pagination)**(110541).
Monthly litter samples were collected from three major beaches in Mangaluru from 2011-2016. Fishing litter persisted at the beaches, resulting in higher abundances by number (59%) and weight (33.4%) relative to all litter in 2016. In addition to plastics, foam comprised 7.14-11.0% of total litter. Significant positive correlations were observed between the amount of plastic on the beaches and rainy days, rainfall, and river discharge. The maximum river discharge coincided with an increase in plastic items on the beach. Yearly quantities of plastic items ($p < 0.01$), plastic bags ($p < 0.001$), and plastic footwear ($p < 0.05$), on the beaches were significantly different indicating clean-up activities reduced the litter quantity. Changes in total beach litter revealed that Panambur Beach, a fishing boat landing centre was the least changed, and thus appropriate incentive-based management options for the resident fishermen could result in collection and elimination of litter. Copyright © 2019

Sumitran-Karuppan, S. (1999). "The clinical importance of choosing the right assay for detection of HLA-specific donor-reactive antibodies." Transplantation **68**(4): 502-509.
BACKGROUNDWe found earlier that there is a close clinical correlation between the presence of histocompatibility leukocyte antigens (HLA) class I-specific donor-reactive antibodies in cross-match serum and a significantly higher frequency of early acute rejection episodes and graft loss during the first year after the transplant.METHODSSpecificity determinations of donor-reactive antibodies present in the cross-match serum before allogeneic kidney transplants were performed. In the present study, we compared the suitability and efficiency of (a) platelet absorptions, (b) blocking with anti-HLA monoclonal antibodies in the microcytotoxicity assay, and (c) donor-specific HLA antigen-coated magnetic microbeads in flow cytometric assays for the definition of clinically relevant HLA antibodies and their correlation with early acute rejections and early graft loss.RESULTSWe found that the microlymphocytoxicity test using donor splenic B lymphocytes often gave positive reactions in the absence of class I or class II antibodies; in other words, a high frequency of false positive reactions was observed. Flow cytometric tests are more sensitive than microlymphocytotoxicity, not only because they are more sensitive, but also because noncomplement-binding antibodies are detected. Platelet absorptions, which detect only reactivity against HLA class I antigens, is insufficient for use in specificity determinations of donor-reactive antibodies. We found that a positive test for HLA antibodies using paramagnetic beads coated with solubilized donor-derived HLA antigens (class I or class II) correlates with early immunological complications after a transplant ($P<0.001$).CONCLUSIONAssays to determine the specificity of donor-reactive antibodies are now available for use during an acute transplant situation. The introduction of such methods is expected to enhance graft survival and to reduce significantly the frequencies of acute rejections episodes after a transplant.

Summers, S., et al. (2018). "Agglomeration of nano- and microplastic particles in seawater by autochthonous and de novo-produced sources of exopolymeric substances." Marine Pollution Bulletin **130**: 258-267.
Microplastics (<5mm) have often been studied under in-vitro conditions where plastics have been investigated in isolation. However, in the natural environment microplastics readily form agglomerates conferring the particles with properties different to their pristine counterparts. Here, we examined the interaction of exopolymers with polystyrene nanoplastics and microplastics. Formation of plastic agglomerates was examined using simulated sea surface conditions. Flow cytometry coupled with microscopy revealed that nano- and microplastic particle spheres form agglomerates in seawater with a mucilagenous material and an associated

microbial community. To characterise this material, differential staining methods revealed it to be glycoprotein in composition. Exposing increasing concentrations of a marine bacterial glycoprotein EPS to nano- or microplastics revealed that these types of polymers contribute to the formation and abundance of plastic agglomerates. This work highlights the importance of EPS on the fate of plastic and future research should take this into account when evaluating the impact of plastics.

Sun, B., et al. (2016). "Kinetics of Brominated Flame Retardant (BFR) Releases from Granules of Waste Plastics." Environmental Science & Technology **50**(24): 13419-13427.

Plastic components of e-waste contain high levels of brominated flame retardants (BFRs), whose releases cause environmental and human health concerns. This study characterized the release kinetics of polybrominated diphenyl ethers (PBDEs) from millimeter-sized granules processed from the plastic exteriors of two scrap computer displays at environmentally relevant temperatures. The release rate of a substitute of PBDEs, 1,2-bis(2,4,6-tribromophenoxy)ethane (BTBPE), from the waste plastics, was reported for the first time. Deca-BDE was the most abundant PBDE congeners in both materials (87-89%), while BTBPE was also present at relatively high contents. The release kinetics of BFRs could be modeled as one-dimensional diffusion, while the temperature dependence of diffusion coefficients was well described by the Arrhenius equation. The diffusion coefficients of BFRs (at 30 °C) in the plastic matrices were estimated to be in the range of 10-27.16 to 10-19.96 m2·s-1, with apparent activation energies between 88.4 and 154.2 kJ·mol-1. The half-lives of BFR releases (i.e., 50% depletion) from the plastic granules ranged from thousands to tens of billions of years at ambient temperatures. These findings suggest that BFRs are released very slowly from the matrices of waste plastics through molecular diffusion, while their emissions can be significantly enhanced with wear-and-tear and pulverization. [ABSTRACT FROM AUTHOR]

Sun, B., et al. (2019). "Releases of brominated flame retardants (BFRs) from microplastics in aqueous medium: Kinetics and molecular-size dependence of diffusion." Water Research **151**: 215-225.

Microplastics (<5mm) are increasingly detected in aquatic environment, and the high levels of brominated flame retardants (BFRs) contained in them can potentially impact water quality. This study characterized the release kinetics of polybrominated diphenyl ethers (PBDEs) and 1,2-bis(2,4,6-tribromophenoxy)ethane (BTBPE) from millimeter-sized microplastic pellets in water at environmentally relevant temperatures. Leaching rates of BFRs from the microplastic pellets made of acrylonitrile butadiene styrene (ABS) were found to be controlled by their diffusion within the plastic matrix, and their diffusion coefficients (D) in the plastic matrices ranged from 10^{-28.30} to 10^{-20.84}m²s⁻¹. The apparent activation energies of the BFRs' diffusion coefficients were estimated to be in the range of 64.1-131.8kJmol⁻¹ based on their temperature dependence and the Arrhenius equation. The diffusion coefficients of the BFRs decrease with their molecular diameters, while the activation energies for diffusion increase with the molecular diameters, which are indicative of significant steric hindrance for BFR diffusion within the plastic matrices. A semi-empirical linear relationship was observed between Log₁₀D and the glass

transition temperature (T_g) of plastics, which allows prediction of the diffusion coefficients of BFRs in other types of microplastics commonly found in marine environment. The half-lives of BFR leaching (i.e., 50% depletion) from the microplastic pellets would range from tens of thousands to hundreds of billions of years at ambient temperatures if their physical and chemical structures could remain intact. Although the release fluxes of BFRs from microplastics are extremely low under the model conditions, a range of physical and chemical processes in the natural environment and the digestive systems of organisms that ingested them could potentially accelerate their leaching by causing breakdown and swelling of the plastic matrices.

Sun, F., et al. (2017). "Isolation of Murine Alveolar Type II Epithelial Cells." Bio protocol **7**(10): 20.

We have optimized a protocol for isolation of alveolar type II epithelial cells from mouse lung. Lung cell suspensions are prepared by intratracheal instillation of dispase and agarose followed by mechanical disaggregation of the lungs. Alveolar type II epithelial cells are purified from these lung cell suspensions through magnetic-based negative selection using a Biotin-antibody, Streptavidin-MicroBeads system. The purified alveolar type II epithelial cells can be cultured and maintained on fibronectin-coated plates in DMEM with 10% FBS. This protocol enables specific investigation of alveolar type II epithelial cells at molecular and cellular levels and provides an important tool to investigate in vitro the mechanisms underlying lung pathogenesis.

Sun, H., et al. (2014). Bead-based microfluidic RT-QPCR analysis of single cancer cells. 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences, MicroTAS 2014.

Single-cell microfluidic RT-qPCR can enable gene expression assays of small volumes, with efficient thermal cycling, and reduced costs. Such devices currently use solution-based methods, which, while well established, do not allow efficient manipulation of samples and reagents or retrieval of reaction products for real-time single-cell genetic analysis. Employing a novel microbead-based approach and for the first time, we present a microchip that integrates all steps for genetic analysis of an individual cell. The effects of the chemotherapy drug (MMS) on the induction of CDKN1A in single human cancer cells (MCF-7) were assayed, demonstrating the potential of the device for single-cell analysis. © 14CBMS.

Sun, H., et al. (2015). "A Bead-Based Microfluidic Approach to Integrated Single-Cell Gene Expression Analysis by Quantitative RT-PCR." RSC advances **5**(7): 4886-4893.

Gene expression analysis at the single-cell level is critical to understanding variations among cells in heterogeneous populations. Microfluidic reverse transcription quantitative real-time polymerase chain reaction (RT-qPCR) is well suited to gene expression assays of single cells. We present a microfluidic approach that integrates all functional steps for RT-qPCR of a single cell, including isolation and lysis of the cell, as well as purification, reverse transcription and quantitative real-time PCR of messenger RNA in the cell lysate. In this approach, all reactions in the multi-step assay of a single lysed cell can be completed on microbeads, thereby simplifying the design, fabrication and operation of the microfluidic device, as well as facilitating the minimization of sample loss or contamination. In the microfluidic device, a single cell is isolated and lysed; mRNA in the cell lysate is then analyzed by RT-qPCR using primers immobilized on microbeads in a single microchamber whose temperature is controlled in closed loop via an integrated heater and temperature sensor. The utility of the approach was demonstrated by the analysis of the effects of the drug (methyl methanesulfonate, MMS) on the induction of the cyclin-dependent kinase inhibitor 1a (CDKN1A) in single human cancer cells (MCF-7), demonstrating the potential of our approach for efficient, integrated single-cell RT-qPCR for gene expression analysis.

Sun, J., et al. (2019). "Microplastics in wastewater treatment plants: Detection, occurrence and removal." Water Research **152**: 21-37.

Microplastics have aroused increasing concern as they pose threats to aquatic species as well as human beings. They do not only contribute to accumulation of plastics in the environment, but due to absorption they can also contribute to spreading of micropollutants in the environment. Studies indicated that wastewater treatment plants (WWTPs) play an important role in releasing microplastics to the environment. Therefore, effective detection of the microplastics and understanding their occurrence and fate in WWTPs are of great importance towards microplastics control. In this review, the up-to-date status on the detection, occurrence and removal of microplastics in WWTPs are comprehensively reviewed. Specifically, the different techniques used for collecting microplastics from both wastewater and sewage sludge, and their pretreatment and characterization methods are reviewed and analyzed. The key aspects regarding microplastics occurrence in WWTPs, such as concentrations, total discharges, materials, shapes and sizes are summarized and compared. Microplastics removal in different treatment stages and their retention in sewage sludge are explored. The development of potential microplastics-targeted treatment technologies is also presented. Although previous researches in microplastics have undoubtedly improved our level of understanding, it is clear that much remains to be learned about microplastics in WWTPs, as many unanswered questions and thereby concerns still remain; some of these important future research areas are outlined. The key challenges appear to be to harmonize detection methods as well as microplastics mitigation from wastewater and sewage sludge.

Sun, L. D., et al. (2008). "Differences in peripheral blood CD34⁺ cell morphology between systemic lupus erythematosus patients and healthy controls. [Chinese]." Journal of Clinical Rehabilitative Tissue Engineering Research **12**(51): 10081-10084.

Background: There is a debate addressing the existence of CD34⁺ cells in systemic lupus erythematosus patients. Objective(s): To observe the morphology of CD34⁺ cells from peripheral blood of systemic lupus erythematosus patients versus health human by atomic force microscopes. Design(s): A case-controlled analysis. Participant(s): Six systemic lupus erythematosus patients (3 male and 3 female), averagely aged 26.3 years old were selected. The disease course was averagely 19.0 months. They were accorded with the diagnostic criteria made by America Rheumatology Association in 1982. Three healthy volunteers were used as controls. Baseline data had comparability in both groups. Method(s): Systemic lupus erythematosus patients were injected with 4 g/ m² cyclophosphamide via intravenous injection. When leukocytes reached <1.0x10⁹/L, granulocyte colony-stimulating factor (5 mu g/kg) was administered. When leukocytes reached > 5.58x10⁹/L and CD34⁺>2%, peripheral blood stem cells were collected. Three healthy volunteers were subjected to mobilization of granulocyte colony-stimulating factor alone. CD34 MicroBeads FcR and FcR Blocking Reagent were added into the peripheral blood stem cells, which was made into cell suspension. Supernatant was removed. After resuspension, samples were filtered. CD34⁺ cells were purified by immunomagnetic bead cell sorting. Main Outcome Measure(s): Atomic force microscopes was used to observe the surface of the CD34⁺ cells. Twenty cells were observed randomly in two groups. The average of some parameters such as diameter, mean square root roughness, mean height and roughness of five images (2 mum x 2 mu m) in each cell represented as the whole cell. Result(s): When the scope of images were 12 mu mx12 mu m, the whole cells could be imaged. When the scope of images were 2 mumx2 mu m, there were

introcession of different sizes, oval process, and rough structure on the surface of the CD34⁺ cells. Compared with the healthy patients, there were no significant differences in the diameter, mean roughness, mean square root roughness, and mean height in systemic lupus erythematosus patients (F=0.203-4.553, P > 0.05). Conclusion(s): Atomic force microscopes can map the surface of CD34⁺ cells at image range of 2 mu mx2 mu m. There are no significant differences in CD34⁺ cell morphology between systemic lupus erythematosus patients and health human.

Sun, M., et al. (2018). "Changes in tetracycline partitioning and bacteria/phage-comediated ARGs in microplastic-contaminated greenhouse soil facilitated by sophorolipid." Journal of Hazardous Materials **345**: 131-139.

The emerging mixed contamination of antibiotics and microplastics in greenhouse soil has made the control of antibiotic resistant gene (ARG) transmission a novel challenge. In this work, surfactant sophorolipid was applied to enhance the dissipation of tetracycline (TC) and tet genes in the presence of microplastics in greenhouse soil. During 49days of incubation, soil bacteria and phages were both found to be the crucial reservoirs of ARGs. Meanwhile, microplastic's presence significantly inhibited the dissipation of TC and ARGs in the soil. However, sophorolipid application was proved to outweigh the negative impact caused by microplastic existence, and lead to the highest dissipation of soil TC and ARGs. Significant positive correlation was detected between the dissipation rate of water-soluble and exchangeable TC content and bacteria/phage co-mediated ARG levels. This also held true between the two fractions of soil TC and the ratio of ARG level in the bacteria to that in the phages (B_{ARGs}/P_{ARGs}). The opposite impacts of microplastic presence and sophorolipid amendment on the TC/ARG dissipation found in this work provides new information for understanding ARG transmission between bacteria and phages in the mixed contaminated greenhouse soil.

Sun, N. Y. (2008). China's Lam talks up recycling & change. **20:** 8-8.

This article presents an interview with Toland Lam, president of the Beijing, China-based China Plastics Processing Industry Association. When asked how would he quantify the current state of China's plastics recycling industry, he replied that China is the final destination of 70 percent of the world's plastic waste. He also said that the ban of imported post-consumer plastic bag will increase prices. He added that plastic recycling started in China in the 1980s.

Sun, Q., et al. (2017). "Ex vivo construction of human primary 3D-networked osteocytes." Bone **105**: 245-252.

A human bone tissue model was developed by constructing ex vivo the 3D network of osteocytes via the biomimetic assembly of primary human osteoblastic cells with 20-25mum microbeads and subsequent microfluidic perfusion culture. The biomimetic assembly: (1) enabled 3D-constructed cells to form cellular network via processes with an average cell-to-cell distance of 20-25mum, and (2) inhibited cell proliferation within the interstitial confine between the microbeads while the confined cells produced extracellular matrix (ECM) to form a mechanically integrated structure. The mature osteocytic expressions of SOST and FGF23 genes became significantly higher, especially for SOST by 250 folds during 3D culture. The results validate that the bone tissue model: (1) consists of 3D cellular network of primary human osteocytes, (2) mitigates the osteoblastic differentiation and proliferation of primary osteoblast-like cells encountered in 2D culture, and (3) therefore reproduces ex vivo the phenotype of human 3D-networked osteocytes. The 3D tissue construction approach is expected to provide a clinically relevant and high-throughput means for evaluating drugs and treatments that target bone diseases with in vitro convenience.

Sun, Q., et al. (2018). "Ex vivo replication of phenotypic functions of osteocytes through biomimetic 3D bone tissue construction." Bone **106**: 148-155.

Osteocytes, residing as 3-dimensionally (3D) networked cells in bone, are well known to regulate bone and mineral homeostasis and have been recently implicated to interact with cancer cells to influence the progression of bone metastases. In this study, a bone tissue consisting of 3D-networked primary human osteocytes and MLO-A5 cells was constructed using: (1) the biomimetic close-packed assembly of 20-25mum microbeads with primary cells isolated from human bone samples and MLO-A5 cells and (2) subsequent perfusion culture in a microfluidic device. With this 3D tissue construction approach, we replicated ex vivo, for the first time, the mechanotransduction function of human primary osteocytes and MLO-A5 cells by correlating the effects of cyclic compression on down-regulated SOST and DKK1 expressions. Also, as an example of using our ex vivo model to evaluate therapeutic agents, we confirmed previously reported findings that parathyroid hormone (PTH) decreases SOST and increases the ratio of RANKL and OPG. In comparison to other in vitro models, our ex vivo model: (1) replicates the cell density, phenotype, and functions of primary human osteocytes and MLO-A5 cells and (2) thus provides a clinically relevant means of studying bone diseases and metastases.

Sun, Q., et al. (2015). "Ex vivo 3D osteocyte network construction with primary murine bone cells." Bone Research **3**: 15026.

Osteocytes reside as three-dimensionally (3D) networked cells in the lacunocanalicular structure of bones and regulate bone and mineral homeostasis. Despite of their important regulatory roles, in vitro studies of osteocytes have been challenging because: (1) current cell lines do not sufficiently represent the phenotypic features of mature osteocytes and (2) primary cells rapidly differentiate to osteoblasts upon isolation. In this study, we used a 3D perfusion culture approach to: (1) construct the 3D cellular network of primary murine osteocytes by biomimetic assembly with microbeads and (2) reproduce ex vivo the phenotype of primary murine osteocytes, for the first time to our best knowledge. In order to enable 3D construction with a sufficient number of viable cells, we used a proliferated osteoblastic population of healthy cells outgrown from digested bone chips. The diameter of microbeads was controlled to: (1) distribute and entrap cells within the interstitial spaces between the microbeads and (2) maintain average cell-to-cell distance to be about 19 micro m. The entrapped cells formed a 3D cellular network by extending and connecting their processes through openings between the microbeads. Also, with increasing culture time, the entrapped cells exhibited the characteristic gene expressions (SOST and FGF23) and nonproliferative behavior of mature osteocytes. In contrast, 2D-cultured cells continued their osteoblastic differentiation and proliferation. This 3D biomimetic approach is expected to provide a new means of: (1) studying flow-induced shear stress on the mechanotransduction function of primary osteocytes, (2) studying physiological functions of 3D-networked osteocytes with in vitro convenience, and (3) developing clinically relevant human bone disease models.

Sun, R. and H. Zhuang (2015). "Biotin-streptavidin-amplified real-time immune-PCR assay for detecting dimethyl phthalate in beverage and drinking water samples." Analytical and bioanalytical chemistry **407**(4): 1261-1265.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Dimethyl phthalate (DMP), one

family of the phthalic acid diesters (PAEs), is an increasing widely used plasticizer. A sensitive and high-throughput direct competitive biotin-streptavidin-amplified system based on real-time immune-PCR (BA-rt-IPCR) techniques was developed for detecting DMP in beverage and drinking water samples. In our assay, we selected dimethyl 4-aminophthalate as the optimal DMP hapten to prepare high titer of rabbit polyclonal anti-DMP antibodies (pAb-DMP). Under the optimized conditions, the proposed method was used to detect DMP with a linearity range from 10 to 100 ng L^sup -1^, and the limit of detection (LOD) was 1.98 pg L^sup -1^. Finally, the results about DMP in beverage and drinking water samples were consistent with those using gas chromatography-mass spectrometry (GC-MS), which proved that the proposed immunoassay for detecting DMP in the environment was accurate, reliably rapid, and receptive.

Sun, S., et al. (2014). "A method to observe the structure of the interface between mesocarbon microbeads and pitch." Journal of Colloid & Interface Science **426**: 206-208.

It is known that mesocarbon microbeads (MCMBs) have ordered structure and grow after absorbing molecules from pitch. However, the structure of pitch used for preparing MCMBs is disordered. Thus question of whether there is a region where the molecules absorbed from pitch change their orientations is a very interesting problem. In this paper, an interface between MCMBs and their pitch matrix has been found and the structure of the interface was observed by scanning electron microcopy. There are some ordered regions in the interface but the number of ordered regions in the interface is much fewer than the number inside the MCMBs. This indicates that the interface between the MCMBs and the pitch is the region where the orientations of the molecules absorbed from pitch change.

Sun, T., et al. (2018). "Suitability of mulching with biodegradable film to moderate soil temperature and moisture and to increase photosynthesis and yield in peanut." Agricultural Water Management **208**: 214-223.

There is a growing interest in developing suitable biodegradable films for mulching crops to minimize the environmental impacts of polyethylene (PE) film. In order to verify whether biodegradable film can satisfy the changing needs of soil conditions in different seasons of crops, six treatments were conducted including four different ratios of starch/polybutyrate adipate terephthalate (PBAT) biodegradable films mulching, containing 0% (B1), 10% (B2), 15% (B3), and 20% (B4) starch, respectively, and PE film mulching and no mulching. A randomized complete block design with three replications was used to compare their effects on soil temperature and moisture, and peanut yield. The results indicated that soil temperature under the B3 treatment was higher than those under other three biodegradable films for the entire grow season. B3 mulching can warm the soil similar to PE film before 60 days after sowing (DAS), however, lowers soil temperature by about 0.4-1.4 degrees C after that. Soil moisture of B3 was similar to that under the PE film at 0-40 cm depth at 20 DAS, lower at 40-60 and 120 DAS, however, higher at 80-100 DAS with the infiltration of rains because of biodegradation. With less (B1 and B2) or more starch (B4), the soil temperature and soil water was lower in whole stage than B3. Compared with other treatments, peanuts mulched with B3 maintained higher LAI, chlorophyll content and net photosynthetic rate at late growth stages. The pod yield under B3 was similar, however, economic benefit was a bit lower than that of PE film because of the higher present cost of biodegradable film. Thus, the results revealed that suitable biodegradable film can satisfy the changing needs of soil conditions in different seasons. The findings suggest that creating more suitable biodegradable mulches to meet the changing needs will be a new direction for maximizing the use of biodegradable film and reducing the long-term plastic pollution (i.e., "white pollution").

Sun, X., et al. (2018). "Toxicities of polystyrene nano- and microplastics toward marine bacterium Halomonas alkaliphila." Science of the Total Environment **642**: 1378-1385.

Nano- and microplastics have been shown to cause negative effects on marine organisms. However, the toxicities of nano- and microplastics toward marine bacteria are poorly understood. In this study, we investigated the toxic effects of polystyrene nano- and microplastics on the marine bacterium Halomonas alkaliphila by determining growth inhibition, chemical composition, inorganic nitrogen conversion efficiencies and reactive oxygen species (ROS) generation. The results showed that both nano- and microplastics inhibited the growth of H. alkaliphila in high concentrations, while nanoplastics rather than microplastics influenced the growth inhibition, chemical composition and ammonia conversion efficiencies of H. alkaliphila at concentration of 80mg/L. The ROS generation indicated oxidative stress induced by nano- but not microplastics, and the oxidative stress induced by nanoplastics may provide a significant effect on bacteria. Furthermore, the positively charged nanoplastics (amine-modified 50nm) induced higher oxidative stress toward bacteria than that induced by negatively charged nanoplastics (non-modified 55nm). The increased extracellular polymeric substances as evidenced by transmission electron microscope (TEM) observation suggested the possible bacterial protective mechanisms. The present study illustrates for the first time the impact of plastics debris on the inorganic nitrogen conversion efficiencies of marine bacteria. Our findings highlight the effects of microplastics on the ecological function of marine organisms.

Sun, X., et al. (2019). "Characteristics and retention of microplastics in the digestive tracts of fish from the Yellow Sea." Environmental Pollution **249**: 878-885.

Microplastics (MPs) are a major global issue in the marine environment, and fish inhabiting coastal environments are susceptible to the ingestion of MPs. Knowledge regarding MPs in fish along the coast of China is very limited. In this study, the characteristics and retention of MPs in 19 fish species in the Yellow Sea were systematically studied. MPs were detected in all of the fish species sampled. Overall, 34% (444/1320) of fish retained plastic, and 552 pieces of plastic were removed from these fish, among which 546 pieces (99%) were microplastics (i.e., <5 mm). Three MP types were found: fibers, pellets, and fragments, which accounted for 67%, 22%, and 11% of the total, respectively. MP length ranged from 16 to 4740 micro m, with an average of 941+or-43 micro m. The average lengths of the fibers, pellets, and fragments were 1233+or-57 micro m, 263+or-24 micro m, and 503+or-91 micro m, respectively, and MP length was positively correlated with fish length. Fourteen polymers were detected, with organic oxidation polymers (40%) being most abundant, followed by polyethylene (22%) and polyamide (11%). The retention of MPs in fish was affected by sampling areas and fish weight. Fish collected from the area adjacent to the Bohai Sea and the Yangtze River Estuary were found to possess higher levels of MPs than those collected from the center of the Yellow Sea. The average MP/fish for fish with plastic was negatively correlated with fish body weight. The retention of MPs may affect the quality and quantity of fishery resources in the Yellow Sea, especially the commercial fish. It is suggested that future studies be conducted to determine the ingestion rate, retention time, and egestion rate of MPs by fish to enable a rational risk assessment by combining the field results.

Sun, X., et al. (2017). "Ingestion of microplastics by natural zooplankton groups in the northern South China Sea." Marine Pollution Bulletin **115**(1/2): 217-224.

The ingestion of microplastics by five natural zooplankton groups in the northern South China Sea was studied for the first time and two types of sampling nets (505 micro m and 160 micro m in mesh size) were compared. The microplastics were detected in zooplankton sampled from 16 stations, with the fibrous microplastics accounting for the largest proportion (70%). The main component of the found microplastics was polyester. The average length of the microplastics was 125 micro m and 167 micro m for Nets I and II, respectively. The encounter rates of microplastics/zooplankton increased with trophic levels. The average encounter rate of microplastics/zooplankton was 5%, 15%, 34%, 49%, and 120% for Net I, and 8%, 21%, 47%, 60%, and 143% for Net II for copepods, chaetognaths, jellyfish, shrimp, and fish larvae, respectively. The average abundance of microplastics that were ingested by zooplankton was 4.1 pieces/m³ for Net I and 131.5 pieces/m³ for Net II.

Sun, X., et al. (2018). "Microplastics in seawater and zooplankton from the Yellow Sea." Environmental Pollution **242**(Part A): 585-595.

Marine plastic pollution is a worldwide problem. Microplastics (MPs) are the predominant form of marine plastic debris, a form small enough to be ingested by and potentially harm marine organisms. It is urgent to develop ecologically relevant metrics for the risk assessment of MPs based on in situ data, especially for coastal areas. For the first time, we performed a comprehensive study of the characteristics of MPs in seawater and zooplankton in the Yellow Sea. For MPs in seawater, the average concentration is 0.13+or-0.20 pieces/m³, dominated by fragments (42%). The average size is 3.72+or-4.70 mm, with the most frequent size appearing at 1200 micro m. The major polymer types are polypropylene and polyethylene, accounting for 88.13% in total. The distribution of MPs in seawater is patchy, with high MP concentrations close to the coastal cities. The average concentration of MPs in 11 total zooplankton groups is 12.24+or-25.70 pieces/m³. The average size is 154.62+or-152.90 micro m, with 90% being <500 micro m. Fiber is the dominant shape of MPs found in zooplankton, accounting for 46%, but the composition of the polymer type is diverse. The retention of MPs in zooplankton depends on the taxa and their abundance in the Yellow Sea. Siphonophorea, Copepoda, Euphausiacea and Amphipoda are the main repositories compared to other groups, achieving 3.57, 2.44, 1.41 and 1.36 pieces/m³, respectively. The high concentration area of MPs in zooplankton appeared near the adjacent waters of the Yangtze estuary. These results prove that zooplankton act as a repository for MPs in coastal waters. The retention of MPs in zooplankton is recommended as a key index for further ecological risk assessment of MPs.

Sun, X., et al. (2019). "Dual-layered pH-sensitive alginate/chitosan/kappa-carrageenan microbeads for colon-targeted release of 5-fluorouracil." International Journal of Biological Macromolecules **132**: 487-494.

A new pH-sensitive drug carrier based on alginate (Alg), chitosan (Cs), and kappa-carrageenan (kC) marine biopolymers was developed, comprising a dual-layered polyelectrolyte complexes microbead structure. Fourier-transform infrared spectroscopy (FT-IR), thermogravimetric analysis (TGA), and scanning electron microscopy (SEM) were used to investigate the structures, thermal stability, and morphological changes, respectively, of the microcapsules we developed. In the intestinal environment (pH7.4), the stability and swelling of Alg microbeads were enhanced after generation of the dual-layered polyelectrolyte complexes. The in vitro release profiles of 5-fluorouracil under simulated GI conditions were also examined. At gastric pH (1.2), the cumulative 5-FU release percentage was decreased by introduction of the additional kC layer from 14% in Alg/Cs microbeads to 7% in the dual-layered Alg/Cs/kC microbeads. Additionally, the release profiles were greatly improved under simulated intestinal and colon conditions. Finally, the microbeads were all biodegradable and showed no cytotoxicity in Chang liver cells. Our results clearly indicate that the dual-layer pH-sensitive Alg/Cs/kC microbeads could be used effectively for the targeted delivery of anticancer drugs to the colon.

Sun, X., et al. (2018). "Retention and characteristics of microplastics in natural zooplankton taxa from the East China Sea." Science of the Total Environment **640-641**: 232-242.

The ubiquitous presence and persistence of microplastics (MPs) in aquatic environments have become of particular concern in recent years. Biological interactions are among the key processes that affect the impact and fate of MPs in the oceans. Zooplankton is one of the most sensitive taxa because their prey is approximately the same size as MPs. However, the status of MPs in zooplankton within natural marine environments remains largely unknown. By focusing on zooplankton in the East China Sea, the characteristics, bioaccumulated concentration, and retention of MPs for 10 zooplankton groups were systematically studied. Three types of MPs were found in zooplankton: fibres, pellets, and fragments. The fibres (54.6%) were more common than the other two types. The average lengths of the fibres, pellets, and fragments were 295.2 +/- 348.6 mum, 20.3 +/- 11.0 mum, and 82.4 +/- 80.5 mum, respectively. Nineteen polymers were detected in the zooplankton via the Thermo Scientific Nicolet iN10 Infrared Microscope. Polymerized oxidized organic material and polyester were dominant, accounting for 35.9% and 25.6% of the polymers, respectively. The bioaccumulated concentration of MPs in the 10 zooplankton taxa varied from 0.13 pieces/zooplankton for Copepoda to 0.35 pieces/zooplankton for Pteropoda. The bioaccumulated concentration was negatively correlated with the abundance of zooplankton, showing a significant biological dilution effect. The bioaccumulated concentration was also influenced by the feeding mode of zooplankton, showing a trend of omnivorous > carnivorous > herbivorous. High retention of MPs was found in the zooplankton community of the East China Sea, achieving 19.7 +/- 22.4 pieces/m³. This is much higher than the MP retention in zooplankton from other reported sea areas. By revealing the characteristics and retention of MPs in the natural zooplankton taxa from the East China Sea, this research identified the influence that MPs have on zooplankton in a typical coastal environment. This information can be utilized for subsequent controlled experiments and risk assessments. Copyright © 2018 Elsevier B.V.

Sun, X., et al. (2019). "Preparation of pH-sensitive Fe3O4@C/carboxymethyl cellulose/chitosan composite beads for diclofenac sodium delivery." International Journal of Biological Macromolecules **127**: 594-605.

In this study, we prepared pH- and magnetism-responsive Fe3O4@C/carboxymethyl cellulose (CMC)/chitosan composite microbeads for controlled release of diclofenac sodium (DS) to (i) prevent complete drug release in gastric area, (ii) maintain blood drug concentration in a specific part of the body, (iii) reduce drug administration time and systemic drug toxicity, and (iv) improve drug efficacy. Through one-step solvent thermal treatment, a polyethylene glycol layer was wrapped into Fe3O4 nanoparticles. Then, Fe3O4@C nanoparticles were incorporated into CMC matrix and coated with chitosan layer via a self-assembly technique to form core-shell polyelectrolyte complexes (PECs). The composite beads were characterized by SEM, TEM, FT-IR spectrometry, and TGA. In addition, the effect of different concentrations of Fe3O4@C, CMC, aluminum chloride (AlCl3), and chitosan on the swelling process of composite beads, DS loading, and controlled release behavior was systematically studied. DS encapsulation efficiency in Fe3O4@C/CMC/chitosan beads reached 70.8 ± 0.65% at concentrations of 0.1% Fe3O4@C, 3% CMC, 3% AlCl3, and 1% chitosan. The beads showed a higher swelling index in phosphate buffer at pH 7.4 and 6.8 than at pH 1.2. The composite beads revealed excellent pH-sensitive in vitro drug release profiles and prevented burst release in the gastrointestinal tract.

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Sun, Y., et al. (2007). "Design and performances of immunoassay based on SPR biosensor with magnetic microbeads." Biosensors and Bioelectronics **23**(4): 473-478.

A surface plasmon resonance (SPR) biosensor system was developed for immunoassay, based on the conjugates of magnetic microbeads coupling with antibody which could be trapped on the Au film firmly due to the magnetic force. The magnetic microbeads were used as the solid support for the heat shock protein 70 (Hsp 70) antibody and antibody immobilized magnetic microbeads were utilized instead of the single antibody for the determination of Hsp 70. Since the magnetic bead is coated with dextran, the antibodies and some specific biomolecular receptors can be immobilized using a variety of chemical reactions. Compared to traditional antibody immobilization on the sensing film, there is not a covalent link between the Au film and the antibody. There is a great advantage in that sensor can be stripped and reused, and the same chemistry used to derivative dextran-coated SPR sensors can be used for the magnetic bead-coated sensors. The sensing layer was formed well. Different dilution ratios (v/v) of the conjugates result in different detectable ranges. When the dilution ratios of the conjugate are 1:10 and 1:5, the lowest concentrations of Hsp 70 that can be detected are 1.50 and 0.30 mu gml super(-) super(1), respectively.

Sun, Y., et al. (2012). "Host cytokine storm is associated with disease severity of severe fever with thrombocytopenia syndrome." Journal of Infectious Diseases **206**(7): 1085-1094.

BACKGROUND: Severe fever with thrombocytopenia syndrome (SFTS) is an emerging viral disease in China, caused by SFTS virus (SFTSV). Severe SFTS patients can quickly proceed to multiorgan dysfunction and death; however, underlying pathogenic mechanisms remain unclear.

METHODS: Serum samples from 15 fatal and 44 nonfatal SFTS cases were subjected to multiplex-microbead immunoassays to detect a broad spectrum of cytokines. The viral load and

virus-specific IgG titers were also tested by real-time PCR and ELISA, respectively.
RESULTS: Cytokines IL-1RA, IL-6, IL-10, G-CSF, IP-10, and MCP-1 were elevated in SFTS patients and produced at robust levels in fatal cases. In contrast, cytokines PDGF-BB and RANTES decreased in SFTS patients. These cytokines reverted to normal ranges during the convalescent phase of SFTSV infection. Cytokines IL-1beta, IL-8, MIP-1alpha, and MIP-1beta showed a unique pattern of elevation in fatal cases but not in nonfatal cases. However, these cytokines increased in the convalescent phase of nonfatal SFTS cases. Our regression analysis revealed that the serum viral load correlated with these cytokines. Moreover, levels of these cytokines correlated with various clinical parameters and virus-specific IgG titers.
CONCLUSION: The study demonstrates that SFTSV infection induces a cytokine storm with abnormally expressed cytokine profiles, which are associated with the disease severity.

Sun, Y., et al. (2008). "Improvement of surface plasmon resonance biosensor with magnetic beads via assembled polyelectrolyte layers." Analytica Chimica Acta **624**(2): 294-300.

The conjugates of magnetic beads coupled with an antibody can be trapped on the Au film firmly due to the magnetic force for the immunoassay of a surface plasmon resonance (SPR) biosensor. However, this approach exhibits significant limitations in robustness and sensitivity due to incomplete dissociation of magnetic beads from the Au film. The incorporation of a polyelectrolyte film on the Au surface can prevent the magnetic beads from the direct contact with the Au film. The layer-by-layer assembly of polyelectrolyte was used as spacer between the gold surface and the magnetic bead. Different layers of polyelectrolyte can be assembled onto the Au film based on an electrostatic force between polycations and polyanions. After the polyelectrolyte film was fabricated on the Au film, the deposition of the magnetic beads was maintained effectively on the film, which favors the sensitivity of the biosensor and the regeneration of the sensing membrane. When the polyelectrolyte layers of (PAH/PSS)<inf>3</inf> were constructed on the Au film, the SPR biosensor with magnetic beads exhibited a satisfactory response to human IgG in the concentration range from 0.25 to 30.00 mug mL⁻¹, and the determination limit obtained is eight times lower than that obtained with (PAH/PSS)<inf>1</inf> layer. © 2008 Elsevier B.V. All rights reserved.

Sun, Y., et al. (2019). "Small-sized microplastics negatively affect rotifers: changes in the key life-history traits and rotifer- phaeocystis population dynamics." Environmental Science and Technology **53**(15): 9241-9251.

Most coastal waters are at risk from microplastics, which vary in concentration and size. Rotifers, as important primary consumers linking primary producers and higher trophic consumers, usually coexist with the harmful alga Phaeocystis and microplastics in coastal waters; this coexistence may interfere with rotifer life-history traits and ingestion of Phaeocystis. To evaluate the effects of microplastics on rotifers, we designed a series of experiments concerning rotifer Brachionus plicatilis life-history traits and rotifer-Phaeocystis (predator-prey) population dynamics under different concentrations and sizes of microplastics. The results showed that small-sized microplastics (0.07 mum) at high levels (>=5 mug mL⁻¹) decreased rotifer survival and reproduction, prolonged the time to maturation, and reduced the body size at maturation, whereas large-sized microplastics (0.7 and 7 mum) had no effect on rotifer life-history traits. For rotifer-Phaeocystis population levels, small-sized microplastics (0.07 mum) significantly delayed the elimination of Phaeocystis by rotifers; this is the first study to test the effects of microplastics on predator-prey dynamics. The results of rotifer-Phaeocystis population dynamics are consistent with the changes in the life-history traits of rotifers and further confirm the negative effects of small-sized microplastics

(0.07 mum) on rotifers. These findings help to reveal the effect of pollutants on predator-prey population dynamics. Copyright © 2019 American Chemical Society.

Sundaran, P. S., et al. (2017). "Drug loaded microbeads entrapped electrospun mat for wound dressing application." Journal of Materials Science: Materials in Medicine **28 (6) (no pagination)**(88).

Abstract: A new design of antibiotic loaded wound dressing and its initial in vitro evaluation is described. Chitosan microbeads loaded with ampicillin were sandwiched within polycaprolactone electrospun mat (MbAPPCL). The morphology was analyzed by scanning electron microscopy and surface chemistry was characterized by Fourier Transform Infrared Spectroscopy. In vitro cytotoxicity using L-929 fibroblast cells by direct contact test and elution assay revealed non-cytotoxic nature of MbAPPCL. The cell adhesion and viability analysis further confirmed the cytocompatibility of MbAPPCL as a wound dressing material. Percentage hemolysis and platelet adhesion on the mat exposed to blood substantiated the hemocompatibility. The antibiotic susceptibility test analyzed on Staphylococcus aureus by agar plate method confirmed the drug release and antimicrobial property. The proposed wound dressing model explained with ampicillin as a candidate drug has the potential to include microbeads with different antibiotics for multi drug treatment. Graphical Abstract: [InlineMediaObject not available: see fulltext.]. Copyright © 2017, Springer Science+Business Media New York.

Sundbaek, K. B., et al. (2018). "Sorption of fluorescent polystyrene microplastic particles to edible seaweed Fucus vesiculosus." Journal of Applied Phycology **30**(5): 2923-2927.

Increased global demands for food have raised interest for seaweed as a healthy and sustainable food source. At the same time, the large amounts of microplastic in the oceans have raised concern in relation to pollution of seafood including sea vegetables. The aim of this study was to examine sorption of fluorescent polystyrene (PS) microplastic particles to edible macroalga (seaweed) Fucus vesiculosus, and to investigate to what extent adsorbed PS particles could be washed off, using an industrial relevant method. PS microplastic particles (diameter of 20 micro m) were used in a concentration of 2.65 mg L⁻¹ (corresponding to 597 particles per mL) in filtrated seawater (50 mL) to treat F. vesiculosus distal tips in blue cap flasks (100 mL) placed in a rotary box for 2 h. Results showed sorption of PS microplastic particles to F. vesiculosus analysed by microscopy and a significant reduction of 94.5% by washing. These results were based on high microplastic concentrations, not comparable to natural conditions/concentrations. Nonetheless, this study provides methodological and mechanistic insights into procedures for investigating the sorption of microplastics to seaweed, for which there is currently no established standardised method.

Super, M. S., et al. (1993). "Density-based separation of thermoplastics found in the post-consumer waste stream." Resources, Conservation and Recycling **9**(1-2): 75-88.

Separation of thermoplastics from each other and from contaminants facilitates their recycling and improves the properties of the reprocessed material. Clean, dry, shredded thermoplastics obtained from post-consumer, plastic waste were separated using pure CO<inf>2</inf> and mixtures of CO<inf>2</inf> and SF<inf>6</inf> in a lab-scale, density-based separator. The separator was designed to operate at the pressures and temperatures required to attain the appropriate densities for the separations using these near-critical fluids. Separation efficiency, factors affecting separation purity, and favorable operating conditions and procedures were determined. Several thermoplastic mixtures were separated, including HDPE/LDPE/PP and PVC/PET. The purity of the separated homopolymers ranged from 100%-77% by weight, with

most runs yielding 96%-100% purity.

Sussarellu, R., et al. (2016). "Oyster reproduction is affected by exposure to polystyrene microplastics." Proceedings of the National Academy of Sciences of the United States of America **113**(9): 2430-2435.

Plastics are persistent synthetic polymers that accumulate as waste in the marine environment. Microplastic (MP) particles are derived from the breakdown of larger debris or can enter the environment as microscopic fragments. Because filter-feeder organisms ingest MP while feeding, they are likely to be impacted by MP pollution. To assess the impact of polystyrene microspheres (micro-PS) on the physiology of the Pacific oyster, adult oysters were experimentally exposed to virgin micro-PS (2 and 6 micro m in diameter; 0.023 mg.L⁻¹) for 2 mo during a reproductive cycle. Effects were investigated on ecophysiological parameters; cellular, transcriptomic, and proteomic responses; fecundity; and offspring development. Oysters preferentially ingested the 6- micro m micro-PS over the 2-micro m-diameter particles. Consumption of microalgae and absorption efficiency were significantly higher in exposed oysters, suggesting compensatory and physical effects on both digestive parameters. After 2 mo, exposed oysters had significant decreases in oocyte number (-38%), diameter (-5%), and sperm velocity (-23%). The D-larval yield and larval development of offspring derived from exposed parents decreased by 41% and 18%, respectively, compared with control offspring. Dynamic energy budget modeling, supported by transcriptomic profiles, suggested a significant shift of energy allocation from reproduction to structural growth, and elevated maintenance costs in exposed oysters, which is thought to be caused by interference with energy uptake. Molecular signatures of endocrine disruption were also revealed, but no endocrine disruptors were found in the biological samples. This study provides evidence that micro-PS cause feeding modifications and reproductive disruption in oysters, with significant impacts on offspring.

Sutherland, W. J., et al. (2012). "A horizon scanning assessment of current and potential future threats to migratory shorebirds." Ibis **154**(4): 663-679.

We review the conservation issues facing migratory shorebird populations that breed in temperate regions and use wetlands in the non-breeding season. Shorebirds are excellent model organisms for understanding ecological, behavioural and evolutionary processes and are often used as indicators of wetland health. A global team of experienced shorebird researchers identified 45 issues facing these shorebird populations, and divided them into three categories (natural, current anthropogenic and future issues). The natural issues included megatsunamis, volcanoes and regional climate changes, while current anthropogenic threats encompassed agricultural intensification, conversion of tidal flats and coastal wetlands by human infrastructure developments and eutrophication of coastal systems. Possible future threats to shorebirds include microplastics, new means of recreation and infectious diseases. We suggest that this review process be broadened to other taxa to aid the identification and ranking of current and future conservation actions.

Sutherland, W. J., et al. (2012). "A horizon scanning assessment of current and potential future threats to migratory shorebirds: [1]." Ibis **154**(4): 663-679.

We review the conservation issues facing migratory shorebird populations that breed in temperate regions and use wetlands in the non-breeding season. Shorebirds are excellent model organisms for understanding ecological, behavioural and evolutionary processes and are often used as indicators of wetland health. A global team of experienced shorebird researchers identified 45 issues facing these shorebird populations, and divided them into three categories (natural, current anthropogenic and future issues). The natural issues included megatsunamis, volcanoes and regional climate changes, while current anthropogenic threats encompassed agricultural intensification, conversion of tidal flats and coastal wetlands by human infrastructure developments and eutrophication of coastal systems. Possible future threats to shorebirds include microplastics, new means of recreation and infectious diseases. We suggest that this review process be broadened to other taxa to aid the identification and ranking of current and future conservation actions. [PUBLICATION ABSTRACT]

Sutton, R., et al. (2016). "Microplastic contamination in the San Francisco Bay, California, USA." Marine Pollution Bulletin **109**(1): 230-235.

Despite widespread detection of microplastic pollution in marine environments, data describing microplastic abundance in urban estuaries and microplastic discharge via treated municipal wastewater are limited. This study presents information on abundance, distribution, and composition of microplastic at nine sites in San Francisco Bay, California, USA. Also presented are characterizations of microplastic in final effluent from eight wastewater treatment plants, employing varying treatment technologies, that discharge to the Bay. With an average microplastic abundance of 700,000particles/km(2), Bay surface water appears to have higher microplastic levels than other urban waterbodies sampled in North America. Moreover, treated wastewater from facilities that discharge into the Bay contains considerable microplastic contamination. Facilities employing tertiary filtration did not show lower levels of contamination than those using secondary treatment. As textile-derived fibers were more abundant in wastewater, higher levels of fragments in surface water suggest additional pathways of microplastic pollution, such as stormwater runoff.

Suwanmanee, U., et al. (2013). "Life cycle assessment of single use thermoform boxes made from polystyrene (PS), polylactic acid, (PLA), and PLA/starch: Cradle to consumer gate." International Journal of Life Cycle Assessment **18**(2): 401-417.

Purpose: Currently, the bio-based plastics have been drawing considerable attention from the packaging industry as a sustainable solution for replacing petroleum-based plastics in order to reduce the accumulation of plastic waste in the environment. This work has benchmarked the environmental impact of bio-based against petroleum-based plastics for single use boxes. In this paper, the cradle to consumer gate environmental impact data of these boxes was calculated and reported as part 1. End-of-life options of both bio- and petroleum-based boxes are an important subject which will be further studied for part 2. The energy sources in this work were taken from the Thailand energy database namely: Thai electricity grid mix (TEGM), Thai coal electricity (TCE), Thai natural gas combine cycle (TNGCC), and Thai coal integrated gasification combine cycle (TIGCC). Method(s): The materials studied were polystyrene (PS) derived from petroleum, polylactic acid (PLA) derived from corn, and PLA/cassava starch blend (PLA/starch). The tray with lid (herein after called box) was processed in a plastic manufacturing in Thailand using cast sheet extrusion and then thermoforming techniques. The functional unit is specified as 10,000 units of 8.0 x 10.0 x 2.5 cm of PS, PLA, and PLA/starch boxes which weigh 447.60, 597.60, and 549.56 kg, respectively. Three impact categories; namely global warming potential including direct greenhouse gas, and indirect land use change (LUC) emissions, acidification, and photochemical ozone formation are investigated. Finally, the normalization results including and excluding LUC consideration were compared and reported. Results and discussion: The results from this study have shown that the total environmental impact including LUC emission of bio-based boxes were different when the various energy sources were supplied throughout the life cycle production stage. It can be seen that the PS box has lower environmental impact than

PLA and PLA/starch boxes when TEGM, TCE, TNGCC, and TIGCC were used as energy supplied. LUC of renewable feedstocks, such as corn and cassava, were considered as the biggest impact of absolute scores of PLA and PLA/starch boxes. These results are consistent with Piemonte and Gironi (2010). Conclusion(s): PLA and PLA/starch boxes give a slightly higher environmental impact than the PS box by 1.59 and 1.09 times, respectively, when LUC was not accounted in the absolute scores and clean energy TIGCC was used throughout the life cycle. © 2012 Springer-Verlag.

Suzuki, R., et al. (2002). "Development of a Novel Cytomedical Treatment that can Protect Entrapped Cells from Host Humoral Immunity." Cell Transplantation **11**(8): 787-797.

Cell therapy is expected to relieve the shortage of donors needed for organ transplantation. When patients are treated with allogeneic or xenogeneic cells, it is necessary to develop a means by which to isolate administered cells from an immune attack by the host. We have developed "cytomedicine, " which consists of functional cells entrapped in semipermeable polymer, and previously reported that alginate-poly-l-lysine-alginate microcapsules and agarose microbeads could protect the entrapped cells from injury by cellular immunity. However, their ability to isolate from humoral immunity was insufficient. It is well known that the complement system plays an essential role in rejection of transplanted cells by host humoral immunity. Therefore, the goal of the present study was to develop a novel cytomedical device containing a polymer capable of inactivating complement. In the screening of various polymers, polyvinyl sulfate (PVS) exhibited high anticomplement activity and low cytotoxicity. Murine pancreatic beta-cell line (MIN6 cell) entrapped in agarose microbeads containing PVS maintained viability and physiological insulin secretion, replying in response to glucose concentration, and resisted rabbit antisera in vitro. PVS inhibited hemolysis of sensitized sheep erythrocytes (EAs) and rabbit erythrocytes by the complement system. This result suggests that PVS inhibits both the classical and alternative complement pathways of the complement system. Next, the manner in which PVS exerts its effects on complement components was examined. PVS was found to inhibit generation of C4a and Ba generation in activation of the classical and alternative pathways, respectively. Moreover, when the EAC1 cells, which were carrying C1 on the EAs, treated with PVS were exposed to C1-deficient serum, hemolysis decreased in a PVS dose-dependent manner. These results suggest that PVS inhibits C1 in the classical pathway and C3 convertase formation in the alternative pathway. Therefore, PVS may be a useful polymer for developing an anticomplement device for cytomedical therapy.

Suzuki, Y., et al. (1977). "A simulation model for regional environmental impact analysis: a case study for the Kinki Region." International Journal of Environmental Studies **10**(2): 91-99.

This paper is concerned with an environmental impact analysis model for decision making in regional planning and management. The model considered in this paper is composed of three environmental impact submodels; namely, air pollution model (APM), water pollution model (WPM) and the model for solid wastes disposal, especially for plastic waste (SWM). All the submodels are set up to be interconnected in a simple but effective way to analyze the essential features of environmental impacts due to our activities in the region. By using the model stated above, a case study has been made of impact analysis for the Kinki Region, one of the economically important regions in Japan. The results of the case study indicate feasibility and applicability of the model to assess the future environmental impacts due to population increase and changes in pattern of material consumptions and of industrial activities in the region.

Svetlicky, N., et al. (2017). "Optimization of donor." Hla **89 (6)**: 405.

The pre-transplant complement-dependent cytotoxicity (CDC) cross-match (Xm) assay is a gold standard method for organ rejection prediction. There are three possible tissue sources for lymphocyte separation: lymph nodes, spleen and peripheral blood. A long established procedure for cell purification is using nylon wool column T and B cells separation. This method is convenient and cost effective, but has been found to be impractical when the lymphocyte source is donor's peripheral blood. In most of cases, results of CDC with nylon wool separated lymphocytes from peripheral blood are un-interpretable for cadaver sources due to high background non-specific cell mortality. However, the logistics of obtaining lymph nodes is more complicated and hence final result is usually much later than that of peripheral blood. The aim of this study was to determine the most effective way to obtain T and B lymphocytes from donor's blood. Toward this end, we compared four methods of separation with regard to yield, purity and convenience: RosetteSep gradient negative selection (StemCell), MACS MicroBeads magnetic beads positive separation (Miltenyi Biotec), MagniSort magnetic beads negative selection (eBioscience) and MACSprep HLA magnetic beads negative separation (Miltenyi Biotec). We found a significant decrease in concentration of lymphocytes in blood of deceased organ donors compared to living donors (2.7 x10^6/mL vs. 0.57 x10^6/mL). Each separation method had its advantages and disadvantages. Overall in our hands, we found the MACSprep HLA kit advantageous especially in terms of yield, purity and convenience. In addition, we compared CDC Xm results with cells that were separated from blood versus cells that were derived from lymph node of the same donor. We found no difference in T cell Xm results; however the B cell CDC sensitivity was much higher with peripheral blood (50% positive vs. 15%). These results requisite additional consideration in the analysis of cross-matches.

Syakti, A. D., et al. (2017). "Beach macro-litter monitoring and floating microplastic in a coastal area of Indonesia." Marine Pollution Bulletin **122**(1-2): 217-225.

Qualitative analysis of the structures of the polymers composing floating plastic debris was performed using attenuated total reflectance-Fourier transform infrared spectroscopy (ATR-FTIR), and the aging of the debris was assessed by measuring carbonyl group formation on the particle surfaces. Plastic material made up >75% of the 2313 items collected during a three-year survey. The size, shape and color of the microplastic were correlated with the polymer structure. The most abundant plastic materials were polypropylene (68%) and low-density polyethylene (11%), and the predominant colors of the plastics were white, blue and green. Cilacap Bay, Indonesia, was contaminated with microplastic at a concentration of 2.5mg.m³. The carbonyl index demonstrated that most of the floating microplastic was only slightly degraded. This study highlights the need to raise environmental awareness through citizen science education and adopting good environmental practices.

Syakti, A. D., et al. (2018). "Simultaneous grading of microplastic size sampling in the Small Islands of Bintan water, Indonesia." Marine Pollution Bulletin **137**: 593-600.

Despite Indonesia being considered as second highest source of marine plastic debris in the world, few studies have been conducted on plastic debris in Indonesia, particularly microplastics. By using a simple device to simultaneously grade floating microplastics, we investigated microplastic contamination in the ecosystem of small islands in Bintan Regency, Riau Island Province, Indonesia. The average number of floating microplastics from 11 beach stations around Bintan Island was 122.8+/-67.8 pieces per station, which corresponds to 0.45 pieces per m³ and represents a low-medium microplastic pollution level compared to the levels of other marine environments worldwide. Polymer identification using Attenuated

Total Reflectance-Fourier Transform Infrared (ATR-FTIR) Spectroscopy successfully identified Polyethylene (PE) (17.3+/-8.3%), Low Density PE (17.6+/-5.5%), Oxidized LDPE (<0.1%), Polypropylene (PP) (54+/-13%), PP Atactic (<0.4%), PP isotactic (<0.2%) and Polystyrene (PS) (10.4+/-9.1%) from different forms and shapes of microplastics i.e., fragments (50.9+/-4.9%), fibers (26.2+/-3%), granule (13.1+/-3.8%) and films (9.8+/-5.1%). We suggest that the generation of these microplastics was likely due to physicochemical processes, including biological degradation in this tropical ecosystem. Environmental implication of microplastics in this area increases the problems associated with ingestion, bioaccumulation and biomagnification across trophic levels and co-pollutants absorbed onto microplastics.

Syakti, A. D., et al. (2019). "Daily apportionment of stranded plastic debris in the Bintan Coastal area, Indonesia." Marine Pollution Bulletin **149 (no pagination)**(110609).

This study aims to provide a baseline report of the apportionment of stranded plastic debris (macro) in Bintan Island beaches. Their quantity and composition were assessed during a 45-day survey demonstrating the occurrence of the 3378 plastic fragments, which were, in decreasing order, constituted by LDPE (22.9%), PS (19.5%), PP (16.6%), PET (10.4%), HDPE (9.2%), PVC (7.2%), PU (4.9%), polyester (4.7%), polyamide (4.3%), and styrene/butadiene (0.3%). The abundance ranged from 1.2 to 4.7 items/m². Additional apportionment ranged from 0.03 to 0.15 items/m² per day with an arithmetic mean of 0.09 +/- 0.05 items/m² per day, mainly related to domestic waste influenced by hydrodynamic action such as longshore current and wind dynamics. Furthermore, we suggested mitigation measures focused on local action to address the plastic debris problem in Bintan beaches, which are typical of the coasts of small islands in Indonesia. Copyright © 2019

Syakti, A. D., et al. (2019). "Bleaching and necrosis of staghorn coral (Acropora formosa) in laboratory assays: Immediate impact of LDPE microplastics." Chemosphere **228**: 528-535.

The impact of low-density polyethylene (LDPE) microplastics (<100 mum; P100-A P100-B, P100-C, 100-200 mum; P200, 200-500 mum; P500) on Acropora formosa was investigated. This study investigated the bleaching and necrosis extent of A. formosa caused by LDPE contamination via laboratory assay. The staghorn coral ingested the microplastics, resulting in bleaching and necrosis that concomitantly occurred with the release of zooxanthellae. P100-A experimentation was the worst case, showing bleaching by day 2 (10.8 +/- 2.2%) and continued bleaching to 93.6% +/- 2.0 by day 14 followed by 5.9 +/- 2.5% necrosis. The overall results confirmed that the LDPE concentration impacts coral health. We highlighted that microplastics have been ingested and partially egested. Their presence showed either a direct or indirect impact on coral polyps via direct interaction or through photosynthesis perturbation due to microplastics that cover the coral surface. Copyright © 2019 Elsevier Ltd

Syberg, K., et al. (2015). "Microplastics: Addressing ecological risk through lessons learned." Environmental Toxicology and Chemistry **34**(5): 945-953.

Plastic litter is an environmental problem of great concern. Despite the magnitude of the plastic pollution in our water bodies, only limited scientific understanding is available about the risk to the environment, particularly for microplastics. The apparent magnitude of the problem calls for quickly developing sound scientific guidance on the ecological risks of microplastics. The authors suggest that future research into microplastics risks should be guided by lessons learned from the more advanced and better understood areas of (eco) toxicology of engineered nanoparticles and mixture toxicity. Relevant examples of advances in these twofields are provided to help accelerate the scientific learning curve within the relatively unexplored area of microplastics risk

assessment. Finally, the authors advocate an expansion of the "vector effect" hypothesis with regard to microplastics risk to help focus research of microplastics environmental risk at different levels of biological and environmental organization. Environ Toxicol Chem 2015;34:945-953. Copyright © 2015 SETAC.

Syberg, K., et al. (2017). "Microplastic potentiates triclosan toxicity to the marine copepod Acartia tonsa (Dana)." Journal of Toxicology and Environmental Health. Part A **80**(23-24): 1369-1371.

Microplastics (MP) are contaminants of environmental concern partly due to plastics ability to sorb and transport hydrophobic organic contaminants (HOC). The importance of this "vector effect" is currently being debated in the scientific community. This debate largely ignores that the co-exposures of MP and HOC are mixtures of hazardous agents, which can be addressed from a mixture toxicity perspective. In this study, mixture effects of polyethylene microbeads (MP) and triclosan (TCS) (a commonly used antibacterial agent in cosmetics) were assessed on the marine copepod Acartia tonsa. Data indicated that MP potentiate the toxicity of TCS, illustrating the importance of understanding the mixture interaction between plastics and HOC when addressing the environmental importance of the vector effect.

Szal, A. (2015). "Is Your State Considering Changes in Chemical Regulations?" Food Manufacturing.

Six states are considering phasing out bisphenol A, or BPA, from consumer products, while four states are set to take up restrictions on cadmium. Other potential measures include restrictions on formaldehyde, triclosan and microbeads.

Szczepanski, M. (2019). "Carbios' Technology Aims to Bio-recycle Plastic on an Industrial Scale." Waste360: N.PAG-N.PAG.

Companies across the globe are developing new ways to reduce plastic waste, which has become a growing problem of concern. Carbios' technology leverages enzymes that fully break down polyethylene terephthalate (PET) plastic waste and polyester fibers feedstock to successfully produce consumer-grade, 100 percent recycled plastic. "Carbios is the first and only company to combine two sciences that are solutions for the end of life of plastics", says Martin Stephan, deputy CEO of Carbios. [Extracted from the article]

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Szczepanski, M. (2019). "India Announces Plans to Ban Scrap Plastic Imports." Waste360: N.PAG-N.PAG.

The article highlights India's announcement for planning ban scrap plastic imports. Topic includes India's efforts to strengthen the implementation of environmentally sound management of hazardous waste; exemption of industries that do not require consent under the Water Prevention and Control of Pollution Act, 1974 and the Air Prevention and Control of Pollution Act, 1981; and encouragement in education especially as programs to reduce contamination.

Szczotka, M., et al. (2012). "Blood dendritic cells in cattle infected with bovine leukemia virus (BLV): isolation and phenotyping." Polish Journal of Veterinary Sciences **15**(4): 599-608.

Dendritic cells (DCs) are most potent antigen presenting cells (APCs) with unique ability to prime

effective immune responses. They express higher levels of MHC class II and accesory molecules on their surface, than other professional APCs. The investigations were performed on DCs generated from blood with the use of microbeads magnetically labeled with mouse anti human CD14. Flow cytometry was applied for determination of DCs immunophenotype in healthy and naturally infected with BLV cattle. For immunophenotyping mouse monoclonal antibodies anti bovine: CD11a, CD11b, CD11c, MHC-I and MHC-II were used. Our results demonstrated that dendritic cells infected with BLV expressed very high percentage of determinants: CD11a, CD11b, CD11c, MHC-I and MHC-II class. Leukaemic DCs exhibited DCs morphology and had a phenotype of mature DCs. The expression of gp51 glycoprotein of BLV on leukaemic DCs was detected in flow cytometry investigations.

T. R, Y. "Towards a Pollution-Free Planet".

The article discusses the highlights of the Third Session of the United Nations Environment Assembly (UNEA-3) held in Nairobi, Kenya in December 2017. Resolutions presented at the session focused on pollution issues, including air quality, marine plastic litter and microplastics and lead paint and lead-acid batteries. Delegates adopted a critical decision on the United Nations Environment Programme's management of trust funds and earmarked contributions.

Tabrizian, N., et al. (2017). "The Biology of beta-D-mannuronic acid (M2000) on Human Dendritic Cell Based on MicroRNA-155 and MicroRNA-221." Current Drug Discovery Technologies **14**(1): 53-58.

BACKGROUND: The aim of this study was to evaluate the effect of s-Dmannuronic acid (M2000) on related miRNAs to dendritic cells (DCs) differentiation. DC-based immunosuppressive drugs can suppress the progression of autoimmune diseases, however, their notable side effects in increasing the risk of infectious diseases and cancers should be considered. The beta-D-mannuronic acid, as a novel non-steroidal anti-inflammatory agent, has been tested in various experimental models.

METHOD: The effect of M2000 on expression of miRNA-155 and miRNA-221 was examined. To investigate how M2000 affects differentiation of human dendritic DCs in a defined inflammatory environment, human peripheral blood mononuclear cells were isolated from healthy blood and the monocytes were purified using anti-CD14 microbeads. The so isolated monocytes were subsequently incubated in the presence of M2000 in two different doses (3 and 6 mMol/well) adding granulocyte-macrophage colony-stimulating factor (GM-CSF) and interleukin-4 for inducing monocytes to immature DC and lipopolysaccharide for running DC differentiation. The expression of miRNA-155 and miRNA-221 were examined with Real Time PCR.

RESULTS: The results demonstrate that M2000 has no significant side effect on expression of miR-155 and miR-221 in both immature DC and mature DC process in vitro.

CONCLUSION: Our findings show that beta-D-mannuronic acid is a safe agent which has no adverse effect on regulatory miRNA-155 and miRNA-221 in dendritic cells.

Tabuenca, B., et al. (2019). "Massive Open Online Education for Environmental Activism: The Worldwide Problem of Marine Litter." Sustainability **11**(10).

Because of the increasing amounts of microplastics and plastics in the environment there are serious concerns about the effects on marine ecosystems, human health [10,11], and food safety [12]. Thinking globally and acting locally is a fundamental attitude to reduce this threat to the environment. [...]in this work, MOOCs are studied as a massive tool focused on action, to explore and disseminate ways of tackling the global problem of marine litter from an educational perspective. Providing in-depth knowledge is the key to identifying the origin of the problem and to providing reachable solutions. [...]this paper shows that students enrolled in the

course aimed at identifying people and specialized organizations to join skills, knowledge, and experiences towards joining forces to combat a worldwide problem (see Section 3.1.2). From a critical perspective, environmental activists might sometimes be isolated in the virtual world leading to inconclusive actions. [...]it is key to facilitate ways to enroll and to participate in active groups to keep the germ of environmental activism from the virtual world (see Section 3.2.1, perceived activism) and also alive in the physical world.

Tagg, A. S. and J. A. Ivar do Sul (2019). "Is this your glitter? An overlooked but potentially environmentally-valuable microplastic." Marine Pollution Bulletin **146**: 50-53.

As microplastic pollution evolved to a well-established research field, microplastic scientists started to explore new avenues in the field. Yet, while a multitude of different types of microplastics (microbeads, fibres, fragments) have been well-documented in microplastic literature, our analysis of this literature shows that glitter particles have been overlooked by the field. However, due to the presence of glitter-based research in forensic science, we explore the idea that glitter may have the potential to act as "flag items" - or markers - of a likely source, due to the often complex and individual composition of glitter particles compared to traditional microplastics, such as microbeads. As such, this article demonstrates glitter has insofar been overlooked as a microplastic particle, and demonstrates that glitter may have an important role in explaining microplastic pollution dynamics from source to sink.

Tagg, A. S. and M. Labrenz (2018). "Closing Microplastic Pathways before They Open: A Model Approach." Environmental Science and Technology **52**(6): 3340-3341.

Taguchi, K., et al. (2014). "Biobased carbon content of resin extracted from polyethylene composite by carbon-14 concentration measurements using accelerator mass spectrometry." Springerplus **3**: 6.

An estimation procedure for biobased carbon content of polyethylene composite was studied using carbon-14 ((14)C) concentration ratios as measured by accelerated mass spectrometry (AMS). Prior to the measurement, additives and fillers in composites should be removed because they often contain a large amount of biobased carbon and may shift the estimation. Samples of resin with purity suitable for measurement were isolated from composites with a Soxhlet extractor using heated cyclohexanone. After cooling of extraction solutions, the resin was recovered as a fine semi-crystalline precipitate, which was easily filtered. Recovery rates were almost identical (99%), even for low-density polyethylene and linear low-density polyethylene, which may have lower crystallinity. This procedure could provide a suitable approach for estimation of biobased carbon content by AMS on the basis of the standard ASTM D 6866. The biobased carbon content for resin extracted from polyethylene composites allow for the calculation of biosynthetic polymer content, which is an indicator of mass percentage of the biobased plastic resin in the composite.

Taguchi, T., et al. (2007). "Detection of Cryptosporidium parvum oocysts using a microfluidic device equipped with the SUS micromesh and FITC-labeled antibody." Biotechnology and Bioengineering **96**(2): 272-280.

Development of a microfluidic device equipped with micromesh for detection of Cryptosporidium parvum oocyst was reported. A micromesh consisting of 10 x 10 cavities was microfabricated on the stainless steel plate by laser ablation. Each cavity size, approximately 2.7 mum in diameter, was adopted to capture a single C. parvum oocyst. Under negative pressure operation, suspensions containing microbeads or C. parvum oocysts flowed into the microchannel. Due to strong non-specific adsorption of microbeads onto the PDMS microchannel surface during sample injection, the surface was treated with air plasma, followed by treatment with 1% sodium dodecyl sulfate (SDS) solution. This process reduced the non-specific adsorption of microbeads on the microchannel to 10% or less in comparison to a non-treated microchannel. This microfluidic device equipped with the SUS micromesh was further applied for the capture of C. parvum oocysts. Trapped C. parvum oocysts were visualized by staining with FITC-labeled anti-C. parvum oocyst antibody on a micromesh and counted under fluoroscopic observation. The result obtained by our method was consistent with that obtained by direct immunofluorescence assay coupled with immunomagnetic separation (DFA-IMS) method, indicating that the SUS micromesh is useful for counting of C. parvum oocysts. The newly designed microfluidic device exploits a geometry that allowed for the entrapment of oocysts on the micromesh while providing the rapid introduction of a series of reagents and washes through the microfluidic structure. Our data indicate that this microfluidic device is useful for high-throughput counting of C. parvum oocysts from tap water sample. © 2006 Wiley Periodicals, Inc.

Tahir, A., et al. (2019). Studies on microplastic contamination in seagrass beds at Spermonde Archipelago of Makassar Strait, Indonesia. Journal of Physics: Conference Series.

There is growing awareness and concern on microplastics pollution in marine environments. Seagrasses are among the most productive shallow water ecosystems, serving a diverse assemblage of fish and invertebrates. Sediment and benthic animal samples collected from small islands at Spermonde archipelago confirmed the presence of microplastics with different levels of contamination. The occurrence of microplastics for up to 28.29% and 25% of contamination level in sediments and benthic animals, respectively, clearly indicated an alarming state of the microplastics pollution in rich and productive shallow water seagrass ecosystem of tropical seas. Moreover, all positively contaminated microplastics of benthic animals are for human consumption and therefore pose threats for microplastics transfers which may facilitate pathways for a wide spectrum of organic pollutants entering the food web and affecting human health. © 2019 Published under licence by IOP Publishing Ltd.

Tahir, A., et al. (2019). "Microplastics in water, sediment and salts from traditional salt producing ponds." Global Journal of Environmental Science and Management **5**(4): 431-440.

Plastic pollution has universally known accumulated in all environment compartments and accelerating threat to the sustainability of earth. Field survey to examine the occurrence of microplastics in ancient sea water evaporation technology of ponds at Pallengu-Jeneponto, was conducted. From this sea salt producing ponds, samples of water, sediment and freshly harvested salts were collected. Sixteen samples each of water and sediments and 12 salts were collected. From 16 water and sediment samples there are 31 microplastics item discovered in 11 water samples (68.75% of total contamination) and 41 microplastics item observed in 10 sediment samples (62.5% total contamination), respectively. Interestingly, sampling points at sedimentation/heating pools were found to be the locations with highest occurrence of microplastics in both water and sediment. There are 7 salt samples positively contaminated with 29 microplastics or 58.3% of total contamination, which predominated by line and fragment forms. Fourier transform infra-red spectroscopy analysis has revealed polymers of polyvinyl acetate (41.7%), polyethylene (33.3%) and polystyrene (25%). There was no significant difference found on microplastics occurrence from 3 kinds of samples collected, although there was a decreasing trend of total microplastics found from water, sediment and salt. Microplastics abundance were ranged 7-55 items/L water, 14.6-50 items/kg sediments and 6.7-53.3 items/kg salt. With microplastics abundance reached over 53 microplastics items/kg salt, it is believed

that continuous consumption by people will end up with possible accumulation of potentially absorbed of various toxic chemical pollutants which present in sea water as salt raw materials. The need for robust and practical strategy in water quality management for reduction of microplastics contamination in consumed salts is a must.

Takacova, M., et al. (2016). "Encapsulation of anti-carbonic anhydrase IX antibody in hydrogel microspheres for tumor targeting." Journal of Enzyme Inhibition & Medicinal Chemistry **31**(sup1): 110-118.

Encapsulation is a well-established method of biomaterial protection, controlled release, and efficient delivery. Here we evaluated encapsulation of monoclonal antibody M75 directed to tumor biomarker carbonic anhydrase IX (CA IX) into alginate microbeads (SA-beads) or microcapsules made of sodium alginate, cellulose sulfate, and poly(methylene-co-guanidine) (PMCG). M75 antibody release was quantified using ELISA and its binding properties were assessed by immunodetection methods. SA-beads showed rapid M75 antibody release in the first hour, followed by steady release during the whole experiment of 7 days. In contrast, the M75 release from PMCG capsules was gradual, reaching the maximum concentration on the 7th day. The release was more efficient at pH 6.8 compared to pH 7.4. The released antibody could recognize CA IX, and target the CA IX-positive cells in 3D spheroids. In conclusion, SA-beads and PMCG microcapsules can be considered as promising antibody reservoirs for targeting of cancer cells.

Takamatsu, H., et al. (2016). "Development of novel human anti-HLA-monoclonal antibodies for clinical applications using peripheral blood B cells derived from anti-HLA antibody-positive donors." Blood. Conference: 58th Annual Meeting of the American Society of Hematology, ASH **128**(22).

Introduction: The development of monoclonal antibodies (mAbs) such as anti-CD20 mAb (rituximab) and anti-CD38 mAb (daratumumab) has revolutionized the treatment of lymphoid malignancies. Potential efficacy of HLA allele-specific mAbs in treating malignant lymphoma has been shown by several studies. However, treatment of B-cell malignancies with humanized mAbs against HLA-DR alleles is associated with infusion-related toxicities (Lin et al., Leuk Lymphoma, 2009). In addition, previous attempts to develop mAbs specific to some HLA alleles (e.g., HLA-B61) by immunizing mice with recombinant HLA proteins have failed, likely because of a wide Variety of polymorphisms of HLA molecules. To overcome these problems, we recently created a novel method to develop mAbs using microarray technology and human peripheral blood (PB) B lymphocytes derived from donors who are positive for anti-HLA antibodies. The process took approximately 1 month to produce human anti-HLA mAbs. Method(s): Approximately 20 ml of PB was collected from anti-HLA antibody-positive donors, and mononuclear cells (MNCs) isolated using the Ficoll-Hypaque method were cultured in RPMI-1640 + 10% FCS containing 5 mug/ml R-848, 1000 IU/ml hIL2, 2.5 mug/ml CpG2006, 2.5 mug/ml anti-CD40 antibody, 100 ng/ml hIL21, 2 ng/ml hIL17, 10 ng/ml hIL4, and 100 ng/ml hBAFF for 6 days. CD138⁺ cells were then isolated using anti-CD138-antibody-conjugated microbeads. A microwell array chip was manufactured using micromachining techniques, as previously described (Jin et al., Nature Medicine, 2009). Microwells (diameter, 10 mum; depth, 15 mum) were formed on a silicon surface. The chip was coated with a PBS-containing purified HLA antigen (10 mug/ml) and incubated overnight at 4degreeC. After removing the antigen solution, 50 mul of the CD138⁺ cell suspension was added to the chip, and the mixture was incubated for 4 h at 37degreeC. After gentle washing with PBS, 2 mug/ml of anti-human IgG Fc-Cy3 solution was added to the microwells, and the plate was left at room temperature for 15 min. Finally, the cells were

stained with 1 muM Oregon Green for 2 min. The microwells were screened for the antigen-specific antibodies released from single cells under a fluorescence microscope. Antigen-specific antibody-secreting cells (ASCs) from individual wells were isolated using a micromanipulator fitted with capillaries under the fluorescence microscope and were then expelled to microtubes for reverse transcription. The antibody cDNA fragments for VH and VL fragments were amplified using the single-cell 5'-RACE method and inserted into expression vectors containing the complete constant region of cDNA for heavy or light chains. Thereafter, CHO cells were transfected with both the heavy and light chain expression vectors to obtain a supernatant containing complete antibody molecules. The antigen specificity of the recombinant antibodies was examined using ELISA and flow cytometry (FCM). The frequency of ASCs in the PB-MNCs of donors was quantified using allele-specific oligonucleotide PCR. Complement-dependent cytotoxicity (CDC) and antibody-dependent cellular cytotoxicity (ADCC) of the mAbs were assessed using conventional methods. Results and Discussion: Two novel human mAbs specific to HLA-A24 and HLA-B61 were successfully generated. The antigen specificity of the mAbs was confirmed using ELISA and FCM. The mAbs bound to normal and malignant blood cells that expressed corresponding HLA alleles and showed CDC/ADCC activities against five B lymphoblastoid cell lines but not against lymphocytes/monocytes/granulocytes derived from five healthy donors, probably because of low expression levels of the target HLA alleles. The frequency of ASCs in PB-MNCs of donors was less than 0.001%. Conclusion(s): The present method enabled the generation of mAbs specific to HLA alleles, which can be used for detecting minimal residual diseases of hematological malignancies as well as for treating B-cell lymphoma, within 1 month.

Takano, K., et al. (2015). "Increase of transglutaminase 2 expression and endocytosis activity by amphotericin B in mouse microglial cell line BV-2." Journal of Pharmacological Sciences **1)**: S221.

Amphotericin B (AmB), a polyene antibiotic, is reported to have therapeutic effects on prion diseases, in which the activation of glial cells has been suggested to play important roles by proliferating and producing various factors such as nitric oxide (NO), proinflammatory cytokines, and so on. In the previous study, we presented that AmB induced NO production and proinflammatory cytokines expression, and changed neurotrophic factors expression in cultured microglia. On the other hand, transglutaminase 2 (TG2), a crosslinking enzyme, is reported to be involved in inflammation and neurodegenerative diseases. In the present study, we investigated the effects of AmB on TG2 expression and endocytosis activity in mouse microglial cell line BV-2. We found that AmB could increase TG2 expression and TG activity in a concentration-dependent manner. AmB also increased endocytosis activity assessed by incorporation of fluorescent microbeads or dead-cells. AmB-increased TG2 expression and endocytosis activity were suppressed by a TG inhibitor, cystamine. These results suggest that AmB could activate microglia to increase phagocytosis accompanied with TG2 expression.

Takao, M., et al. (2018). "Flow cytometric quantitation of EpCAM-positive extracellular vesicles by immunomagnetic separation and phospholipid staining method." Genes to Cells **23**(11): 963-973.

Extracellular vesicles (EV) have attracted attention as circulating biomarkers for many diseases, particularly cancer. Conventional immunofluorescence staining has been used for the detection of target antigens on EV by flow cytometry. However, the staining intensity depends on the amount of antigen expressed on the vesicles and is often only around the noise level. Instead of immunofluorescence, we combined immunomagnetic separation using nanosize MACS MicroBeads with phospholipid staining of EV (IMS-PS method). EpCAM-positive EV were prepared from the culture supernatants of OVCAR3 (EpCAM-high), A431 (EpCAM-low) or

Colon-26 (non-human control) cells as cancer models and were examined by the IMS-PS method using EpCAM mAb-coated MicroBeads. By employing Polaric-500c6F as the dye for staining EV phospholipids and using appropriate flow cytometry settings, autofluorescence was excluded, whereas pretreatment of the MicroBeads with conventional blocking agents reduced nonspecific binding to non-target vesicles. These modifications resulted in a linear relation between the number of EV detected and the sample volume, regardless of the level of EpCAM expression on the vesicles. A431 EV spiked into healthy volunteer plasma were enumerated with good accuracy. The IMS-PS method may be useful for clinical evaluation of EV with low levels of antigen expression that are difficult to detect by conventional immunofluorescence.

Takao, M. and K. Takeda (2011). "Enumeration, characterization, and collection of intact circulating tumor cells by cross contamination-free flow cytometry." Cytometry Part A: The Journal of the International Society for Analytical Cytology **79**(2): 107-117.

Circulating tumor cells (CTC) are an important biomarker for several solid cancers. Most of the commercially available systems for enumeration of CTC are based on immunomagnetic enrichment of epithelial cell adhesion molecule (EpCAM/CD326)-expressing CTC before microscopic cell imaging or reverse-transcription PCR (RT-PCR). The aim of this study was to establish a practical method for enumeration of CTC using a novel flow cytometer that has a disposable microfluidic chip, which is designed to realize absolute cross contamination-free measurements and to collect the analyzed cell sample. Although the process of enumeration and labeling of CTC was optimized for this device, the simplified protocol described here could be applied to other flow cytometers. Cultured cancer cells spiked into normal blood were enriched using MACS EpCAM-MicroBeads following cell labeling with an allophycocyanin (APC)-conjugated EpCAM mAb, instead of by intracellular staining of cytokeratins (CK). The EpCAM double-positive selection/labeling method allows enumeration of intact CTC, maintenance of cellular integrity, and the concomitant performance of a CTC viability test. The combination of the fine-tuned CTC enrichment process and the cytometric multicolor analysis resulted in a linear relationship between the output cell count and the input cell number from zero to hundreds of cells. In particular, a satisfactory signal/noise ratio was obtained by gate-exclusion of leukocyte signals using an anti-CD45 mAb. The entire process had little influence on the viability of the spiked lung cancer cell PC-9. Measured PC-9 and breast cancer MCF-7 cells bearing EpCAM-MicroBeads, APC-conjugated EpCAM mAb, and the DNA staining dye SYTO9 grew normally, demonstrating the potential usefulness of the collected samples for further studies. This intact CTC enumeration and analysis procedure (iCeap) would be of great benefit to clinicians by providing them with rapid stratification of antitumor therapy, and to basic researchers by permitting further molecular and cellular characterization of CTC.

Takayama, H., et al. (1985). "[A case of ossifying fibroma of the skull]." No Shinkei Geka - Neurological Surgery **13**(6): 669-673.

A 23-year-old woman was admitted to our hospital because of a soft, painful mass in the right parietal region for a month. Neurological examination revealed no abnormality. Laboratory data including serum Ca, P and alkaline phosphatase were normal. Skull x-ray film showed a partially osteolytic, not well circumscribed lesion in the right frontal, parietal and occipital bone. No remarkable sclerotic area was seen in the lesion. CT scan showed that the lesion was located in the diploe, destroying both inner and outer tables of the bone. Right external carotid angiogram revealed that the lesion is supplied by the branches of superficial temporal artery and middle meningeal artery. 99mTc bone scan showed increased uptake in the lesion. The patient underwent a right parietal craniectomy. The skull bone was invaded by the tumor, which was yellow-brown in color, thickened and fragile. We could easily perforate it through. The tumor didn't invade the dura mater or periosteum. It was extensively removed with an airtome and rongeurs. A cranioplasty was carried out using a plastic resin. The pathological specimen showed that the tumor was mainly composed of mature, regularly-aligned bone and intermingled fibrous tissue. Neither mitosis nor atypical cellular features was seen. These findings were compatible with the diagnosis of ossifying fibroma. The postoperative course was uneventful and the patient was discharged in a good condition. There was no evidence of local recurrence 10 months later. Ossifying fibroma is a rare, benign bone tumor that mainly involves the craniofacial bone. The differential diagnosis of ossifying fibroma versus fibrous dysplasia is difficult. These diseases can be differentiated on combined clinical, radiological and morphological grounds.

Takenouchi, T., et al. (2017). "Immortalization and Characterization of Porcine Macrophages That Had Been Transduced with Lentiviral Vectors Encoding the SV40 Large T Antigen and Porcine Telomerase Reverse Transcriptase." Frontiers in Veterinary Science **4**: 132.

The domestic pig is an important agricultural animal, and thus, infectious diseases that affect pigs can cause severe economic losses in the global swine industry. Various porcine pathogens target macrophages, which are classical innate immune cells. Although macrophages basically protect the host from pathogens, they also seem to contribute to infectious processes. Therefore, cultured macrophages can be used to develop in vitro models for studying not only genes associated with porcine innate immunity but also the infectious processes of porcine pathogens. However, the availability of porcine macrophage cell lines is limited. In this study, we describe a novel immortalized porcine kidney-derived macrophage (IPKM) cell line, which was generated by transferring the SV40 large T antigen (SV40LT) and porcine telomerase reverse transcriptase (pTERT) genes into primary porcine kidney-derived macrophages using lentiviral vectors. The IPKM displayed a typical macrophage morphology and was routinely passaged (doubling time: about 4 days). These cells were immunostained for macrophage markers. In addition, they exhibited substantial phagocytosis of polystyrene microbeads and released inflammatory cytokines upon lipopolysaccharide (LPS) stimulation. Furthermore, the maturation and secretion of interleukin-1beta were observed after nigericin-induced inflammasome activation in LPS-primed IPKM. These findings suggest that IPKM exhibit the typical inflammatory characteristics of macrophages. By transferring the SV40LT and pTERT genes using lentiviral vectors, we also successfully immortalized macrophages derived from the peripheral blood of a low-density lipoprotein receptor-deficient pig. These results suggest that the co-expression of SV40LT and pTERT is an effective way of immortalizing porcine macrophages.

Takeuchi, M., et al. (2009). "Chemistry of fly ash and cyclone ash leachate from waste materials and effects of ash leachates on bacterial growth, nitrogen-transformation activity, and metal accumulation." Journal of Hazardous Materials **165**(1-3): 967-973.

The effects of waste ash leachates on soil microorganism were evaluated along with a chemical characterization of ash leachates. Thirty fly ash samples and cyclone ash samples obtained from the incineration of municipal solid waste, plastic waste, and construction waste were used. Twenty-one and 22 samples inhibited N transformation activity of soil microorganism and growth of Bacillus subtilis, respectively. On the other hand, 11 and 18 samples stimulated bacterial activity and growth, respectively, at low concentrations. Generally, cyclone ash contained a smaller amount of toxic metals than fly ash. Our results suggest that cyclone ash can be further studied for reuse, perhaps as a soil amendment. Pb was found to be highly accumulated in B. subtilis cells, and should be carefully monitored when waste ash is reused in

the environment.

Taki, H., et al. (2019). "Fundamental evaluation and optimization of porous spherical silica for developing functional fine particles via fluidized bed coating." International Journal of Pharmaceutics **571**: 118685.

Particle coating, a taste-masking technique for drugs, is limited by its long manufacturing time, which is caused by the decrease in the spray rate required to prevent particle agglomeration. Mesoporous silica particles, which have a high surface area and pore sizes in the range of 2-50nm, possess high surface free energy; they have attracted significant interest for numerous applications in adsorption, separation, and catalysis and drug delivery. A form of mesoporous silica, microbead silicate, can prevent particle aggregation because of its good water absorbency and drying properties. Hence, it has been suggested to be applicable for particle coating. This study evaluated the physical properties and drug release capability of microbead silicate with different pore sizes. Although microbead silicate with small pores displayed a rapid drug release profile, drug release was incomplete. Contrastingly, microbead silicate with large pores achieved complete drug release even with high drug loading. Furthermore, in the case of 100% layering, the porosity of microbead silicate was maintained, thus sufficiently preventing aggregation due to the prevention of formation of liquid bridging of the coating solution. These results suggest that using microbead silicate with large pores for particle coating enables complete drug release while improving manufacturability.

Tallec, K., et al. (2019). "Surface functionalization determines behavior of nanoplastic solutions in model aquatic environments." Chemosphere **225**: 639-646.

Plastic debris are classified as a function of their size and recently a new class was proposed, the nanoplastics. Nano-sized plastics have a much greater surface area to volume ratio than larger particles, which increases their reactivity in aquatic environment, making them potentially more toxic. Only little information is available about their behavior whereas it crucially influences their toxicity. Here, we used dynamic light scattering (DLS) to explore the influence of environmental factors (fresh- and saltwater, dissolved organic matter) on the behavior (surface charge and aggregation state) of three different nano-polystyrene beads (50nm), with (i) no surface functionalization (plain), (ii) a carboxylic or (iii) an amine functionalization. Overall, the positive amine particles were very mildly affected by changes in environmental factors with no effect of the salinity gradient (from 0 to 653mM) and of a range 1-30mug.L⁻¹ and 1-10mug.L⁻¹ of organic matter in artificial seawater and ultrapure water, respectively. These observations are supposedly linked to a coating specificity leading to repulsive mechanisms. In contrast, the stability of the negatively charged carboxylic and plain nanobeads was lost under an increasing ionic strength, resulting in homo-aggregation (up to 10mum). The increase in organic matter content had negligible effect on these two nanobeads. Analysis performed over several days demonstrated that nanoplastics formed evolving dynamic structures detected mainly with an increase of the homo-aggregation level. Thus, surface properties of given polymers/particles are expected to influence their fate in complex and dynamic aquatic environments.

Tallec, K., et al. (2018). "Nanoplastics impaired oyster free living stages, gametes and embryos." Environmental Pollution **242**(Part B): 1226-1235.

In the marine environment, most bivalve species base their reproduction on external fertilization. Hence, gametes and young stages face many threats, including exposure to plastic wastes which represent more than 80% of the debris in the oceans. Recently, evidence has been produced on the presence of nanoplastics in oceans, thus motivating new studies of their impacts on marine life. Because no information is available about their environmental concentrations, we performed dose-response exposure experiments with polystyrene particles to assess the extent of micro/nanoplastic toxicity. Effects of polystyrene with different sizes and functionalizations (plain 2- micro m, 500-nm and 50-nm; COOH-50 nm and NH₂-50 nm) were assessed on three key reproductive steps (fertilization, embryogenesis and metamorphosis) of Pacific oysters (Crassostrea gigas). Nanoplastics induced a significant decrease in fertilization success and in embryo-larval development with numerous malformations up to total developmental arrest. The NH₂-50 beads had the strongest toxicity to both gametes (EC₅₀=4.9 micro g/mL) and embryos (EC₅₀=0.15 micro g/mL), showing functionalization-dependent toxicity. No effects of plain microplastics were recorded. These results highlight that exposures to nanoplastics may have deleterious effects on planktonic stages of oysters, presumably interacting with biological membranes and causing cyto/genotoxicity with potentially drastic consequences for their reproductive success.

Talvitie, J., et al. (2015). "Do wastewater treatment plants act as a potential point source of microplastics? Preliminary study in the coastal Gulf of Finland, Baltic Sea." Water Science & Technology **72**(9): 1495-1504.

This study on the removal of microplastics during different wastewater treatment unit processes was carried out at Viikinmaki wastewater treatment plant (WWTP). The amount of microplastics in the influent was high, but it decreased significantly during the treatment process. The major part of the fibres were removed already in primary sedimentation whereas synthetic particles settled mostly in secondary sedimentation. Biological filtration further improved the removal. A proportion of the microplastic load also passed the treatment and was found in the effluent, entering the receiving water body. After the treatment process, an average of 4.9 (+/-1.4) fibres and 8.6 (+/-2.5) particles were found per litre of wastewater. The total textile fibre concentration in the samples collected from the surface waters in the Helsinki archipelago varied between 0.01 and 0.65 fibres per litre, while the synthetic particle concentration varied between 0.5 and 9.4 particles per litre. The average fibre concentration was 25 times higher and the particle concentration was three times higher in the effluent compared to the receiving body of water. This indicates that WWTPs may operate as a route for microplastics entering the sea.

Talvitie, J., et al. (2017). "Solutions to microplastic pollution - Removal of microplastics from wastewater effluent with advanced wastewater treatment technologies." Water Research **123**: 401-407.

Conventional wastewater treatment with primary and secondary treatment processes efficiently remove microplastics (MPs) from the wastewater. Despite the efficient removal, final effluents can act as entrance route of MPs, given the large volumes constantly discharged into the aquatic environments. This study investigated the removal of MPs from effluent in four different municipal wastewater treatment plants utilizing different advanced final-stage treatment technologies. The study included membrane bioreactor treating primary effluent and different tertiary treatment technologies (discfilter, rapid sand filtration and dissolved air flotation) treating secondary effluent. The MBR removed 99.9% of MPs during the treatment (from 6.9 to 0.005 MP L⁻¹), rapid sand filter 97% (from 0.7 to 0.02 MP L⁻¹), dissolved air flotation 95% (from 2.0 to 0.1 MP L⁻¹) and discfilter 40-98.5% (from 0.5 - 2.0 to 0.03-0.3 MP L⁻¹) of the MPs during the treatment. Our study shows that with advanced final-stage wastewater treatment technologies WWTPs can substantially reduce the MP pollution discharged from wastewater treatment plants into the aquatic environments.

Talvitie, J., et al. (2017). "How well is microlitter purified from wastewater? - A detailed study on the stepwise removal of microlitter in a tertiary level wastewater treatment plant." Water Research **109**: 164-172.

Wastewater treatment plants (WWTPs) can offer a solution to reduce the point source input of microlitter and microplastics into the environment. To evaluate the contributing processes for microlitter removal, the removal of microlitter from wastewater during different treatment steps of mechanical, chemical and biological treatment (activated sludge) and biologically active filter (BAF) in a large (population equivalent 800 000) advanced WWTP was examined. Most of the microlitter was removed already during the pre-treatment and activated sludge treatment further decreased the microlitter concentration. The overall retention capacity of studied WWTP was over 99% and was achieved after secondary treatment. However, despite of the high removal performance, even an advanced WWTP may constitute a considerable source of microlitter and microplastics into the aquatic environment given the large volumes of effluent discharged constantly. The microlitter content of excess sludge, dried sludge and reject water were also examined. According to the balance analyses, approximately 20% of the microlitter removed from the process is recycled back with the reject water, whereas 80% of the microlitter is contained in the dried sludge. The study also looked at easy microlitter sampling protocol with automated composite samplers for possible future monitoring purposes.

Tamaddon, F. and W. Hogland (1993). "Review of cadmium in plastic waste in Sweden." Waste Management and Research **11**(4): 287-295.

Cadmium containing stabilizers are used only in certain polyvinylchloride (PVC) products for special weather, light or temperature resistance. The total consumption of cadmium used as a chemical stabilizer in Sweden is expected to be about 1.5 tonnes/year in 1991-1992, while the amount in pigments is approximated to be 6 tonnes/year. It is determined that most of the cadmium that enters into the combustible fraction of municipal solid waste (MSW) comes from plastics and pigments in various products. Acrylonitrile Butadiene Styrene copolymers (ABS) products are the main source of plastics contained cadmium pigments. These products are usually consumer electronics such as television and telephone sets, computer, radios, etc. In practice, it is very difficult for a country like Sweden to act alone and implement regulations for cadmium due to international trade and heavy import/export of products. There is no doubt that the transition period to adopt other alternatives, as requested by the Swedish Cadmium Ordinance, takes time and a flow of cadmium from plastic wastes into landfills and incinerators is expected during the coming years. This is also due to the long lifetime of some plastic products which contain cadmium. Continuous and consistent monitoring of cadmium in landfills and incineration plants is required in order to be able to evaluate the effect of the Ordinance on cadmium.

Tamminga, M., et al. (2018). "Microplastic analysis in the South Funen Archipelago, Baltic Sea, implementing manta trawling and bulk sampling." Marine Pollution Bulletin **128**: 601-608.

Microplastic contamination in surface waters of the South Funen Archipelago in Denmark was assessed. Therefore, ten manta trawls were conducted in June 2015. Moreover, 31 low-volume bulk samples were taken to evaluate, whether consistent results in comparison to the net-based approach can be obtained. Microplastic contamination in the South Funen Archipelago (0.07+/-0.02particles/m3) is slightly below values reported before. The sheltered position of the study area, low population pressure on adjacent islands and the absence of any major potential point sources were identified as major factors explaining the low concentration of microplastics. Within the Archipelago, harbors or marinas and the associated vessel traffic are the most probable sources of microplastics. The concentration of microplastics in low-volume bulk samples is not comparable to manta trawl results. This is mainly due to insufficient representativeness of the bulk sample volumes.

Tamminga, M., et al. (2019). "On the representativeness of pump water samples versus manta sampling in microplastic analysis." Environmental Pollution **254**: N.PAG-N.PAG.

To broaden the understanding of sources, pathways and sinks for microplastic pollution in the environment, the exact and representative determination of pollution levels is crucial. Still, sampling techniques differ greatly between studies and the influence of these differences is not fully understood. Thus, we evaluate the representativeness of manta trawling and pump sampling for microplastics in a freshwater lake. While large microplastics are not captured by most pump sampling approaches due to their low abundance, small and fibrous microplastics pass the relatively coarse nets of volume-reduced techniques. Testing different water volumes for pump samples, we show that sample volumes should be large enough to minimize overestimation induced by scaling up results. Moreover, we discuss the influence of sample numbers for microplastic analysis. Finally, we argue that manta trawling and pump sampling are complementary techniques, as they cover different parts of the overall microplastic pollution. Image 1 • Manta trawling and pump sampling are complementary techniques. • Sample volumes have a strong influence on obtained results. • Sampling replicates of more than five are needed to prevent extensive variation. • Nile Red staining showed a high validation rate (98.6%) by µ-Raman-spectroscopy. • Microplastic pollution followed spatial gradients driven by human activities. We assess the representative collection of microplastics in freshwater bodies by comparing manta trawling and bulk water sampling and demonstrate these to be complementary techniques. [ABSTRACT FROM AUTHOR]

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Tamura, M., et al. (2014). "Optical cell separation from three-dimensional environment in photodegradable hydrogels for pure culture techniques." Scientific Reports **4**: 4793.

Cell sorting is an essential and efficient experimental tool for the isolation and characterization of target cells. A three-dimensional environment is crucial in determining cell behavior and cell fate in biological analysis. Herein, we have applied photodegradable hydrogels to optical cell separation from a 3D environment using a computer-controlled light irradiation system. The hydrogel is composed of photocleavable tetra-arm polyethylene glycol and gelatin, which optimized cytocompatibility to adjust a composition of crosslinker and gelatin. Local light irradiation could degrade the hydrogel corresponding to the micropattern image designed on a laptop; minimum resolution of photodegradation was estimated at 20 micro m. Light irradiation separated an encapsulated fluorescent microbead without any contamination of neighbor beads, even at multiple targets. Upon selective separation of target cells in the hydrogels, the separated cells have grown on another dish, resulting in pure culture. Cell encapsulation, light irradiation and degradation products exhibited negligible cytotoxicity in overall process.

Tan, X., et al. (2019). "Microplastics and associated PAHs in surface water from the Feilaixia Reservoir in the Beijiang River, China." Chemosphere **221**: 834-840.

Microplastics have been a prevalent and persistent contamination problem in the global aquatic environment. In particular, microplastics that can adsorb persistent organic pollutants (POPs) and therefore transfer these POPs to organisms in the aquatic environment have received much attention. In this study, an investigation of microplastics in the surface water of the Feilaixia Reservoir (Guangdong Province, China), which is an important part of people's daily lives in Guangdong Province was carried out, mainly focusing on the characteristics and spatial distribution of microplastics, as well as microplastics and their adsorded PAHs in the surface water of the Feilaixia Reservoir were investigated. The average abundance of microplastics in the surface water of the Feilaixia Reservoir was 0.56+/-0.45 items/m³. Six kinds of polymers, including polyethylene (PE), polypropylene (PP), polystyrene (PS), expanded polystyrene (EPS), polyvinyl chloride (PVC) and polyethylene terephthalate (PET), were identified, among which PP (52.31%) and PE (27.39%) were the major compositions. Four shapes of microplastics, i.e., foams, films, fragments and fibers were found, and films (37.78%) being the main shape. The most common typical size of the plastic particles ranged from 0.6 to 2mm (41.36%). The total concentration of the sixteen PAHs carried on the EPS, PE and PP microplastics ranged from 282.4 to 427.3ng/g; chrysene, benzo [ghi] perylene, and phenanthrene were abundant in the samples, at concentrations of 39.5-89.6ng/g, 34.6-56.8ng/g and 25.6-45.6ng/g, respectively. Based on the ratios of the PAH isomers (Flut/Py<1 and Phe/Ant >10), it was speculated that the source of the PAHs may be derived from the imperfect combustion of fossil fuels.

Tan, Y., et al. (2010). "Mechanical characterization of human red blood cells under different osmotic conditions by robotic manipulation with optical tweezers." IEEE Transactions on Biomedical Engineering **57**(7): 1816-1825.

The physiological functions of human red blood cells (RBCs) play a crucial role to human health and are greatly influenced by their mechanical properties. Any alteration of the cell mechanics may cause human diseases. The osmotic condition is an important factor to the physiological environment, but its effect on RBCs has been little studied. To investigate this effect, robotic manipulation technology with optical tweezers is utilized in this paper to characterize the mechanical properties of RBCs in different osmotic conditions. The effectiveness of this technology is demonstrated first in the manipulation of microbeads. Then the optical tweezers are used to stretch RBCs to acquire the force-deformation relationships. To extract cell properties from the experimental data, a mechanical model is developed for RBCs in hypotonic conditions by extending our previous work , and the finite element model is utilized for RBCs in isotonic and hypertonic conditions. Through comparing the modeling results to the experimental data, the shear moduli of RBCs in different osmotic solutions are characterized, which shows that the cell stiffness increases with elevated osmolality. Furthermore, the property variation and potential biomedical significance of this study are discussed. In conclusion, this study indicates that the osmotic stress has a significant effect on the cell properties of human RBCs, which may provide insight into the pathology analysis and therapy of some human diseases.

Tanabe, S., et al. (2004). "PCDDs, PCDFs, and Coplanar PCBs in Albatross from the North Pacific and Southern Oceans: Levels, Patterns, and Toxicological Implications." Environmental Science & Technology **38**(2): 403-413.

Concentrations of polychlorinated dibenzo-p-dioxins (PCDDs), polychlorinated dibenzofurans

(PCDFs), and coplanar polychlorinated biphenyls (coplanar PCBs) were determined in five albatross species collected from the North Pacific and Southern Oceans to assess the north-south differences in residue levels, accumulation patterns, and toxic potential. Black-footed and Laysan albatrosses from the North Pacific Ocean contained higher levels of PCDD/ Fs and coplanar PCBs than albatrosses from the Southern Ocean, indicating that emission sources of these contaminants were predominant in the northern hemisphere. Residue levels in albatrosses from the remote North Pacific Ocean far from the point source of pollution were comparable to or higher than those in terrestrial and coastal birds from contaminated areas in developed nations, suggesting the specific exposure and accumulation of PCDD/ Fs and coplanar PCBs in albatross. The long life span and ingestion of plastic resin pellets by albatrosses could be the plausible explanations for the elevated accumulation of persistent and lipophilic contaminants including PCDD/ Fs and coplanar PCBs in these birds. Relative proportions of PCOFs and coplanar PCBs in albatross were higher than those observed in birds inhabiting terrestrial and coastal areas, suggesting that these toxic chemicals may have higher transportability by air and water than PCDDs. [ABSTRACT FROM AUTHOR]

Tanaka, K. and H. Takada (2016). "Microplastic fragments and microbeads in digestive tracts of planktivorous fish from urban coastal waters." Scientific Reports **6**: 34351.

We investigated microplastics in the digestive tracts of 64 Japanese anchovy (Engraulis japonicus) sampled in Tokyo Bay. Plastic was detected in 49 out of 64 fish (77%), with 2.3 pieces on average and up to 15 pieces per individual. All of the plastics were identified by Fourier transform infrared spectroscopy. Most were polyethylene (52.0%) or polypropylene (43.3%). Most of the plastics were fragments (86.0%), but 7.3% were beads, some of which were microbeads, similar to those found in facial cleansers. Eighty percent of the plastics ranged in size from 150 mum to 1000 mum, smaller than the reported size range of floating microplastics on the sea surface, possibly because the subsurface foraging behavior of the anchovy reflected the different size distribution of plastics between surface waters and subsurface waters. Engraulis spp. are important food for many humans and other organisms around the world. Our observations further confirm that microplastics have infiltrated the marine ecosystem, and that humans may be exposed to them. Because microplastics retain hazardous chemicals, increase in fish chemical exposure by the ingested plastics is of concern. Such exposure should be studied and compared with that in the natural diet.

Tanaka, Y., et al. (2003). "Nasal reconstruction with an auricular helix free flap. [Japanese]." Japanese Journal of Plastic and Reconstructive Surgery **46**(9): 901-908.

Free flaps derived from the ascending helix of the ear have been used to reconstruct defects of the nose. However, the pedicle of an auricular helix free flap is short and the recipient vessels in the naso-labial groove are often too small for microsurgical anastomosis. Therefore, long vein grafts are necessary in most cases for arterial and venous repair. Long vein grafts are believed to carry a greater risk of failure and this is the reason why many surgeons are reluctance to use an auricular helix free flap even though it could provide an excellent match of color and contour. Our methods of nasal reconstruction with an auricular free flap are described here. To allow greater reliability in an auricular free flap transfer, we used the descending branch of the lateral circumflex femoral artery and its venae comitantes instead of vein grafts. In addition, cranio-plastic resin and a nasal-retainer were used to fashion a complicated three-dimensional defect of the nose, and the resin model was transferred to the ascending helix to determine the amount of skin and cartilage required. These strategies will be of use in obtaining good results for nasal reconstruction using an auricular helix free flap.

Tanase, E. E., et al. (2017). "Sustainable packaging solutions for organic fresh berries." Food and Environment Safety **16**(4): 269-275.

Climate changes and particularly global warming are topics carefully treated by specialists already since decades. The most pregnant factor that influences climate change is pollution, namely the high level carbon dioxide emissions. Besides other substances used by the most of the industries (oil, charcoal, fertilizers, etc.), plastics are not to be ignored when talking about pollution. Plastic waste affects animals and humans, as well as their habitat. In this respect, food industry engages in preserving the good functioning of the environment by developing and using biodegradable and bio-based resources for food packaging. The aim of this literature review was to identify the optimal sustainable packaging solution used for berries. The results of the study pointed out that the most used environmentally friendly packaging technique is the one that involves modified atmosphere. In terms of packaging materials, the literature is limited when it comes to biodegradable/bio-based solutions. However, active packaging gains popularity among researchers, considering the endless possibilities to include sustainable compounds in a biopolymer based matrix, in order to prolong the shelf-life of berries or fruits in general.

Tang, B. L. (2017). "Commentary: Tissue accumulation of microplastics in mice and biomarker responses suggest widespread health risks of exposure." Frontiers in Environmental Science.

In recent years, a good number of studies have indeed demonstrated that microplastics (either pristine or dye-conjugated) exert detectable acute and toxic effects on marine invertebrate and fishes under controlled laboratory settings (see Table 1 for a non-exhaustive summary). Again, the authors reported that focused analysis on liver tissues revealed signs of inflammation, accumulation of lipid droplets, elevation of oxidative stress markers, defects in energy metabolism, and altered metabolomics. [...]although the changes reported were moderate, they were statistically significant. [...]the findings of Deng et al.

Tang, D., et al. (2015). "Modeling and Simulation of Mass Transfer Process of Tubular Cathode in a Direct Ethanol Fuel Cell." Electrochemistry **83**(11): 962.

The tubular cathode bodies of a direct ethanol fuel cell (DEFC) are shaped by the gelcasting technology and the tubular cathode is prepared by spraying the diffusion layer and the Pt/C catalyst layer after the sintering process based on raw material of mesocarbon microbead (MCMB) and graphite. The process of mass transfer in DEFC is simulated using CFD software including the concentration of oxygen, liquid water saturation inside the tubular cathode and the cell performance under different operating temperature, inlet pressure and porosity. The results show that proper increase in operating temperature and porosity have obvious improvements on mass transfer process and the cell performance, while inlet pressure has little impact on cell performance.

Tang, G., et al. (2018). "Microplastics and polycyclic aromatic hydrocarbons (PAHs) in Xiamen coastal areas: Implications for anthropogenic impacts." Science of the Total Environment **634**: 811-820.

Microplastics and polycyclic aromatic hydrocarbons (PAHs) were investigated to study the influence of human activities and to find their possible relationship on the coastal environments, where the coastal areas around Xiamen are undergoing intensive processes of industrialization and urbanization in the southeast China. The abundance of microplastics in Xiamen coastal areas was 103 to 2017 particles/m³ in surface seawater and 76 to 333 particles/kg in sediments. Concentrations of dissolved PAHs varied from 18.1 to 248 ng/L in surface seawater. The abundances of microplastics from the Western Harbor in surface seawater and sediments were higher than those from other areas. Foams were dominated in surface seawater samples, however, no foams were found in sediments samples. The microscope selection and FTIR analysis suggested that polyethylene (PE) and polypropylene (PP) were dominant microplastics. The cluster analysis results demonstrated that fibers and granules had the similar sources, and films had considerably correlation with all types of PAHs (3 or 4-ring PAHs and alkylated PAHs). Plastic film mulch from agriculture practice might be a potential source of microplastics in study areas. Results of our study support that river runoff, watershed area, population and urbanization rate influence the distribution of microplastics in estuarine surface water, and the prevalence of microplastic pollution calls for monitoring microplastics at a national scale. Copyright © 2018 Elsevier B.V.

Tang, J., et al. (2018). "Acute microplastic exposure raises stress response and suppresses detoxification and immune capacities in the scleractinian coral Pocillopora damicornis." Environmental Pollution **243**(Part A): 66-74.

Microplastics are widespread emerging contaminants that have been found globally in the marine and freshwater ecosystem, but there is limited knowledge regarding its impact on coral reef ecosystem and underpinning mechanism. In the present study, using Pocillopora damicornis as a model, we investigated cytological, physiological, and molecular responses of a scleractinian coral to acute microplastic exposure. No significant changes were observed in the density of symbiotic zooxanthellae during the entire period of microplastic exposure, while its chlorophyll content increased significantly at 12 h of microplastic exposure. We observed significant increases in the activities of antioxidant enzymes such as superoxide dismutase and catalase, significant decrease in the detoxifying enzyme glutathione S-transferase and the immune enzyme alkaline phosphatase, but no change in the other immune enzyme phenoloxidase during the whole experiment period. Transcriptomic analysis revealed 134 significantly up-regulated coral genes at 12 h after the exposure, enriched in 11 GO terms mostly related to stress response, zymogen granule, and JNK signal pathway. Meanwhile, 215 coral genes were significantly down-regulated at 12 h after exposure, enriched in 25 GO terms involved in sterol transport and EGF-ERK1/2 signal pathway. In contrast, only 12 zooxanthella genes exhibited significant up-regulation and 95 genes down-regulation at 12 h after the microplastic exposure; genes regulating synthesis and export of glucose and amino acids were not impacted. These results suggest that acute exposure of microplastics can activate the stress response of the scleractinian coral P. damicornis, and repress its detoxification and immune system through the JNK and ERK signal pathways. These demonstrate that microplastic exposure can compromise the anti-stress capacity and immune system of the scleractinian coral P. damicornis, despite the minimal impact on the abundance and major photosynthate translocation transporters of the symbiont in the short term.

Tang, J., et al. (2019). "Molecular characterization of thioredoxin reductase in waterflea Daphnia magna and its expression regulation by polystyrene microplastics." Aquatic Toxicology **208**: 90-97.

Global scale concerns regarding rise in microplastics pollution in the environment have recently aroused. Ingestion of microplastics by biota, including freshwater zooplankton has been well studied, however, despite keystone species in freshwater food webs, the molecular response (e.g. oxidative defense) of zooplankton in response to microplastics is still in its infancy. The thioredoxin (TRx) system has a vital function in cellular antioxidative defense via eliminating the excessive generation of reactive oxygen species (ROS). Therefore, it is necessary to investigate the effects of thioredoxin reductase (TRxR), due to its triggering the TRx catalysis cascade. The present study identified TRxR in Daphnia magna (Dm-TRxR) for the first time, and found that the full-length cDNA was 1862 bp long, containing an 1821-bp open reading frame. Homologous alignments showed the presence of conserved catalytic domain CVNVGC and the seleocysteine (SeCys) residue (U) located in the N- and C-terminal portions. Subsequently, the expression of Dm-TRxR, together with permease, arginine kinase (AK), was investigated by approach of quantitative real-time PCR after exposure to four (1.25- micro m) polystyrene (PS) microbeads concentrations: 0 (control), 2, 4 and 8 mg L⁻¹ for 10 days. Dm-TRxR, permease and AK mRNA were significantly upregulated after exposure to 2, 4 mg L⁻¹ of PS, but then declined in the presence of 8 mg L⁻¹ PS. The gene expression results suggested that oxidative defense, energy production and substance extra cellular transportation were significantly regulated by microplastic exposure. Collectively, the present study will advance our knowledge regarding the biological effects of microplastic pollution on zooplankton, and builds a foundation for freshwater environmental studies on mechanistic and biochemical responses to microplastics.

Tang, L., et al. (2012). "Colorimetric and ultrasensitive bioassay based on a dual-amplification system using aptamer and DNAzyme." Analytical Chemistry **84**(11): 4711-4717.

Rapid detection of ultralow amount of biomarkers in a biologically complex mixture remains a major challenge. Herein, we report a novel aptamer-based protein detection assay that integrates two signal amplification processes, namely, polymerase-mediated rolling-circle amplification (RCA) and DNA enzyme-catalyzed colorimetric reaction. The target biomarker is captured in a sandwich assay by primary aptamer-functionalized microbeads (MBs) and a secondary aptamer that is connected to a RCA primer/circular template complex. RCA reaction, which amplifies the single biomarker binding events by a factor of hundreds to thousands (the first amplification) produces a long DNA molecule containing multiple DNAzyme units. The peroxidase-like DNAzyme catalyzes the oxidation of 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (the second amplification), which generates a blue-green colorimetric signal. This new biosensing platform permits the ultrasensitive, label-free, colorimetric detection of biomarker in real time. Using platelet-derived growth factor B-chain (PDGF-BB) as a model system, we demonstrated that our assay can detect a protein marker specifically in a serum-containing medium, at a concentration as low as 0.2 pg/mL in ~2 h, which rivals traditional assays such as ELISA. We anticipate this simple methodology for biomarker detection can find utility in point-of-care applications.

Tang, M., et al. (2012). "Human embryonic stem cell encapsulation in alginate microbeads in macroporous calcium phosphate cement for bone tissue engineering." Acta Biomaterialia **8**(9): 3436-3445.

Human embryonic stem cells (hESC) are promising for use in regenerative medicine applications because of their strong proliferative ability and multilineage differentiation capability. To date there have been no reports on hESC seeding with calcium phosphate cement (CPC). The objective of this study was to investigate hESC-derived mesenchymal stem cell (hESCd-MSC) encapsulation in hydrogel microbeads in macroporous CPC for bone tissue engineering. hESC were cultured to form embryoid bodies (EB), and the MSC were then migrated out of the EB.

hESCd-MSC had surface markers characteristic of MSC, with positive alkaline phosphatase (ALP) staining when cultured in osteogenic medium. hESCd-MSC were encapsulated in alginate at a density of 1millioncellsml(-1), with an average microbead size of 207mum. CPC contained mannitol porogen to create a porosity of 64% and 218-mum macropores, with 20% absorbable fibers for additional porosity when the fibers degrade. hESCd-MSC encapsulated in microbeads in CPC had good viability from 1 to 21days. ALP gene expression at 21days was 25-fold that at 1day. Osteocalcin (OC) at 21days was two orders of magnitude of that at 1day. ALP activity in colorimetric p-nitrophenyl phosphate assay at 21days was fivefold that at 1day. Mineral synthesis by the encapsulated hESCd-MSC at 21days was sevenfold that at 1day. Potential benefits of the CPC-stem cell paste include injectability, intimate adaptation to complex-shaped bone defects, ease in contouring to achieve esthetics in maxillofacial repairs, and in situ setting ability. In conclusion, hESCd-MSC were encapsulated in alginate microbeads in macroporous CPC, showing good cell viability, osteogenic differentiation and mineral synthesis for the first time. The hESCd-MSC-encapsulating macroporous CPC construct is promising for bone regeneration in a wide range of orthopedic and maxillofacial applications.

Tang, P. L., et al. (2019). "Handheld FT-IR Spectroscopy for the Triage of Micro- and Meso-Sized Plastics in the Marine Environment Incorporating an Accelerated Weathering Study and an Aging Estimation." Spectroscopy **34**(2): 54-60.

Debris in the marine environment can be either natural, such as floating vegetation or volcanic ash deposits, or man-made. The man-made sources cover the whole gamut of material types, such as sewage, glass, mineral, fabric, and, of increasing concern, plastic or polymeric materi-als. Virtually all plastics absorb infrared (IR) light in a highly selective manner, making their infrared spectra a useful qualitative diagnostic. The triage of the visible micro- (~1 mm to 5 mm), meso-, macro- or mega-sized plastic particles with handheld Fourier Transform IR (FT-IR) enables rapid determination of the material on-site, and reduces time wasted on non-polymers on-site or at site. Four of the most prevalent neustonic plastic types, and their FT-IR spectral changes correlated with accelerated weathering, were successfully examined chronologically, detailing significant differences in aging profiles and chemical changes. Subsequently, a small spectroscopically identifiable degraded piece of plastic found in Greenland was correlated to the appropriate aging profile. Finally, a targeted methodology for quantification of submilli-meter microplastic in dried estuarine sediment was evaluated to ascertain the potential limit of detection.

Tang, R., et al. (2012). "X-ray Phase Contrast Imaging of Cell Isolation with Super-Paramagnetic Microbeads." PLoS ONE **7**(9).

Super-paramagnetic microbeads are widely used for cell isolation. Evaluation of the binding affinity of microbeads to cells using optical microscopy has been limited by its small scope. Here, magnetic property of microbeads was first investigated by using synchrotron radiation (SR) in-line x-ray phase contrast imaging (PCI). The cell line mouse LLC (Lewis lung carcinoma) was selected for cell adhesion studies. Targeted microbeads were prepared by attaching anti-VEGFR2 (vascular endothelial growth factor receptor-2) antibody to the shell of the microbeads. The bound microbeads were found to better adhere to LLC cells than unbound ones. PCI dynamically and clearly showed the magnetization and demagnetization of microbeads in PE-50 tube. The cells incubated with different types of microbeads were imaged by PCI, which provided clear and real-time visualization of the cell isolation. Therefore, PCI might be considered as a novel and efficient tool for further cell isolation studies.

Tang, S., et al. (2019). "Pb(II) uptake onto nylon microplastics: Interaction mechanism and adsorption performance." Journal of Hazardous Materials **386**: 121960.

Both heavy metals and microplastic pollutants are ubiquitous in the aquatic environment. The uptake of lead(II) ions from aqueous solutions onto aged nylon microplastics was investigated as a function of pH, contact time, temperature, supporting electrolyte concentration and fulvic acid concentration in batch studies. The effect of surface properties on the adsorption behavior of lead(II) was investigated with scanning electron microscope equipped with the energy dispersive X-ray spectroscope (SEM-EDAX), Fourier transform-infrared (FTIR) spectroscopy, thermal gravimetric analysis (TGA), X-ray diffraction (XRD) and differential scanning calorimetric (DSC). The adsorption kinetics conformed to the pseudo-second order equation, Elovich equation and intraparticle diffusion model well. The experimental data of the adsorption process was fitted to the Langmuir and Freundlich adsorption isotherms and the parameters were estimated. The lead(II) uptake on aged nylon microplastics was spontaneous and endothermic in nature. The lead(II) adsorption was significantly dependent on the sodium chloride concentrations, initial solution pH and fulvic acid concentrations.

Tang, Y., et al. (2019). "Immunotoxicity of microplastics and two persistent organic pollutants alone or in combination to a bivalve species." Environmental Pollution **258**: 113845.

Both microplastics and persistent organic pollutants (POPs) are ubiquitously present in natural water environment, posing a potential threat to aquatic organisms. While it has been suggested that the immune responses of aquatic organisms could be hampered by exposure to microplastics and POPs, the synergistic immunotoxic impact of these two types of pollutants remain poorly understood. In addition, little is known about the mechanism behind the immunotoxic effect of microplastics. Therefore, in the present study, the immunotoxicity of microplastics and two POPs, benzo[a]pyrene (B[a]P) and 17beta-estradiol (E2), were investigated alone or in combination in a bivalve species, Tegillarca granosa. Evident immunotoxicity, as indicated by alterations of haemocyte count, blood cell composition, phagocytic activity, intracellular content of ROS, concentration of Ca²⁺ and lysozyme, and lysozyme activity, was revealed for both microplastics and the two POPs examined. In addition, the expression of six immune-, Ca²⁺ signalling-, and apoptosis-related genes was significantly altered by exposure of clams to the contaminants studied. Furthermore, the toxicity of POPs was generally aggravated by smaller microplastics (500 nm) and mitigated by larger ones (30 mum). This size dependent effect on POP toxicity may result from size dependent interactions between microplastics and POPs. Data obtained in this study also indicate that similar to exposure to B[a]P and E2, exposure to microplastics may hamper the immune responses of clams through a series of interdependent physiological and molecular processes.

Tang, Z., et al. (2014). "Polybrominated diphenyl ethers in soils, sediments, and human hair in a plastic waste recycling area: a neglected heavily polluted area." Environmental Science & Technology **48**(3): 1508-1516.

The release of pollutants during the recycling of contaminated plastics is a problem which has drawn worldwide attention; however, little information on the transfer of polybrominated diphenyl ethers (PBDEs) in these processes is available. We conducted a survey of PBDEs in soils, sediments, and human hair in a typical plastic waste recycling area in northern China. The total concentrations (ng/g) of 21 PBDEs were 1.25-5504 (average 600), 18.2-9889 (average 1619), and 1.50-861 (average 112) in soils, sediments, and hair, respectively. The PBDE concentrations were comparable to concentrations observed in e-waste recycling areas; however, the concentrations

in soils and sediments were 1-3 orders of magnitude higher than in other areas, and the concentrations in hair were much higher than in other areas. This indicates that this area is highly polluted with PBDEs. BDE-209 was the dominant congener (representing 91.23%, 92.3%, and 91.5% of the total PBDEs observed in soils, sediments, and hair, respectively), indicating that the commercial deca-BDE product was dominant. The commercial penta- and octa-BDE products made small contributions to the total PBDE concentrations, unlike what has been found in some e-waste recycling areas. Our results show that crude plastic waste processing is a major contributor of PBDEs to the environment and humans, which should be of great concern.

Tang, Z., et al. (2016). "Polybrominated diphenyl ethers (PBDEs) and heavy metals in road dusts from a plastic waste recycling area in north China: implications for human health." Environmental Science & Pollution Research **23**(1): 625-637.

Road dusts were collected from an area where intense mechanical recycling of plastic wastes occurs in Wen'an, north China. These dusts were investigated for polybrominated diphenyl ethers (PBDEs) and heavy metals contamination to assess the health risk related to these components. Decabromodiphenyl ether (BDE-209) and SIGMA21PBDE concentrations in these dusts ranged from 2.67 to 10,424 ng g(-1) and from 3.23 to 10,640 ng g(-1), respectively. These PBDE concentrations were comparable to those observed in road dust from e-waste recycling areas but were 1-2 orders of magnitude higher than concentrations in outdoor or road dusts from other areas. This indicates that road dusts in the study area have high levels of PBDE pollution. BDE-209 was the predominant congener, accounting for 86.3% of the total PBDE content in dusts. Thus, commercial deca-BDE products were the dominant source. The average concentrations of As, Cd, Cr, Cu, Hg, Pb, Sb, and Zn in these same dust samples were 10.1, 0.495, 112, 54.7, 0.150, 71.8, 10.6, and 186 mg kg(-1), respectively. The geoaccumulation index suggests that road dusts in this area are moderately to heavily polluted with Cd, Hg, and Sb. This study shows that plastic waste processing is a major source of toxic pollutants in road dusts in this area. Although the health risk from exposure to dust PBDEs was low, levels of some heavy metals in this dust exceeded acceptable risk levels for children and are of great concern.

Tang, Z., et al. (2015). "Contamination and risk of heavy metals in soils and sediments from a typical plastic waste recycling area in North China." Ecotoxicology & Environmental Safety **122**: 343-351.

Plastic wastes are increasingly being recycled in many countries. However, available information on the metals released into the environment during recycling processes is rare. In this study, the contamination features and risks of eight heavy metals in soils and sediments were investigated in Wen'an, a typical plastic recycling area in North China. The surface soils and sediments have suffered from moderate to high metal pollution and in particular, high Cd and Hg pollution. The mean concentrations of Cd and Hg were 0.355 and 0.408 mg kg(-1), respectively, in the soils and 1.53 and 2.10 mg kg(-1), respectively, in the sediments. The findings suggested that there is considerable to high potential ecological risks in more than half of the soils and high potential ecological risk in almost all sediments. Although the health risk levels from exposure to soil metals were acceptable for adults, the non-carcinogenic risks to local children exceeded the acceptable level. Source assessment indicated that heavy metals in soils and sediments were mainly derived from inputs from poorly controlled plastic waste recycling operations in this area. The results suggested that the risks associated with heavy metal pollution from plastic waste recycling should be of great concern.

Tanikawa-Takahashi, Y., et al. (1997). Fabrication of dynamic optical head phantoms from an MRI head model. Proceedings of SPIE - The International Society for Optical Engineering.

Optical tomography is a new modality of noninvasive diagnosis for imaging the distribution of optical properties in human bodies. In the process of developing optical tomography systems which can be applicable to human heads for diagnosis of disease and study of brain functions, we need realistic optical phantoms which anatomically and optically simulate human heads with complicated and multi-layered structures. Previously we have reported design and fabrication methods of optical head phantoms based on an MRI human head image. The phantoms have simulated the multi-layered structure with different optical properties specified to each layer. They had five layers; i.e., skin, skull, cerebrospinal fluid layer, gray matter and white matter. Also some inclusions simulating hematoma were embedded in some part of the head phantoms. However, the phantoms were made all of solid plastic resin and the temporal variation of physiological functions in brain could not be simulated by the static phantoms. We have improved the fabrication method and succeeded in making dynamic optical phantoms which are able to include some parts simulating the temporal variation of blood flow rate and oxygenation status.

Taoka, M., et al. (2017). "A Sensitive Microbead-Based Organic Media-Assisted Method for Proteomics Sample Preparation from Dilute and Denaturing Solutions." Acs Applied Materials & Interfaces **9**(49): 42661-42667.

We developed a robust and sensitive sample preparation method for proteomics termed microbead-based and organic-media-assisted proteolysis strategy (BOPs). BOPs combines two advantages of current techniques, (1) unbiased binding of reversed-phase polymeric microbeads to any type of protein and (2) enhanced trypsin digestion efficiency in CH₃CN-aqueous solvent systems, into a single-tube workflow. Compared with conventional techniques, this method effectively concentrates proteins and improves proteolytic digestion, and can be used with submicromolar protein samples in dilute or denaturing solutions, such as 70% formic acid, 8 M urea, or 7 M guanidine hydrochloride without any sample pretreatment. Proteome analysis of single Caenorhabditis elegans organisms demonstrates that BOPs has the sensitivity, reproducibility, and unbiasedness required to characterize worm proteins at a single organism level. We also show that, by simply incorporating an acetone washing step for detergent removal, BOPs is applicable to low concentration samples contaminated with a variety of detergents, including sodium dodecyl sulfate, with negligible protein loss. Moreover, the utility of this modification has also been demonstrated through proteomic characterization of 2000 human (HEK293T) cells lysed using 1% Triton X-100. The simplicity and availability of the present BOPs make it especially attractive for next-stage proteomics of rare and sample-limited systems.

Taoka, M., et al. (2019). "An Ionic Liquid-Based Sample Preparation Method for Next-Stage Aggregate Proteomic Analysis." Analytical Chemistry **91**(21): 13494-13500.

A wide variety of proteomic methods have been applied for protein profiling of insoluble aggregates or inclusion bodies deposited in various cells or tissues. However, these are essentially optimized or modified classical protein chemistry techniques using conventional denaturing agents such as formic acid, urea, and sodium dodecyl sulfate (SDS). The use of these denaturants has several shortcomings, including limited solubilization, contamination, and restrictions on absolute sample quantity and throughput. Here, we describe an alternative proteomic sample preparation platform for widespread aggregation analysis. This approach combines two techniques, (1) the use of ionic liquid for protein solubilization and (2) the recently published microbead-based and organic-media-assisted proteolysis strategy (BOPs), into a single-tube workflow. We demonstrate that the combined approach (iBOPs) enabled the successful solubilization of heat-aggregated hen egg whites within 10 min and supported sensitive mass spectrometry (MS) analysis. The performance of the iBOPs system surpassed those of conventional detergents and chaotropes. Moreover, this technology enabled ultrasensitive proteomic characterization of protein aggregates deposited in individual Caenorhabditis elegans nematodes. We identified ubiquitin and other molecules as candidate stochastic factors whose accumulation levels varied among aging nematode individuals. The sensitivity and applicability of the present iBOPs make it especially attractive for next-stage aggregate proteomic analysis of various biological processes.

Tappin, A. D. and G. E. Millward (2015). "The English Channel: contamination status of its transitional and coastal waters. (Special Issue: The English Channel and it's catchments: status and responses to contaminants.)." Marine Pollution Bulletin **95**(2): 529-550.

The chemical contamination (organic compounds, metals, radionuclides, microplastics, nutrients) of English Channel waters has been reviewed, focussing on the sources, concentrations and impacts. River loads were only reliable for Pb, whereas atmospheric loads appeared robust for Cd, Pb, Hg, PCB-153 and gamma -HCH. Temporal trends in atmospheric inputs were decreasing. Contaminant concentrations in biota were relatively constant or decreasing, but not for Cd, Hg and HBCDD, and deleterious impacts on fish and copepods were reported. However, data on ecotoxicological effects were generally sparse for legacy and emerging contaminants. Intercomparison of activity concentrations of artificial radionuclides in sediments and biota on both Channel coasts was hindered by differences in methodological approaches. Riverine phosphate loads decreased with time, while nitrate loads remained uniform. Increased biomass of algae, attributable to terrestrial inputs of nutrients, has affected benthic production and shellfisheries. A strategic approach to the identification of contaminant impacts on marine biota is recommended.

Taqvi, S. Z. (2007). Notch ligand functionalized microbeads for T cell differentiation of stem cells.

In recent years, great advances have been made in the field of stem cell differentiation. Seminal insights in the area of developmental biology and tissue regeneration have made ex vivo differentiated cells a realistic alternative for transplantation applications. The recent application of these murine-based insights to human systems has paved new paths in autoimmune disease, chemotherapy, and immuno-deficiency research. Such strides would eliminate the hurdles associated with adoptive transfer including limited availability of transplantable cells, site morbidity, difficulties in cell isolation and expansion lag time. Current approaches in ex vivo hematopoiesis and T cell differentiation have begun to explore the effects of biomaterials on differentiation efficiency. These approaches, however, have not fully studied the quantitative effects of biomaterials and their properties on hematopoietic and T cell differentiation generation. Our goal was to design biomaterials whose properties could be tailored to improve differentiation efficiencies in T cell differentiation. Our work is dedicated to fabricating and characterizing Notch ligand functionalized microbeads for T cell differentiation applications. Our work has shown stable functionalization of Notch ligands on microbeads that can be quantitatively varied to achieve optimal Notch signaling. We have also demonstrated limited cellular toxicity and effective Notch signaling upon exposure to Notch ligand functionalized beads. Finally, we have successfully differentiated T cell progenitors from hematopoietic stem cells using the functionalized microbeads. As a side study, we have fabricated and characterized polymeric PLA scaffolds that were systematically varied and studied for their effects on hematopoietic differentiation efficiency. Insights gained from these studies should provide a better understanding of the microenvironmental signals in hematopoiesis and aid in the development of efficient technologies for the production of hematopoietic progenitors and T cells for therapeutic applications.

Tarnok, A., et al. (2001). "Preoperative prediction of postoperative edema and effusion in pediatric cardiac surgery by altered antigen expression patterns on granulocytes and monocytes." Cytometry **44**(4): 247-253.

Postoperative edema and effusion (POEE) following cardiopulmonary bypass (CPB) surgery in children retards recovery and may aggravate postpericardiotomy (PPS), capillary leak syndrome (CLS), or multiorgan failure (MOF). Compared with complication-free children, POEE affected children have different preoperative serum levels of circulating cytokines and adhesion molecules. These levels may be used preoperatively to assess POEE, but their determination is time consuming, costly, and a substantial blood volume is required. Altered serum levels of cytokines and adhesion molecules also may be reflected in altered antigen expression on circulating blood leukocytes. The predictive potential of flow cytometric (FCM) leukocyte immunophenotyping was explored as a sensitive and fast method that required small blood samples. Blood samples taken 24 h preoperatively from 49 patients (3-18 years old) were stained with monoclonal antibodies for adhesion molecules (ICAM-1, LFA-1, Mac-1) or constitutive/activation markers (CD4, CD14, CD16, CD25, CD54, CD69, HLA-DR) and measured on a microbead calibrated FCM. Neutrophils, monocytes, and eosinophils from POEE patients express higher preoperative levels of LFA-1, monocytes, HLA-DR, and other activation markers (all $P < 0.03$). Over 89% of the patients were classified correctly by using two discriminant analysis methods (sensitivity, >76%; specificity, >86%; positive prediction, >80%; negative prediction, >83%). Granulocytes and monocytes of postoperative POEE patients exhibit significant preoperative immune activation, suggesting an increased risk for patients with atopic/allergic predisposition. Surgical trauma and CPB cause additional immune activation, leading to POEE by a summative response. Most patients at risk for POEE can be identified preoperatively by using data pattern analysis on FCM-derived parameters. © 2001 Wiley-Liss, Inc.

Tatsuno, K., et al. (2016). "TSLPR expressing CD4+ T cells produce enhanced IL-4 by directly responding to TSLP in AD." Journal of Dermatological Science **84 (1)**: e63.

Recent studies have suggested that thymic stromal lymphopoi-etin (TSLP) activates LCs to induce the differentiation of naive T cells into Th2 cells, and previous documentations underscore the contributory role of TSLP in the pathogenesis of AD via this type of DCs. Meanwhile, TSLP receptor (TSLPR) is expressed on various immunocompetent cells, including mast cells, basophils, monocytes, and T cells, indicating the possibility of direct TSLP interaction with these cells. We therefore investigated the expression of TSLPR, focusing on T cells. In freshly isolated PBMCs from normal individuals, TSLPR expression was minimal (0.045% of PBMCs) whilePBMCsfromADpatientsdemonstratedincreasedfre-quencies of TSLPR⁺CD4⁺T cells (0.40% of PBMCs) ($p<0.05$). TSLPR+ T cells were CCR4+, CXCR3-, CLA+, CCR7-, CCR10+, and CD45RO+, indicative of skin-homing effector CD4+ T cells. Furthermore, CD4+ T cells isolated from PBMCs of AD patients (n=23) and normal individuals (n=7) were stimulated with anti-CD3/28 Ab-coated microbeads with or without rhTSLP, and cultured for 48h. Subsequently, supernatants were collected and cytokine concentration was measured by CBA assay. Production of IL-4 was enhanced by 30% in CD4+ T cells from AD patients in response to TSLP, and secretion of IL-17A also increased moderately (10%). In comparison, CD4+ T cells from normal individuals responded to TSLP with augmented production of IFN-g, but not with IL-4 or IL-17A. In conclusion, TSLP seems to possess the ability

to directly modify the cytokine producing ability of effector T cells, and the effect was favored toward Th2 in AD. Interestingly, TSLP acted differently on T cells of normal individuals, and this discrepancy in the T cell response to TSLP may be associated with the development of AD.

Ta-Tung, W. and L. Yueh-Hui (2015). "A WASTE CATALYST FOR A HAZARDOUS CHLORINE -- CONTAINING PLASTIC WASTE." Environmental Engineering & Management Journal (EEMJ) **14**(9): 2127-2138.

The recycling of plastic waste is important both in the conservation of resources and the environmental protection. A plastic waste (PE/PP/PS/PVC) was pyrolyzed over a series of post-use FCC catalysts using a fluidizing reaction system similar to the FCC process operating isothermally at ambient pressure. Experiments carried out with these catalysts gave good yields of valuable hydrocarbons with differing selectivity in the final products dependent on reaction conditions. A model based on kinetic considerations associated with chemical reactions and catalyst deactivation in the catalytic degradation of plastics has been developed. Greater product selectivity was observed with a hybrid catalyst of MCM-41/Cat-R1 with more than 70.5 wt% olefins products. It is demonstrated that the catalytic degradation of post-consumer chloro-commingled plastics over these recycled catalysts coped with the utility of fluidizing cracking system was shown to be a useful method for the production of potentially valuable hydrocarbons. [ABSTRACT FROM AUTHOR]

Tavakoli, S., et al. (2016). "Mechanobiophysics of the alveolus-reconstruction of strain and forces at the gas-blood barrier." Pneumologie. Conference **70**(5).

Congress Abstract Introduction: In the last years, the importance of mechano-chemical cellular responses for biology and pathobiology has been recognized. As cells sense their mechanical environment, they respond to extracellular forces. This is particularly important for lung epithelial and endothelial cells forming the air-blood barrier where they constantly get stretched during breathing. Mechanical stretch in the alveolus plays a key role in triggering the secretion of pulmonary surfactant which reduces surface tension at the alveolar air-liquid interface. However, an integrated research of the alveolar environment has been precluded due to the complex biophysical environment of the alveoli that has to be reconstructed. This includes a multiphase system with an air-liquid-interface, a co-culture model combining cell types with different mechanical properties, as well as the occurrence of cyclic mechanical stretch. Method(s): Biomimetic microfluidic devices have appeared to be a promising solution in this matter. These devices are mostly made of a transparent biocompatible polymer known as Polydimethylsiloxane (PDMS), and are fabricated using soft lithography. Cell growth and differentiation of primary lung epithelial cells on PDMS is currently under testing. Result(s): At the moment, we are engineering a lung-on-a-chip prototype based on the publication by Huh (Huh, D. et al., 2010). The chip contains a porous PDMS membrane with a thickness of 10 mum, which separates the two central channels. On the apical side of the membrane, primary epithelial cells obtained from rat lung are cultured at the air-liquid-interface, while on the bottom side endothelial cells are perfused with media. The smaller side channels of the chip can be air-evacuated to stretch the membrane, and thereby approximately 10% cyclic strain can be applied to cells attached on the membrane. Discussion(s): This lab-on-a-chip device will enable to explore distinct biomechanical response of different lung cells, under cyclic strain conditions combined with pathophysiological conditions. For that purpose, we will incorporate fluorescent microbeads into the porous membrane as subcellular force/strain sensor, which allows the evaluation of cell stiffness and viscosity by tracking and analyzing bead displacements (Das, T. et al., 2008). Alongside the sensory application, the lab-on-a-chip device can also be used for live cell imaging of surfactant release and adsorption at the air-liquid interface and it has the potential for drug delivery studies.

Tavares, R., et al. (2018). "Microplastics thermal treatment by polyethylene terephthalate-biomass gasification." Energy Conversion and Management **162**: 118.

In this paper, a previously developed Aspen Plus model for gasification of biomass was adapted to the gasification of microplastics in a temperature range of 400–1200 °C. The effect of parameters such as equivalence ratio (ER), steam-to-biomass ratio (SBR) and gasification temperature in hydrogen production was evaluated, as well as three different gasifying agents namely air, O2 and steam were tested. The relationship between all these variables was assessed in order to better characterize the final syngas. Results showed that for higher hydrogen yields, microplastics composition should be majorly polyethylene terephthalate (PET), assuring H2 molar fraction contents in the order of 63–66%. The achieved lower heating value (LHV) was 9.2 MJ/Nm3 which endorsed high-quality syngas.

Tayebi, M., et al. (2011). "PrP(Sc)-specific antibodies with the ability to immunodetect prion oligomers." PLoS ONE [Electronic Resource] **6**(5): e19998.

The development of antibodies with binding capacity towards soluble oligomeric forms of PrPSc recognised in the aggregation process in early stage of the disease would be of paramount importance in diagnosing prion diseases before extensive neuropathology has ensued. As blood transfusion appears to be efficient in the transmission of the infectious prion agent, there is an urgent need to develop reagents that would specifically recognize oligomeric forms of the abnormally folded prion protein, PrPSc.To that end, we show that anti-PrP monoclonal antibodies (called PRIOC mAbs) derived from mice immunised with native PrP-coated microbeads are able to immunodetect oligomers/multimers of PrPSc. Oligomer-specific immunoreactivity displayed by these PRIOC mAbs was demonstrated as large aggregates of immunoreactive deposits in prion-permissive neuroblastoma cell lines but not in equivalent non-infected or prn-p(0/0) cell lines. In contrast, an anti-monomer PrP antibody displayed diffuse immunoreactivity restricted to the cell membrane. Furthermore, our PRIOC mAbs did not display any binding with monomeric recombinant and cellular prion proteins but strongly detected PrPSc oligomers as shown by a newly developed sensitive and specific ELISA. Finally, PrioC antibodies were also able to bind soluble oligomers formed of Abeta and alpha-synuclein. These findings demonstrate the potential use of anti-prion antibodies that bind PrPSc oligomers, recognised in early stage of the disease, for the diagnosis of prion diseases in blood and other body fluids.

Taylor, B. (2009). "Scarcely Different." Recycling Today **47**(9): 8-8.

The article looks at the condition of the global economy and its impact on the scrap recycling industry as of 2009. It says that during the decade, more oil, steel, copper and other materials have been consumed by the developing economies of Asia. According to the article, the demand of Asia for materials has impacted pricing in North America, Europe and other areas where basic materials are produced and consumed.

Taylor, H. I. and D. Parkinson (1971). "Growth and activity of Penicillium decumbens under different environmental conditions in glass microbead media." Canadian Journal of Microbiology **17**(7): 967-973.

Taylor, M. L., et al. (2016). "Plastic microfibre ingestion by deep-sea organisms." Scientific Reports **6**: 33997.

Plastic waste is a distinctive indicator of the world-wide impact of anthropogenic activities. Both macro- and micro-plastics are found in the ocean, but as yet little is known about their ultimate fate and their impact on marine ecosystems. In this study we present the first evidence that microplastics are already becoming integrated into deep-water organisms. By examining organisms that live on the deep-sea floor we show that plastic microfibres are ingested and internalised by members of at least three major phyla with different feeding mechanisms. These results demonstrate that, despite its remote location, the deep sea and its fragile habitats are already being exposed to human waste to the extent that diverse organisms are ingesting microplastics.

Taylor, V. F., et al. (2019). "Preliminary investigation of polymer-based in situ passive samplers for mercury and methylmercury." Chemosphere **234**: 806-814.

Development of an in situ passive sampler for mercury (Hg), and its toxic form, methylmercury (MeHg), using simple polymer films, was explored for the potential to make an efficient and environmentally relevant monitoring tool for this widespread aquatic pollutant. The sulfur-containing polymers polysulfone (PS), and polyphenylene sulfide (PPS), were found to accumulate both MeHg and inorganic Hg (iHg), whereas polyethylene (PE) sorbed iHg but not MeHg, and polyoxymethylene (POM) and polyethersulfone (PES) films had low affinity for both Hg species. Uptake rates of Hg species into polymers were linear over two weeks, and dissolved organic matter at natural levels had no effect on partitioning of MeHg or iHg to the polymers. Sorption of MeHg to PS and PPS from three estuarine sediments correlated with uptake into diffusive gel-type samplers over time, and in PPS, with accumulation by the estuarine amphipod, Leptocheirus plumulosus. These polymers had lower MeHg adsorption rates, but are simpler to assemble, than diffusive gel-type samplers. Higher contaminant concentrations in polymer and gel-type samplers corresponded with porewater concentrations across sediments, suggesting they sample the dissolved MeHg pool, whereas MeHg levels in amphipods were more elevated with higher bulk sediment MeHg, which may reflect feeding strategy. While polymers with higher affinity for MeHg and iHg are needed for some environmental applications, this work suggests a simple sampling approach has potential for time-integrated, environmentally-meaningful MeHg monitoring in contaminated sediments. Image 1 • Plastics adsorb mercury and methylmercury at a constant rate. • Sulfur containing polymers have a high affinity for mercury species. • Methylmercury levels in passive samplers correspond with porewater concentrations. [ABSTRACT FROM AUTHOR]

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Tayot, J. L., et al. (1987). "Large scale use of Spherosil ion exchangers in plasma fractionation." Developments in Biological Standardization **67**: 15-24.

Spherosil microbeads are spherical and made of porous silica. Their surface is coated with hydrophilic and/or hydrophobic polymers. They are specially designed for the separation of proteins on an industrial scale either by ion exchange or by bioaffinity chromatography. Since 1980, large columns have been used in Institut Merieux for the purification of placental albumin and several vaccines. Here we describe a chromatographic process for the purification of human albumin and immunoglobulins (IgG) from 25 1 of plasma per cycle. First the plasma was freed of the coagulation factors and then clarified at pH 5.25. The corresponding supernatant was filtered and processed in sterile conditions. Albumin was then purified by ion exchange on 3 successive columns, respectively containing: 6.25 kg of DEAE SPHEROSIL W-1000; 3.5 kg of QMA SPHEROSIL PH-1000; 8 kg of COOH-SPHEROSIL W-1000. The concentration and pH of the buffers were selected to reduce, as much as possible, the total quantity of ion exchangers required per cycle. IgG were then purified from the filtrate of the first of the previous columns. 1 column of 6.25 kg of DEAE SPHEROSIL W-1000 was used at pH 6.8. The selected chromatographic parameters allowed us to demonstrate a total elimination of HBs Ag and HB Virus when voluntarily added to an initial sample (RIA determination and HBV-DNA analysis by molecular hybridization). A second column of a large pore anion exchanger: DEAE SPHEROSIL LP-3000 was added at the end of the IgG purification, as a final security to avoid any risk of transmitting the Hepatitis B virus. The yield and quality of the final products will be presented.

Tekman, M. B., et al. (2017). "Marine litter on deep Arctic seafloor continues to increase and spreads to the North at the HAUSGARTEN observatory." Deep-Sea Research Part I: Oceanographic Research Papers **120**: 88-99.

The increased global production of plastics has been mirrored by greater accumulations of plastic litter in marine environments worldwide. Global plastic litter estimates based on field observations account only for 1% of the total volumes of plastic assumed to enter the marine ecosystem from land, raising again the question 'Where is all the plastic? '. Scant information exists on temporal trends on litter transport and litter accumulation on the deep seafloor. Here, we present the results of photographic time-series surveys indicating a strong increase in marine litter over the period of 2002–2014 at two stations of the HAUSGARTEN observatory in the Arctic (2500 m depth). Plastic accounted for the highest proportion (47%) of litter recorded at HAUSGARTEN for the whole study period. When the most southern station was considered separately, the proportion of plastic items was even higher (65%). Increasing quantities of small plastics raise concerns about fragmentation and future microplastic contamination. Analysis of litter types and sizes indicate temporal and spatial differences in the transport pathways to the deep sea for different categories of litter. Litter densities were positively correlated with the counts of ship entering harbour at Longyearbyen, the number of active fishing vessels and extent of summer sea ice. Sea ice may act as a transport vehicle for entrained litter, being released during periods of melting. The receding sea ice coverage associated with global change has opened hitherto largely inaccessible environments to humans and the impacts of tourism, industrial activities including shipping and fisheries, all of which are potential sources of marine litter. © 2016 The Authors

Telang, S., et al. (2012). "Small molecule inhibition of 6-phosphofructo-2-kinase suppresses t cell activation." Journal of Translational Medicine **10 (1) (no pagination)**(95).

Background: T cell activation is associated with a rapid increase in intracellular fructose-2,6-bisphosphate (F2,6BP), an allosteric activator of the glycolytic enzyme, 6-phosphofructo-1-kinase. The steady state concentration of F2,6BP in T cells is dependent on the expression of the bifunctional 6-phosphofructo-2-kinase/fructose-2,6-bisphosphatases (PFKFB1-4) and the fructose-2,6-bisphosphatase, TIGAR. Of the PFKFB family of enzymes,

PFKFB3 has the highest kinase:bisphosphatase ratio and has been demonstrated to be required for T cell proliferation. A small molecule antagonist of PFKFB3, 3-(3-pyridinyl)-1-(4-pyridinyl)-2-propen-1-one (3PO), recently has been shown to reduce F2,6BP synthesis, glucose uptake and proliferation in transformed cells. We hypothesized that the induction of PFKFB3 expression may be required for the stimulation of glycolysis in T cells and that exposure to the PFKFB3 antagonist, 3PO, would suppress T cell activation. Method(s): We examined PFKFB1-4 and TIGAR expression and F2,6BP concentration in purified CD3⁺ T cells stimulated with microbead-conjugated agonist antibodies specific for CD3 and the co-stimulatory receptor, CD28. We then determined the effect of 3PO on anti-CD3/anti-CD28-induced T cell activation, F2,6BP synthesis, 2-[1-¹⁴C]-deoxy-d-glucose uptake, lactate secretion, TNF-alpha secretion and proliferation. Finally, we examined the effect of 3PO administration on the development of delayed type hypersensitivity to methylated BSA and on imiquimod-induced psoriasis in mice. Result(s): We found that purified human CD3⁺ T cells express PFKFB2, PFKFB3, PFKFB4 and TIGAR, and that anti-CD3/anti-CD28 conjugated microbeads stimulated a >20-fold increase in F2,6BP with a coincident increase in protein expression of the PFKFB3 family member and a decrease in TIGAR protein expression. We then found that exposure to the PFKFB3 small molecule antagonist, 3PO (1-10 muM), markedly attenuated the stimulation of F2,6BP synthesis, 2-[1-¹⁴C]-deoxy-D-glucose uptake, lactate secretion, TNF-alpha secretion and T cell aggregation and proliferation. We examined the in vivo effect of 3PO on the development of delayed type hypersensitivity to methylated BSA and on imiquimod-induced psoriasis in mice and found that 3PO suppressed the development of both T cell-dependent models of immunity in vivo. Conclusion(s): Our data demonstrate that inhibition of the PFKFB3 kinase activity attenuates the activation of T cells in vitro and suppresses T cell dependent immunity in vivo and indicate that small molecule antagonists of PFKFB3 may prove effective as T cell immunosuppressive agents. © 2012 Telang et al.; licensee BioMed Central Ltd.

Tellini, M. G. and P. Céntola (2007). "Automobile Shredder Residue (ASR) destruction in a plasma gasification reactor." International Journal of Environmental Technology & Management **7**(1/2): 21-38.

Test results on Automobile Shredder Residue (ASR), or car fluff, demonstrated destruction efficiency and safe conversion to synthesis gas and a glass residue, in a plasma gasification system. The synthesis gas consists primarily of hydrogen and carbon monoxide in the range between 20 and 22 vol-% respectively, or 45 and 55 vol-% dry basis, when corrected for nitrogen. In dry reforming operation, carbon dioxide conversion approached 90%. The system is designed to work with oxygen in autothermal conditions, reducing thus the electric power requirement for the plasma reactor. The vitrified residue leach rate makes the product suitable for construction works. [ABSTRACT FROM AUTHOR]

Teltschik, H. M., et al. (2010). "Haploidentical stem cell transplantation in paediatric patients with myelodysplastic syndrome." Bone Marrow Transplantation **2)**: S266-S267.

We investigated a cohort of 11 pediatric patients with myelodysplatic syndrome transplanted with T-cell depleted grafts from haploidentical donors. 2 patients had refractory cytopenia, 5 patients had refractory cytopenia with excess blasts in transformation (REAB-T). 4 patients had relapsed MDS (RAEBT) after a previous transplantation from a matched unrelated donor and received a 2nd allogeneic stem cell transplantation (SCT) from a haploidentical donor. Median age was 7.7 years (1.7-18). 6 patients received Busilvex/Cyclophosphamid/Melphalaned, 5 patients underwent a reduced intensity conditioning with Melphalane/Thiotepa and Fludarabine or Clofarabine. All patients received peripheral stem cells. In 7 patients Graft manipulation was carried out by direct depletion using antiCD3/ antiCD19 coated magnetic microbeads. 4 patients received CD34 positive selected stem cells. Median CD34 + progenitor cell content of the grafts was 13.6 x 10⁶/kg BW (4.6 - 41 x 10⁶), the median T-cell content of the grafts was 63.9 x 10³/kg BW (1.8-162.4 x 10³). Primary engraftment occured in 10 of 11 patients. 1 patient failed to engraft but could be rescued with a second stem cell donation from the same donor. 2 patients rejected the graft after primary engraftment. Both patients could be successfully retransplanted from a second parental donor. Thus, Final engraftment could be obtained in all patients. Median time to reach > 500 neutrophiles/microliter was 11 days (9-15). Independence from platelet substitution was reached after a median time of 10 days (7-18). No severe (>degree2) acute graft versus host disease (GvHD) was observed, 36% (4 out of 11) developed acute GvHD degree1-2 and 64% of the patients (7 out of 11) developed no acute GvHD at all. 2 out of 11 patients relapsed (19%), median time to relapse was 106 days. There was no transplant related mortality (TRM) within the first 100 days after SCT. Over all TRM was 2 out of 11 patients (20%). Event free survival (EFS) was 64%. Conclusion(s): Fast recoveries of neutrophiles and platelets were achieved without occurrence of severe acute GvHD. TRM was low although more than 1/3 of the patients underwent intensive pretreatment according to previous allogeneic SCT. Low relapse rate let to a favourable event free survival. Thus, haploidentical SCT with T-cell depleted grafts is a save and effective treatment for MDS if no matched donor is available.

Teltschik, H. M., et al. (2016). "Haploidentical stem cell transplantation (SCT) with T cell depleted grafts in advanced pediatric sarcomas." Bone Marrow Transplantation **1)**: S265-S266.

Introduction: The rationale for transplanting pediatric sarcoma patients with haploidentical grafts is a hypothesised graft-vs-tumour effect. We investigated a cohort of 21 pediatric patients with advanced sarcomas transplanted with T- and B-cell depleted peripheral stem cell grafts from haploidentical donors between 2005 and 2013. Material (or patients) and methods: 11 patients had advanced Ewings sarcoma, only 2 of them achieved complete remission (CR) before SCT. 10 patients had advanced Rhabdomyosarcomas or Rhabdo-like tumours (RMS), 6 of them achieved CR prior to SCT. Median follow up was 8.4 month. Median age at SCT was 14.3 years. Standard conditioning regimen consisted of Melphalan (2x70mg/m²), Fludarabin (4x40mg/m²), Thiotepa (1x10mg/kg), and OKT3 or ATG. Graft manipulation was carried out by direct depletion using anti CD3/CD19 or TCRalphabeta/CD19 coated magnetic microbeads. A median number of 10.4x10⁶ CD34+ Progenitor cells and 38.8x10³ T cells/kg body weight (BW) were transfused. Pharmacological Graft vs. Host Disease (GvHD) prophylaxis was carried out with Mycofenolate until day 60, if residual T-cells in the graft exceeded 25000/kg BW. 4/21 patients rejected the haplo graft and needed reconditioning with Fludarabine (3x40mg/m²), Thiotepa (1x5mg/kg), ATG and/or OKT3, 7 Gy TLI and a second stem cell donation from a different donor. Result(s): Final engraftment was achieved in 21/21 patients. Median time to reach 500/mul neutrophiles was 10 days (8-15). Independence from platelet substitution was reached after 9 days (7-21). 17/21 patients (81%) had no signs of GvHD or GvHD grade I, 1 patient (5%) had GvHD grade II, 3 patients developed grade III (15%). TRM at day+100 and after 3 years was 0% and 15%, respectively. Event free survival (EFS) of the total cohort after 3 years was 18% (4 out of 21). EFS of RMS was 29% after 3 years, whereas patients with Ewings sarcoma showed a poorer outcome with only 1 out of 11 patient surviving at 2 years, which was presumably due to the higher portion of Ewing patients being transplanted in non remission (NR) (9 out of 11). According to remission status at SCT none of the patients with progressive disease or NR survived, whereas patients with complete remission (CR) had a more favorable outcome of 47% (4 out of 8 patients) surviving at 3 years. Conclusion(s): Fast recoveries of neutrophiles and platelets as well as low incidence of high grade GvHD resulted in a low TRM even if retransplantation was necessary. Hence haploidentical SCT with T-cell depleted grafts presents a feasible therapy option for patients with advanced sarcomas achieving remission prior to transplant.

Teltschik, H. M., et al. (2012). "Flow cytometry based chimerism analysis can predict graft rejection in pediatric patients receiving hla mismatched stem cell transplantation." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Graft failure is a life-threatening complication after allogeneic stem cell transplantation and its probability increases with the degree of HLA disparity between donor and recipient. In HLA-mismatched transplantation, specific T cells against mismatched HLA class I alleles were shown to be associated with rejection. Moreover, HLA mismatches allow to monitor the chimerism status of several cell populations by flow cytometry with specific monoclonal antibodies against HLA alleles with high sensitivity even in very low cell numbers. We report our experience with this method in a cohort of 90 pediatric patients who received T and B cell depleted haploidentical stem cells after myeloablative conditioning regimens. Diagnoses were: leukemias n=43, solid tumors n=28, non malignant diseases n=19. Graft manipulation was carried out by magnetic microbeads and the clinimacsO device with 4 to 5 log depletion efficacy. Conditioning regimens were TBI, Bu or Mel based and comprised ATG or OKT3. Immunosuppression with mycophenolate mofetil (MMF) was given in most patients (if donor T cells in the graft exceeded 25.000/kg body weight) Flow cytometry with HLA antibodies for detection of chimerism status of T and NK cell subsets in peripheral blood was started at day 0 and was repeated at least weekly. 14 out of 90 patients (15%) rejected the graft between day 19 and 86 (median day 33). Two different rejection patterns were observed: early rejections (diagnosis of rejection, day 19-40, median day 28) with cytokine release syndrome including high fever, massive elevation of CRP, ferritin, LDH and D-Dimers or late rejections without signs of inflammation (diagnosis of rejection, day 53-86). In all patients, residual T cells of recipient origin were still detectable after the conditioning procedure. The portion of residual recipient T cells within the first week (day 0-7) was predictive: Non-rejectors had a median percentage of 46+-5% recipient T cells detectable (n=42 analyses) whereas rejectors showed a significant higher percentage (85+-7%, n=13 analyses, p<0.001). In more than 90% of the rejectors, the portion of detectable autologous recipient T cells exceeded 60%. Thus, the risk of rejection for patients with >60% detectable recipient T cells was 41% (12 out of 29 rejected), whereas patients with <60% recipient T cells had a risk of 4% (only 1 out of 27 rejected; p=0.001). In non-rejectors, recipient T cells where detectable at a very low level (median 0,7/mul) up to day 60 without proliferation tendency, whereas strongly increasing and significantly higher numbers were observed in rejectors (from 3/mul at day 0-3 up to 617/mul at day 15-18; p< 0,05 for all data pairs). Based on these data, donor lymphocyte infusions (DLI) and cessation of MMF were performed in 12 patients with increasing residual recipient T cells to prevent imminent rejection (1-4 infusions, median number: 1; starting dose: 25.000 CD3+cells/kg bw). Recipient T cells were reduced/eradicated in 7/12 patients (60%) after DLIs and no rejection occurred. In 5 patients, DLIs had no impact on increasing recipient T cells, resulting in graft rejection in 4 out of these 5

patients. Conclusion(s): Flow cytometry with specific monoclonal antibodies against HLA alleles allows to analyze the origin of lymphocyte subsets and their kinetics after HLA mismatched transplantation with high sensitivity even in very low cell numbers. The percentage of residual recipient T cells in the first week posttransplant was predictive, since patients with >60% detectable recipient T cells had a significantly higher risk to experience graft rejection. In all cases, rejection was associated with increasing recipient T cells. Intervention with DLI and cessation of immune suppression may contribute to prevent rejection.

Tendulkar, S., et al. (2012). "A three-dimensional microfluidic approach to scaling up microencapsulation of cells." Biomedical Microdevices **14**(3): 461-469.

Current applications of the microencapsulation technique include the use of encapsulated islet cells to treat Type 1 diabetes, and encapsulated hepatocytes for providing temporary but adequate metabolic support to allow spontaneous liver regeneration, or as a bridge to liver transplantation for patients with chronic liver disease. Also, microcapsules can be used for controlled delivery of therapeutic drugs. The two most widely used devices for microencapsulation are the air-syringe pump droplet generator and the electrostatic bead generator, each of which is fitted with a single needle through which droplets of cells suspended in alginate solution are produced and cross-linked into microbeads. A major drawback in the design of these instruments is that they are incapable of producing sufficient numbers of microcapsules in a short-time period to permit mass production of encapsulated and viable cells for transplantation in large animals and humans. We present in this paper a microfluidic approach to scaling up cell and protein encapsulations. The microfluidic chip consists of a 3D air supply and multi-nozzle outlet for microcapsule generation. It has one alginate inlet and one compressed air intlet. The outlet has 8 nozzles, each having 380 micrometers inner diameter, which produce hydrogel microspheres ranging from 500 to 700 mu m in diameter. These nozzles are concentrically surrounded by air nozzles with 2 mm inner diameter. There are two tubes connected at the top to allow the air to escape as the alginate solution fills up the chamber. A variable flow pump 115 V is used to pump alginate solution and Tygon registered tubing is used to connect in-house air supply to the air channel and peristaltic/syringe pump to the alginate chamber. A pressure regulator is used to control the flow rate of air. We have encapsulated islets and proteins with this high throughput device, which is expected to improve product quality control in microencapsulation of cells, and hence the outcome of their transplantation.

Teng, J., et al. (2019). "Microplastic in cultured oysters from different coastal areas of China." Science of the Total Environment **653**: 1282-1292.

Microplastics are an emerging concern in the marine environment due to their small size; they can be ingested by aquatic organisms, especially filter-feeding organisms, such as oysters. The presence of microplastics in seafood may pose a threat to food safety, and there is an urgent need to evaluate the potential risks of microplastics to human health. This study quantified the microplastics in oysters from 17 sites along the coastline of China. Qualitative attributes, such as shape and size, were also determined under a microscope. Additionally, the polymer types were identified using Fourier-Transform Infrared Micro-Spectroscopy (μ-FT-IR). The results showed that the average abundance of microplastics in oyster was 0.62 items/g (wet weight) or 2.93 items/individual. Additionally, 84% of the sampled oysters had inhaled microplastics, indicating the high prevalence of microplastic pollution in different coastal areas of China. Fibers were the most common shape (60.67%), and the most common size was <1500 μm, accounting for 81.89% of the total microplastics. The μ-FT-IR analysis identified eight different polymers, and the main polymeric types of microplastics were cellophane (CP), polyethylene (PE) and

polyethylene terephthalate (PET). Our results suggest the widespread prevalence of microplastics in cultured oysters from different coastal areas of China with similar or lower abundances than other countries. In addition, our results exhibited regional characteristics of high microplastics abundance in southern coastal area of China and low microplastics abundance in northern China. Further investigations are warranted to examine microplastics contamination in other seafood species from different geographical sites in coastal area of China. Graphical abstract Unlabelled Image Highlights • Microplastic uptake was identified in cultured oysters from 17 cites of China. • Eighty-four percent of sampled oysters had inhaled microplastics. • The average microplastics abundance was 0.62 items/g (ww) or 2.93 items/individual. • The most common polymeric types of microplastics in oysters were CP, PE and PET. [ABSTRACT FROM AUTHOR]

Teo, Y., et al. (2016). "Relationship between virus replication and apoptosis events in IgM+ cells from chicken spleen and bursa of Fabricius infected with Malaysia strain of very virulent infectious bursal disease virus." Acta Scientiae Veterinariae **44**(1419).

Infection of IBDV was reported to be endemic worldwide, including Malaysia, and can be spread orally through polluted fodder and water sources, thus causing economic losses especially in the commercial poultry industry. The infection results in the depletion of B lymphocytes and subsequently destruction of the bursa, which leads to immunosuppression of the bird and it was postulated that the depletion of cells in the bursa was due to induction of apoptosis. In the current study, the infection of a Malaysian isolate of very virulent IBDV UPM0081 on IgM bearing B lymphocytes (IgM+ cells) from chicken spleen and bursa was compared. A total of sixty eggs were obtained and raised until the age of 3 weeks old. The birds were divided into two groups (n=30), which one of them served as control while IBDV strain UPM0081 was used to infect another group of birds at the concentration of 103 ELD50. The birds were observed and sacrificed at days 2, 4 and 5 post infections. Spleen and bursa of Fabricius were harvested and subjected to IgM+ cell enrichment using microbeads. The cell viability of enriched cells was assayed using MTT and cell cycle was analysed using propidium iodide. Annexin V FITC and acridine orange/propidium iodide double stain assays were used to determine the event of apoptosis in the enriched IgM+ cells. Also, the IBDV viral load was also quantified by using real time polymerase chain reaction (PCR) to evaluate the relationship between virus replication and apoptosis events in the infected chickens. Current results showed that the apoptotic events were observed to be significantly higher in IgM+ cells isolated from chicken bursa as compared to the cells isolated from spleen. The bursal B lymphocytes cell viability decreased following the infection of very virulent IBDV. The cells were then investigated of their apoptotic rate and data showed that increasing apoptotic cells (early and late apoptosis) were observed in AO/PI double stain as well as increment of SubG0/G1 population in the cell cycle analysis and also increment of Annexin V FITC bound cells in the apoptosis study. As for B lymphocytes from chicken spleen, the magnitude of damage caused by very virulent IBDV was not as severe as that in the chicken bursa, with the cell viability drastically decreased on day 4 following IBDV infection. IBDV caused severe destruction in bursa of Fabricius compared to spleen, in which cell death events in the former was reported to be directly caused by the virus. Apoptotic event in chicken spleen

following IBDV infection was observed to be caused by oxidative stress. Thus, viral replication played a role in inducing bursal IgM+ cells death while such phenomenon was not observed in spleen isolated IgM+ cells. In summary, the cell death events of IgM+ cells in chicken spleen and bursa of Fabricius may be accounted for by different factors upon infection with the Malaysian strain of IBDV UPM0081. It is obvious that IgM+ cells from chicken bursa suffered from apoptotic cell death in an increasing manner considerably with time of infection and RNA load detected in the cells, which supported by previous literature that IBDV induces host cells apoptosis, with both VP2 and VP5 playing a role in binding and apoptosis. Meanwhile, the cell death events of B lymphocytes in chicken spleen was observed to be more relevant to other factors such as the oxidative stress or proinflammatory cytokines that caused by the virus infection rather than the viral RNA load.

Ter Halle, A., et al. (2016). "Understanding the Fragmentation Pattern of Marine Plastic Debris." Environmental Science & Technology **50**(11): 5668-5675.

The global estimation of microplastic afloat in the ocean is only approximately 1% of annual global plastic inputs. This reflects fundamental knowledge gaps in the transformation, fragmentation, and fates of microplastics in the ocean. In order to better understand microplastic fragmentation we proceeded to a thorough physicochemical characterization of samples collected from the North Artlantic subtropical gyre during the sea campaign Expedition seventh Continent in May 2014. The results were confronted with a mathematical approach. The introduction of mass distribution in opposition to the size distribution commonly proposed in this area clarify the fragmentation pattern. The mathematical analysis of the mass distribution points out a lack of debris with mass lighter than 1 mg. Characterization by means of microscopy, microtomography, and infrared microscopy gives a better understanding of the behavior of microplastic at sea. Flat pieces of debris (2 to 5 mm in length) typically have one face that is more photodegraded (due to exposure to the sun) and the other with more biofilm, suggesting that they float in a preferred orientation. Smaller debris, with a cubic shape (below 2 mm), seems to roll at sea. All faces are evenly photodegraded and they are less colonized. The breakpoint in the mathematical model and the experimental observation around 2 mm leads to the conclusion that there is a discontinuity in the rate of fragmentation: we hypothesized that the smaller microplastics, the cubic ones mostly, are fragmented much faster than the parallelepipeds.

Teramo, A., et al. (2014). "Analysis of STAT3 mutations in patients affected by lymphoproliferative disorders of large granular lymphocyte." Haematologica **2)**: S53.

Introduction. T large granular lymphocytes leukemia (T-LGLL) and NKtype chronic lymphoproliferative disorder (CLPD-NK) are rare diseases characterized by the abnormal expansion of large granular lymphocytes (LGL). The majority of patients are asymptomatic, although neutropenia or autoimmune rheumatic diseases can be reported in a significant percentage of cases. Actually, the pathogenesis of these disorders is still unknown. Several data indicate that LGL proliferation is maintained through the activation of many signaling pathways, among them JAK/STAT pathway has a relevant role in LGL survival and proliferation. Recently, both in T-LGLL and CLPD-NK, somatic STAT3 mutations have been reported in the SH2 domain, mostly represented by Y640F and D661Y. The aims of this study include: i) the analysis of STAT3 point mutations in T-LGLL and CLPD-NK patients DNA samples; ii) the evaluation of these mutations over time (mean follow-up 6 + 3 y); iii) the correlation between the presence of STAT3 mutations and clinical (in particular neutropenia) and biological (namely immunophenotypic) features of patients' LGL. Methods. One hundred one patients were

included in the study: 60 affected by T-LGLL and 41 by CLPD-NK. Peripheral blood mononuclear cell (PBMC) immunophenotype was analyzed by flow cytometry for CD3, CD16, CD57, CD56, CD4, CD8, CD5, CD19, gammadelta, Vbeta and Killer Immunoglobulin like Receptor (KIR) markers. For molecular analysis, LGLs were purified by microbeads or FACSAria cell sorting and DNA samples were sequenced by Sanger method. In addition, DNA samples were analyzed by Amplification Refractory Mutations System (ARMS-PCR) for Y640F and D661Y STAT3 mutations. Results. By the combination of Sanger sequencing and ARMS-PCR, 14/101 patients were found mutated in STAT3: 11 with T-LGLL (18% of all T-LGLL patients analyzed), and 3 with CLPDNK (7% of all CLPD-NK patients analyzed). By flow cytometry we defined a discrete immunophenotype of LGLs in mutated T-LGLL patients characterized by CD8+, CD57+, CD16+ expression, a restricted TCR BV repertoire or KIR expression and more than 55% of total lymphocytes represented by LGLs. In all mutated patients mutations have been detected also during the follow-up. Furthermore, we found that 9/11 (82%) of T-LGLL mutated patients were characterized by neutropenia (ANC<1,000/mul), in particular 5/11 (45%) presenting with severe neutropenia (ANC<500/mul). Conclusions. Although the clinical relevance of STAT3 mutations is not yet completely clarified in these disorders, our results indicate that patients carrying STAT3 mutations might represent a subset with clinical and biological features suggestive for a more symptomatic disease.

Terao, C., et al. (2012). "The human leukocyte antigen DRB1*13:02-DQB1*06:04-DPB1*04:01 haplotype isclosely associated with dermatomyositis patients with Anti-CADM-140 (melanoma differentiation-associated protein 5: MDA5) antibody. Yuji hosono1." Arthritis and Rheumatism **10)**: S821-S822.

Background/Purpose: Recent studies have revealed that anti-CADM- 140 (MDA5/IFIH1)-antibody positive dermatomyositis (DM) patients frequently develop acute or subacute progressive interstitial pneumonia (A/SIP) with poor prognosis. However, genetic background of anti-CADM-140- antibody positive DM is currently unclear. Here, we intended to analyze the relationship between specific human leukocyte antigen (HLA) alleles in anti-CADM-140-positive DM patients. Method(s): Anti-CADM-140-antibody positive DM patients (CADMs, N=20) and healthy controls (HCs, N=2972) were enrolled in this study. Autoantibodies were screened using immunoprecipitation with [35S]methionine-labelled HeLa cells. HLA class I (A, B, and C) and class II (DRB1, DQA1, DQB1, and DPB1) genotyping was carried out with a highthroughput, high-resolution genotyping method (WAKFlow WAKUNAGA) by combining PCR and sequence-specific oligonucleotide probe protocols with the Luminex 100 xMAP flow cytometry dual-laser system to quantify fluorescently labelled oligonucleotides attached to colour-coded microbeads. Allele frequency was compared between CADMs and HCs by chi-square test or Fisher's exact test. Haplotypes with frequency more than 10% in CADMs were analyzed for comparison between CADMs and HCs with chi-square test. Result(s): No specific HLA class I alleles show significant associations with CADMs.CADMs demonstrated higher allele frequencies of DRB1*1302 (15% vs 5.5%; with OR=2.73,0.0854), DQB1*0604 (12.5% vs 5.5%; with OR=2.5,P= 0.0114), and DPB1*0401 (12.5% vs 5G with OR=2.5,P= 0.03469) than HCs. However, no specific HLA alleles reached significant difference between CADMs and NCs due to lack of power. The observed distribution of HLA class II alleles among patients and controls suggested the notion that specific combinations of alleles at the DRB1, DQB1, and DPB1 loci are associated with the risk for CADMs. Haplotype analysis showed the frequency of the haplotype DRB1*13:02-DQB1*06:04- DPB1*04:01 was higher in CADMs than NCs (12.5% vs 3.6%;OR 3.79, 95%CI 1.47-9.76, P = 0.0030). Conclusion(s): HLA-DRB1*13:02-DQB1*06:04-DPB1*04:01 haplotype is closely associated with CADMs, suggesting that the production of anti- CADM-140

may be associated with a certain immunogenetive background.

Terry, V. H., et al. (2009). "CD44 MicroBeads accelerate HIV-1 infection in T cells." Virology **388**(2): 294-304.

Super-paramagnetic CD44 MicroBeads (Miltenyi) designed for the isolation of infectious HIV-1 from dilute or difficult biological samples dramatically enhance the infectivity of bound HIV virions, even if the original viral suspension is merely incubated with beads. Infection of the CEM T cell line with the NL4-3 virus clone or primary human CD4 T cells with X4- and R5-tropic clones and a clade C primary virus isolate all showed accelerated p24 production and larger fractions of infected target cells. Effects could be detected very early; incubation of virus with the CD44 MicroBeads promoted higher levels of viral integration within the first infection cycle. In summary, CD44 MicroBeads provide the means not only to concentrate dilute viral samples, but also to directly facilitate within days rather than weeks the in vitro expansion of patient isolates independent of coreceptor usage and the performance of HIV replication assays that require a large fraction of infected primary T cells.

Teschner, D., et al. (2012). "Clinical grade depletion of naive T cells using CD45RA MicroBeads." Onkologie **6)**: 156-157.

Introduction: We and others have previously demonstrated that naive T cells contain a much higher frequency of alloreactive precursors compared to memory T cells. This study aims at the development of a good manufacturing practice (GMP) procedure for depleting naive CD45RA+ T cells from donor lymphocyte infusion (DLI) products, as a new approach to primary graft-versus-host disease (GvHD) prophylaxis. Method(s): Leukapheresis products from healthy donors (n = 6) were depleted from CD45RA+ cells under clean room conditions, using CliniMACS CD45RA MicroBeads. Two fractions (i.e. unseparated, CD45RA-) were analyzed by phenotypic and functional assays. Result(s): CD45RA depletion eliminated >99.9% of CD45RA+ cells (median 4.4 log depletion). The CD45RA- subset contained a higher proportion of CD4+ T cells than the untouched leukapheresis (median 17.5 vs. 11.6 %). In contrast, CD8+ T cells and CD4+CD25+FOXP3+ regulatory T cells were reduced in the CD45RA- fraction (6.8 vs. 13.9% and 1.3 vs. 1.8%). CD16+CD56+ NK cells and CD19+ B cells were almost completely eliminated (0.1 vs. 7.7% and 0 vs. 13.9%), whereas CD14+ monocytes and CD15+ granulocytes were enriched in the CD45RA- fraction (40.9 vs. 23.1% and 7.9 vs. 1.6%). CD4+ and CD8+ T cells in the CD45RA- subset showed a memory phenotype (entirely CD45ROpositive, low expression of CD62L and CCR7, intermediate expression of CD27 and CD28). In IFN-gamma ELISpot assays, persistent reactivity to cytomegalovirus, Epstein-Barr virus, candida, and aspergillus antigens could be demonstrated in the CD45RA- subset. In allogeneic mixed lymphocyte reaction (MLR) assays, alloreactive CD8+ T cells were strongly reduced (around 1-log) upon CD45RA depletion, even in clinically inapplicable (10 out of 10) HLA mismatch settings. In contrast to our previous in vitro work (single HLA mismatch), alloreactive CD4+ precursors appeared in similar quantities in both fractions when applying 10 out of 10 HLA mismatch MLR. Conclusion(s): Clinical grade depletion of CD45RA+ cells from entire leukapheresis products is feasible and highly efficient using GMP CD45RA MicroBeads. The CD45RA- target fraction contains memory T cells that show preserved reactivity to common viral and fungal pathogens. T cell mediated alloreactivity appears to be reduced in the CD45RA- fraction, with apparently stronger efficacy in the CD8 compared to the CD4 subset. Our data pave the way for clinical trials that investigate if CD45RA-depletion of DLI can reduce GvHD.

Teschner, D., et al. (2011). "Depletion of alloreactive naive T cells using GMP-conform CD45RA

MicroBeads." Onkologie **6)**: 284.

Introduction: Alloreactive T cells are major inducers of graft-versus-host disease (GvHD) and originate mainly from naive precursors. We have previously shown that naive CD45RA+ CD4 and CD8 T cells contain an overall 1-log higher frequency of allo-HLA mismatch reactive T cells compared to memory CD45RA-counterpart fractions in vitro. Therefore, the aim of the current study is to establish a good manufacturing practice (GMP) procedure for depleting naive CD45RA+ T cells from donor allografts as a new approach of primary GvHD prophylaxis. Method(s): Leukapheresis products from healthy donors were separated under clean room conditions using novel GMP-conform CliniMACS CD45RA MicroBeads into CD45RA+ and CD45RA-cells. Flow cytometric phenotyping of unseparated cells and CD45RA fractions was performed for T cell subsets including natural killer (NK) cells and B cells. Compatible with the intended clinical setting, three fractions (i.e. unseparated, CD45RA+, CD45RA-) were frozen under GMP guidelines. Ongoing work analyzes all fractions for numbers of regulatory T cells, monocytes and neutrophils, and for T cell responses to alloantigens and to common pathogens such as cytomegalovirus, Epstein-Barr virus, candida, and aspergillus. Result(s): Untouched leukapheresis products showed a typical distribution of cell types with a proportion of 38.1% +/- 5.8 CD3+CD45RA+ T cells and a CD4/ CD8 ratio of 2.9-3.1/1. Depletion by CD45RA MicroBeads eliminated >99.9% of CD45RA+ cells (>7-log depletion) during a 4-hour CliniMACS procedure. The CD45RA-subset contained a higher proportion of CD4⁺ T cells than the CD45RA+ counterpart subset (73.3 vs. 39.0 % in separated viable cells). In contrast, CD8+ T cells were increased in the CD45RA+ fraction (19.8 vs. 10.9%). CD16+CD56+ NK cells and CD19+ B cells were almost completely depleted by CD45RA beads (0.1% vs. 19.0% and 0% vs. 8.6%, respectively). Conclusion(s): In vitro depletion of CD45RA+ cells from entire leukapheresis products is highly efficient using GMP-conform CD45RA MicroBeads. The CD45RA-target fraction is enriched for memory T cells, and contains more CD4⁺ T cells compared to the CD45RA+ counterpart subset. In contrast, CD45RA depletion decreases the numbers of CD8+ T cells as well as NK and B cells to different extent. Further experiments concerning phenotype, alloreactivity and anti-pathogen reactivity of both subsets are ongoing and will be presented at the meeting.

Tetik, S., et al. (2010). "Oxidative modification of fibrinogen affects its binding activity to glycoprotein (GP) IIb/IIIa." Clinical & Applied Thrombosis/Hemostasis **16**(1): 51-59.

AIM: Proteins are sensitive biomarkers of human disease condition associated with oxidative stress. Alteration of protein structures by oxidants may result in partial or complete loss of protein functions. We have investigated the effect of structural modifications induced by metal ion catalyzed oxidation of fibrinogen on its binding capacity to glycoprotein IIb/IIIa (GpIIb/IIIa) and human platelets.

METHODS: We identified and quantified of binding capacity of native and oxidized fibrinogen to its receptor in vitro by flow cytometer. Dityrosine formation on oxidized fibrinogen were detected spectrophotometrically. Elevated degradation products of fibrinogen after oxidation were revealed in the HPLC analysis. The native and oxidized fibrinogen were analyzed on mass spectrum upon digestion with trypsin.

RESULTS: Oxidatively modified fibrinogen showed less binding activity than native fibrinogen to GpIIb/IIIa coated micro beads and human platelets whereas slightly higher binding capacity to ADP induced stimulated platelets. Formation of di-tyrosines in the amino acid side chains of fibrinogen were observed upon oxidation. Decreased binding capacity of oxidized fibrinogen correlated with intensities of dityrosine formation. Oxidized fibrinogen had more ion-mass intensities at higher than native fibrinogen.

CLINICAL IMPLICATIONS: Important point is decreased of binding capacity of the oxidized fibrinogen to own receptor. The decreased rate of binding, leading to effect in the diseases of clot formation may account for the association between oxidation of fibrinogen and the incidence of effect in human diseases.

Tetik, S., et al. (2008). "Low-density lipoprotein specifically binds glycoprotein IIb/IIIa: a flow cytometric method for ligand-receptor interaction." Clinical & Applied Thrombosis/Hemostasis **14**(2): 210-219.

Primary platelet aggregation requires agonist-mediated activation of membrane receptor glycoprotein (GP) IIb/IIIa, binding of fibrinogen to GpIIb/IIIa, and cellular events after fibrinogen binding. This study investigated whether fibrinogen receptor GpIIb/IIIa is also the binding site for low-density lipoprotein (LDL) in platelets by using GpIIb/IIIa-coated polystyrene microbeads incubated with various concentrations of fluorescein isothiocyanate (FITC)-labeled ligands. Binding was assayed by flow cytometry. Binding of fibrinogen (Fg)-FITC and LDL-FITC to GpIIb/IIIa coated microbeads was concentration dependent, reaching saturation. Binding of LDL-FITC to GpIIb/IIIa coated microbeads was inhibited by fibrinogen. Binding of LDL-FITC or Fg-FITC to freshly isolated platelets gave similar results as those of GpIIb/IIIa coated microbeads. Glycoprotein IIb/IIIa, the fibrinogen receptor on platelets is also one of the binding sites of LDL on platelets. This rapid and reliable flow cytometric technique using coated microbeads may be used as a first step for the study of all ligand receptor interactions.

Tetteh-Wright, T. A. and T. Dwight (2019). "ECOS 40(4): Undergraduate winner: What are our otters eating?" Ecos - A Review of Conservation **40**(4): 1-1.

Tetu, S. G., et al. (2019). "Plastic leachates impair growth and oxygen production in Prochlorococcus, the ocean's most abundant photosynthetic bacteria." Communications Biology **2**(1): 184.

Plastic pollution is a global threat to marine ecosystems. Plastic litter can leach a variety of substances into marine environments; however, virtually nothing is known regarding how this affects photosynthetic bacteria at the base of the marine food web. To address this, we investigated the effect of plastic leachate exposure on marine Prochlorococcus, widely considered the most abundant photosynthetic organism on Earth and vital contributors to global primary production and carbon cycling. Two strains of Prochlorococcus representing distinct ecotypes were exposed to leachate from common plastic items: high-density polyethylene bags and polyvinyl chloride matting. We show leachate exposure strongly impairs Prochlorococcus in vitro growth and photosynthetic capacity and results in genome-wide transcriptional changes. The strains showed distinct differences in the extent and timing of their response to each leachate. Consequently, plastic leachate exposure could influence marine Prochlorococcus community composition and potentially the broader composition and productivity of ocean phytoplankton communities.

Teunou, E. and D. Poncelet (2005). "Rotary disc atomisation for microencapsulation applications - prediction of the particle trajectories." Journal of Food Engineering **71**(4): 345-353.

Disintegration of a liquid by a rotating disc is a technique that has been widely used in spray drying, cooling or freezing for atomisation of the liquid into fine droplets before drying or freezing. This technique is applied today for microencapsulation, which is a promising method to protect the core material, improve the product characteristics and functionalities. It is actually one of the few methods that can be economically applied for microencapsulation in food industries. For this purpose, the structure and the quality of the capsules are determining factors in guaranteeing the properties of the capsules. The capsules, in this case, must be collected in a gentle way, and the trajectory of the capsules, which is the objective of this paper, must be determined. So, paraffin microbeads (1-1000 micro m in diameter) were produced by disintegration of hot liquid paraffin with a rotating disc. The trajectory of the particle was measured. A theoretical model of a capsule travelling in static air was derived to predict the trajectory. It estimates closely the distance of projection of particles. Since it has been developed on a real basis such as the mechanism of disintegration for beads formation, slippage of liquid on the surface, radial velocity of the formed droplet at the edge of the disc and has taken into account interactions between the surrounding air, the atomised liquid and rotating disc characteristics, it can be used to predict the trajectory of beads produced by any type of rotating disc and atomised liquid. This model can also help to determine a surface productivity parameter of such system on an industrial scale.

Thai, K., et al. (2013). "Chronic inflammation-induced hematuria involves molecular modulation of the urothelial barrier and bladder vasculature." Journal of Urology **1)**: e468.

INTRODUCTION AND OBJECTIVES: Bladder surgery-, chemotherapy-, and infection-induced inflammation can breach the urothelial barrier and cause hematuria. Defining the mechanisms of urothelial compromise and hematuria in inflammation models may reveal shared pathways suitable as therapeutic targets. METHOD(S): We expanded on our mouse model of urogenital schistosomiasis (Fu et al., PLOS Pathogens 2012) to study how chronic inflammation breaches the urothelial barrier and causes hematuria. In this model, Schistosoma haematobium eggs are injected into the bladder walls of mice, which recapitulates key features of human infection, i.e. urothelial hyperplasia and hematuria. RESULT(S): Microarray analysis demonstrated that despite the onset of urothelial hyperplasia, transcription of junctional adhesion molecule, claudin and uroplakin genes, key components of the urothelial barrier, were all decreased compared to controls after bladder exposure to eggs (>=2-fold, p<0.05). Luminex liquid microbead immunoassays demonstrated higher levels of bladder vascular endothelial growth factor (VEGF) compared to controls after egg injection (p>0.05). Correspondingly, microarray and DAVID pathways analysis revealed more transcription of VEGF pathway-related genes in egg- vs. control-injected bladders. Perfusion of egg-injected mice with FITClectin and Red Fluoromax microspheres revealed widespread bladder neovascularization and more microvascular permeability relative to controls (Figure). Finally, mass spectrometry of urine from egg-injected mice demonstrated the presence of multiple blood proteins not observed in control-injected mice. CONCLUSION(S): These unexpected findings suggest that chronic inflammation-induced hematuria is associated with intricate modulation of the bladder vasculature and urothelial barrier on the cellular and molecular level. Future work will define how VEGF and other factors mediate these processes, which may lead to new management approaches for hematuria. (Figure Presented).

Thanh, N. P., et al. (2010). "Household solid waste generation and characteristic in a Mekong Delta city, Vietnam." Journal of Environmental Management **91**(11): 2307-2321.

This study was undertaken to evaluate the quantity and composition of household solid waste to identify opportunities for waste recycling in Can Tho city, the capital city of the Mekong Delta region in southern Vietnam. Two-stage survey of 100 households was conducted for dry season and rainy season in 2009. Household solid waste was collected from each household and classified into 10 physical categories and 83 subcategories. The average household solid waste generation rate was 285.28 g per capita per day. The compostable and recyclable shares respectively accounted for 80.02% and 11.73%. The authors also analyzed the relations between some socioeconomic factors and household solid waste generation rates by physical categories

and subcategories. The household solid waste generation rate per capita per day was positively correlated with the population density and urbanization level, although it was negatively correlated with the household size. The authors also developed mathematical models of correlations between the waste generation rates of main physical categories and relevant factors, such as household size and household income. The models were proposed by linear models with three variables to predict household solid waste generation of total waste, food waste, and plastic waste. It was shown that these correlations were weak and a relationship among variables existed. Comparisons of waste generation by physical compositions associated with different factors, such as seasonal and daily variation were conducted.

Thanh, N. P., et al. (2011). "Assessment of plastic waste generation and its potential recycling of household solid waste in Can Tho City, Vietnam." Environmental Monitoring & Assessment **175**(1-4): 23-35.

Plastic solid waste has become a serious problem when considering the disposal alternatives following the sequential hierarchy of sound solid waste management. This study was undertaken to assess the quantity and composition of household solid waste, especially plastic waste to identify opportunities for waste recycling. A 1-month survey of 130 households was carried out in Can Tho City, the capital city of the Mekong Delta region in southern Vietnam. Household solid waste was collected from each household and classified into ten physical categories; especially plastic waste was sorted into 22 subcategories. The average household solid waste generation rate was 281.27 g/cap/day. The compostable and recyclable shares respectively accounted for high percentage as 80.74% and 11%. Regarding plastic waste, the average plastic waste generation rate was 17.24 g/cap/day; plastic packaging and plastic containers dominated with the high percentage, 95.64% of plastic waste. Plastic shopping bags were especially identified as the major component, accounting for 45.72% of total plastic waste. Relevant factors such as household income and household size were found to have an existing correlation to plastic waste generation in detailed composition. The household habits and behaviors of plastic waste discharge and the aspects of environmental impacts and resource consumption for plastic waste disposal alternatives were also evaluated.

Thanh Truc, N. T. and B. K. Lee (2019). "Sustainable hydrophilization to separate hazardous chlorine PVC from plastic wastes using H₂O₂/ultrasonic irrigation." Waste Management **88**: 28-38.

Polyvinyl chloride (PVC) products comprise a large portion of plastic wastes and cause severe environmental burdens in thermal recycling such as toxic release and disposal difficulties. Selective separation methods for PVC containing hazardous chlorine are required for the development of suitable disposal or material recycling processes. However, separating PVC selectively from municipal plastic waste mixtures is difficult due to their similar hydrophobic surface and appearance densities. This study presents a one-step, selective separation technique for PVC using H₂O₂ solution under ultrasonic irrigation to promote the selective development of hydrophilicity only on the PVC surface. The combined treatment helped to decrease air bubbles attached on the PVC surface because of increased wettability, which allowed the treated PVC to settle on the bottom of the flotation reactor. However, the remaining plastic wastes were easily floated off because they maintained their hydrophobicity. The combined treatment with a low concentration of 3% H₂O₂ and ultrasonic irrigation for 30min afforded 100% purity and recovery of the PVC separated from the municipal plastic waste mixture. This proposed treatment is therefore a promising and inexpensive way to improve plastic recycling quality

through selective PVC separation by the selective development of hydrophilicity on its surface.

Thanh Truc, N. T., et al. (2017). "Surface hydrophilization of acrylonitrile butadiene styrene by the mild heat treatment for its selective separation to recycling." Separation and Purification Technology **173**: 226-232.

Acrylonitrile-butadiene-styrene (ABS) is one of hazardous halogenic plastics which containing brominated flame-retardants (BFRs) is considered as toxic wastes due to releasing hydrogen bromide and brominated dioxins through incineration or disposal activities. In present, recycling is aimed as a sustainable plastic waste management of ABS containing BFRs in ways that minimize the potential impact on human health and environment. This study was conducted to facilitate the separation of ABS plastics from heavy plastic mixture by froth flotation after surface rearrangement of ABS with mild heat treatment for its recycling. Hydrophilic moieties would be more likely to develop on the mild heat-treated ABS surfaces than on other plastics perhaps due to the difference of molecular mobility. This provides an excellent base for selective separation of ABS by froth flotation technique. As a result of froth flotation after mild heat treatment, about 97% of ABS with 100% purity was selectively separated from heavy plastics. The detailed mechanism for the selective separation of the ABS in the treatment (froth flotation after mild heat treatment) was discussed. Finally, this study facilities selective separation application effective and inexpensive method for of ABS from waste plastics.

Thavakumar, A., et al. (2016). "Eosinophil apoptosis is negatively associated with body mass index in asthma." Thorax **71 (Supplement 3)**: A218.

Background Obese asthmatics are known to have reduced eosinophils in sputum, as well as poor control of asthma symptoms.1 We have shown that, compared to non-obese patients, there is an elevated number of eosinophils in the airway submucosa of obese asthmatic patients.2 This study aims to determine whether a differential susceptibility to apoptosis, between obese and non-obese patients, could contribute to these clinical observations. Method Patients with a clinical diagnosis of asthma were recruited (n = 28) and consented at Glenfield Hospital for blood donation to study eosinophil apoptosis; the patients recruited had varying severities of asthma and BMI. Eosinophils were isolated from whole blood by negative immunomagnetic selection using CD16 microbeads to a purity of mean +/- SD 95.7% (+/- 4). Purified eosinophils (Time 0) were placed into culture in RPMI (1640 + GlutaMAX-1 supplemented with 10% FBS and 1% penicillin and streptomycin) and harvested at 17 and 21 hours later to measure apoptosis by flow cytometry using Annexin V and Propidium Iodide (Becton Dickinson). Cells were considered apoptotic if they were Annexin V positive/PI negative and reported as a percentage of total eosinophils. Results At 0 hours, the mean% of annexin V positive cells was 0.47% and there was no significant association with BMI (r = -0247, p value = 0.245). At 17 and 21 hours there were 12.68% and 21.0% annexin V positive cells, respectively, and we noted a significant negative Pearson's correlation between eosinophil apoptosis and BMI at time 17 (r = -0.449; p = 0.028) and time 21 (r = -0.448; p = 0.028). These correlations were independent of lung function, steroid medication and percentage eosinophil purity. Conclusion Eosinophils from obese asthmatic patients are less susceptible to apoptosis compared to those from non-obese patients. This may contribute to the differential presence of eosinophils in the lamina propria and airway of obese patients compared to non-obese individuals.

The Lancet Planetary, H. (2017). "Microplastics and human health-an urgent problem." The lancet. Planetary Health **1**(7): e254.

The Lancet Planetary, H. (2018). "Can Europe lead the transformation of the plastic pollution crisis?" The Lancet Planetary Health **2**(7): e274.

Theaker, S. M., et al. (2016). "T-cell libraries allow simple parallel generation of multiple peptide-specific human T-cell clones." Journal of Immunological Methods **430**: 43-50.

Isolation of peptide-specific T-cell clones is highly desirable for determining the role of T-cells in human disease, as well as for the development of therapies and diagnostics. However, generation of monoclonal T-cells with the required specificity is challenging and time-consuming. Here we describe a library-based strategy for the simple parallel detection and isolation of multiple peptide-specific human T-cell clones from CD8(+) or CD4(+) polyclonal T-cell populations. T-cells were first amplified by CD3/CD28 microbeads in a 96U-well library format, prior to screening for desired peptide recognition. T-cells from peptide-reactive wells were then subjected to cytokine-mediated enrichment followed by single-cell cloning, with the entire process from sample to validated clone taking as little as 6 weeks. Overall, T-cell libraries represent an efficient and relatively rapid tool for the generation of peptide-specific T-cell clones, with applications shown here in infectious disease (Epstein-Barr virus, influenza A, and Ebola virus), autoimmunity (type 1 diabetes) and cancer.

TheinHan, W., et al. (2013). "Non-rigid calcium phosphate cement containing hydrogel microbeads and absorbable fibres seeded with umbilical cord stem cells for bone engineering." Journal Of Tissue Engineering & Regenerative Medicine **7**(10): 777-787.

The need for bone repair has increased as the population ages. Non-rigid calcium phosphate scaffolds could provide compliance for micro-motions within the tissues and yet have load-supporting strength. The objectives of this study were to: (a) develop a non-rigid calcium phosphate cement (CPC) with microbeads and fibre reinforcement; and (b) investigate human umbilical cord mesenchymal stem cell (hUCMSC) proliferation, osteodifferentiation and mineralization on non-rigid CPC for the first time. Non-rigid CPC was fabricated by adding extra tetracalcium phosphate in the traditional CPC and by incorporating chitosan, absorbable fibres and hydrogel microbeads. The non-rigid CPC-microbead scaffold possessed a strain-at-failure of 10.7%, much higher than the traditional CPC's strain of 0.05% which is typical for brittle bioceramics. Flexural strength of non-rigid CPC-microbead was 4-fold that of rigid CPC-microbead scaffold, while work-of-fracture (toughness) was increased by 20-fold. The strength of non-rigid CPC-microbead-fibre scaffold matched that of cancellous bone. hUCMSCs on non-rigid CPC proliferated from 100 cells/mm(2) at 1 day to 600 cells/mm(2) at 8 days. Alkaline phosphatase, osteocalcin and collagen gene expressions of hUCMSCs were greatly increased, and the cells synthesized bone minerals. hUCMSCs on non-rigid CPC-microbead-fibre constructs had higher bone markers and more mineralization than those on rigid CPC controls. In conclusion, this study developed the first non-rigid, in situ-setting calcium phosphate-microbead-fibre scaffold with a strain-at-failure exceeding 10%. hUCMSCs showed excellent proliferation, osteodifferentiation and mineralization on non-rigid CPC scaffold. The novel non-rigid CPC-hUCMSC construct with good strength, high strain-at-failure and toughness, as well as superior stem cell proliferation, osteodifferentiation and mineralization, is promising for load-bearing bone regeneration applications.

Theodoropoulou, E., et al. (2019). "Different epigenetic clocks reflect distinct pathophysiological features of multiple sclerosis." Epigenomics **11**(12): 1429-1439.

Aim: Accumulating evidence links epigenetic age to diseases and age-related conditions, but little is known about its association with multiple sclerosis (MS). Material(s) and Method(s): We estimated epigenetic age acceleration measures using DNA methylation from blood or sorted cells of MS patients and controls. Result(s): In blood, sex (p = 4.39E-05) and MS (p = 2.99E-03) explained the variation in age acceleration, and isolated blood cell types showed different epigenetic age. Intrinsic epigenetic age acceleration and extrinsic epigenetic age acceleration were only associated with sex (p = 2.52E-03 and p = 1.58E-04, respectively), while PhenoAge Acceleration displayed positive association with MS (p = 3.40E-02). Conclusion(s): Different age acceleration measures are distinctly influenced by phenotypic factors, and they might measure separate pathophysiological aspects of MS. Data deposition: DNA methylation data can be accessed at Gene Expression Omnibus database under accession number GSE35069, GSE43976, GSE106648, GSE130029, GSE130030. Copyright © 2019 Maja Jagodic.

Thiagarajan, V., et al. (2019). "Influence of differently functionalized polystyrene microplastics on the toxic effects of P25 TiO₂ NPs towards marine algae Chlorella sp." Aquatic Toxicology **207**: 208-216.

Increased utilization of titanium dioxide nanoparticles (TiO₂ NPs) for commercial as well as industrial purposes resulted in the accumulation of nanoparticles in the marine system. Microplastics being an emerging secondary pollutant in the marine ecosystem have an impact on the toxic effects of TiO₂ NPs which has not been evaluated up to date. So it is important to assess the toxic effects of both these pollutants on the marine environment. The present study examines the impact of differently functionalized microplastics on the toxic effects of P25 TiO₂ NPs to marine algae Chlorella sp. The tendency of nanoparticles to undergo aggregation in artificial seawater was observed with increase in time. The median effective concentration for TiO₂ NPs was found to be 81 muM which indicates higher toxic effects of NPs toward algae. In contrast, microplastics irrespective of their difference in functionalization had minimal toxic effect of about 15% at their higher concentration tested, 1000 mg L⁻¹. Plain and aminated polystyrene microplastics enhanced the TiO₂ NPs toxicity which was further validated with oxidative stress determination studies like reactive oxygen species and lipid peroxidation assays. Negatively charged carboxylated polystyrene microplastics decreased the TiO₂ NPs toxicity with possible hetero-aggregation between TiO₂ NPs and microplastics in the system. The toxicity data obtained for the mixture was further corroborated with Abbott's mathematical model.

Thiele, C. J., et al. (2019). "Evaluation of existing methods to extract microplastics from bivalve tissue: Adapted KOH digestion protocol improves filtration at single-digit pore size." Marine Pollution Bulletin **142**: 384.

Methods standardisation in microplastics research is needed. Apart from reagent-dependent effects on microplastics, varying target particle sizes can hinder result comparison between studies. Human health concerns warrant recovery of small microplastics. We compared existing techniques using hydrogen peroxide, Proteinase-K, Trypsin and potassium hydroxide to digest bivalve tissue. Filterability, digestion efficacy, recoverability of microplastics and subsequent polymer identification using Raman spectroscopy and a matching software were assessed. Only KOH allowed filtration at ≤25 µm. When adding a neutralisation step prior to filtration, KOH digestates were filterable using 1.2-µm filters. Digestion efficacies were >95.0% for oysters, but lower for clams. KOH destroyed rayon at 60 °C but not at 40 °C. Acrylic fibre identification was affected due to changes in Raman spectra peaks. Despite those effects, we recommend KOH as the most viable extraction method for exposure risk studies, due to microplastics recovery from bivalve tissues of single-digit micrometre size.

Thomas, A. C., et al. (2019). "A self-preserving, partially biodegradable eDNA filter." Methods in Ecology and Evolution **10**(8): 1136-1141.

eDNA studies often rely on water filtration in the field and immediate sample preservation to prevent DNA degradation during sample transport. However, filter membrane transfer steps for preservation can increase risk of sample contamination and the reliance on typical single-use filter housings produces significant plastic waste.We created a new eDNA filter housing (compatible with any suction pump) partially comprised of a biodegradable, hydrophilic material that functions to automatically preserve captured eDNA via desiccation—no filter membrane transfer steps, no chemical or cold storage required.We tested the self-preservation capabilities of the desiccating filter housings by filtering replicate samples in an eDNA mesocosm study and compared with ethanol preservation. Self-preserving filters were placed back into original packaging for storage, and samples for both preservation methods were kept at room temperature until extraction at prescribed time points (11 days, 18 days, 25 days, 32 days, 60 days, 88 days, 172 days) post-filtration. Paired field samples were also collected from six pond locations targeting an additional species to demonstrate field performance.Quantitative PCR results from the mesocosm study indicated that both methods effectively preserved eDNA over a 6-month storage period, with the self-preserving filters yielding slightly more target DNA on average (SQ = 329 copies) than ethanol-preserved samples (SQ = 288 copies) (F1,38 = 4.050, p = 0.051). Neither method showed signs of degradation after 172 days. Results from field sampling indicated a larger difference between preservation methods, with the self-preserving filters containing approximately 2X the eDNA of ethanol-preserved samples on average (paired t test, p = 0.020).These data suggest that self-preserving eDNA filter housings are a viable alternative to standard ethanol preservation methods and may provide higher detection sensitivity in some circumstances. The new filter housings should also help in reducing the risk of sample contamination, minimize protocol steps and result in less plastic waste. Such innovations are important to assure eDNA data quality and to help in facilitating the inclusion of non-expert sample collectors (e.g. citizen scientists) in research programs.

Thomas, J. H., et al. (2004). "Microbead-based electrochemical immunoassay with interdigitated array electrodes." Analytical Biochemistry **328**(2): 113-122.

The objective of this study was to develop a sensitive and miniaturized immunoassay by coupling a microbead-based immunoassay with an interdigitated array (IDA) electrode. An IDA electrode amplifies the signal by recycling an electrochemically redox-reversible molecule. The microfabricated platinum electrodes had 25 pairs of electrodes with 1.6-mum gaps and 2.4-mum widths. An enzyme-labeled sandwich immunoassay on paramagnetic microbeads with mouse IgG as the analyte and beta-galactosidase as the enzyme label was used as the model system. beta-Galactosidase converted p-aminophenyl beta-D- galactopyranoside to p-aminophenol (PAP). This enzyme reaction was measured continuously by positioning the microbeads near the electrode surface with a magnet. Electrochemical recycling occurred with PAP oxidation to p-quinone imine (PQI) at +290mV followed by PQI reduction to PAP at -300mV vs Ag/AgCl. Dual-electrode detection amplified the signal fourfold compared to single-electrode detection, and the recycling efficiency reached 87%. A calibration curve of PAP concentration vs anodic current was linear between 10⁻⁴ and 10⁻⁶M. A signal from 1000 beads in a 20-muL drop was detectable and the immunoassay was complete within 10min with a detection limit of 3.5x10⁻¹⁵mol mouse IgG. © 2004 Elsevier Inc. All rights reserved.

Thomas, M., et al. (2020). "The world is your oyster: low-dose, long-term microplastic exposure of juvenile oysters." Heliyon **6**(1): e03103.

Bivalve filter feeders, such as oysters, filter large volumes of water and are particularly exposed to microplastics (MP). Consequently, these animals digest and assimilate high levels of MP in their bodies that may likely impact their physiology, and potentially affect shellfish stocks, benthic habitats and, indirectly, the health status of the marine ecosystem and human consumers. In this study we exposed juvenile oysters, Crassostrea gigas, to 3 different MP concentrations (10⁴, 10⁵ and 10⁶ particles L⁻¹), represented by 6mum Polystyrene (PS) microbeads, compared to a control treatment receiving no MP. The study ran for a period of 80 days to test for the impacts of MP on growth, Condition Index and Lysosomal Stability. From histological analysis, microbeads were detected in the intestines of exposed oysters and in the digestive tubules, but no cellular inflammatory features were observed over time. Weight and shell length remained comparable between the different treatments and control. We found that Condition Index in the highest concentration increased initially but significantly reduced over time. The oysters in the highest MP exposure also showed the lowest mean Lysosomal Stability score throughout the experiment. Lysosomes play a vital role in the cells defense mechanisms and breakdown of constituents, crucial for the oysters' wellbeing. Most importantly, we detected an increased mortality in those oysters who were chronically exposed to the highest loads of MP.

Thompson, J. A. and H. H. Bau (2011). "Pulsating Bead-Based Assay." Analytical Chemistry **83**(8): 2858.

In recent years, there has been a growing interest in using porous microbeads such as agarose beads as solid supports to bind target molecules from complex fluid samples. Porous beads have large surface area to volume ratios and high receptor concentrations, and they facilitate relatively high sensitivity detection and multiplexing. Unfortunately, to take full advantage of the porous beads' attributes, long incubation times are needed due to the relatively slow mass transfer of target molecules from the exterior solution into the beads' interior. To accelerate the mass transfer process, we propose a novel assay in which functionalized porous beads are periodically compressed and expanded. Preliminary experiments were carried out to compare the performance of the pulsating beads with that of conventional, nonpulsating beads. These experiments indicate that the pulsating beads significantly accelerate binding rates with minimal increase in nonspecific binding. Thus, pulsing has the potential of significantly reducing assay time. [PUBLICATION ABSTRACT]

Thompson, R. C., et al. (2004). "Lost at Sea: Where Is All the Plastic?" Science **304**(5672): 838.

Thompson et al seek to establish that microscopic plastic fragments and fibers are also widespread in the oceans and have accumulated in the pelagic zone and sedimentary habitats. To quantify the abundance of microplastics, they collected sediment from beaches and from estuarine and subtidal sediments around Plymouth, UK. To assess the extent of contamination, a further 17 beaches were examined, and similar fibers were found, demonstrating that microscopic plastics are common in sedimentary forms. Their findings demonstrate that the broad spatial extent and accumulation of this type of contamination. Given the rapid increase in plastic production, the longevity of plastic, and the disposable nature of plastic items, the contamination is likely to increase, aside from the potential for plastics to adsorb, release, and transport chemicals. However, it remains to be shown whether toxic substances can pass from plastics to the food chain.

Thorp, B. H., et al. (1986). "Embedding of skeletal tissue in plastic for vascular and histological study to demonstrate delayed endochondral ossification in Leghorn type fowl." Research in Veterinary Science **40**(2): 236-240.

A method is described which enables visualization of the blood supply in developing avian long bones, followed by the preparation of undecalcified histological sections from the same material. The circulatory system was perfused with a solution of fixative, dye and barium sulphate. The skeletal tissue was cleared in plastic resin before embedding and tissue blocks were cut into 1 mm slabs. The vascular canals were then examined with a dissecting microscope. Slabs were re-embedded in resin and 5 micro m sections cut for routine undecalcified histological staining. Focal areas of delayed endochondral ossification were demonstrated in slabs prepared from the proximal ends of femora of White Leghorns. These lesions are considered to be a less severe form of the dyschondroplastic condition occurring in broilers.

Thushari, G. G. N., et al. (2017). "Effects of microplastics on sessile invertebrates in the eastern coast of Thailand: An approach to coastal zone conservation." Marine Pollution Bulletin **124**(1): 349-355.

This study assessed the microplastic contamination of 3 most abundant sessile and intertidal invertebrates (Rock Oyster: Saccostrea forskalii, Striped Barnacle: Balanus amphitrite, Periwinkle: Littoraria sp.) in 3 beaches of the eastern coasts of Thailand. The results showed a significant accumulation of microplastics in the invertebrates at rates of 0.2-0.6 counts/g indicating higher pollution levels along the coastline. Filter feeding organisms showed comparatively higher accumulation rates of microplastics. Thus, contaminated bivalves pose potential health risks for seafood consumers. The plastic pollutant prevalence in sessile and intertidal communities was corresponded with pollution characteristics of contaminated beach habitats where they live. Thus, bivalves, gastropods and barnacles can be used as indicators for contamination of microplastics in the areas. This study also demonstrated the need for controlling plastic pollution in Thai coastal areas. Copyright © 2017 The Authors

Tian, F., et al. (2015). "B10 cells induced by Schistosoma japonicum soluble egg antigens modulated regulatory T cells and cytokine production of T cells." Parasitology Research **114**(10): 3827-3834.

A distinct subset of B cells, also known as regulatory B cells, can negatively regulate T cell immune responses, but the role of these cells in schistosomiasis has not been clarified. Soluble egg antigen (SEA) and soluble adult worm antigen preparation (SWAP), which are two important antigen sources during Schistosoma japonicum infection, both can induce Th1, Th2, Th17, and Treg cells and the corresponding cytokines. However, whether they can induce the production of regulatory B cells and the regulatory function of schistosome-induced regulatory B cells remains unclear. In our studies, we first analyzed the production of regulatory B cells stimulated by SEA or SWAP using flow cytometry and enzyme-linked immunosorbent assay, and observed these cells in mice immunized by SEA or SWAP. Then, B10 cells sorted by MicroBeads were co-cultured with CD4⁺ T cells, and the proportion of Treg cells were detected. At the same time, the IFN- gamma , IL-4, and IL-17 levels in the culture supernatant were measured. The results showed that B10 cells were preferentially induced by SEA in vitro, and B10 could also be induced in mice immunized by SEA. SEA-induced B10 cells promoted the expansion of regulatory T cells and induced IL-4 secretion, but inhibited IL-17 production. These findings reveal that the generation of B10 cells is determined by parasitic antigen, and suggest the function of B10 cell induced by SEA. This study significantly contributes to the understanding of the immune regulatory role in schistosomiasis and may help protect hosts from infection.

Tian, L., et al. (2009). "Influence of antigen dose and DC number on CD8⁺ T cell differentiation and proliferation of OT-I transgenic mice." Journal of Northwest A & F University Natural

Science Edition **37**(9): 7-12.

Objective: The study was to investigate the influence of peptide SIINFEKL concentration and Dendritic Cell (DC) number on primary CD8⁺ T cell differentiation and proliferation. Method: Bone marrow-derived DCs were generated from bone marrow cells in the presence of GM-CSF and IL-4. OT-I mice CD8⁺ T cells were isolated by anti-mCD8 conjugated magnetic microbeads, and stimulated by SIINFEKL peptides and mature dendritic cells (maDC). Serial diluted peptides SIINFEKL (100, 10, 1, 0.1, 0.01, 0.001 ng/mL) and different amounts of DCs (DC/T ratio of 1/20, 1/5) were co-cultured with CD8⁺ T cells to stimulate the activation of CD8⁺ T cells. Then the cell number, division rate and activated surface marker of co-cultured CD8⁺ T cells were analyzed by flow cytometry, and cell vitality was measured by propidium iodide (PI) stain. Result: Deficient peptides result in insufficient CD8⁺ T cell proliferation, while excess peptides impair live CD8⁺ T cell number. CD8⁺ T cell proliferation was more pronounced when more DCs were used to present peptides ranging from 0.001 ng/mL to 0.1 ng/mL and fewer DCs were used to present peptides ranging from 1 ng/mL to 100 ng/mL. High concentration of peptide antigen or large numbers of DCs lead to the fully activation and division of CD8⁺ T cells but followed a remarkable decrease in CD8⁺ T cell number, which may be caused by activation induced cell death (AICD).

Tian, L., et al. (2019). "A carbon-14 radiotracer-based study on the phototransformation of polystyrene nanoplastics in water <i>versus</i> in air (Electronic supplementary information (ESI) available. See DOI: 10.1039/c9en00662a)." Environmental Science: Nano **6**(9): 2907-2917.

Nanoplastic (<1 μm plastic debris) pollution, derived from degradation of larger plastic debris or direct release from cosmetic or cleaning products, is an emerging concern in the environment. In this study, we quantitatively investigated the degradation and mineralization of polystyrene (PS) nanoplastics under ultraviolet (UV) radiation at 254 nm using 14C radioisotope tracer technology. 14C-polystyrene (PS) nanoplastics were synthesized from 14C-styrene. Moreover, to study the role of water during the photodegradation of PS nanoplastics, 14C-PS nanoplastics were exposed to UV radiation in air or suspended in water. The X-ray photoelectron spectroscopy (XPS) results showed that after 48 h of UV irradiation, C–O groups formed on the surface while no significant change was observed from the Fourier-transform infrared spectroscopy (FTIR) analysis, indicating that short-term photo-oxidation only occurs on the thin surface layer of the PS nanoplastics. The molecular weight (Mw) of the PS nanoplastics increased in air after the irradiation, suggesting cross-linking of the PS chains, while it did not show significant changes in the presence of water. The mineralization of the PS nanoplastics was higher in water (17.1 ± 0.55%) than in air (6.17 ± 0.1%). A significant amount (11.0 ± 0.1%) of by-products with small Mw was detected in water during UV irradiation, much higher than that being washed out from the surface of nanoplastics exposed in air. The higher photoreactivity in water suggests that the mechanisms underlying the phototransformation of the PS nanoplastics in the two matrices could be different. The present study provided the first evidence of photodegradation of PS nanoplastics in aqueous environments.

Tian, L., et al. (2017). "Mineralisation of ¹⁴C-labelled polystyrene plastics by Penicillium variabile after ozonation pre-treatment." New Biotechnology **38**(Part B): 101-105.

Large amounts of polystyrene (PS), one of the most widely used plastics in the world, end up in the environment through industrial discharge and littering, becoming one of the major components of plastic debris. Such plastics, especially the small-sized microplastics and nanoplastics, have received increasing concerns in terms of their potential environmental risks.

Feasible approaches for the degradation of PS in waste materials and in the environment are highly desirable. Physicochemical pretreatments of PS may be applied to enhance biological degradation. In the present study, we synthesized ¹⁴C-labelled PS polymers, either uniformly labelled on the ring ([U-ring-¹⁴C]-PS) or labelled at the beta -carbon position of the alkyl chain ([beta -¹⁴C]-PS), and investigated the mineralisation of the ¹⁴C-PS polymers by the fungus Penicillium variabile CCF3219 as well as the effect of ozonation as a physico-chemical pre-treatment on the mineralisation by the fungi. Biodegradation of the ¹⁴C-PS polymers was studied in liquid medium (pH 7.5, without additional carbon substrate) with P. variabile for 16 weeks. During the incubation time, ¹⁴CO₂ was captured to calculate the mineralisation of ¹⁴C-PS and the remaining polymers were analysed by means of scanning electron microscopy (SEM), Fourier transform infrared (FT-IR) spectrometry and gel-permeation chromatography (GPC). The results showed that the fungi mineralised both labelled polymers, and that the [U-ring-¹⁴C]-PS with a lower molecular weight led to a higher mineralisation rate. Ozonation pre-treatment strongly enhanced mineralisation of [beta -¹⁴C]-PS. SEM analysis showed that the surface of the ozonated [beta -¹⁴C]-PS became uneven and rough after the incubation, indicating an attack on the polymer by P. variabile. FT-IR analysis showed that ozonation generated carbonyl groups on the [beta -¹⁴C]-PS and the amount of the carbonyl groups decreased after incubation of the [beta -¹⁴C]-PS with P. variabile. GPC analysis showed that the molecular weights of the ozonated [beta -¹⁴C]-PS decreased after incubation. The present data suggest that ozonation pretreatment could be a potential approach for degradation of PS waste and remediation of PS-contaminated sites.

Tian, X., et al. (2019). "A Magnetic Dynamic Microbiointerface with Biofeedback Mechanism for Cancer Cell Capture and Release." Acs Applied Materials & Interfaces **11**(44): 41019-41029.

Dynamic biointerfaces with reversible surface bioactivities enable dynamic modulation of cell-material interactions, thus attracting great attention in biomedical science. Herein, we demonstrated a paradigm shift of dynamic biointerfaces from macroscopical substrates to micron-sized particles by reversible engineering of a phenylboronic acid (PBA)-functionalized magnetic microbead with mussel-inspired cancer cell-targeting peptide. Due to reversible catechol-boronate interactions between the peptides and microbeads, the micron-sized dynamic biointerface exhibited sugar-responsive cancer-targeting activity, showing the potential as a microplatform for magnetic and noninvasive isolation of cancer cells through natural biofeedback mechanism (e.g., human glycemic volatility). Our results demonstrated that the dynamic magnetic platform was capable of selective cancer cell capture (~85%) and sugar-triggered release of them (>93%) in cell culture medium with high efficiency. More importantly, by using this platform, a decent number of target cells (~23 on average) could be magnetically isolated and identified from artificial CTC blood samples (1 mL) spiked with 100 cancer cells. In view of the biomimetic nature, high capture efficiency, excellent selectivity, and superiority in cell separation and purification processes, the dynamic magnetic microplatform reported here would be a promising and general tool for rare cell detection and separation and cell-based disease diagnosis.

Tian, X. L., et al. (2012). "Changes of Fcγ receptors on monocytes in children with acute Henoch-Schonlein purpura." Chinese Journal of Microbiology and Immunology (China) **32**(10): 885-889.

Objective: To investigate the changes and roles of Fc gamma receptors (FcγR) expressed on monocytes in the immune pathogenesis of Henoch-Schonlein purpura (HSP). Methods: Thirty children of HSP and 15 health controls were enrolled in this study. The expressions of FcγR I and FcγR III on monocytes were determined by flow cytometry, and real-time PCR was performed to detect the transcription levels of FcγR II a, FcγR II b, cytokines (IL-1β, IL-6, TNF-α, IFN-α), chemokine(IP-10, RANTES, iNOS), and BLyS/April in monocytes isolated by microbeads. The plasma concentrations of IL-4, IL-10 and TNF-a were analyzed by enzyme-linked immunosorbent assay (ELISA). Results: (1) The expressions of FcγR I and FcγR III on monocytes in patients with HSP were significantly up-regulated compared with healthy controls. Transcription level of FcγR II a on monocytes in patients with acute HSP was found to be higher than that in healthy controls while the inhibitory FcγR II b mRNA was significant down-regulated (P<0.05), which resulted in a higher ratio of FcR II a/II b in patients with acute HSP. (2) The expressions of cytokine/chemokines factor such as IL-1β, IL-6, TNF-α, IP-10, RANTES, and iNOS in patients with HSP was detected to be higher than those in healthy controls(P<0.05). In addition, expression levels of BLyS/April were up-regulated during acute HSP(P<0.05), the positive correlations were observed between the FcγR II a/FcγR II b and the cytokine/chemokines factor in monocytes (P<0.05). (3) Plasma concentrations of IL-4, IL-10 and TNF-α were significantly elevated during acute HSP(P<0.05), and a negative correlation was observed between concentrations of TNF-a and the mRNA level of FcγR II b in monocytes. Conclusion: The abnormal expression of the cytokines and the imbalance of stimulatory and inhibitory FcγR of monocyte in acute HSP. Copyright © 2012 by the Chinese Medical Association.

Tiani, K. A., et al. (2018). "Extending viability of Lactobacillus plantarum and Lactobacillus johnsonii by microencapsulation in alginate microgels." International Journal of Food Sciences & Nutrition **69**(2): 155-164.

AIM: To investigate whether microencapsulation of Lactobacillus in alginate microbeads will lead to increased longevity during refrigerated storage or simulated digestion.

MATERIALS AND METHODS: Microscopy was used to confirm that Lactobacillus plantarum ATCC BAA-793 and Lactobacillus johnsonii ATCC 33200 were immobilised within the microbeads and laser scattering analysis was used to determine the mean diameter of the microbeads. The number of viable cells were enumerated throughout refrigerated storage and simulated digestion experiments.

RESULTS: Microencapsulation was shown to have differing effects on viability depending on the species, but led to extended viability during refrigerated storage and simulated digestion in L. johnsonii and L. plantarum respectively.

CONCLUSION: Fermented functional foods contain microbes beneficial to human health. However, extended shelf storage and the harsh environment of the GI tract significantly reduces the number of viable microbes reaching the consumer. Microencapsulation allows beneficial microbes to reach the gut of the consumer in higher numbers, and thus confer greater health benefits.

Tibbetts, J., et al. (2018). "Abundance, distribution, and drivers of microplastic contamination in urban river environments." Water **10**(11).

Given the persistence of microplastics in the environment and their potential toxicity to ecosystems, understanding of likely microplastic accumulation 'hotspots' in rivers is urgently needed. To contribute to this challenge, this paper reports results of a microplastic survey from a heavily urbanised catchment, the River Tame and four of its tributaries, which flows through the city of Birmingham, UK. All sediment sampled was found to contain microplastics with an average abundance of 165 particles kg⁻¹. While urban areas generally have a greater abundance of microplastics as compared with rural, there is no simple relationship

between microplastic numbers and population density or proximity to wastewater treatment sites. The greatest change in microplastic abundance was due to the presence of a lake along the course of the River Tame - i.e., flow velocities are reduced on entering the lake, which promotes the deposition of fine sediment and potentially microplastics. This suggests that the greatest concentrations of microplastics will not be found in-channel but rather on the floodplain and other low velocity environments such as meander cutoffs. We also identified a new mechanism of microplastic fixation in freshwater environments through ecological engineers, specifically caddisflies, that incorporated microplastics into their casing. These results highlight the need to explore further hydrodynamic and ecological impacts on microplastics fate and transport in rivers.

Tibbetts, J. H. (2015). "Managing Marine Plastic Pollution." Environmental Health Perspectives **123**(4): A90-A93.

The article focuses on plastic waste management to reduce marine pollution. Topics discussed include causes of pollution such as lost fishing nets and containers, marine plastic pollution by coastal countries such as the U.S., the growth of megacities which contribute to marine pollution and extended producer responsibility (EPR) model adopted by European countries to manage their plastic wastes by recycling, reusing and diverting plastics to power plants to be used as fuels. INSET: Fate of Plastics in the Ocean.

Tibbetts, J. H. (2015). "Plastics on the Half Shell." BioScience **65**(8): 836-836.

The article focuses on the studies directing towards the evidence that small plastic fragments enter the human diet through wild and cultured seafood. Topics discussed include views of environmental toxicologist Lisbeth Van Cauwenberghe, on tiny plastic fragments drawn by bivalves and plankton; challenges faced by researchers in the extraction of microscopic plastic bits from fleshy bivalves; and efforts of scientists for the identification of microplastics lodged in marine animals.

Tickell, O. (2016). "BRITAIN COULD BAN PLASTIC MICROBEADS." Resurgence & Ecologist(298): 8-8.

The article reports on the potential ban of plastic microbeads from use in toothpaste, cosmetics and other products to protect fish and ocean wildlife under a new policy in Great Britain. Minister of State George Eustice at the Department of Environment, Food and Rural Affairs states that the manufacture of products with microbeads could be banned in the country. It mentions that the hazard presents by microplastics on human health and environment.

Tiercy, J. M., et al. (2010). "A shared HLA-DRB1 epitope in the DR beta first domain is associated with Vogt-Koyanagi-Harada syndrome in Indian patients." Molecular Vision **16**: 353-358.

PURPOSE: Vogt-Koyanagi-Harada (VKH) disease and sympathetic ophthalmia (SO) are two distinct entities that share common clinical and histopathological features; however, it remains unknown whether they have a common genetic susceptibility. Several studies have shown an association of human leukocyte antigen (HLA)-DR4 with VKH disease in patients of different ethnic backgrounds. We present in this paper the HLA-DRB1 genotyping analysis of a large cohort of VKH patients from southern India and compare these patients to patients with SO and to healthy individuals from the same geographic area.

METHODS: VKH patients were diagnosed according to the revised criteria of the International Committee on VKH disease. Patients with granulomatous uveitis after ocular trauma or multiple eye surgeries were diagnosed as having SO. Genomic DNA was extracted from all patients and controls. Samples were analyzed for HLA-DRB1 alleles by reverse polymerase chain reaction

(PCR) sequence-specific oligonucleotide (SSO) hybridization on microbeads, using the Luminex technology, and by PCR sequence-specific primers (SSP) typing for DRB1*04 allele determination. Strength of associations was estimated by odds ratios (OR) and 95% confidence intervals (CI) and frequencies were compared using the Fisher's exact test.
RESULTS: HLA-DRB1 alleles were determined in 94 VKH patients, 39 SO patients, and 112 healthy controls. HLA-DRB1*04 frequency was higher in VKH patients (20.2% versus 10.3% in controls; OR=2.2, p=0.005, pc=0.067). This association was lower than the association of HLA-DRB1*04 frequency in cohorts of patients from different origins. No significant DR4 association with SO was detected. HLA-DRB1*0405 and HLA-DRB1*0410 alleles were significantly increased in VKH patients (8.5% versus 0.9% in controls; OR=10.3, 95% CI=2.34-45.5, p<0.001). These two alleles share the epitope S57-LLEQRRAA (67-74) in the third hypervariable region of the HLA-DR molecule. None of the DRB1 alleles was significantly associated with SO.
CONCLUSIONS: Based on the association of HLA-DRB1*0405 and HLA-DRB1*0410 alleles with VKH disease, we propose that the epitope S57-LLEQRRAA (67-74) in the third hypervariable region of the HLA-DRbeta1 molecule is the relevant susceptibility epitope. This genetic component seems specific to VKH disease since no correlation could be identified in SO patients. The weaker association with HLA-DR4 in this VKH patient cohort compared to VKH patients from northern India is probably related to the lower frequency of HLA-DRB1*0405 in our study group. The HLA-DRB1 association with susceptibility to VKH syndrome seems weaker in Indian patients compared to Japanese or Hispanic patients, suggesting a different non-HLA immunogenetic background in Indian VKH patients.

Tijhuis, L., et al. (1994). "Solids retention time in spherical biofilms in a biofilm airlift suspension reactor." Biotechnology and Bioengineering **44**(8): 867-879.

Fluorescent microparticles were used as tracer beads to measure the dynamics of solids in spherical biofilms in a biofilm airlift suspension reactor. Attachment to, release from, and penetration into the biofilms of the tracer beads were measured. The coverage of the biofilm surface was low and the steady state particle concentration on the surface was dependent on the biofilm surface characteristics. The measured attachment rate constant was identical in both experiments and appeared to be determined by the hydrodynamic conditions in the turbulent lent reactor. The attachment rate was much faster than the release rate of the tracer beads and, therefore, the solids retention time in the biofilm particle is not due to a simple reversible adsorption-desorption process. The heterogeneity of the distribution of tracer beads on different sectors on the biofilm surface decreased during the attachment period. Due to random detachment processes the heterogeneity of the tracer bead distribution increased during the release period. The tracer beads quickly penetrated into the biofilm and became distributed throughout the active layer of the biofilm. The observed penetration into biofilms, the nonuniform distribution on the biofilm surface, and the fast uptake and slow release of tracer beads cannot be described by a simple model based on a reversible adsorption-desorption mechanism, nor with existing biofilm models. These biofilm models, which balance growth and advection assuming a uniform biofilm with a homogeneous surface, are inadequate for the description of the observed solids retention time in biofilms. Therefore, a new concept of biofilm dynamics is proposed, in which formation of cracks and fissures, which are rapidly filled with growing biomass, combined with nonuniform local detachment, explains the observed fast penetration into the biofilm of tracer beads, the long residence time, and the nonuniform distribution of fluorescent microparticles.

Till, P. (1976). "Solid tissue model for the standardization of the echo-ophthalmograph 7200 MA

(Kretztechnik)." Documenta Ophthalmologica **41**(2): 205-240.
After discussion of the biologic basis of echographic tissue differentiation and of the required standardization of the ultrasonic diagnostic device by means of tissue models (citrated blood), a technical standard is presented. This solid tissue model, which can be used an unlimited number of times, enables the investigator to determine or check the tissue sensitivity of his instrument at any time easily and quickly. The model consists of a synthetic resin (Wacker Silgel 504) to which a certain number of microbeads (glass beads S-100) are added before it hardens. The acoustic properties of this technical standard correspond to those of the biologic standard (citrated blood) including all important factors such as reflectivity, degree of scattering and sound attenuation.

Tillman, J., et al. (2015). "Rowcovers and strip tillage provide an alternative to plasticulture systems in summer squash production." HortScience **50**(12): 1777-1783.
Plastic mulch is often used in cucurbit production, but it has negative soil health and environmental implications due to use of tillage for installation and generation of plastic waste. This 2-year study aimed to find a viable alternative to plastic mulch through the use of strip tillage and rowcovers, as rowcovers could help minimize yield loss from strip tillage by providing warmer air and soil as well as providing insect protection. A split-plot design was used in both conventionally and organically managed summer squash (Cucurbita pepo), with production system as the whole-plot factor [conventional tillage with black plastic mulch also referred to as plasticulture (PL) and strip tillage into rolled cereal rye (Secale cereale) (ST)] and rowcover use as the subplot factor (rowcover until anthesis or no rowcover). Rowcovers reduced the incidence of squash vine borer (Melittia cucurbitae) and eliminated the need for insecticide sprays to control this insect pest, but did not reduce the incidence of yellow vine decline or the sprays needed to control squash bug (Anasa tristis). Rowcovers increased average air temperature by 1.6 to 4.0 degrees C and increased maximum air temperature by up to 10.3 degrees C. Rowcovers decreased average light intensity by 33% to 39%. Though soil temperature in PL tended to be higher than in ST, in 1-year rowcovers helped bridge the gap. Plant biomass was consistently higher in the PL than the ST system. Averaged across rowcover treatments, plants in PL had higher marketable yields than those in ST; however, the use of rowcovers often led to comparable yields between the production system treatments. Rowcover was a significant factor explaining marketable yield for the organically managed fields both years. There was no consistent effect of production system on soil microbial biomass carbon (MBC). Based on our results, strip tillage into rolled rye could be a viable alternative to plasticulture for summer squash production in Iowa, and rowcovers could help increase yields in ST especially in an organic management system.

Tilmatine, A. and L. Dascalescu (2010). "Set-point identification of a free-fall triboelectrostatic separation process for plastic particles." International Journal of Environmental Studies **67**(1): 27-40.
Identification of the optimal operating conditions and evaluation of their sensibility to changes in certain critical factors are critical issues for the industrial application of electrostatic separation techniques. The aim of this paper is to validate an experimental procedure for optimising the selective sorting of non-conductive constituents of granular industrial plastic wastes using a free-fall triboelectrostatic separator. [ABSTRACT FROM AUTHOR]
Copyright of International Journal of Environmental Studies is the property of Routledge and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use. This abstract may be abridged. No warranty is given about the accuracy of the

Tilmatine, A., et al. (2013). "Processes for sustainable development using high-intensity electric fields." International Journal of Sustainable Engineering **6**(2): 177-185.

Intense electric fields up to 107 V/m generate very interesting and useful applications for the environment. Several processes using high electrical voltage for environment preservation were developed in the laboratory. The purpose of this study was to review these applications, highlighting their economic and environmental benefits: (1) electrostatic separators of particles used in industrial wastes recycling; (a) role-type electrostatic separator for granular mixtures of plastic–metal particles; (b) free-fall and rotating belt triboelectric separators for mixtures of plastic–plastic particles; (c) plate-type electrostatic separator for mixtures of metal–metal particles, (2) electrostatic precipitators for gas cleaning and (3) ozone generators for air and water treatment. [ABSTRACT FROM AUTHOR]

Tione Buranda, T. B. J. H., et al. (2003). "Biomimetic Molecular Assemblies on Glass and Mesoporous Silica Microbeads for Biotechnology." Langmuir **19**(5): 1654-1663.

This paper describes the use of glass and mesoporous silica microspheres (typically 1-50 *mm) as supports for biomimetic lipid bilayer membrane architectures for use in biotechnological applications. We present methods and characterization of lipid bilayer membranes supported on commercially available glass beads and mesoporous silica beads formed by an aerosol process that takes advantage of self-assembly of surfactant template phases in sol-gel synthesis. Methods for controlling the concentration of fluorescent lipids, ligands, receptors, and transmembrane proteins in the bead-supported bilayer assemblies are discussed, along with methods for measuring the concentration of these species using flow cytometry. Diffusion of molecular species both within the lipid bilayer and within the mesoporous bead structure is probed using fluorescence recovery after photobleaching. Flow cytometry and confocal fluorescence microscopy are used to examine dye uptake of the porous beads and the stability of the encapsulating lipid bilayer membranes to proton and fluorophore leakage. The studies presented herein form the basis for the use of several new types of biomimetic bead-supported bilayer architectures in a variety of biotechnological applications including microimmunoassays and fluorescence-based high-throughput screening of biochemical recognition and protein function.

Tirapu-Azpiroz, J., et al. (2017). "Dielectrophoretic microbead sorting using modular electrode design and capillary-driven microfluidics." Biomedical Microdevices **19**(4): 95.

Multiplexing assays using microbeads in microfluidics offers high flexibility and throughput, but requires the ability to sort particles based on their physical properties. In this paper, we present a continuous method for separating microbeads that is compact, modular and adaptive, employing an optimized electrode layout that alternates sorting and concentration of microbeads using dielectrophoresis and a nested design. By simulating the combined effects of the hydrodynamic drag and dielectrophoresis forces on polystyrene beads, the parameters of

the electrode layout and voltage configuration are optimized for maximum separation based on particle size with a small number of slanted planar electrodes. Experimental verification confirms the efficient separation of 10 mum and 5 mum beads, with ~98% of all concentrated beads sorted in two separate streams and only ~2% of 5 mum beads leaking into the 10 mum bead stream. In addition, this method is implemented on capillary-driven microfluidic chips for maximum portability and ease of use.

Tirella, A., et al. (2014). "Sphyga: a multiparameter open source tool for fabricating smart and tunable hydrogel microbeads." Biofabrication **6**(2): 025009.

Hydrogel microbeads are used in many biological applications, particularly for cell, protein or drug encapsulation. Although there are several methods for fabricating microbeads with controlled shapes and dimensions, many are limited to a small range of materials or sizes. We describe a compact open source tool-the spherical hydrogel generator (Sphyga)-for the fabrication of highly reproducible hydrogel based microbeads with predictable shapes and diameters ranging from 100 to 2000 micro m. The unique feature of the system is the ability to modulate multiple parameters independently, so as to create a wide range of working conditions for fabricating tailored microbeads. Hence, by combining the different fabrication parameters, hydrogel beads with chosen shapes, sizes and materials can be generated with Sphyga. A multiparameter working-window was obtained by fixing the concentration of the base material, alginate, and varying the viscosity of the solution along with Sphyga's fabrication parameters (needle size, external air pressure, and material outflow). To validate the multiparameter working window, components such as proteins, cells, dyes and nanoparticles were also used to fabricate composite microbeads. The results show that the architecture of hydrogel microbeads can be engineered by considering the viscosity of the initial solution, which depends principally on the pH and composition of alginate solution. Coupled with Sphyga's multiple working parameters, material viscosity can then be used to tune hydrogel domains and thereby generate complex biologically relevant microenvironments for many biomedical applications.

Tirthankar, B. and R. K. Srivastava (2012). "Plastics waste management and resource recovery in India." International Journal of Environment and Waste Management **10**(1): 90-111.

Exponential growth in plastic production and consumption has evoked concerns for its effective management. Within a decade, India has witnessed a substantial growth of 890% and 340% in plastic production and per capita consumption, respectively. Plastic recycling industries have mushroomed autonomously and accounts for 47% of annual recycling. Further, unscientific collection, transportation, uncontrolled disposal of plastic waste has grave environmental implications. This paper reviews contemporary research done on the integrated management of plastic waste and also considers the potential options available for optimum resource recovery. Other innovative waste management technologies are also considered to find out their adaptability under Indian circumstances.

Tirupati, S., et al. (2016). "Production of Laccase by Cochliobolus sp. Isolated from Plastic Dumped Soils and Their Ability to Degrade Low Molecular Weight PVC." Biochemistry Research International **2016**.

One of the utmost man-made problems faced today has been the ever-increasing plastic waste filling the world. It accounts for an estimated 20-30% (by volume) of municipal solid waste in landfill sites worldwide. Research on plastic biodegradation has been steadily growing over the past four decades. Several fungi have been identified that produce enzymes capable of plastic degradation in various laboratory conditions. This paper presents a study that determined the

ability of fungi to degrade low molecular weight polyvinyl chloride (PVC) by the enzyme laccase. We have isolated a fungal species, Cochliobolus sp., from plastic dumped soils and they were cultured on Czapek Dox Agar slants at 30°C. The effectiveness of this fungal species on the degradation of commercial low molecular weight polyvinyl chloride (PVC) was studied under laboratory conditions. Significant differences were observed from the FTIR, GC-MS, and SEM results in between control and Cochliobolus sp. treated PVC.

Tittlbach, H., et al. (2017). "GMP-production of purified human B lymphocytes for the adoptive transfer in patients after allogeneic hematopoietic stem cell transplantation." Journal of Translational Medicine **15**(1): 228.

BACKGROUND: We have recently shown that memory B cells from murine CMV immune donor animals adoptively transferred into immunodeficient mice were highly effective in protecting from a viral infection indicating a therapeutic potential of virus specific memory B cells. These preclinical data provided evidence that a cell-based strategy supporting the humoral immune response might be effective in a clinical setting of immunodeficiency after allogeneic hematopoietic stem cell transplantation. As adoptive transfer of B cells has not been used before in a clinical setting it was necessary to establish a technology for the generation of good manufacturing practice (GMP)-grade B cell products.

METHODS: Starting from the leukapheresis product of healthy blood donors, B cells were purified by two different separation strategies using GMP-grade microbeads and the CliniMACS system. A one-step protocol was used for positive enrichment of B lymphocytes with anti-CD19 microbeads. In a two-step enrichment protocol, first T lymphocytes were depleted by anti-CD3 microbeads and the remaining fraction was positively selected by anti-CD19 microbeads.

RESULTS: The purity and recovery after enrichment of B lymphocytes from the leukapheresis material in both separations strategies was not statistically different. However, contamination of the B-cell product with T cells was significantly lower after the two-step protocol (0.16%, range 0.01-0.43% after two-step separation and 0.55%, range 0.28-0.85% after one-step separation, p < 0.05). Therefore, a combined CD3 depletion and CD19 enrichment was used for the production of GMP-conform B-cell products from the leukapheresis material of 17 healthy stem cell donors. The absolute B-cell numbers obtained in the final product was 4.70 +/- 3.64 x 10⁸ with a purity of 95.98 +/- 3.31% B lymphocytes and a recovery of 18.9 +/- 10.6%. Importantly, the contamination with CD3⁺ T cells was extremely low in the final B- cell products (0.10 +/- 0.20%). Purified B cells exhibited normal antibody production after in vitro stimulation and showed excellent viability after cryopreservation.

CONCLUSIONS: A GMP-grade B-cell product can be obtained with high purity and very low T-cell contamination using the two-step enrichment protocol based on CliniMACS technology.

Tiwari, M., et al. (2019). "Distribution and characterization of microplastics in beach sand from three different Indian coastal environments." Marine Pollution Bulletin **140**: 262.

The occurrence of microplastic particles were evaluated on beaches along the Indian coast from three different locations Girgaon Mumbai (Arabian sea coast), Tuticorin, and Dhanushkodi (Bay of Bengal coast). Density separation method was adopted for isolation of microplastics from sand. Isolated microplastics were characterized using three different analytical techniques e.g. fluorescence microscopy (after staining with Nile Red), FTIR and SEM-EDS techniques. Microplastic concentrations in beach sands were from 45 ± 12 # MP kg−1 to 220 ± 50 # MP kg−1 of dry sand. The order of abundance of plastic type was polyethylene (43%) > polyethylene terephthalate (17.3%) ≈ polystyrene (17%) > polypropylene (12.3%) > Others (11%) > polyvinylchloride (1.33%), and very similar profile was observed for all monitored locations. SEM

images show microplastics surfaces with characteristic cracks, suggests their polymer aging, mechanical and oxidative weathering, which was found highest for the microplastics collected from Mumbai.

Tlili, S. and C. Mouneyrac (2019). "The wedge clam Donax trunculus as sentinel organism for Mediterranean coastal monitoring in a global change context." Regional Environmental Change **19**(4): 995-1007.

The wedge clam Donax trunculus is commonly used in environmental monitoring studies as sentinel species for the biomonitoring of sandy beaches in Mediterranean areas. Taking in account the combined effects of chemical stressors and global changes in marine organisms, research efforts in ecotoxicology should be up-to-date for a more relevant and integrative monitoring studies. In the same context, it is an actual need to select bioindicators able to reflect both global change effects and conventional/emergent stressors in marine ecosystems. D. trunculus indeed appears as appropriate integrative sentinel specie. Apart from being an easy to collect species, D. trunculus presents many advantages justifying its use in (eco)toxicological studies such as large distribution, bioaccumulation capacity, responses (biomarkers) to contaminants and well studied biology, physiology and ecology. Herein, we propose a review based on a literature survey of (eco)toxicological aspects of D. trunculus with a special focus on the suitability of its use as a sentinel species in laboratory/ field studies and as potential indicator for regional and global changes. We recommend its further use in the environmental impact assessment of emerging contaminants (such as pharmaceuticals, micro and nanoplastics). Recommendations for an integrative environmental monitoring in a global change context are also highlighted. [ABSTRACT FROM AUTHOR]

Todd, W. W. (1996). "PFA-a Component in Building Materials Produced from the German Plastic Packaging Waste Stream." Waste Management **16**(1): 203.

Extensive plastics recycling is practiced in Germany, which has created surpluses of packaging waste. To deal with this surplus, a composite material has been produced for the construction industry, which consists of plastic-waste agglomerate combined with pulverized fuel ash (PFA). The structural properties of the composite material are described, including compressive, flexural, and tensile-splitting strength, punching shear resistance, water absorption and porosity, shrinkage and swelling, and creep stiffness. The material is shown to be viscoelastic and susceptible to time of loading and temperature, similar to that of bituminous mortars. The composite exhibits very low porosity and permeability, and is frost-resistant and moderately resistant to sulfate attack. The material is shown to be suitable for non-structural use, such as paving blocks, fence posts, and crash barriers.

Togashi, M., et al. (2014). "Practical fluorescence detection of acrolein in human plasma via a two-step tethering approach." Chemical Communications **50**(95): 14946-14948.

Acrolein, a cytotoxic alpha,beta-unsaturated aldehyde and disease biomarker, was determined in plasma by means of a novel tethering strategy using Michael addition of the compound to a fluorescent dye, followed by immobilization of the product on microbeads via the aldehyde

moiety. Elevation of blood acrolein was detected in mice treated with an anticancer agent cyclophosphamide, which releases acrolein upon activation. This method should be suitable for high-throughput diagnostic and clinical application.

Tohda, K. and M. Gratzl (2006). "Micro-miniature autonomous optical sensor array for monitoring ions and metabolites 1: design, fabrication, and data analysis." Analytical Sciences **22**(3): 383-388.

A micro-miniature array of sensing capsules for optical monitoring of pH, potassium and glucose is described. Optode technology translates the respective ionic levels into variable colors of ionophore/dye/polymeric liquid micro-beads stuffed into individual capsules. Glucose is monitored indirectly, by coupling through glucose oxidase (GOX) immobilized in cellulose acetate phthalate (CAP) based microscopic beads that are stuffed into another microcapsule together with pH sensitive optical microscopic beads. The electrolyte and glucose sensing capsules are embedded in a transparent cellulose acetate bar 300-500 microm wide and 2-2.5 mm long called the sliver sensor that includes also a white capsule made of micro-beads without dye for optical reference. By adding further capsules custom combinations of analytes can be monitored in biomedical and non-biological contexts. In this work, as an example, design, fabrication and testing of a sliver sensor that could be developed for in vivo use are described.

Tokes-Fuzesi, M., et al. (2018). "Microparticles as potential biomarkers in chronic obstructive pulmonary disease." Clinical Chemistry and Laboratory Medicine **56 (9)**: eA155.

Microparticles (MPs) are small shedding membrane vesicles released into the extracellular microenvironment from circulating blood and endothelial cells during cell activation or apoptosis mainly under inflammatory conditions. The role of endothelial microparticles (EMPs) in pathophysiology of chronic obstructive pulmonary disease (COPD) is relatively well-known. On the contrary, the release and function of MPs from other cellular origin (e.g. platelets, leukocytes, red blood cells) are not clearly evaluated in this patient group. We measured - in addition to the EMPs - MPs derived from other cells in the circulation of stable and exacerbated COPD patients. 19 healthy volunteers and 50 patients with COPD (34 with stable and 16 with exacerbated COPD) were enrolled in the study. Endothelial (CD31+, CD62E+), platelet derived (CD61+, CD41+, CD42a+, PAC1+), red blood cell derived (GlyA+), leukocyte derived (CD45+, CD13+, CD14+) and lymphocyte derived (CD56+) MPs were measured. MPs were separated from the cell free plasma after centrifugation of citrated blood. Flow cytometry was performed on Beckman Coulter FC500 analyzer. MP reference gate was set using 0.3-0.5-1mum microbeads with MP size gates of 0.5-1mum. Statistical analysis was done with SPSS 19 software. All the measured MPs were significantly ($p<0.001$) higher in COPD patients than in the controls. Furthermore, CD62E+, CD41+, CD42a+ and CD14+ MP values were significantly ($p<0.001$) elevated in exacerbated COPD compared to stable COPD. COPD is accompanied by increased numbers of various MPs in the systemic circulation, particularly platelet and monocyte derived MPs seem to be important in the process of exacerbation.

Tokes-Fuzesi, M., et al. (2018). "Role of microparticles derived from monocytes, endothelial cells and platelets in the exacerbation of COPD." International Journal of Copd **13**: 3749-3757.

Background: Microparticles (MPs) are shedding membrane vesicles released from activated blood and endothelial cells under inflammatory conditions. The role of endothelial MPs (EMPs) in pathophysiology of COPD is relatively well known. However, the release and function of MPs of other cellular origins, eg, platelets, red blood cells and leukocytes, are not clearly evaluated in COPD.

Purpose: The aim of this study was to measure EMPs and other cell-derived circulating MPs in stable and

exacerbated COPD patients.
Patients and methods: A total of 50 patients with COPD and 19 healthy volunteers were enrolled in the study. EMPs (CD31+, CD62E+) and platelet-derived (CD61+, CD41+, CD42a+, PAC1+), red blood cell-derived (GlyA+) and leukocyte-derived (CD45+, CD13+, CD14+, CD56+) MPs were measured. Flow cytometry (FC) was performed on Beckman Coulter FC500 analyzer. MP reference gate was set using 0.3-0.5-0.9 micro m microbeads with MP size gates of 0.5-1.0 micro m.
Results: All the measured MPs were significantly (P<0.001) higher in COPD patients than in the controls. Furthermore, CD62E+, CD41+, CD42a+ and CD14+ MP values were significantly (P<0.001) increased in exacerbated COPD compared to stable COPD. These MPs showed significant (P<0.001) inverse correlation with FEV₁/FVC, as well.
Conclusion: In this study, we describe a reliable flow cytometric assay for MP analysis that was successfully applied in COPD. Besides EMPs, COPD is accompanied by an increased concentration of various MPs in the systemic circulation; particularly, platelet- and monocyte-derived MPs seem to be important in exacerbation.

Tolic-Norrelykke, I. M. and N. Wang (2005). "Traction in smooth muscle cells varies with cell spreading." Journal of Biomechanics **38**(7): 1405-1412.

Changes in cell shape regulate cell growth, differentiation, and apoptosis. It has been suggested that the regulation of cell function by the cell shape is a result of the tension in the cytoskeleton and the distortion of the cell. Here we explore the association between cell-generated mechanical forces and the cell morphology. We hypothesized that the cell contractile force is associated with the degree of cell spreading, in particular with the cell length. We measured traction fields of single human airway smooth muscle cells plated on a polyacrylamide gel, in which fluorescent microbeads were embedded to serve as markers of gel deformation. The traction exerted by the cells at the cell-substrate interface was determined from the measured deformation of the gel. The traction was measured before and after treatment with the contractile agonist histamine, or the relaxing agonist isoproterenol. The relative increase in traction induced by histamine was negatively correlated with the baseline traction. On the contrary, the relative decrease in traction due to isoproterenol was independent of the baseline traction, but it was associated with cell shape: traction decreased more in elongated than in round cells. Maximum cell width, mean cell width, and projected area of the cell were the parameters most tightly coupled to both baseline and histamine-induced traction in this study. Wide and well-spread cells exerted larger traction than slim cells. These results suggest that cell contractility is controlled by cell spreading.

Toloken, S. (2004). "Study: emissions underreported." Plastics News **16**(17): 3-22.

The plastic resin manufacturing industry probably emits five times more of some major pollutants than it reports to the federal government, according to a study from two environmental groups. The June 22 study from the Environmental Integrity Project and a Houston-area group said it took data developed by Texas state regulators about gaps in reporting of air emissions and for the first time applied it nationwide to four industries, including plastic resin manufacturing. The problem, according to the study, is that official emissions figures reported by companies to the U.S. Environmental Protection Agency (EPA) are estimates based on EPA formulas, and are not measurements of actual emissions.

Tolvanen, O. K. (2001). "Airborne bio-aerosols and noise in a dry waste treatment plant in Pietarsaari, Finland." Waste Management & Research **19**(2): 108-114.

Ewapower Ltd in Pietarsaari, Finland produces pellets from paper and plastic waste for burning.

During 1998 and 1999, several measurements were made to determine the dust, particle, microbe and endotoxin concentrations, and also the noise level in the hall where the waste is received and pre-crushed. The noise level exceeded the Finnish recommended level of 85 dBA. The dust and the particle concentrations were low, but the microbe concentrations, especially in the summer and in the autumn, were at a level which may be harmful to health. The total concentration of microbes (both dead and alive) was high--approximately 4.8 million particles m(-3). The concentrations of endotoxins was high in summer and in autumn, from 340 to 1000 ng m(-3) and exceeded recommended values. In the winter, the concentration of the endotoxin was lower, ranging between 4.7 and 33 ng m(-3).

Tomer, A., et al. (2005). "Autoimmune thrombocytopenia: Flow cytometric determination of platelet-associated autoantibodies against platelet-specific receptors." Journal of Thrombosis and Haemostasis **3**(1): 74-78.

Immune thrombocytopenic purpura (ITP) is an autoimmune disorder characterized by antibody-induced platelet destruction. Despite its clinical importance, the diagnosis of ITP is one of exclusion, thus, inevitably associated with potential difficulties. We here describe a feasible diagnostic method using the commonly available technique of flow cytometry. An antigen-specific assay for platelet-associated antibody was developed and tested in 62 adult patients with chronic ITP, 14 patients with thrombocytopenia of decreased production and 60 healthy controls. The method is based on flow cytometric (FCM) detection of autoantibodies reacting with specific platelet receptors immobilized on microbeads. The average fluorescence level in the ITP group calculated as a ratio to normal was 4.07 (range 0.8-31.0), in the non-ITP thrombocytopenic patients 0.9 (range 0.7-1.2), and in the healthy controls 1.0 (range 0.7-1.3). The average assay coefficient of variation was 0.218 [95% confidence interval (CI) 0.213, 0.221]. The difference between the ITP patients and both groups was highly significant (P < 0.001), using a stringent non-parametric analysis. A comparison of the FCM assay with the radioactive immunobead assay previously reported on the same cohort of patients showed significant correlation (R² = 0.71, 95% CI 0.39, 0.53). The overall performance of the FCM assay in discriminating between ITP patients and normals was estimated by the receiver operating characteristic (ROC) plot, showing an area under the curve of 0.96 (maximal value 1.0), with standard error of 0.033. We conclude that the present FCM assay is clinically useful for routine diagnosis and follow-up of ITP. © 2005 International Society on Thrombosis and Haemostasis.

Tomlin, J. and N. W. Read (1988). "Laxative properties of indigestible plastic particles." BMJ **297**(6657): 1175-1176.

Tommasi, F. (2017). "Microplastics in aquatic and marine habitats: an emerging global environmental health issue." Notiziario dell'Istituto Superiore di Sanita **30**(6): 7-10.

Plastic is one of the most versatile materials invented and developed in the twentieth century. But at the same time, its products, which are often disposable, poorly managed and released into the environment, have become an environmental problem, affecting marine habitats even ubiquitously. Plastic products, prior to degradation, in the sea crumble into smaller form or microplastics, creating ubiquitous and increasing pollution. Microplastics affect all levels of the marine trophic chains: they transport and spread pollutants, reducing fishing stocks, and enter the food chain to humans, with risks to the environment and man.

Tommasi, F. and L. Mancini (2019). "THE ISSUE OF MARINE LITTER FROM A PERSPECTIVE OF

SUSTAINABLE DEVELOPMENT FOR MEDITERRANEAN REGION: A REVIEW." Fresenius Environmental Bulletin **29**(6): 4963-4969.

Plastic is one of the most versatile materials invented and developed in the twentieth century. But at the same time, its products, which are often disposable, poorly managed and released into the environment, have become an environmental problem, affecting marine habitats the Medi-terranean ecosystem area. Plastic products, prior to degradation, in the sea crumble into micro-plastics, creating ubiquitous and increasing pollution. Microplastics (their smallest form) affect all levels of the marine trophic chains: transporting and spreading pollutants, reducing fishing stocks, entering the food chain to humans, with risks to the environment and man. We need economical, eco-systemic and industrial sustainable solution facing up to this growing issue. The only way out is in a sustainable and regulated approach on designing, producing, manaiging and recycling plastic products all along the value chain. We describe most recent proposals and policy management of land-based waste production and recycling. [ABSTRACT FROM AUTHOR]

Tong, M., et al. (2020). "Transport behaviors of plastic particles in saturated quartz sand without and with biochar/Fe₃O₄-biochar amendment." Water Research **169**: 115284.

As an environmentally friendly material, biochar has been widely used to remediate soil/water contaminants such as heavy metals and organic pollutants. The addition of biochar or modified biochar to porous media might affect the retention of plastic particles and thus influence their fate in natural environment. In this study, both biochar and magnetic biochar (Fe₃O₄-biochar) were synthesized via a facile precipitation method at room temperature. To determine the significance of biochar and Fe₃O₄-biochar amendment on the transport and deposition behaviors of plastic particles, the breakthrough curves and retained profiles of three different sized plastic particles (0.02mum nano-plastic particles, and 0.2mum and 2mum micro-plastic particles) in quartz sand were compared with those obtained in quartz sand either with biochar or Fe₃O₄-biochar amendment in both 5mM and 25mM NaCl solutions. The results show that for all three different sized plastic particles under both examined solution conditions, the addition of biochar and Fe₃O₄-biochar in quartz sand decreases the transport and increases the retention of plastic particles in porous media. Fe₃O₄-biochar more effectively inhibits the transport of plastic particles than biochar. We found that the addition of biochar/Fe₃O₄-biochar could change the suspension property and increase the adsorption capacity of porous media (due to the increase of porous media surface roughness and negatively decrease the zeta potentials of porous media), contributing to the enhanced deposition of plastic particles. Moreover, we found that negligible amount of biochar and Fe₃O₄-biochar (<1%) were released from the columns following the plastic particle transport when the columns were eluted with very low ionic strength solution at high flow rate (to simulate a sudden rainstorm). Similarly, small amount of plastic particles were detached from the porous media under this extreme condition (16.5% for quartz sand, 14.6% for quartz sand with biochar amendment, and 7.5% for quartz sand with

Fe₃O₄-biochar amendment). We found that over 74% of the Fe₃O₄-biochar can be recovered from the porous media after the retention of plastic particles by using a magnet and 87% plastic particles could be desorbed from Fe₃O₄-biochar by dispersing the Fe₃O₄-biochar into 10mM NaOH solution. In addition, we found that the amendment of unsaturated porous media with biochar/Fe₃O₄-biochar also decreased the transport of plastic particles. When biochar/Fe₃O₄-biochar were added into porous media as one layer of permeable barrier near to column inlet, the decreased transport of plastic particles could be also obtained. The results of this study indicate that magnetic biochar can be potentially applied to immobilize plastic particles in terrestrial ecosystems such as in soil or groundwater.

Tong, M., et al. (2020). "Cotransport and deposition of biochar with different sized-plastic particles in saturated porous media." Science of the Total Environment **713**: 136387.

Plastic particles recently are reported to be ubiquitous in natural environments, while biochar is widely employed as an amendment into natural environments e.g. soil for pollution remediation. It is highly likely their transport behaviors in porous media would be altered due to interaction with each other. In this study, the cotransport and deposition behaviors of biochar and plastic particles (0.02 mum nanoplastics (NPs), 0.2 mum and 2 mum micrometer-plastics (MPs)) in quartz sand were investigated at both low (5 mM) and high ionic strength (25 mM) in NaCl solutions at pH 6. The results demonstrated that smaller sized plastic particles (0.02 mum NPs and 0.2 mum MPs) increased biochar transport under both 5 and 25 mM NaCl solutions, while large plastic particles (2 mum MPs) increased biochar transport in 5 mM NaCl solutions yet decreased biochar transport in 25 mM NaCl solutions. For all sized plastic particles, biochar significantly decreased their transport at both low (5 mM) and high (25 mM) ionic strengths in NaCl solutions. The change of zeta potentials of biochar due to heteroaggregation with plastic particles, and the steric repulsion induced by the suspended plastic particles contributed to the enhanced biochar transport with the copresence of smaller sized plastic particles (0.02 mum NPs and 0.2 mum MPs). While, the cotransport of biochar with 2 mum MPs due to their heteroaggregation contributed to the varied transport behaviors of biochar observed at low and high ionic strength with the copresence of 2 mum MPs. The formation of plastic particles-biochar heteroaggregates drove to the decreased transport of all three different sized plastic particles with the copresence of biochar. Considering the coexistence of biochar and plastic particles in natural environment, they would interact with each other (form heteroaggregates) and thus lead to the change of transport behaviors in porous media.

Tongesayi, S. and T. Tongesayi (2017). Water Quality and Public Health: Role of Wastewater, Elsevier Inc.**:** 553-596.

The quest to sustain modern civilization and food security amid the world's population explosion has resulted in unprecedented levels of water contamination from anthropogenic sources. Natural phenomena such as climate change are also set to worsen the already grave situation. Public health is under threat from emerging and reemerging water-related illnesses. In developed countries, thriving economies and advances in technology had rendered waterborne illnesses "a-thing-of-the-past". The problem was left for developing countries to deal with but not anymore! The increase in the world's population and the resultant increase in demand- and pollution-driven water stress amid faltering global economies have thrust the issue of water quality to global prominence once again. Donald Hopkins, of the Carter Center once described the situation almost perfectly: "Throughout parts of the developing world, some people work hard "just to get dirty water" for drinking, cooking, and for other personal needs.....Although the overall quality of water is far better, developed countries also face challenges in maintaining drinking water quality standards."[1] Streams of raw wastewater in streets and residential areas are now a common sight in both developed and developing countries, and water is inevitably getting contaminated by a slew of environmental pollutants. William K. Reilly, a former E.P.A. administrator under President George H.W. Bush once said of the United States drinking water: "For years, people said that America has the cleanest drinking water in the world That was true 20. years ago. But people don't realize how many new chemicals have emerged and how much more pollution has occurred. If they did, we would see very different attitudes." [2] This chapter discusses the sources and health impacts of water contaminants. The biogeochemistry, speciation, toxicity of selected heavy metal(loid)s, as influenced by wastewater and microplastics, will also be discussed. 2017 Elsevier Inc. All rights reserved.

Toosky, M. N., et al. (2019). "A rapid, point-of-care antibiotic susceptibility test for urinary tract infections." Journal of medical microbiology. **17**.

Introduction. The alarming rise in urinary tract infection (UTI) antimicrobial resistance has resulted from a combination of high prevalence, low specificity and the lack of a rapid, point-of-care (POC) antibiotic susceptibility test (AST), which has led to the overuse/inappropriate use of antibiotics.Aim. This study aimed to evaluate the performance of a rapid POC phenotypic AST device in reporting susceptibility information within 2 h.Methodology. Instrument calibration was performed with model bacteria and fluorescent microbeads to determine the dynamic range and limit of detection for quantifying concentrations of bacteria and demonstrate the ability to rapidly differentiate susceptible and resistant model bacteria. We then evaluated 30 presumptive UTI-positive patient urine samples in a clinical pilot study using a panel of 5 common UTI antibiotics plus a growth control and compared our results to the hospital standard of care AST.Results. Our device was able to robustly detect and quantify bacteria concentrations from 50 to 105 colony-forming units (c.f.u.) ml-1. The high sensitivity of this measurement technique enabled the device to differentiate between susceptible and resistant model bacteria with 100 % specificity over a 2 h growth period. In the clinical pilot study, an overall categorical agreement (CA) of 90.7 % was observed (sensitivity=91.4 %, specificity=88.9 %, n=97) with performance for individual drugs ranging from 85 % CA (ceftazidime) to 100 % (nitrofurantoin).Conclusions. By reducing the typical timeframe for susceptibility testing from 2-3 days to 2 h, our POC phenotypic AST can provide critical information to clinicians prior to the administration of antibiotic therapy.

Toraman, H. E., et al. (2014). "Detailed compositional characterization of plastic waste pyrolysis oil by comprehensive two-dimensional gas-chromatography coupled to multiple detectors." Journal of Chromatography A **1359**: 237-246.

The detailed compositional characterization of plastic waste pyrolysis oil was performed with comprehensive two-dimensional GC (GC. x. GC) coupled to four different detectors: a flame ionization detector (FID), a sulfur chemiluminescence detector (SCD), a nitrogen chemiluminescence detector (NCD) and a time of flight mass spectrometer (TOF-MS). The performances of different column combinations were assessed in normal i.e. apolar/mid-polar and reversed configurations for the GC. x. GC-NCD and GC. x. GC-SCD analyses. The information obtained from the four detectors and the use of internal standards, i.e. 3-chlorothiophene for the FID and the SCD and 2-chloropyridine for the NCD analysis, enabled the identification and quantification of the pyrolysis oil in terms of both group type and carbon number: hydrocarbon groups (n-paraffins, iso-paraffins, olefins and naphthenes, monoaromatics, naphthenoaromatics, diaromatics, naphthenodiaromatics, triaromatics, naphthenotriaromatics and tetra-aromatics), nitrogen (nitriles, pyridines, quinolines, indole, caprolactam, etc.), sulfur (thiols/sulfides, thiophenes/disulfides, benzothiophenes, dibenzothiophenes, etc.) and oxygen containing compounds (ketones, phenols, aldehydes, ethers, etc.). Quantification of trace impurities is illustrated for indole and caprolactam. The analyzed pyrolysis oil included a significant amount of nitrogen containing compounds (6.4. wt%) and to a lesser extent sulfur containing compounds (0.6. wt%). These nitrogen and sulfur containing compounds described approximately 80% of the total peak volume for respectively the NCD and SCD analysis. TOF-MS indicated the presence of the oxygen containing compounds. However only a part of the oxygen containing compounds (2.5. wt%) was identified because of their low concentrations and possible overlap with the complex hydrocarbon matrix as no selective detector or preparative separation for oxygen compounds was used. © 2014 Elsevier B.V.

Toriumi, D. M., et al. (1996). "Vascular anatomy of the nose and the external rhinoplasty approach." Archives of Otolaryngology -- Head & Neck Surgery **122**(1): 24-34.

OBJECTIVE: To characterize the venous, lymphatic, and arterial blood supply of the nose and determine the effect of the external rhinoplasty approach on this vasculature. We hypothesized that dissection in the areolar tissue plane below the musculoaponeurotic layer of the nose will preserve the nasal vasculature and minimize postoperative nasal tip edema.

DESIGN: The study included preoperative and postoperative clinical evaluation, cadaver dissection, and histologic examination. In the clinical section, lymphoscintigraphy was performed before and after rhinoplasty using the endonasal (transnostril) or external (open) approach. Additionally, nasal tip edema was subjectively quantified at specified interval after surgery. In the cadaver dissection section, 15 fresh cadavers were dissected to identify the venous and arterial vasculature. In the histology section, fresh nasal tissue was examined by light microscopy to verify the anatomy of arteries, veins, and lymphatic vessels.

SETTING: Subjects for the clinical section of the study were volunteers undergoing primary rhinoplasty surgery at the University of Illinois College of Medicine at Chicago.

PATIENTS: Lymphoscintigraphy was performed on nine patients who underwent rhinoplasty surgery. Seven of these patients underwent postoperative lymphoscintigraphy.

INTERVENTIONS: The rhinoplasty procedures included three different methods of exposure of the nasal structures. Two patients underwent an endonasal (transnostril) nondelivery approach using a transcartilaginous incision. Five patients underwent the external approach with three receiving dissection in the areolar tissue plane below the musculoaponeurotic layer (preserving major nasal vasculature) and two undergoing dissection above the musculoaponeurotic layer (disrupting nasal vasculature).

MAIN OUTCOME MEASURES: In the clinical section of the study, the outcome measures were tracer flow as seen on lymphoscintigraphy and tip edema scores subjectively quantitated on a scale from 1 (none) to 4 (maximal).

RESULTS: Clinical Section: Lymphoscintigraphy revealed flow of tracer along the lateral aspect of the nose (cephalic to lateral crura) to the preparotid lymph nodes. Postoperative scans revealed preservation of flow of tracer with the endonasal (transnostril) approach and the external approach with submusculoaponeurotic areolar tissue plane dissection. There was loss of normal flow of tracer with the external approach using dissection that disrupted the musculoaponeurotic layer with supratip debulking. The nasal tip edema scores for the transnostril and external approach using areolar plane dissection were significantly lower than the external approach with disruption of the musculoaponeurotic layer. Cadaver Dissection

Section: Other than the lateral nasal veins, the major arteries, veins, and lymphatic vessels ran superficial to the musculoaponeurotic layer of the nose. The lateral and dorsal nasal and the columellar arteries comprise an alar arcade that provides the major blood supply to the flap elevated in the external rhinoplasty approach. Histologic Section: Light microscopy of plastic resin sections verified the lymphoscintigraphic and cadaver dissection findings. The lymphatic vessels were located primarily in the reticular dermis above the muscle layer.

CONCLUSIONS: The major arterial, venous, and lymphatic vasculature courses in or above the musculoaponeurotic layer of the nose. In the external rhinoplasty approach, dissection in the areolar tissue plane below the musculoaponeurotic layer will minimize tip edema and protect against skin necrosis by preserving the major vascular supply to the nasal tip.

Tormoen, G. W., et al. (2011). "Procoagulant activity of intravascular tissue factor is dependent on carrier burden." Journal of Thrombosis and Haemostasis **2)**: 432.

Background: Tissue factor (TF) is essential for the hemostatic initiation of the extrinsic pathway of blood coagulation. We found that cancer and benign tumor cells have different TF-dependent procoa-gulant activities (PCA). Intravascular microparticle-, cancer-, or other cell-associated TF may initiate thrombosis but circulating TF levels are not necessarily concordant with thrombosis. We investigated the role of TF concentration, carrier number, and fluid transport on coagulation. Method(s): We utilized microbeads and human monocytic-like U937 cells as TF carriers. Microbeads of 1, 5, 10 or 20 im in diameter were coated with a solution of 0.03, 0.1, 0.3 or 1 nM TF. U937 cells were stimulated with endotoxin to induce surface expression of TF. Particle effect on clotting was measured in a closed transport system using a coagulometer. Occlusive thrombus formation was measured in an open transport system using a flow chamber under a constant pressure gradient. Result(s): Initiation of coagulation was more dependent on procoagu-lant surface-sequestered TF carrier burden than overall TF load. TF-coated beads and LPS-stimulated U937 cells were procoagulant in both closed and open systems in a concentration-dependent manner over the range 102-106 carriers/mL. PCA of TF-coated beads were dependent upon the TF-coating concentration and bead number, but not microbead diameter or total TF-load. The PCA of U937 cells was dependent on TF-expression and cell number. In an open system, TF carriers significantly decreased the time to form an occlusive thrombus. The blockade of both tissue factor and the contact pathway was required to abrogate occlusion. Conclusion(s): These findings suggest that threshold levels of localized TF may be necessary for significant PCA and initiation of coagulation. Thus, pathological intravascular surface TF may play a role in thrombogenesis in manner that is largely dependent upon the TF carrier burden rather than overall TF concentration.

Tosetto, L., et al. (2016). "Microplastics on beaches: ingestion and behavioural consequences for beachhoppers." Marine Biology **163**(10).

Microplastics are ubiquitous in the marine environment worldwide, and may cause a physical and chemical risk to marine organisms. Their small size makes them bioavailable to a range of organisms with evidence of ingestion at all levels of the marine ecosystem. Despite an increasing body of research into microplastics, few studies have explored how consumption changes complex behaviours such as predator avoidance and social interactions. Pollutant exposure can result in alterations in behaviour that not only leads to sub optimal conditions for individual organisms but may also serve as a warning sign for wider effects on a system. This research assessed the impacts of microplastics on the ecology of coastal biota using beach hoppers (Platorchestia smithi) as model organisms. We exposed beach hoppers to marine-contaminated microplastics to understand effects on survival and behaviour. Beach hoppers readily ingested

microplastics, and there was evidence for accumulation of microplastics within the organisms. Exposure tests showed that microplastic consumption can affect beach hopper survival. Individuals also displayed reduced jump height and an increase in weight, however, there was no significant difference in time taken to relocate shelter post disturbance. Overall, these results show that short-term ingestion of microplastics have an impact on survival and behaviour of P. smithi. A reduction in the capacity for beach hoppers to survive and function may have flow on effects to their local environment and higher trophic levels.

Tosi, P. F., et al. (1991). "Quantitative immunofluorescent assay of full-length, recombinant CD4 in solution and mapping of its epitopes." Journal of Fluorescence **1**(2): 141-146.

A specific, rapid, and sensitive method for the detection of CD4 in solution was developed using pairs of fluorescently stained monoclonal antibodies which do not cross-compete. The assay is quantitated by flow cytometry using Simply Cellular microbeads (SC beads) as the primary support for the first anti-CD4 mAb. This method uses the standard conditions for anti-CD4 monoclonal antibody binding, washing, detection, and quantitation by flow cytometry of the CD4 antigen either bound to the SC beads or expressed on the cell surface. The monoclonal antibody used (Leu 3a PE) is the standard reference used to evaluate the CD4 concentration. This method differs from ELISA techniques, which need an antigen standard curve and thus can be influenced by the quality and source of the antigen. This type of assay is also a procedure which enables determination of the level of oligomerization of the bound antigen. It can be used for any antigen to which monoclonal antibodies recognizing at least two distinct epitopes are available. The use of soluble or full-length CD4 derivatives as potential therapeutic agents against AIDS, would benefit from a precise quantitation of the CD4 molecules which still have their proper tertiary structure.

Tosin, M., et al. (2012). "Laboratory test methods to determine the degradation of plastics in marine environmental conditions." Frontiers in Microbiology **3**: 225.

In this technology report, three test methods were developed to characterize the degradation of plastic in marine environment. The aim was to outline a test methodology to measure the physical and biological degradation in different habitats where plastic waste can deposit when littered in the sea. Previously, research has focused mainly on the conditions encountered by plastic items when floating in the sea water (pelagic domain). However, this is just one of the possible habitats that plastic waste can be exposed to. Waves and tides tend to wash up plastic waste on the shoreline, which is also a relevant habitat to be studied. Therefore, the degradation of plastic items buried under sand kept wet with sea water has been followed by verifying the disintegration (visual disappearing) as a simulation of the tidal zone. Most biodegradable plastics have higher densities than water and also as a consequence of fouling, they tend to sink and lay on the sea floor. Therefore, the fate of plastic items lying on the sediment has been followed by monitoring the oxygen consumption (biodegradation). Also the effect of a prolonged exposure to the sea water, to simulate the pelagic domain, has been tested by measuring the decay of mechanical properties. The test material (Mater-Bi) was shown to degrade (total disintegration achieved in less than 9 months) when buried in wet sand (simulation test of the tidal zone), to lose mechanical properties but still maintain integrity (tensile strength at break = -66% in 2 years) when exposed to sea water in an aquarium (simulation of pelagic domain), and substantially biodegrade (69% in 236 days; biodegradation relative to paper: 88%) when located at the sediment/sea water interface (simulation of benthic domain). This study is not conclusive as the methodological approach must be completed by also determining degradation occurring in the supralittoral zone, on the deep sea floor, and in the anoxic sediment.

Toto, D. CALL TO ACTION.
The article discusses the highlights of the 2011 Institute of Scrap Recycling Industries Convention & Exposition held at the Los Angeles Convention Center in California on April 5-9. With the theme "Action," the event had an exhibition featuring nearly 300 equipment and service suppliers to the recycling industry. Several sessions were conducted that dwelt on various topics including electronics recycling, plastics recovered from end-of-life electronics and automobiles, and trends in paper recycling.

Toto, D. (2011). "DOMESTIC BLISS." Recycling Today **49**(7): 42-46.
The article discusses the strong domestic price and demand for secondary plastics in the U.S. despite falling prices of primary materials, citing a consumer preference for recycled materials as of July 2011. A wide gap between prices of prime and recycled plastics is analyzed. Exports of recycled materials to China however, have declined due to higher Chinese import duties, increasing wages, and government efforts to curb inflation.

Toumi, H., et al. (2019). "Microplastics in freshwater environment: the first evaluation in sediments from seven water streams surrounding the lagoon of Bizerte (Northern Tunisia)." Environmental Science & Pollution Research **26**(14): 14673-14682.
Microplastic (MP) concentrations were determined, for the first time, in surface sediment of seven streams around the lagoon of Bizerte (Northern Tunisia), using a saturated NaCl flotation technique. Microplastics were categorised according to type, colour and size using a stereoscopic microscope.

Tourinho, P. S., et al. (2019). "Partitioning of chemical contaminants to microplastics: Sorption mechanisms, environmental distribution and effects on toxicity and bioaccumulation." Environmental Pollution **252**(Pt B): 1246-1256.
There is an increasing awareness of the threats posed by the worldwide presence of microplastics (MPs) in the environment. Due to their high persistence, MPs will accumulate in the environment and their quantities tend to increase with time. MPs end up in environments where often also chemical contaminants are present. Since the early 2000s, the number of studies on the sorption of chemicals to plastic particles has exponentially increased. The objective of this study was to critically review the literature to identify the most important factors affecting the sorption of chemical contaminants to MPs. These factors include the physicochemical properties of both the MPs and the chemical contaminants as well as environmental characteristics. A limited number of studies on soil together with an increased notion of the importance of this compartment as a final sink for MPs was observed. Therefore, we assessed the distribution of model chemicals (two PCBs and phenanthrene) in the soil compartment in the presence of MPs using a mass balance model. The results showed a high variation among chemicals and microplastic types. Overall, a higher partitioning to MPs of chemical contaminants in soil is expected in comparison to aquatic environments. As sorption to a large extent determines bioavailability, the effects of combined exposure to chemicals and MPs on the toxicity and bioaccumulation in biota are discussed. Finally, some considerations regarding sorption and toxicity studies using MPs are given.

Toussaint, B., et al. (2019). "Review of micro- and nanoplastic contamination in the food chain." Food Additives & Contaminants. Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment **36**(5):

639-673.

Whereas the dramatic environmental impact of plastic waste rightfully receives considerable attention by scientists, policy makers and public in general, the human health impact of micro- and nanoplastics contamination of our food and beverages remains largely unknown. Indeed, most studies aim at understanding the environmental impact rather than the human health impact of a possible exposure to micro- and nanoplastics. In addition, these papers generally lack a methodological, standardised approach. Furthermore, some studies focus on the damage to and contamination level of animal species collected from the wild environment, and others investigate the rate and biology of microplastic uptake of animals fed with microplastics in laboratory. This review aims at understanding human exposure. Since there is, with few exceptions, no evidence available on the presence of micro- and nanoplastics in a normal diet, this study takes an indirect approach and analyses peer-reviewed publications since 2010 that document the presence of micro- and nanoplastics in those animals (more than 200 species) and food products that are part of the human food chain and that may thus contribute directly or indirectly to the uptake of micro- and nanoplastics via the human diet. It also addresses the question of the definitions, the methodologies and the quality criteria applied to obtain the reported results. This review suggests that, beyond a few estimations and comparisons, precise data to assess the exact exposure of humans to micro- and nanoplastics through their diet cannot be produced until standardised methods and definitions are available.

Townsend, K. R., et al. (2019). "Associations between microplastic pollution and land use in urban wetland sediments." Environmental Science & Pollution Research **26**(22): 22551-22561.

Microplastic pollution is concerning because it is widespread in aquatic environments and there is growing evidence of negative biological effects. Here, we present one of the first studies to examine microplastic pollution (plastic particles < 1 mm) in urban wetlands and investigate relationships between contamination and urban land use. Sediment samples were collected from 20 independent urban wetlands, each with different types of urban land use within their catchments. Microplastics were observed at all wetlands, with an average abundance of around 46 items/kg of dry sediment. Plastic fragments were the most common type of microplastic, accounting for 68.5% of all microplastics found. Consistent with other studies, microplastic abundance was positively correlated with increased catchment urbanisation. On closer examination, plastic fragments and beads correlated with catchment urbanisation. Fragment abundance also increased in wetlands with catchments that had a higher proportion of industrial land use and decreased in catchments with higher residential densities. This study demonstrates the susceptibility of urban wetlands to microplastic pollution, further highlighting the ubiquitous nature of microplastic pollution. The prevalence of microplastic fragments indicates that plastic litter degradation is a significant source of microplastics in urban environments, especially in industrial areas.

Tozzi, C., et al. (2004). "Increased sensitivity of autoantibody determination by coupled-particle light-scattering assay by poly(ethylene glycols)-modified beads." Analytica Chimica Acta **510**(2): 153-161.

New kinds of coatings by using polyethylene glycols were studied and were applied to a qualitative homogeneous immunoassay that exploits the agglutination reaction for the detection of autoimmune antibodies in a complex matrix. We used a piece of new technology, the Copalis^{TM}, which uses a special optical-sizing flow particle analysis and a semiconductor laser as a light source. Polystyrene microbeads coated with the antigen were used as markers and were put in contact with the serum sample. Different polyethylene glycols were synthesised and tested, optimising the experimental parameters. Human serum specimens were evaluated and we obtained a higher sensitivity with good discrimination between negative and positive samples. All the experimental steps are easy, rapid and enable us to process many samples in a short period of time. © 2004 Elsevier B.V. All rights reserved.

Tozzoli, R. (2007). "Recent advances in diagnostic technologies and their impact in autoimmune diseases." Autoimmunity Reviews **6**(6): 334-340.

Conventional immunological methods for the detection of serum autoantibodies have been an essential tool for the diagnosis of autoimmune diseases for 40 years: in the last decade autoantibody tests have become accepted criteria for the diagnosis and classification of the main systemic and organ-specific autoimmune diseases. The high degree of purification reached by the autoantigens used in these methods has allowed high diagnostic sensitivity and specificity, especially in the case of some new autoantibodies of particular clinical significance, such as anti-nucleosome, anti-transglutaminase, anti-TSH receptor and anti-citrullinated protein autoantibodies. In the last 5 years the advent of proteomic technology, which allows the simultaneous measurement of a number of autoantibodies (multiplexing), has opened up new horizons in the diagnosis of autoimmune diseases. Multiplexing is particularly interesting for clinical laboratories, for organisational, logistical/managerial, physiopathological and research reasons. The emerging technologies are represented by systems based on planar or non-planar (suspension) arrays: the latter include methods which use addressable microbeads or nanobarcoded particles. Within a few years, the new methods will allow testing of individual autoantibody profiles, which will probably improve understanding of the physiopathology of autoimmunity, allow early diagnosis (due to the predictive value of autoantibodies), and drive the diffusion of antigen-specific therapies in autoimmune diseases. [References: 40]

Trang, T., et al. (2014). "Pancreatic enzyme replacement therapy for pancreatic exocrine insufficiency in the 21(st) century." World Journal of Gastroenterology **20**(33): 11467-11485.

Restitution of normal fat absorption in exocrine pancreatic insufficiency remains an elusive goal. Although many patients achieve satisfactory clinical results with enzyme therapy, few experience normalization of fat absorption, and many, if not most, will require individualized therapy. Increasing the quantity of lipase administered rarely eliminates steatorrhea but increases the cost of therapy. Enteric coated enzyme microbead formulations tend to separate from nutrients in the stomach precluding coordinated emptying of enzymes and nutrients. Unprotected enzymes mix well and empty with nutrients but are inactivated at pH 4 or below. We describe approaches for improving the results of enzyme therapy including changing to, or adding, a different product, adding non-enteric coated enzymes, (e.g., giving unprotected enzymes at the start of the meal and acid-protected formulations later), use of antisecretory drugs and/or antacids, and changing the timing of enzyme administration. Because considerable lipid is emptied in the first postprandial hour, it is prudent to start therapy with enteric coated microbead prior to the meal so that some enzymes are available during that first hour. Patients with hyperacidity may benefit from adjuvant antisecretory therapy to reduce the duodenal acid load and possibly also sodium bicarbonate to prevent duodenal acidity. Comparative studies of clinical effectiveness of different formulations as well as the characteristics of dispersion, emptying, and dissolution of enteric-coated microspheres of different diameter and density are needed; many such studies have been completed but not yet made public. We discuss the history of pancreatic enzyme therapy and describe current use of modern preparations, approaches to overcoming unsatisfactory clinical responses, as well as studies needed to be able to provide reliably effective therapy.

Travagliati, M., et al. (2014). "Acoustofluidics and Whole-Blood Manipulation in Surface Acoustic Wave Counterflow Devices." Analytical Chemistry **86**(21): 10633.

On-chip functional blocks for sample preprocessing are necessary elements for the implementation of fully portable micrototal analysis systems (...TAS). We demonstrate and characterize the microparticle and whole-blood manipulation capabilities of surface acoustic wave (SAW) driven counterflow micropumps. The motion of suspended cells in this system is governed by the two dominant acoustic forces associated with the scattered SAW (of wavelength ...): acoustic-radiation force and acoustic-streaming Stokesian drag force. We show that by reducing the microchannel height (h) beyond a threshold value the balance of these forces is shifted toward the acoustic-radiation force and that this yields control of two different regimes of microparticle dynamics. In the regime dominated by the acoustic radiation force (h ...), microparticles are collected in the seminodes of the partial standing sound-wave arising from reflections off microchannel walls. This enables the complete separation of plasma and corpuscular components of whole blood in periodical predetermined positions without any prior sample dilution. Conversely, in the regime dominated by acoustic streaming (h ...), the microbeads follow vortical streamlines in a pattern characterized by three different phases during microchannel filling. This makes it possible to generate a cell-concentration gradient within whole-blood samples, a behavior not previously reported in any acoustic-streaming device. By careful device design, a new class of SAW pumping devices is presented that allows the manipulation and pretreatment of whole-blood samples for portable and integrable biological chips and is compatible with hand-held battery-operated devices. (ProQuest: ... denotes formulae/symbols omitted.)

Tresset, G. and S. Takeuchi (2004). "A microfluidic device for electrofusion of biological vesicles." Biomedical Microdevices **6**(3): 213-218.

This paper reports a microfabricated device with high aspect-ratio electrodes and low power consumption for the electrofusion of liposomes and cells. The applications may range from gene transfection or cell tracking to biophysical studies of membrane proteins. The device consists of 250 microm thick silicon electrodes bonded to a glass substrate and covered by a PDMS-coated glass slide. Liposomes were first aligned by AC voltage at 300 kHz and then fused with short DC pulses. The fusion yield can reach 75% and is globally better for liposome diameters larger than 10 microm. The encapsulation of microbeads inside liposomes has also been demonstrated and opens up the route towards fusion-based delivery of artificial microstructures into cells.

Trevail, A. M., et al. (2015). "Elevated levels of ingested plastic in a high Arctic seabird, the northern fulmar (Fulmarus glacialis)." Polar Biology **38**(7): 975-981.

Plastic pollution is of worldwide concern; however, increases in international commercial activity in the Arctic are occurring without the knowledge of the existing threat posed to the local marine environment by plastic litter. Here, we quantify plastic ingestion by northern fulmars, Fulmarus glacialis, from Svalbard, at the gateway to future shipping routes in the high Arctic. Plastic ingestion by Svalbard fulmars does not follow the established decreasing trend away from human marine impact. Of 40 sampled individuals, 35 fulmars (87.5%) had plastic in their stomachs, averaging at 0.08 g or 15.3 pieces per individual. Plastic ingestion levels on Svalbard exceed the ecological quality objective defined by OSPAR for European seas. This highlights an urgent need for mitigation of plastic pollution in the Arctic as well as international regulation of future commercial activity.

Trevisan, R., et al. (2019). "Nanoplastics Decrease the Toxicity of a Complex PAH Mixture but Impair

Mitochondrial Energy Production in Developing Zebrafish." Environmental Science & Technology **53**(14): 8405.

Plastics are recognized as a worldwide threat to the environment, possibly affecting human health and wildlife. Small forms of plastics such as micro- and nanoplastics can interact with other organic contaminants, potentially acting as chemical carriers and modulating their toxicity. In this study, we investigated the toxicity of polystyrene nanoparticles (Nano-PS) and a real-world environmental PAH mixture (Elizabeth River Sediment Extract, ERSE, comprised of 36 detected PAHs) to zebrafish embryos and larvae. Embryos were exposed to Nano-PS (0.1–10 ppm) or ERSE (0.1–5% v/v, equivalent to ΣPAH 5.07–25.36 ppb) or coexposed to a combination of both. Larvae exposed to Nano-PS did not exhibit developmental defects, while larvae exposed to ERSE (2–5%) showed classic signs of PAH toxicity such as heart malformation and deformities in the jaw, fin, and tail. ERSE (5%) also impaired vascular development in the brain. When coexposed, Nano-PS decreased the developmental deformities and impaired vascular development caused by ERSE. This was strongly correlated to the lower PAH bioaccumulation detected in the coexposed animals (whole larvae, as well as the yolk sac, brain, and heart). Our data suggest that PAHs are sorbing to the surface of the Nano-PS, decreasing the concentration, uptake, and toxicity of free PAHs during the exposure. Such sorption of PAHs increases the agglomeration rate of Nano-PS during the exposure time, potentially decreasing the uptake of Nano-PS and associated PAHs. Despite that, similar induction of EROD activity was detected in animals exposed to ERSE in the presence or not of Nano-PS, suggesting that enough PAHs were accumulated in the organisms to induce cellular defense mechanisms. Nano-PS exposure (single or combined with ERSE) decreased the mitochondrial coupling efficiency and increased NADH production, suggesting an impairment on ATP production accompanied by a compensatory mechanism. Our data indicate that nanoplastics can sorb contaminants and potentially decrease their uptake due to particle agglomeration. Nanoplastics also target and disrupt mitochondrial energy production and act as vectors for the mitochondrial uptake of sorbed contaminants during embryonic and larval stages. Such negative effects of nanoplastics on energy metabolism and efficiency could be detrimental under multiple-stressors exposures and energy-demanding scenarios, which remains to be validated.

Triebskorn, R., et al. (2019). "Relevance of nano- and microplastics for freshwater ecosystems: A critical review." TrAC - Trends in Analytical Chemistry **110**: 375-392.

The current paper critically reviews the state-of-the-science on (1) microplastics (MP) types and particle concentrations in freshwater ecosystems, (2) MP and nanoplastics (NP) uptake and tissue translocation, (3) MP/NP-induced effects in freshwater organisms, and (4) capabilities of MP/NP to modulate the toxicity of environmental chemicals. The reviewed literature as well as new data on MP and NP concentrations in the river Elbe and on particle uptake into human cells indicate an environmental relevance of small particles in the low nano- and micrometer range higher than that of larger MP. © 2018 Elsevier B.V.

Trifkovic, K. T., et al. (2014). "Chitosan microbeads for encapsulation of thyme (Thymus serpyllum L.) polyphenols." Carbohydrate Polymers **111**: 901-907.

In this work chitosan microbeads were prepared by emulsion technique and loaded with thyme polyphenols by diffusion from an external aqueous solution of Thymus serpyllum L. The effects of concentrations of chitosan (1.5-3% (w/v)) and GA (glutaraldehyde) (0.1-0.4% (v/v)), as a crosslinking agent on the main properties of microbeads were assessed. The obtained microgel beads from ~ 220 to ~ 790 mum in diameter were exposed to controlled drying process at air (at 37 degreeC) after which they contracted to irregular shapes (~ 70-230 mum). The loading of

dried microbeads with polyphenols was achieved by swelling in the acidic medium. The swelling rate of microbeads decreased with the increase in GA concentration. Upon this rehydration, thyme polyphenols were effectively encapsulated (active load of 66-114 mg GAE g(beads)(-1)) and the microbeads recovered a spherical shape. Both, the increase in the amount of the crosslinking agent and the presence of polyphenols, contributed to a more pronounced surface roughness of microbeads. The release of encapsulated polyphenols in simulated gastrointestinal fluids was prolonged to 3h.

Trifuoggi, M., et al. (2019). "Microplastic-induced damage in early embryonal development of sea urchin Sphaerechinus granularis." Environmental Research **179**(Pt A): 108815.

Two microplastic sets, polystyrene (PS) and polymethyl methacrylate (PMMA), were tested for adverse effects on early life stages of Sphaerechinus granularis sea urchins. Microparticulate PS (10, 80 and 230mum diameter) and PMMA (10 and 50mum diameter) were tested on developing S. granularis embryos from 10min post-fertilisation (p-f) to the pluteus larval stage (72h p-f), at concentrations ranging from 0.1 to 5mgL⁻¹. Both PS and PMMA exposures resulted in significant concentration-related increase of developmental defects and of microplastic uptake in plutei. Moreover, embryo exposures to PS and PMMA (5 and 50mgL⁻¹) from 10min to 5h p-f resulted in a significant increase of cytogenetic abnormalities, expressed as significantly increased mitotic aberrations, while mitotoxicity (as % embryos lacking active mitoses) was observed in embryos exposed to PS, though not to PMMA. When S. granularis sperm suspensions were exposed for 10min to PS or to PMMA (0.1-5mgL⁻¹), a significant decrease of fertilisation success was observed following sperm exposure to 0.1mgL⁻¹ PS, though not to higher PS concentrations nor to PMMA. Sperm pretreatment, however, resulted in significant offspring damage, as excess developmental defects in plutei, both following sperm exposure to PS and PMMA, thus suggesting transmissible damage from sperm pronuclei to the offspring. The overall results point to relevant developmental, cytogenetic and genotoxic effects of PS and PMMA microplastics to S. granularis early life stages, warranting further investigations of other microplastics and other target biota.

Trinacty, J., et al. (1999). "Passage and retaining of plastic particles in digestive tract of dry cows." Czech Journal of Animal Science **44**(6): 263-268.

Three crossbred (Czech Pied x Black Pied Friesian) rumen-cannulated dry cows were fed a diet consisting of 6 kg alfalfa hay and 2 kg mixture (32% barley meal, 32% maize meal, 32% wheat meal, 2% mineral supplement and 2% sodium chloride). Plastic cylindrical particles with a specific gravity of 1.25+or-0.05 g/cmsuperscript 3 were applied manually through cannulae into the bottom of the ventral sac, anterior blind sac and reticulum of the rumen. 50 pieces of 8 mm and 50 pieces of 12 mm particles were inserted. Each day, the particles were removed from the stomach, counted, and put back. After 8 days the particles were removed completely. Regurgitated particles and particles in faeces were also counted. The anterior blind sac and reticulum performed a similar role in the passage of the particles through the reticulo-rumen. The particles passed through both parts in one day, and were retained mainly in the bottom of the ventral sac. Regurgitation of 8 mm particles varied from 0 to 2.0%, regurgitation of 12 mm particles was between 8.0 and 11.7%. The particles (10.7 to 21.3%) were retained behind the reticulo-omasal orifice for 9 to 32 days.

Trinacty, J., et al. (2000). "Passage and interactions of large plastic particles applied into lactating cows." Czech Journal of Animal Science **45**(8): 349-354.

Two trials were performed on 2 lactating cows. In the first trial the diet consisted of 5.4 kg maize silage, 3.7 kg lucerne hay and 5.3 kg concentrates (in DM), and the mean milk yield was 17.09 kg. Plastic particles of 6, 8, 10 and 12 mm were used, 50 particles of each size. In the second trial with similar diet the mean milk yield was 22.12 kg, and only particles of 6 and 10 mm (768 and 172 pieces, respectively) were applied separately or together. The specific gravity of particles, which were applied orally, was 1.25+or-0.05 g/cmsuperscript 3. The aim was to determine the recovery and retention time of individual particles, and in the second trial the interaction of 6 and 10 mm particles was also evaluated. Mean cumulative faecal recovery of 6, 8, 10 and 12 mm particles in the first trial was: 98.7, 98.7, 96.0 and 82.7%, and total mean retention time was 39.7, 41.4, 44.5 and 58.4 h, respectively. In the second trial the highest interaction between 6 and 10 mm particles was found when 28 h had elapsed after application, when the cumulative faecal recovery was 60.3 and 54.8%, respectively.

Tripathi, G. and S. Singh (2010). "Formulation and In Vitro evaluation of pH sensitive oil entrapped polymeric blended gellan gum buoyant beads of clarithromycin." Daru: Journal of Faculty of Pharmacy, Tehran University of Medical Sciences **18**(4): 247-253.

BACKGROUND AND THE PURPOSE OF THE STUDY: A gastroretentive pH sensitive system has been a frontier approach to release the drug in controlled manner in stomach and duodenum. The aim of this study was to develop buoyant beads of gellan based, wherein, the oil was entrapped, blended with hydroxypropyl methyl cellulose or carbopol 934 in order to evaluate its potential for targeted sustained delivery of clarithromycin in the gastric region.

METHODS: Buoyant beads of gellan was developed by inotropic gelation technique using calcium carbonate as gas forming agent and the drug polymer dispersion was emulsified with mineral oil. The oil was entrapped and blended with hydroxypropyl methyl cellulose or carbopol 934. The developed beads were evaluated in terms of diameter,% floating, encapsulation efficiency, In vitro drug release, In vivo gastric residence efficacy and clarithromycine concentration in the mucosa of the experimental animal model.

RESULTS: The scanning electron microscope photograph indicated that the prepared beads were spherical in shape and buoyancy, encapsulation efficiency and drug content obtained from all batches were satisfactory. Particle size and percentage buoyancy of the gel beads increased by raising the concentration of calcium carbonate. The formulation exhibited sustained release profile and was best fitted in the Peppas model with $n<0.45$. Subsequent coating of microbeads exhibited zero-order sustained pattern of the drug release up to 8 hrs. Batch B(4) showed comparatively better residence and the drug concentration in the gastric mucosa of the treated animals.

CONCLUSION: The result provides evidence that the prepared optimized formulation may be used effectively for pH sensitive gastric targeted antibiotic such as clarithromycin.

Tripathi, G. K., et al. (2012). "Formulation and In-vitro Evaluation of pH-Sensitive Oil Entrapped Polymeric Blend Amoxicillin Beads for the Eradication of Helicobacter pylori." Iranian Journal of Pharmaceutical Research **11**(2): 447-455.

Oral pH sensitive drug delivery systems are of utmost importance as these systems deliver the drug at specific part of the gastrointestine (GI) as per the pH of GI, resulting in improved patient therapeutic efficacy and compliance. The pH range of fluids in various segments of the GI tract may provide environmental stimuli for drug release. The aim of this study was to design buoyant beads containing amoxicillin (Am) and to evaluate its potential for the eradication of Helicobacter pylori (H. pylori). The gel bead of gellan, wherein the oil was entrapped, was blended with hydroxypropyl methyl cellulose or Carbopol 934. Buoyant beads of gellan were prepared through ionotropic gellation technique to achieve the controlled and pH-sensitive drug release in stomach. The effects of processing variables such as particle size, buoyancy, percent encapsulation efficiency and in-vitro antimicrobial activity were evaluated. The scanning electron micrograph indicated that prepared beads were spherical in shape and all the beads showed satisfactory floating efficiency in the phthalate buffer solution. The diameter of the gel beads was increased through raising the gellan gum and calcium carbonate concentration. The formulation exhibited sustained release profile and was best fitted in the Peppas model with $n < 0.45$. Subsequent coating of microbeads exhibited zero-order sustained pattern of the drug release up to 8 h. In-vitro growth inhibition study showed complete eradication of the isolated H. pylori strain .These results provide evidence that the optimized formulation bearing antibiotics like amoxicillin should be useful in H. pylori treatment.

Trivedi, A., et al. (2018). "CD14 positive selection displays an edge in the isolation of macrophages from induced sputum of COPD patients using immunobead technology." Indian Journal of Physiology and Pharmacology **62**(1): 32-40.

Objectives: Macrophages plays an important role in the pathophysiology of COPD. Sputum induction is a safe and non-invasive method for evaluation of airway inflammation in COPD. The present study aims to evaluate the yield of macrophage isolation from induced sputum of COPD patients by using commercially available immunomagnetic bead based approaches. Method(s): Sputum induction was done in COPD patients (n=13). Cell pellets obtained after the processing of sputum samples (n=11) were subjected to different isolation kits. Macrophages were isolated from cell pellet using positive and negative selection strategies. CD66abce microbead kit, PAN monocyte isolation kit and CD14 microbeads were used in three different combinations for obtaining pure and enriched macrophages from sputum. Result(s): The results obtained from all sets of experiments were compared and per cent purity and enrichment of macrophages was calculated. CD14 positive selection kit when used for isolation yielded maximum enrichment (> 20-folds) and yielded greater purity as compared to negative selection strategies. Conclusion(s): CD14 microbeads based positive selection appeared to be the method of choice for isolating macrophages from induced sputum of COPD patients for various downstream experimental processes. Copyright © 2018, Association of Physiologists and Pharmacologists of India. All rights reserved.

TrOeger, C., et al. (2008). "Ageing of acrylate-based resins for stereolithography: thermal and humidity ageing behaviour studies." Rapid Prototyping Journal **14**(5): 305-317.

Purpose - The purpose of this paper is to describe the ageing behaviour of acrylate-based resins for stereolithography (SL) technology using different test methods and to investigate these effects on polymers. Design-methodology-approach - Controlling the polymer degradation requires an understanding of many different phenomena, including the different chemical mechanisms underlying structural changes in polymer macromolecules, the influences of polymer morphology, the complexities of oxidation chemistry and the complex reaction pathways of polymer additives. Several ageing characterization experiments are given. Findings - The paper covers the ageing process analysis of acrylate-based polymers. An overview of the ageing behaviour is given, along with the bandwidth of material characteristics for a prolonged lifetime of this material class. Research limitations-implications - For research and development in the field of rapid prototyping (RP) materials data about ageing behaviour and environmental effects are crucial. The authors show possible methods for measuring these effects and discuss the consequences in material research using a recently developed biocompatible SL resin as an example. Practical implications - The study of the ageing behaviour of polymers is important for

understanding their usability, storage, lifetime and recycling. The presented polymeric formulations are able to meet the growing demand for both soft and stiff manufacturing resin materials in the engineering and medical fields. Originality-value - The analysis of the ageing behaviour of polymer materials is an important issue for engineering applications, recycling of post-consumer plastic waste, as well as the use of polymers as biological implants and matrices for drug delivery and the lifetime of an article. The paper gives an overview of details involving ageing behaviour and their meaning for applications of acrylate-based SL resins and is therefore of high importance to people with interest in long-term behaviour and ageing of RP materials.

Trojanowska, A., et al. (2015). "Plasmonic-polymer hybrid hollow microbeads for surface-enhanced Raman scattering (SERS) ultradetection." Journal of Colloid & Interface Science **460**: 128-134.

Hybrid composites are known to add functionality to plasmonic nanomaterials. Although these substrates can be produced by common synthetic methods, the percentage of metal loaded into the functional material is usually small. Herein, we exploit a phase inversion precipitation method to incorporate large amounts of silver nanoparticles inside the polymeric matrix of polysulfone microbeads. The composite material combines the high SERS activity resulting from the plasmonic coupling of highly interacting nanoparticles and the ability to accumulate analytes of the polysulfone porous support. This allows for the quantitative SERS detection down to the nanomolar level, with a liner response that extends over an impressive concentration range of five orders of magnitude.

Troost, T. A., et al. (2018). "Do microplastics affect marine ecosystem productivity?" Marine Pollution Bulletin **135**: 17.

Marine and coastal ecosystems are among the largest contributors to the Earth's productivity. Experimental studies have shown negative impacts of microplastics on individual algae or zooplankton organisms. Consequently, primary and secondary productivity may be negatively affected as well. In this study we attempted to estimate the impacts on productivity at ecosystem level based on reported laboratory findings with a modelling approach, using our biogeochemical model for the North Sea (Delft3D-GEM). Although the model predicted that microplastics do not affect the total primary or secondary production of the North Sea as a whole, the spatial patterns of secondary production were altered, showing local changes of ±10%. However, relevant field data on microplastics are scarce, and strong assumptions were required to include the plastic concentrations and their impacts under field conditions into the model. These assumptions reveal the main knowledge gaps that have to be resolved to improve the first estimate above.

Trotter, B., et al. (2019). "Plastic waste interferes with chemical communication in aquatic ecosystems." Scientific Reports **9**(1): 5889.

Environmental pollution with plastic waste has gained increasing attention, as the contamination of aquatic habitats poses a challenge to these ecosystems. Plastic waste has direct negative effects on animals such as reduced growth rate, fecundity or life span. However, the indirect effects of plastic waste, which has the ability to sorb chemicals from the surrounding media, on chemical communication have yet to be investigated. Chemical communication is crucial for aquatic organisms, e.g., to avoid predation. The planktonic water flea Daphnia (Crustacea), an important link between trophic levels, relies on info-chemicals (kairomones) to assess its current predation risk and to form inducible defences. We show that plastic waste, composed of high-density polyethylene (HDPE) and polyethylene terephthalate (PET) interferes with the formation of inducible defences in Daphnia longicephala when exposed

to a combination of kairomones of Notonecta glauca and plastic waste. D. longicephala shows a reduction in all defensive traits, including body length, crest width and time until primiparity, compared to exposure to solely kairomone conditioned media. Plastic waste in the absence of kairomones had no effect on defensive traits. Since it is vital to adjust these defences to the current predation risk, any misperception can have far-reaching ecological consequences. Therefore, plastic waste can have indirect effects on organisms, which may manifest at the community level.

Trucillo, E., et al. (2019). "Growth factor sustained delivery from poly-lactic-co-glycolic acid microcarriers and its mass transfer modeling by finite element in a dynamic and static three-dimensional environment bioengineered with stem cells." Biotechnology & Bioengineering **116**(7): 1777-1794.

Poly-lactic-co-glycolic acid (PLGA) microcarriers (0.8 +/- 0.2 mum) have been fabricated with a load of 20 mug/g_{PLGA} by an emulsion-based-proprietary technology to sustained deliver human bone morphogenetic protein 2 (hBMP2), a growth factor largely used for osteogenic induction. hBMP2 release profile, measured in vitro, showed a moderate "burst" release of 20% of the load in first 3 days, followed by a sustained release of 3% of the load along the following 21 days. PLGA microbeads loaded with fluorescent marker (8 mg/g_{PLGA}) and hydroxyapatite (30 mg/g_{PLGA}) were also fabricated and successfully dispersed within three-dimensional (3D) alginate scaffold (Ca-alginate 2% wt/wt) in a range between 50 and 200 mg/cm³ ; the presence of microcarriers within the scaffold induced a variation of its stiffness between 0.03 and 0.06 MPa; whereas the scaffold surface area was monitored always in the range of 190-200 m² /g. Uniform microcarriers dispersion was obtained up to 200 mg/cm³ ; higher loading values in the 3D scaffold produced large aggregates. The release data and the surface area were, then, used to simulate by finite element modeling the hBMP2 mass transfer within the 3D hydrogel bioengineered with stem cells, in dynamic and static cultivations. The simulation was developed with COMSOL Multiphysics giving a good representation of hBMP2 mass balances along microbeads (bulk eroded) and on cell surface (cell binding). hBMP2 degradation rate was also taken into account in the simulations. hBMP2 concentration of 20 ng/cm³ was set as a target because it has been described as the minimum effective value for stem cells stimulation versus the osteogenic phenotype. The sensitivity analysis suggested the best microbeads/cells ratio in the 3D microenvironment, along 21 days of cultivations in both static and dynamic cultivation (perfusion) conditions. The simulated formulation was so assembled experimentally using human mesenchymal stem cells and an improved scaffold stiffness up to 0.09 MPa (n = 3; p <= 0.01) was monitored after 21 days of cultivation; moreover a uniform extracellular matrix deposition within the 3D system was detected by Von Kossa staining, especially in dynamic conditions. The results indicated that the described tool can be useful for the design of 3D bioengineered microarchitecture by quantitative understanding.

Trucillo, E., et al. (2019). "Growth factor sustained delivery from poly-lactic-co-glycolic acid microcarriers and its mass transfer modeling by finite element in a dynamic and static three-dimensional environment bioengineered with stem cells." Biotechnology and Bioengineering **116**(7): 1777-1794.

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Trufanova, N. A., et al. (2010). "Cryopreservation of human mesenchymal stromal cells in suspension and encapsulated in alginate microbeads by vitrification in multicomponent solutions." Cryobiology **61 (3)**: 407-408.

Mesenchymal stromal cells (MSCs) are a promising cell type for fabrication of tissue engineered constructs due to the high proliferation activity of MSCs, relative easiness of isolation, expansion and ability to differentiation into multiple cell types. Alginate encapsulation is a novel process for manipulation and cryopreservation of MSCs in regenerative medicine. The aim of this study is to investigate the response of single cell suspension and alginate encapsulated human mesenchymal stromal cells to vitrification in multicomponent solution.Human fetal mesodermal tissues and adult dermis derived MSCs were isolated according to Ethical guidelines and expanded in vitro. Two vitrification solutions called DEPS-1 (10% ME<inf>2</inf>SO, 20% EG, 20% 1.2-PD, 0.5 M sucrose) and DEPS-2 (10% ME<inf>2</inf>SO, 15% EG, 15% 1.2-PD, 1 M sucrose) were stepwise added to standard cryovials with MSCs either in suspension or encapsulated in alginate microbeads at room temperature. Samples were frozen by immersion in liquid nitrogen, thawed in a water bath at 40 degreeC and cryoprotectants were washed out in 0.5 M sucrose solution. The glass forming tendency and the stability of the amorphous state were studied by differential scanning calorimetry (DSC). The viability of single cell suspension was assessed by Trypan Blue staining and by cell adhesion test, whereas alginate encapsulated cells by double fluorescein diacetate (FDA) and ethidium bromide (EB) staining. The metabolic activity of MSCs was estimated by the Alamar Blue reduction and MTT-test when cultured for 24 h. Both vitrification solutions during cooling transformed into amorphous state, but DEPS-1 demonstrated higher glass forming tendency than DEPS-2. After vitrification in DEPS-1 viability decreased for 20%, adhesion and metabolic activity - for 40-45% compare to control. After vitrification in DEPS-2 viability and metabolic activity were lower, therefore DEPS-1 was chosen for the further experiments. It was shown that after vitrification in DEPS-1 MSCs demonstrated ability to differentiation into osteogenic and adipogenic lineages. Vitrification of MSCs encapsulated in alginate microbeads by protocol suitable for single cell suspension led to cell

death. Variation of exposure time of MSCs with vitrification solution on each step allowed to significantly improve viability and metabolic activity. The results obtained demonstrate the possibility of using vitrification protocol in standard cryovials for the cryopreservation of MSCs in cell suspension and encapsulated in alginate microbeads for application in cell biology, regenerative medicine and tissue engineering.

Truini, J. (1999). "Bottle bill worries recyclers." Waste News **5**(32): 3.
Reports on recyclers' concern over the impact of California's expanded bottle bill on the quality of scrap plastic in the market. Inclusion of all plastic beverage containers in the state's revised bottle bill; Association of Post-Consumer Plastic Recyclers' concern about contamination; Requirement for businesses to help pay for California's program through processing fees.

Truini, J. (2009). "Plastics recyclers seek voice within ISRI." Waste & Recycling News **14**(28): 14-11NULL.
The article focuses on the hopes pinned by post-consumer plastic packaging recyclers in the U.S., after the move by the Institute of Scrap Recycling Industries to form a plastic recycling council. Though organizations like the Association of Postconsumer Plastic Recyclers already exists, post-consumer plastic recyclers have reportedly complained of the lack of a platform to voice their concerns. Industry members are quoted, who seem much upbeat about the prospects.

Truslow, D. (2017). "MICROBEADS AND THE TOXICS USE REDUCTION ACT: PREVENTING POLLUTION AT ITS SOURCE." Boston College Environmental Affairs Law Review **44**(1): 149-178.
Microbead pollution presents a significant threat to human health and the environment. As a result, Congress enacted a national ban on microbeads in 2015. This ban is a drastic, reactionary measure that fails to address the continued threat posed by already existing pollution. In addition, the ban represents a continued preference for the command-and-control regulatory framework that failed to prevent microbead pollution in the first place. In contrast, pollution prevention, an alternative regulatory technique adopted by Congress as national policy in 1990, more efficiently prevents pollution by focusing on reducing pollution at its source. In 1989, Massachusetts became the first state to successfully implement a comprehensive pollution prevention statute and, as a result, achieved significant pollution reduction throughout the state. If it had applied to microbeads, the pollution prevention model, could have eliminated the need for a national ban and addressed the continued threat posed by already existing pollution. [ABSTRACT FROM AUTHOR]
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Tsai, C. J., et al. (2009). "The pollution characteristics of odor, volatile organochlorinated compounds and polycyclic aromatic hydrocarbons emitted from plastic waste recycling plants." Chemosphere **74**(8): 1104-1110.
Plastic waste treatment trends toward recycling in many countries; however, the melting process in the facilities which adopt material recycling method for treating plastic waste may emit toxicants and cause sensory annoyance. The objectives of this study were to analyze the pollution characteristics of the emissions from the plastic waste recycling plants, particularly in

harmful volatile organochlorinated compounds, polycyclic aromatic hydrocarbons (PAHs), odor levels and critical odorants. Ten large recycling plants were selected for analysis of odor concentration (OC), volatile organic compounds (VOCs) and PAHs inside and outside the plants using olfactometry, gas chromatography-mass spectrometry and high performance liquid chromatography-fluorescence detector, respectively. The olfactometric results showed that the melting processes used for treating polyethylene/polypropylene (PE/PP) and polyvinyl chloride (PVC) plastic waste significantly produced malodor, and the odor levels at downwind boundaries were 100-229 OC, which all exceeded Taiwan's EPA standard of 50 OC. Toluene, ethylbenzene, 4-methyl-2-pentanone, methyl methacrylate and acrolein accounted for most odors compared to numerous VOCs. Sixteen organochlorinated compounds were measured in the ambient air emitted from the PVC plastic waste recycling plant and total concentrations were 245-553 microg m(-3); most were vinyl chloride, chloroform and trichloroethylene. Concentrations of PAHs inside the PE/PP plant were 8.97-252.16 ng m(-3), in which the maximum level were 20-fold higher than the levels detected from boundaries. Most of these recycling plants simply used filter to treat the melting fumes, and this could not efficiently eliminate the gaseous compounds and malodor. Improved exhaust air pollution control were strongly recommended in these industries.

Tsai, H., et al. (2015). "Detection of rabbit IgG by using functional magnetic particles and an enzyme-conjugated antibody with a homemade magnetic microplate." Chemistry Central Journal **9**: 8.

BACKGROUND: The enzyme-linked immunosorbent assay (ELISA) has been used for diagnosing medical and plant pathologies. In addition, it is used for quality-control evaluations in various industries. The ELISA is the simplest method for obtaining excellent results; however, it is time consuming because the immunoreagents interact only on the contact surfaces. Antibody-labeled magnetic particles can be dispersed in a solution to yield a pseudohomogeneous reaction with antigens which improved the efficiency of immunoreaction, and can be easily separated from the unreactive substances by applying a magnetic force. We used a homemade magnetic microplate, functional magnetic particles (MPs) and enzyme-labeled secondary antibody to perform the sandwich ELISA successfully.

RESULTS: Using antibody-labeled MPs enabled reducing the analysis time to one-third of that required in using a conventional ELISA. The secondary antibody conjugated with horseradish peroxidase (HRP) was affinity-bound to the analyte (IgG in this study). The calibration curve was established according to the measured absorbance of the 3, 3', 5, 5'-tetramethybezidine-HRP reaction products versus the concentrations of standard IgG. The linear range of IgG detection was 114 ng/mL-3.5 ng/mL. The limit of detection (LOD) of IgG was 3.4 ng/mL. The recovery and coefficient of variation were 100% (+/-7%) and 116% (+/-4%) for the spiked concentrations of 56.8 ng/mL and 14.2 ng/mL, respectively.

CONCLUSION: Pseudohomogeneous reactions can be performed using functional MPs and a magnetic microplate. Using antibody-labeled MPs, the analysis time can be reduced to one-third of that required in using a conventional ELISA. The substrate-enzyme reaction products can be easily transferred to another microplate, and their absorbance can be measured without interference by light scattering caused by magnetic microbeads. This method demonstrates great potential for detecting other biomarkers and in biochemical applications. Graphical AbstractA magnetic ELISA with convenient magnetic microplate.

Tsang, Y. Y., et al. (2017). "Microplastic pollution in the marine waters and sediments of Hong Kong." Marine Pollution Bulletin **115**(1-2): 20-28.

The presence of plastic waste with a diameter of less than 5 mm ("microplastics") in marine

environments has prompted increasing concern in recent years, both locally and globally. We conducted seasonal surveys of microplastic pollution in the surface waters and sediments from Deep Bay, Tolo Harbor, Tsing Yi, and Victoria Harbor in Hong Kong between June 2015 and March 2016. The average concentrations of microplastics in local coastal waters and sediments respectively ranged from 51 to 27,909 particles per 100 m³and 49 to 279 particles per kilogram. Microplastics of different shapes (mainly fragments, lines, fibers, and pellets) were identified as polypropylene, low-density polyethylene, high-density polyethylene, a blend of polypropylene and ethylene propylene, and styrene acrylonitrile by means of Attenuated Total Reflectance - Fourier Transform Infrared Spectroscopy. This is the first comprehensive study to assess the spatial and temporal variations of microplastic pollution in Hong Kong coastal regions. Copyright © 2016 Elsevier Ltd

Tsiamis, D. A., et al. (2018). "Role of plastics in decoupling municipal solid waste and economic growth in the U.S." Waste Management **77**: 147-155.

Analysis of data from the US Environmental Protection Agency (EPA) on municipal solid waste (MSW) generation rates correlated to personal consumption expenditure (PCE) uncovers a decoupling event occurring between 1997 and 2000. A comparison of waste generation rates for each material category found in MSW reveals that plastics increased by nearly 84 times from 1960 to 2013 while total MSW increased only 2.9 times. The increase in plastic waste generation coincides with a decrease in glass and metal found in the MSW stream. In addition, calculating the material substitution rates for glass, metal and other materials with plastics in packaging and containers demonstrates an overall reduction by weight and by volume in MSW generation of approximately 58% over the same time period. A quantitative calculation of a scenario where plastics were not used in packaging and containers to replace glass, metal, and other materials demonstrates that MSW generation rate rises equally with PCE. Therefore, this study has determined that the increase of plastic use is a contributing factor to the decoupling of MSW generation from PCE.

Tsirigotis-Maniecka, M., et al. (2017). "Microencapsulation of hesperidin in polyelectrolyte complex microbeads: physico-chemical evaluation and release behavior." Journal of Food Engineering **214**: 104-116.

The aim of the study was to develop and characterize alginate microparticles coated with polyelectrolytes and containing hesperidin - a natural bioflavonoid of great nutritional potential. Hesperidin's solubility is moderate, thus it was essential to develop a stable carrier which enables its targeted delivery to the intestine. The cargo was entrapped in the alginate (ALG) hydrogel matrix by means of the extrusion/external gelation technique. To achieve customized functional properties of microbeads, biopolymers (chitosan, gelatin) and synthetic polymers (PAH/PSS pair) were deposited on the ALG cores. The fabricated microparticles successfully encapsulated hesperidin (>87%) and were compared in terms of moisture content, surface morphology and particle size (SEM). FTIR spectroscopy confirmed the formation of polyelectrolyte complexes and the microsystems were further characterized with DSC. The swelling and release behaviors were studied in detail, including in vitro release experiments. The results obtained indicate that the fabricated microcapsules revealed the desired pH-dependent release ability.

Tsuchida, D., et al. (2011). "Hydrogen sulfide production by sulfate-reducing bacteria utilizing additives eluted from plastic resins." Waste Management & Research **29**(6): 594-601.

In the present study it was demonstrated that organic additives eluted from plastic resins could be utilized as substrates by sulfate-reducing bacteria. Two laboratory-scale experiments, a microcosm experiment and a leaching experiment, were conducted using polyvinyl chloride (PVC) as a model plastic resin. In the former experiment, the conversion of sulfate to sulfide was evident in microcosms that received plasticized PVC as the sole carbon source, but not in those that received PVC homopolymer. Additionally, dissolved organic carbon accumulated only in microcosms that received plasticized PVC, indicating that the dissolved organic carbon originated from additives. In the leaching experiment, phenol and bisphenol A were found in the leached solutions. These results suggest that the disposal of waste plastics in inert waste landfills may result in the production of H(2)S.

Tsuchiya, M., et al. (2019). "Eye-recognizable and repeatable biochemical flexible sensors using low angle-dependent photonic colloidal crystal hydrogel microbeads." Scientific Reports **9**(1): 17059.

This paper presents eye-recognizable and repeatable biochemical flexible sensors using low angle-dependent stimuli-responsive photonic colloidal crystal hydrogel (PCCG) microbeads. Thanks to the stimuli-responsive PCCG microbeads exhibiting structural color, users can obtain sensing information without depending on the viewing angle and the mechanical deformation of the flexible sensor. Temperature-responsive PCCG microbeads and ethanol-responsive PCCG microbeads were fabricated from a pre-gel solution of N-isopropylacrylamide (NIPAM) and N-methylolacrylamide (NMAM) by using a centrifuge-based droplet shooting device (CDSD). As a proof-of-concept of thin and flexible biochemical sensors, temperature- and ethanol-sensing devices were demonstrated. By comparing the structural color of the stimuli-responsive PCCG microbeads and the color chart of the device, sensing information, including skin temperature of the human body and ethanol concentration in alcoholic beverages, was obtained successively. We expect that our device design using low angle-dependent stimuli-responsive PCCG microbeads would contribute to the development of user-friendly biochemical sensor devices for monitoring environmental and healthcare targets.

Tsuchiya, M., et al. (2019). "Sediment sampling with a core sampler equipped with aluminum tubes and an onboard processing protocol to avoid plastic contamination." MethodsX **6**: 2662-2668.

Microplastics are abundant even on the deep-sea floor far from land and the ocean surface where human activities take place. To obtain samples of microplastics from the deep-sea floor, a research vessel and suitable sampling equipment, such as a multiple corer, a box corer, or a push corer manipulated by a remotely operated (ROV) or human occupied vehicle (HOV) are needed. Most such corers use sampling tubes made of plastic, such as polycarbonate, acrylic, or polyvinyl chloride. These plastic tubes are easily scratched by sediment particles, in particular during collection of coarse sandy sediments, and, consequently, the samples may become contaminated with plastic from the tube. Here, we report on the use of aluminum tubes with both a multiple corer and a push corer to prevent such plastic contamination. When compared with plastic tubes, aluminum tubes have the disadvantages of heavier weight and non-transparency. We suggest ways to overcome these problems, and we also present an onboard processing protocol to prevent plastic contamination during sediment core sampling when plastic tubes are used. *Use of a sediment corer with aluminum tubes reduces the risk of plastic contamination in the sediment samples*The proposed method allows undisturbed sediment cores to be retrieved with comparable efficiency to conventional transparent core tubes.

Tsuzuki, Y., et al. (2006). "Differential modulation in the functions of intestinal dendritic cells by long- and medium-chain fatty acids." Journal of Gastroenterology **41**(3): 209-216.

Background: Although dendritic cells (DCs) play significant roles in intestinal immune responses, little is known regarding the direct effects of luminal foods on DC functions in the intestinal mucosa. In this study, we examined the effects of fatty acids (FAs) with various chain length on the phagocytic function, antigen presentation, and chemotaxis of intestinal DCs.

Tue, K. A. and M. M. Thwe (2013). "RECYCLE OF PLASTIC WASTE AND AGRICULTURAL WASTE." Energy Research Journal **4**(1): 24.

Manufacturing of polymer composites using plastic waste is one of the solutions to solve the environmental pollution problems caused by non-biodegradable polymer. In this study, Rice husk fiber Reinforced Polyethylene composites (RhRP) have been fabricated with rice husk fiber and plastic waste (recycle low density polyethylene) by compression molding method. Effect of fiber volume fraction, pressure and temperature on the properties of the composite samples was studied. In addition, mechanical properties, thermal properties and durability of RhRP composites were measured. Moreover, chemical modification of rice husk fiber was done through acid and aqueous alkaline solution. The modified fiber samples exhibit the higher strength as well as the lower water absorption rate compared with the unmodified fiber composite samples. Therefore, the resistance to aging of the composites in aqueous environment improved significantly for the modified composite samples. Furthermore, Scanning Electron Microscope (SEM) was also used to characterize the surface feature and the interfacial adhesion between fiber and matrix polymer. The modified composite samples reveal better interfacial adhesion than the unmodified composite ones. Thermo Gravimetric Analysis (TG/DTA) was employed to determine thermal stability of the composite samples. The modified fiber samples have higher thermal stability than the unmodified composite ones.

Tumino, M., et al. (2016). "ALFA/Beta T AND CD19+ lymphocite depleted hematopoietic stem cell transplantation from haploidentical donors in pediatric patients: A single center experience." Bone Marrow Transplantation **1)**: S352.

Introduction: Transplantation of haploidentical hematopoietic stem cells (haploHSCT) has become an accepted option for pediatric patients with malignant and non malignant diseases (MD, NMD) who lack a matched related or unrelated donor. In order to prevent severe GvHD, many techniques of cells manipulation have been used. In this setting, immune recovery delay and high rate of rejection represent major concerns. Material (or patients) and methods: We retrospective analyzed a cohort of 24 pediatric patients with MD and NMD, who received alphabeta T- and B-cell depleted allografts from haploidentical family donors (haploHSCT alphabeta T- and B-cell depleted). Myeloablative conditioning regimen and serotherapy with ATG were used for the most. Graft manipulation was carried out with anti-TCRalphabeta and anti-CD19 Abs and immunomagnetic microbeads. Gamma/delta T cells, NK, and other cells remained in the grafts. This procedure was compared with standard transplant procedures for each groups: matched sibling donor stem cell transplantation (MSD-SCT: 27 patients) and matched unrelated donor SCT (MUD-SCT: 58 patients). Result(s): In haploHSCT alphabeta T- and B-cell depleted SCT patients, primary engraftment was achieved in all patients, acute GvHD (aGvHD) grade III-IV and chronic GvHD (cGvHD) occurred in 25% and 12% respectively (MSD-SCT primary engraftment, aGvHD III-IV and cGvHD, respectively 100%, 15% and 5%. MUD-SCT primary engraftment, aGvHD III-IV, and cGvHD respectively 100%, 48% and 16%). No differences occurred between three groups in terms of OS, TRM and PFS as both as MD and NMD (MD P-value: OS 0.52, TRM 0.96, PFS 0.29. NMD P-value: OS 0.28, TRM 0.29, PFS 0.13). In the setting of MD, relapses represent the major cause of death, especially in the state of non complete remmission before transplant. Conclusion(s): Compared with standard transplant procedures

(MUD and MFD) we may consider haploHSCT alphabeta T- and B-cell depleted a valid alternative in pediatric MD and NMD. In MD newer cellular approaches are mandatory to controll relapses after transplantation. In this context, prompt availability of the donor such as in the haploidentical procedures represents an advantage.

Tuncan, M., et al. (2003). "The use of waste materials in asphalt concrete mixtures." Waste Management & Research **21**(2): 83-92.

The purpose of this study was to investigate (a) the effects of rubber and plastic concentrations and rubber particle sizes on properties of asphalt cement, (b) on properties of asphalt concrete specimens and (c) the effects of fly ash, marble powder, rubber powder and petroleum contaminated soil as filler materials instead of stone powder in the asphalt concrete specimens. One type of limestone aggregate and one penetration-graded asphalt cement (75-100) were used. Three concentrations of rubber and plastic (i.e. 5%, 10% and 20% of the total weight of asphalt cement), three rubber particle sizes (i.e. No. 4 [4.75mm] - 20 [0.85 mm], No. 20 [0.85mm] - 200 [0.075mm] and No. 4 [4.75mm] - 200 [0.075mm]) and one plastic particle size (i.e. No. 4 [4.75mm] - 10 [2.00mm]) were also used. It was found that while the addition of plastic significantly increased the strength of specimens, the addition of rubber decreased it. No. 4 [4.75mm] - 200 [0.075mm] rubber particles showed the best results with respect to the indirect tensile test. The Marshall stability and indirect tensile strength properties of plastic modified specimens increased. Marble powder and fly ash could be used as filler materials instead of stone powder in the asphalt concrete pavement specimens.

Tuncel, A., et al. (1993). "Cibacron Blue F3G-A-attached monosize poly(vinyl alcohol)-coated polystyrene microspheres for specific albumin adsorption." Journal of Chromatography **634**(2): 161-168.

Monosize polystyrene (PS) microbeads (4 mum in diameter) were produced by phase inversion polymerization of styrene in ethanol-methoxyethanol medium. They were coated with poly(vinyl alcohol) (PVAL) by adsorption and chemical cross-linking to decrease the non-specific protein adsorption. Cibacron Blue F3G-A was then attached for specific protein adsorption. The adsorption conditions were optimized to increase the amount of PVAL by changing the initial concentration of PVAL, and using different types of salts at different ionic strengths. Higher amounts of PVAL (up to 19 mg PVAL/g PS) were loaded by increasing the PVAL initial concentration and by using Na<inf>2</inf>SO<inf>4</inf> at a higher ionic strength (0.2). Bovine serum albumin (BSA) adsorption and desorption on these PS-based microbeads were also investigated under different conditions. PVAL coating prevented the non-specific BSA adsorption. A higher amount of BSA (up to 60 mg BSA/g dye-attached PS/PVAL) was specifically adsorbed on dye-attached PS microbeads, especially around pH 5 and lower ionic strengths (0.01). About 90% of the adsorbed BSA was desorbed in 1 h by using 0.5 M NaSCN.

Tung, S., et al. (2010). "Third party umbilical cord blood regulatory T cells prevents graft versus host disease in a xenogenic murine model." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

Background: Umbilical Cord Blood (UUCB) Regulatory T cells (Tregs) co-expressing CD4/CD25 have been shown to inhibit alloreactive T cell function. We hypothesized that prophylactic infusion of 3rd party UCB Tregs can abrogate Graft versus Host Disease (GvHD). Method(s): (a) Treg generation: Naturally occurring CD25+ Tregs, purified from thawed UCB units by magnetic activated cell sorting (MACS) using Miltenyi CD25 reagents (as per manufacturer's instructions), were cultured at 1x106 cells/ml in ExVivo medium (Gibco) containing interleukin (IL)-2 (100 IU/ml) with irradiated K562 cells engineered to express CD86, CD69, CD187c, IL-15, CD64 and

OKT3 (provided by Dr. Laurence Cooper, MDACC) or with microbeads bearing CD3 and CD28 antibodies on their surface (T-Cell Expander, Invitrogen). Cultures were initiated at a ratio of 1 Treg: 4 engineered K562 cells or Invitogen beads and maintained at 1x106 cells/ml over a 14 day period by the addition of fresh medium. Fresh IL-2 was added to maintain 100 IU/ml on an every-other-day basis. Flow cytometry, Western blot analysis and demonstration of ability to reduce in vitro MLR reactions confirmed the Treg phenotype of the expanded cells. (b) Xenogeneic graft vs. host model: On day -1, NOD-SCID IL2Rgnull (NSG) mice were sublethally-irradiated (320 cGy) and received 107 Treg cells intravenously. On day 0, 107 human apheresis PBMCs were injected intravenously. Mice were regularly monitored, weighed and graded according to a GvHD scale developed by Dr. James Ferrara (University of Michigan Comprehensive Cancer Center). Result(s): (a) Ex vivo Treg expansion of up to 700 fold was achieved yielding approximately 2.5x108 Treg cells from an average frozen UCB unit. Analysis of the ex vivo expanded product after 14 days revealed: (i) 95% co-expressed FOXP3/CD4/CD25 (flow cytometry), and (ii) expression of peptidase inhibitor 16, known to be uniquely associated with FOXP3 expression (western blot, Figure 1). Further, addition of UCB Tregs showed suppression of two-way allo-MLR by 93% (measured by tritiated thymidine and CFSE studies). (b) In the NSG GvHD model, mice receiving PBMC showed: (i) a significant (P=0.0002, student's paired t-test) 30% reduction in body weight, (ii) gross evidence of GvHD (average Ferrara score of 6) and (iii) reduced survival, when compared to mice receiving intravenous injection of Tregs on day -1. By comparison, mice receiving Tregs on day -1: (i) did not lose weight, (ii) scored consistently lower on the Ferrara scale (average score of 3) and (iii) had significantly improved survival (70% survival vs. 15%; P < 10-4, figure 2). Xenogenic transplanted mice showed clear histopathological evidence of GvHD in skin, gut, liver, spleen, lung, esophagus, and bone marrow whereas histopathology remained comparable to controls in the Treg rescued mice. (Figure presented) Conclusion(s): Infusion of 3rd party UCB Tregs markedly reduced the severity of xenoGVHD in a mouse transplant model. These preclinical data support the initiation of a phase I/II clinical trial to assess the efficacy of third party allogenic UCB Tregs in a traditional transplant setting.

Tuppo, L., et al. (2013). "Peamaclein--a new peach allergenic protein: similarities, differences and misleading features compared to Pru p 3." Clinical & Experimental Allergy **43**(1): 128-140.

BACKGROUND: Among the peach-derived allergens which are already known, the lipid transfer protein (Pru p 3) seems to be the one to exert severe allergic reactions.

OBJECTIVE: To identify and characterize a new peach allergen causing a clinical picture similar to that of Pru p 3.

METHODS: Patients were selected on the basis of their severe clinical reactivity and negative results to a panel of peach allergens available on the ISAC103 microarray. Several in-house and commercial preparations were compared. Several methods were used to characterize the newly identified molecule. Specific IgE and inhibition assays were performed using the Allergen micro-Beads Array (ABA) assay.

RESULTS: Negative ISAC results to Pru p 3 were confirmed by additional testing in contrast with the positive results obtained by commercial Pru p 3-enriched peach peel extracts. The analyses of one of these preparations led to the identification of Peamaclein, a new allergenic protein. It is a small, basic, cysteine-rich, heat-stable, digestion-resistant protein, homologous to a potato antimicrobial peptide. Peamaclein was able to trigger positive skin test reactions and to bind IgE in the ABA assay. It displays an electrophoretic mobility and chromatographic behaviour similar to that of Pru p 3; therefore, it can be hidden in Pru p 3 preparations. In fact, Pru p 3-enriched peach peel extracts were found to contain both Pru p 3 and Peamaclein by means of comparative in vivo testing, and by biochemical and immunochemical assays. Commercially available anti-Pru p 3 polyclonal antibodies were found to have a double specificity for the two molecules.

CONCLUSIONS AND CLINICAL RELEVANCE: A new allergen from peach belonging to a new family of allergenic proteins has been identified and characterized. This knowledge on Peamaclein will improve our understanding on the clinical aspects of the peach allergy and the quality of diagnostic reagents.

Turco, G., et al. (2011). "Mechanical spectroscopy and relaxometry on alginate hydrogels: a comparative analysis for structural characterization and network mesh size determination." Biomacromolecules **12**(4): 1272-1282.

The structure of calcium-saturated alginate hydrogels has been studied by combining rheological determinations and relaxometry measurements. The mechanical spectroscopy analyses performed on alginate gel cylinders at different polysaccharide concentration allowed estimating their main structural features such as the average mesh size. The calculation was based on the introduction of a front factor in the classical rubber elasticity approach which was correlated to the average length of the Guluronic acid blocks along the polysaccharide chain. Transverse relaxation time (T(2)) determinations performed on the cylinders revealed the presence of two relaxation rates of the water entrapped within the hydrogel network. The cross-correlation of the latter data with the rheological measurements allowed estimating the mesh size distribution of the hydrogel network. The results obtained for the hydrogel cylinders were found to be consistent with the relaxometric analysis performed on the alginate microbeads where, however, only one type of water bound into the network structure was detected. A good correlation was found in the average mesh size determined by means of relaxometric measurements on alginate microbeads and by a statistical analysis performed on TEM micrographs. Finally, the addition of a solution containing calcium ions allowed investigating further the different water relaxation modes within alginate hydrogels.

Turner, A. (2017). "In situ elemental characterisation of marine microplastics by portable XRF." Marine Pollution Bulletin **124**(1): 286-291.

The performance of a portable x-ray fluorescence spectrometer configured in a test stand and coupled to a laptop has been evaluated for the determination of various elements (including Br, Cd, Cl, Cr, Cu, Fe, Pb and Zn) in beached microplastics. Under laboratory conditions, analysis of samples that covered the 3-mm x-ray beam returned concentrations that, on average, were within 20% of concentrations determined by ICP following acid digestion. Analysis of progressively smaller offcuts (to < 1 mm) resulted in corresponding concentrations that were comparable to those determined in original samples but errors and detection limits that progressively increased. When the configuration was deployed in situ with two operators, up to 35 microplastics counted for 60 s each could be processed per hour. Advantages of immediate measurements include the development of an iterative study strategy, rapid compliance-evaluation, and identification of specific materials for further characterisation or study in the laboratory. Copyright © 2017 Elsevier Ltd

Turner, A. (2017). "Trace elements in fragments of fishing net and other filamentous plastic litter from two beaches in SW England." Environmental Pollution **224**: 722-728.

Filamentous plastic litter collected from two beaches in south west England has been characterized by FTIR and XRF. The majority of samples were constructed of polyethylene and consisted of twisted or braided strands of a variety of colours that appeared to be derived from commercial fishing nets. A number of different elements were detected among the samples but, from an environmental perspective, the regular occurrence of Cr and Pb and the occasional or isolated occurrence of Br, Cd and Se were of greatest concern. The highest total concentrations of Br (2420 μg g-1), Cd (1460 μg g-1), Cr (909 μg g-1), Pb (3770 μg g-1) and Se (240 μg g-1) were always encountered among orange samples and are attributed to the presence of lead chromates and cadmium sulphoselenide as colourants and to brominated compounds as flame retardants. Element bioaccessibility was evaluated by ICP-MS following an acidic extraction test that mimics the digestive tract of seabirds, with maximum values after a seven-day incubation period and relative to respective total concentrations of 0.2-0.4% for Cd, Cr and Pb and about 7% for Br. In addition to the well-documented impacts on wildlife through entrapment, filamentous plastic waste may act as a significant source of hazardous chemicals into the marine foodchain through ingestion. [ABSTRACT FROM AUTHOR]

Turner, A. (2018). "Black plastics: Linear and circular economies, hazardous additives and marine pollution." <u>Environment International</u> **117**: 308-318.

Black products constitute about 15% of the domestic plastic waste stream, of which the majority is single-use packaging and trays for food. This material is not, however, readily recycled owing to the low sensitivity of black pigments to near infrared radiation used in conventional plastic sorting facilities. Accordingly, there is mounting evidence that the demand for black plastics in consumer products is partly met by sourcing material from the plastic housings of end-of-life waste electronic and electrical equipment (WEEE). Inefficiently sorted WEEE plastic has the potential to introduce restricted and hazardous substances into the recyclate, including brominated flame retardants (BFRs), Sb, a flame retardant synergist, and the heavy metals, Cd, Cr, Hg and Pb. The current paper examines the life cycles of single-use black food packaging and black plastic WEEE in the context of current international regulations and directives and best practices for sorting, disposal and recycling. The discussion is supported by published and unpublished measurements of restricted substances (including Br as a proxy for BFRs) in food packaging, EEE plastic goods and non-EEE plastic products. Specifically, measurements confirm the linear economy of plastic food packaging and demonstrate a complex quasi-circular economy for WEEE plastic that results in significant and widespread contamination of black consumer goods ranging from thermos cups and cutlery to tool handles and grips, and from toys and games to spectacle frames and jewellery. The environmental impacts and human exposure routes arising from WEEE plastic recycling and contamination of consumer goods are described, including those associated with marine pollution. Regarding the latter, a compilation of elemental data on black plastic litter collected from beaches of southwest England reveals a similar chemical signature to that of contaminated consumer goods and blended plastic WEEE recyclate, exemplifying the pervasiveness of the problem.

Turner, A. (2018). "Mobilisation kinetics of hazardous elements in marine plastics subject to an avian physiologically-based extraction test." <u>Environmental Pollution</u> **236**: 1020-1026.

Samples of plastic collected from two beaches in southwest England (n = 185) have been analysed by XRF spectrometry for elements that are hazardous or restricted in synthetic polymers (namely, As, Ba, Br, Cd, Cr, Hg, Pb, Sb and Se). Overall, one or more restricted element was detected in 151 samples, with 15 cases exhibiting non-compliance with respect to the Restriction of Hazardous Substances (RoHS) Directive. Twelve plastics that were RoHS-non-compliant were subsequently processed into microplastic-sized fragments and subjected to an avian physiologically-based extraction test (PBET) that simulates the chemical conditions in the gizzard-proventriculus of the northern fulmar. Kinetic profiles of metal and metalloid mobilisation in the PBET were fitted using a pseudo-first-order diffusion model with rate constants ranging from ~0.02 to 0.5 h^{-1}, while profiles for Br were better fitted with a parabolic diffusion model and rate constants of 7.4–9.5 $(\mu g\ L^{-1})^{-1}\ h^{-1/2}$. Bioaccessibilities, based on maximum or equilibrium concentrations mobilised relative to total (XRF) concentrations, ranged from <1% for Cd and Se in polyethylene and polypropylene to over 10% for Br in a sample of expanded polystyrene and Pb in a sample of PVC. Calculations suggest that ingested plastic could contribute about 6% and 30% of a seabird's exposure to and accumulation of Pb and brominated compounds, respectively. [ABSTRACT FROM AUTHOR]

Turner, A. and M. Filella (2017). "Bromine in plastic consumer products - Evidence for the widespread recycling of electronic waste." Science of the Total Environment **601-602**: 374-379.

A range of plastic consumer products and components thereof have been analysed by x-ray fluorescence (XRF) spectrometry in a low density mode for Br as a surrogate for brominated flame retardant (BFR) content. Bromine was detected in about 42% of 267 analyses performed on electronic (and electrical) samples and 18% of 789 analyses performed on non-electronic samples, with respective concentrations ranging from 1.8 to 171,000mugg⁻¹ and 2.6 to 28,500mugg⁻¹. Amongst the electronic items, the highest concentrations of Br were encountered in relatively small appliances, many of which predated 2005 (e.g. a fan heater, boiler thermostat and smoke detector, and various rechargers, light bulb collars and printed circuit boards), and usually in association with Sb, a component of antimony oxide flame retardant synergists, and Pb, a heavy metal additive and contaminant. Amongst the non-electronic samples, Br concentrations were highest in items of jewellery, a coffee stirrer, a child's puzzle, a picture frame, and various clothes hangers, Christmas decorations and thermos cup lids, and were often associated with the presence of Sb and Pb. These observations, coupled with the presence of Br at concentrations below those required for flame-retardancy in a wider range of electronic and non-electronic items, are consistent with the widespread recycling of electronic plastic waste. That most Br-contaminated items were black suggests the current and recent demand for black plastics in particular is met, at least partially, through this route. Given many Br-contaminated items would evade the attention of the end-user and recycler, their disposal by conventional municipal means affords a course of BFR entry into the environment and, for food-contact items, a means of exposure to humans.

Turner, A. and L. A. Holmes (2015). "Adsorption of trace metals by microplastic pellets in fresh water. (Special Issue: Microplastics in the environment.)." Environmental Chemistry **12**(5): 600-610.

Adsorption of trace metals (Ag, Cd, Co, Cr, Cu, Hg, Ni, Pb, Zn) to new (virgin) and aged (beached) plastic production pellets suspended in river water (pH ~6.5) has been studied under laboratory conditions. Over a 7-day period, reaction kinetics largely conformed to a pseudo-first-order reversible mechanism with forward rate constants that were typically at least an order of magnitude greater for beached pellets than virgin pellets. Adsorption isotherms were defined by a linear model in many cases, with maximum distribution coefficients of ~6 mL g⁻¹ for virgin pellets (Hg and Pb) and of the order of 10² mL g⁻¹ for beached pellets (Ag and Pb). However, more significant fits to the data were obtained using Freundlich or Langmuir models with adsorption constants that were orders of magnitude greater for beached pellets than virgin pellets and, regarding the former, that were greatest for Ag, Hg and Pb. Increasing pH of river water resulted in an increase in adsorption of Ag, Cd, Co, Ni, Pb and Zn, a reduction in adsorption of Cr and no clear trend for Cu or Hg, and adsorption was always greater to beached pellets than virgin pellets. The ability of pellets to adsorb metals was attributed to the modification of the surface through the attachment of organic matter during the experiments and, with regard to beached pellets, their long-term pre-modification through photooxidation and attrition of charged material. Interactions at the pellet surface likely involve metal cations, oxyanions (HCrO₄⁻/CrO₄²⁻) and organic complexes.

Turner, A., et al. (2019). "Identification, origin and characteristics of bio-bead microplastics from beaches in western Europe." Science of the Total Environment **664**: 938-947.

Primary microplastics have been collected from 17 beaches along the Atlantic, English Channel and southern North Sea coasts of western Europe. Based on visual characteristics, these plastics were differentiated as either relatively smooth, lentil- or disc-shaped pre-production pellets (or nurdles), which were usually a few mm in diameter and were mainly white to off-white, or rougher and more irregular pellets that were slightly larger and usually black. The latter appeared to be bio-beads, or plastics that are specifically manufactured for use as biomedia in certain sewage water treatment (SWT) plants and, possibly, in other industrial wastewater treatment applications. Identification of bio-beads was confirmed following the acquisition of identical samples from a SWT plant in southwest England and a French supplier of bio-beads. Infrared and x-ray fluorescence analysis revealed that bio-beads have, at least historically, been constructed of plasticised polyethylene and, unlike pre-production pellets, contained variable quantities of potentially toxic elements: Br, Cd, Cr, Hg, Pb and Sb; with a distinctive Br to Sb ratio indicative of brominated flame retardants and antimony-based retardant synergists. It is asserted that bio-beads have been manufactured from a heterogeneous mix of recycled polyethylene and end-of-life electrical and electronic plastic, with concentrations of Br, Cd, Cr or Pb in about 50 bio-beads (out of 497 analysed) non-compliant or potentially non-compliant with respect to current regulations on hazardous plastic waste. Concentrations of Br, Cd, Cr, Pb and Sb extracted from individual bio-beads by a simulated avian digestive fluid were variable, with maximum values of about 14, 0.8, 1.3, 20 and 1.4 mug g⁻¹, respectively. The presence and, in many cases, dominance of bio-beads among beached primary microplastics is discussed with regard to the classification of microplastics and potential impacts on wildlife. Copyright © 2019 Elsevier B.V.

Turner, S., et al. (2019). "A temporal sediment record of microplastics in an urban lake, London, UK." Journal of Paleolimnology **61**(4): 449-462.

A radionuclide-dated (210Pb and 137Cs) sediment core collected from Hampstead Pond No. 1, a North London lake, was used to provide novel data on the historical accumulation of microplastic waste in the urban environment. Microplastics were extracted from sediments by sieving and dense-liquid separation. Fibres of anthropogenic origin dominated the assemblage.

Microplastics were first identified by microscopy before Raman spectroscopy of selected particles was used to determine the composition of synthetic polymers and dyes. Polystyrene microplastic particles were identified, in addition to synthetic fibres of polyacrylonitrile, polyvinyl chloride and fibres containing synthetic dyes. Concentrations of total microplastics in the sediment samples ranged from detection level to 539 particles per kilogram of dried sediment. Proliferation of microplastics is evident in the core from the late 1950s to the present. Relatively low numbers of particles were found in older sediments, comparable to laboratory blanks, highlighting the difficulty of extending a plastic chronostratigraphy back to the early twentieth century. This study shows that, with optimisation, routine extraction of microplastics from radionuclide-dated lake sediments can add an important temporal perspective to our understanding of microplastics in aquatic systems.

Twiss, M. R. (2016). "Standardized methods are required to assess and manage microplastic contamination of the Great Lakes system." Journal of Great Lakes Research **42**(5): 921-925.

Microplastics are products of large plastic item erosion or small (<1 millimeter) manufactured plastic items. When disposed into waste streams microplastics often end up widely dispersed in both freshwater and marine systems worldwide. Most published reports of microplastics in the aquatic systems to date indicate efforts that are unable to properly sample for microplastics. Advances in the science of environmental monitoring of microplastics are necessary. There is a need to standardize sampling procedures, and notably to adopt the use of "clean" techniques to avoid compromising sample integrity, to insure robust, replicable assessments of microplastic pollution. Reliable, standardized methods are of utmost importance for accurately evaluating the amounts of microplastics in aquatic environments and thus enable the assessment and management of these contaminants.

Tyrpekl, V., et al. (2014). "Synthesis of dense yttrium-stabilised hafnia pellets for nuclear applications by spark plasma sintering." Journal of Nuclear Materials **454**(1-3): 398-404.

Dense yttrium-stabilised hafnia pellets (91.35 wt.% Hf sub(O2) and 8.65 wt.% Y sub(2)O sub(3)) were prepared by spark plasma sintering consolidation of micro-beads synthesised by the "external gelation" sol-gel technique. This technique allows a preparation of HfO sub(2)-Y sub(2)O sub(3) beads with homogenous yttria-hafnia solid solution. A sintering time of 5 min at 1600 [degrees]C was sufficient to produce high density pellets (over 90% of the theoretical density) with significant reproducibility. The pellets have been machined in a lathe to the correct dimensions for use as neutron absorbers in an experimental test irradiation in the High Flux Reactor (HFR) in Petten, Holland, in order to investigate the safety of americium based nuclear fuels.

Tziampazis, E. and A. Sambanis (1995). "Tissue engineering of a bioartificial pancreas: Modeling the cell environment and device function." Biotechnology Progress **11**(2): 115-126.

Cell-based implantable artificial tissues are most promising for the long-term treatment of endocrine diseases, such as diabetes. One type of a bioartificial pancreas device consists of calcium alginate microbeads containing insulin-secreting cells and is surrounded by a poly(L-lysine) (PLL) membrane. The membrane is semipermeable, allowing cellular nutrients and metabolites to diffuse through but excluding the antibodies and cytotoxic cells of the host, thus immunoprotecting the cells. The device can be modeled by writing the equations for diffusion of nutrients and metabolites through the polymer and for consumption of the former and production of the latter by the cells. In this paper, we describe the construction and analysis of such a model for alginate/PLL microbeads with insulin-secreting recombinant mouse pituitary

AtT-20 and mouse insulinoma beta TC3 cells. Entrapped AtT-20 cells are a simplified model system, whereas microbeads with beta TC3 cells constitute a realistic artificial pancreatic device. Effective diffusivities of key compounds through the polymer with entrapped, inactivated AtT-20 spheroids were measured first. The kinetics of glucose and oxygen consumption and insulin secretion were modeled next, and the equations for diffusion and reaction were then combined to describe the entire system. The model was used to compute nutrient and metabolite concentration profiles in beads and the bead secretory response for different bead sizes and cell loadings. The size and loading necessary for the cells to be well nourished and for the beads to be rapidly responsive to step-ups and step-downs of secretion stimuli were evaluated. It was shown that if the cells are hypersensitive to glucose, i.e., they do not shut off secretion at the physiological glucose threshold but at a lower one, so are the microbeads. This work demonstrates the usefulness of mechanistic models with representative parameter values in optimizing the design of artificial tissues and in characterizing aspects of their behavior that are of importance for restoring in vivo function.

Ubeda, S., et al. (2019). "Migration of oligomers from a food contact biopolymer based on polylactic acid (PLA) and polyester." Analytical & Bioanalytical Chemistry **411**(16): 3521-3532.

Polylactic acid (PLA) is a biopolymer commonly used in food packaging due to its good characteristics, similar to PET. To evaluate the safety of this material, the analysis of the non-intentionally added substances (NIAS) is required. Oligomers are NIAS and their behavior needs a deep study, especially if they migrate to the food. In this work, the analysis of the polymer and the migration to food simulants was carried out. A total dissolution/precipitation procedure was applied to PLA pellets and films, using dichloromethane and ethanol as solvent and antisolvent system respectively. The migration tests were carried out in three liquid simulants to mimic any kind of food. Since oligomers are not present in the positive list of the Directive 10/2011/EC, their concentration must be below the 0.01 mg/kg of food. UPLC-QTOF-MS, with and without ion mobility (IM), was used for the analysis. Thirty-nine different PLA oligomers made of repeated monomer units of [LA] (C₃H₄O₂) and with different structures were identified. They corresponded to cyclic oligomers with [LA]_n structure and two groups of linear oligomers, one with an hydroxyl group, OH-[LA]_n-H, and the other one with an ethoxy group, CH₃-CH₂-O-[LA]_n-H. Cyclic oligomers only appeared in the material and were not present in migration solutions. Linear oligomers HO-[LA]_n-H were already present in the pellets/film and they migrated in a higher extension to aqueous food simulants (EtOH 10% and AcH 3%). However, linear oligomers CH₃-CH₂-O-[LA]_n-H were not present initially in the pellets/film, but were detected in migration to simulants with ethanol content, EtOH 95% and EtOH 10%. Furthermore, 5 cyclic polyester oligomers were identified in migration. Ethanol 95% and ethanol 10% migration solutions were also analyzed by scanning electron microscopy (SEM), and the presence of microstructures that could be attributed to the oligomers migration was found. They could be seen as microplastics.

Uber, T. H., et al. (2019). "Sorption of non-ionic organic compounds by polystyrene in water." Science of the Total Environment **682**: 348-355.

Polystyrene (PS) is a plastic material that is well known for its use in many different applications, e.g. as shock sensitive packaging. With its prevalence across society, PS contributes significantly to the overall plastic load in aqueous systems. Sorption of organic compounds by the plastics, especially micrometer-sized particles, in the environment has become a concern in the past years. The aim of this study was to improve the understanding of sorption properties of PS, one of the major plastic pollutants in the aqueous environment. Batch experiments with PS film (29mum thickness) were performed for 4days using a diverse set of 24 sorbates to account for varying molecular properties like polarity or molecular volume. Isotherms were evaluated using different sorption models to elucidate the sorption process of PS. Sorption to PS film was non-linear and absorption into the bulk material was the dominant sorption mode. A clear discrimination between the specific and non-specific interactions in the aqueous environment could be shown. The non-linear sorption to PS was shown to be controlled by the molar volume but also by the polarizability/dipolarity parameter (S) of the ppLFER model. The latter is influenced by the aromatic pi-pi-interactions of PS with the sorbate. Similar to other plastics like polyethylene, sorption to PS is driven by hydrophobic interactions but phase descriptors of pristine PS were significantly different than descriptors for other environmental relevant plastics.

Uber, T. H., et al. (2019). "Characterization of sorption properties of high-density polyethylene using the poly-parameter linearfree-energy relationships." Environmental Pollution **248**: 312-319.
High-density polyethylene (HDPE) is a known sorbent for non-ionic organic compounds in technical applications. Nevertheless, there is little information available describing sorption to industrial HDPE for a broad range of compounds. With a better understanding of the sorption properties of synthetic polymers, environmental risk assessment would achieve a higher degree of accuracy, especially for microplastic interactions with organic substances. Therefore, a robust methodology for the determination of sorbent properties for non-ionic organic compounds by HDPE is relevant for the understanding of molecular interactions for both technical use and environmental risk assessment. In this work, sorption properties of HDPE material used for water pipes were characterized using a poly-parameter linear free-energy relationship (ppLFER) approach. Sorption batch experiments with selected probe sorbates were carried out in a three-phase system (air/HDPE/water) covering an aqueous concentration range of at least three orders of magnitude. Sorption in the concentration range below 10−2 of the aqueous solubility was found to be non-linear and the Freundlich model was used to account for this non-linearity. Multiple regression analysis (MRA) using the determined distribution coefficients and literature-tabulated sorbate descriptors was performed to obtain the ppLFER phase descriptors for HDPE. Sorption properties of HDPE were then derived from the ppLFER model and statistical analysis of its robustness was conducted. The derived ppLFER model described sorption more accurately than commonly used single-parameter predictions, based i.e., on log K o/w. The ppLFER predicted distribution data with an error 0.5 log units smaller than the spLFERs. The ppLFER was used for a priori prediction of sorption by the characterized sorbent material. The prediction was then compared to experimental data from literature and this work and demonstrated the strength of the ppLFER, based on the training set over several orders of magnitude. Image 1 • Sorption data were determined for 25 molecular probe compounds. • Sorption to HDPE at two decades below aqueous solubility is non-linear. • Sorption is dependent on polymer density and crystallinity. • The ppLFER model showed to be an improvement over spLFER models without overparameterization. Sorption of non-ionic organic compounds to HDPE in an aquatic environment is non-linear and strongly dependent on polyethylene density and crystallinity. [ABSTRACT FROM AUTHOR]

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Ucar, C., et al. (2003). "Investigation of megakaryocyte apoptosis in children with acute and chronic idiopathic thrombocytopenic purpura." European Journal of Haematology **70**(6): 347-352.

OBJECTIVE: Although the platelet destruction shows a primary role in the thrombocytopenia of idiopathic thrombocytopenic purpura (ITP), it has been demonstrated that impaired platelet production may also contribute to the severity of thrombocytopenia in ITP. The present study examined megakaryocyte apoptosis in bone marrow aspirates of children with acute and chronic ITP and investigated the role of megakaryocyte apoptosis in ITP pathophysiology.

METHODS: Thirteen children diagnosed with acute ITP and eight children diagnosed with chronic ITP comprised the study group. Ten children, who were hospitalized for scoliosis operation but healthy otherwise, comprised the control group. In all children, megakaryocytes were isolated from the same amount of bone marrow aspirate samples using MACS CD61 MicroBeads (Miltenyl Biotec, Auburn, CA, USA). Megakaryocyte apoptosis was studied with transferase-mediated d-UTP-bitin nick end-labeling method.

RESULTS: Isolated megakaryocyte counts did not differ significantly between acute ITP, chronic ITP and control groups. The percentage of apoptotic megakaryocytes did not differ significantly between acute ITP group and control group and between chronic ITP group and control group. The percentage of apoptotic megakaryocytes in patients with chronic ITP was significantly lower than the patients with acute ITP. There was no correlation between the percentage of apoptotic megakaryocytes and platelet counts of the cases.

CONCLUSIONS: Increased megakaryocytic apoptosis does not play a role in the pathogenesis of dysmegakaryopoiesis and impaired platelet production in children with ITP. Decreased megakaryocyte apoptosis in cases with chronic ITP may be due to suppression of megakaryocyte maturation, as the terminal phase of the megakaryocyte lifespan is characterized by the onset of apoptosis.

Uchiyama, K., et al. (2004). "Development of a Bio-MEMS for Evaluation of dioxin toxicity by immunoassay method." Sensors and Actuators B: Chemical **B103**(1-2): 200-205.

The Ah-Immunoassay method was developed using a Bio-MEMS approach and applied to the evaluation of dioxin toxicity in this study. The aim of the research is to develop a real time sensing system for the analysis of Dioxins, generated at the air flue by using a novel micro instrument combining the biological field with micro instrumentation. The micro instrument was fabricated from Si and glass, employing photolithographic techniques. A prototype model of the system was established. Micro-beads, coated with Avidine, were used as a reaction medium. The reaction chamber was first filled with the micro-beads and then the receptor immunoassay was carried out in the micro chamber. Poly- aromatic hydrocarbon, having a highly flat structure, was used as a test sample. The reactivity was evaluated using fluorometry, the fluorescence being detected by fluorescent microscopy.

Ueki, S., et al. (2016). "Eosinophil extracellular trap cell death-derived DNA traps: Their presence in secretions and functional attributes." Journal of Allergy & Clinical Immunology **137**(1): 258-267.

BACKGROUND: Activated human eosinophils, as well as neutrophils, can release extracellular chromatin to form DNA traps through cytolytic extracellular trap cell death (ETosis). Although formations of neutrophil DNA traps are recognized in patients with various inflammatory conditions, neither the presence of ETosis-derived eosinophil DNA traps in human allergic diseases nor the characteristics of these DNA traps have been studied.

OBJECTIVE: We investigated the presence of ETosis-derived DNA traps in eosinophil-rich sinus and ear secretions and the functional attributes of ETosis DNA traps.
METHODS: Eosinophil-rich secretions obtained from patients with eosinophilic chronic rhinosinusitis and eosinophilic otitis media were studied microscopically. In vitro studies of ETosis and DNA trap formation used blood-derived eosinophils and neutrophils, and studies of the binding capacities of DNA traps used labeled bacteria and fluorescent microbeads. Stabilities of DNA traps were evaluated by using fluorescence microscopy.
RESULTS: Abundant nuclear histone H1-bearing DNA traps formed in vivo in the eosinophilic secretions and contributed to their increased viscosity. In vitro, after brief shear flow, eosinophil ETosis-elicited DNA traps assembled to form stable aggregates. Eosinophil DNA traps entrapped bacteria and fungi and, through hydrophobic interactions, microbeads. In comparison with neutrophil-derived DNA traps, eosinophil DNA traps ultrastructurally exhibited thicker fibers with globular structures and were less susceptible to leukocyte-derived proteolytic degradation, likely because of the lesser protease activities of eosinophils.
CONCLUSIONS: In human allergic diseases local cytolysis of eosinophils not only releases free eosinophil granules but also generates nuclear-derived DNA traps that are major extracellular structural components within eosinophil-rich secretions.

Uhde, J., et al. (2005). "Viscoelasticity of entangled actin networks studied by long-pulse magnetic bead microrheometry." Physical Review E. Statistical, Nonlinear, & Soft Matter Physics **72**(6 Pt 1): 061916.
We studied the viscoelastic response of entangled actin networks using embedded microbeads driven by force pulses with amplitudes in the range from 3 to 120 pN and durations up to 60 s. We distinguished three regimes in the time dependence of the compliance J(t) of the network. These were characterized by specific power laws J(t) approximately t(alpha)(i) (i=1, 2, 3). In the short-time regime (i=1), we observed the exponent alpha1 approximately 0.75. In the long-time regime (i=3), we find that alpha3 approximately 1. For the intermediate-time interval (i=2), we observed a novel dynamic regime: for all actin concentrations and all applied forces, it was characterized by the exponent alpha3 approximately 0.5. In both regimes i=2 and i=3, the compliance depended upon the actin concentration c, such as J approximately c(-gamma)(i) with gamma2 approximately 1.1 and gamma 3 approximately 1.4. Using these results, we calculated the shear modulus in the frequency domain and found that the intermediate-time regime in the t domain corresponds to its plateau behavior.

Umfress, A., et al. (2014). "Early changes in retinal layers detected in vivo following microbead-induced ocular hypertension." Investigative Ophthalmology and Visual Science **55 (13)**: 2412.
Purpose: Neurodegeneration in glaucoma is characterized by early deficits in retinal ganglion cell axon function in the optic projection. Here, we tested whether optical coherence tomography (OCT) could detect changes in retinal layer thickness in vivo following short-term elevations in ocular pressure in mice induced by microbead injection. Method(s): We induced ocular hypertension (OHT) in 3 month C57 mice (n=10) through microbead occlusion (1 ul) of the anterior chamber and monitored ocular pressure using TonoLab rebound tonometry. The contralateral eye received an equivalent volume saline injection. OCT imaging was performed weekly over 2-3 weeks using the Bioptigen Envisu R2200 VHR Rodent OCT with InVivoVue Clinic Acquisition software. Images were taken in each eye at nine locations using the optic nerve head as register. Data including retinal layer thickness were analyzed with the Bioptigen InVivoVue Diver 2.0 Software using the Retina Template panel. Result(s): Consistent with published results, microbead-injected eyes exhibited an elevation in IOP of about 30% compared to their saline-injected counterparts. Compared to baseline, 2-3 weeks of OHT induced an 8%

increase in retinal nerve fiber layer thickness (p=0.002); thickness in the saline eye remained the same (p=0.10). Over the same period, thickness of the inner plexiform layer varied greatly in both eyes over a range of 38-60 um, with thickness in the OHT retina on average 4% less (p=0.04) Conclusion(s): Our results indicate that even short-term elevations in IOP induced by microbead occlusion are associated with detectable changes in retinal layer thickness as measured by OCT. In particular, prior to axon loss in this model, which occurs after 5-6 weeks of OHT, the retinal nerve fiber layer actually increases in thickness. This change likely reffects early stages of ganglion cell axonopathy and could be utilized as a surrogate biomarker for onset of pathogenesis.

Unice, K. M., et al. (2019). "Characterizing export of land-based microplastics to the estuary - Part II: Sensitivity analysis of an integrated geospatial microplastic transport modeling assessment of tire and road wear particles." Science of the Total Environment **646**: 1650-1659.

Integrated models addressing microplastic (MP) generation, terrestrial distribution, and freshwater transport are useful tools characterizing the export of MP to marine waters. In Part I of this study, a baseline watershed-scale MP mass balance model was developed for tire and road wear particles (TRWP) in the Seine watershed. In Part II, uncertainty and sensitivity analysis (SA) methods were used to identify the parameters that determine the transport of these particles to the estuary. Local differential, local range and global first-order variance-based SA identified similar key parameters. The global SA (1000 Monte Carlo simulations) indicated that most of the variance in TRWP exported to the estuary can be apportioned to TRWP diameter (76%), TRWP density (5.6%), the fraction of TRWP directed to combined sewers with treatment (3.9%), and the fraction of TRWP distributed to runoff (versus roadside soil; 2.2%). The export fraction was relatively insensitive to heteroaggregation processes and the rainfall intensity threshold for road surface washoff. The fraction of TRWP exported to estuary in the probabilistic assessment was centered on the baseline estimate of 2%. This fraction ranged from 1.4 to 4.9% (central tendency defined as 25th to 75th percentile) and 0.97% to 13% (plausible upper bound defined as 10th to 90th percentiles). This study emphasizes the importance of in situ characterization of TRWP diameter and density, and confirms the baseline mass balance presented in Part I, which indicated an appreciable potential for capture of TRWP in freshwater sediment.

Unterleuthner, D., et al. (2017). "An Optimized 3D Coculture Assay for Preclinical Testing of Pro- and Antiangiogenic Drugs." SLAS discovery **22**(5): 602-613.

Angiogenesis is a promising target for anticancer therapies, but also for treating other diseases with pathologic vessel development. Targeting the vascular endothelial growth factor (VEGF) pathway did not proof as effective as expected due to emerging intrinsic resistance mechanisms, as well as stromal contributions leading to drug insensitivity. Therefore, alternative strategies affecting the interaction of endothelial cells (ECs) with other stromal cells seem to be more promising. Human preclinical in vitro angiogenesis models successfully recapitulating these interactions are rare, and two-dimensional (2D) cell cultures cannot mimic tissue architecture in vivo. Consequently, models combining three-dimensionality with heterotypic cell interaction seem to be better suited. Here, we report on an improved human fibroblast-EC coculture assay mimicking sprouting angiogenesis from EC-covered microbeads resembling existing endothelial structures. Culture conditions were optimized to assess pro- and antiangiogenic compounds. Important characteristics of angiogenesis, that is, the number of sprouts and branch points, sprout length protrusion, and overall vessel structure areas, were quantified. Notably, the endothelial sprouts display lumen formation and basal membrane

establishment. In this model, angiogenesis can be inhibited by genetic interference of pro-angiogenic factors expressed in the fibroblasts. Moreover, bona fide antiangiogenic drugs decreased, whereas pro-angiogenic factors increased vessel formation in 24-well and 96-well settings, demonstrating the applicability for screening approaches.

Upadhyay, M., et al. (2018). "Development of biopolymers based interpenetrating polymeric network of capecitabine: A drug delivery vehicle to extend the release of the model drug." International Journal of Biological Macromolecules **115**: 907-919.

The research aims the development and optimization of capecitabine loaded interpenetrating polymeric network by ionotropic gelation method using polymers locust bean gum and sodium alginate by QbD approach. FMEA was performed to recognize the risks influencing CQAs. BBD was applied to study the effect of factors (polymer ratio, amount of cross-linker and curing time) on responses (particle size, % drug entrapment and % drug release). Polynomial equations and 3-D graphs were plotted to relate between factors and responses. The results of the optimized batch viz. particle size (457.92 +/- 1.6 mum), % drug entrapment (74.11 +/- 3.1%) and % drug release (90.23 +/- 2.1%) were close to the predicted values generated by Minitab 17. Characterization techniques SEM, EDX, FTIR, DSC and XRD were also performed for the optimized batch. To study the water transport inside IPN microbeads, swelling study was done. In vitro drug release of optimized batch showed controlled drug release for 12 h. Pharmacokinetic study carried out following oral administration in Albino Wistar rats exhibited that optimized microbeads had better PK parameters than free drug. In vitro cytotoxicity against HT-29 cells revealed significant reduction of the cell growth when treated with optimized formulation indicating IPN microbeads as effective dosage form for treating colon cancer. Copyright © 2018

Upadhyay, M., et al. (2019). "Locust bean gum and sodium alginate based interpenetrating polymeric network microbeads encapsulating Capecitabine: Improved pharmacokinetics, cytotoxicity &in vivo antitumor activity." Materials Science & Engineering. C, Materials for Biological Applications **104**: 109958.

A combination of biopolymers sodium alginate and locust bean gum has been used to prepare an interpenetrating polymeric network of an anticancer drug Capecitabine by ionotropic gelation method. For the optimization 3² levels, a full factorial design was employed to examine the influence of independent factors, i.e. polymer ratio and cross-linker concentration on responses particle size and drug entrapment. The obtained optimized formulation was examined for solid-state characterization, swelling study, in vitro drug release, SRB study, oral toxicity study, in vivo pharmacokinetic and in vivo antitumor study. The results of all the studies performed were found suitable in extending the release of a short elimination half-life drug with improved bioavailability and suggesting it to be safe and effective for oral drug delivery in treating colon cancer.

Upadhye, S. A., et al. (2016). "Fabrication & characterzation of dual cross linked pulsatile beads of diacerein using natural gum." Indian Drugs **53**(3): 60-62.

In the present study, pulsatile dual cross linked beads were prepared by ionotropic gelation method. Diacerein dual crossed linked beads were prepared by dropping dispersed phase of diacerein (DCN), Moringa olifera gum and sodium alginate into dispersed phase of different concentration of calcium chloride solution followed by 5% & 10% Aluminum chloride solution and 2% sodium tripolyphosphate (TPP) solution. In vitro release studies showed lag time of 3-7 h before the release of diacerein from the formulated beads, which were found to be intact for 5

h. Thus, formulated dual cross linked beads when administered at morning time may release the drug when needed most for chronotherapeutics of osteoarthritis in chronic patients.

Urase, T., et al. (2008). "Emission of volatile organic compounds from solid waste disposal sites and importance of heat management." Waste Management & Research **26**(6): 534-538.

The emission of volatile organic compounds (VOCs) from a solid waste disposal site for municipal solid wastes was quantified. The VOCs contained in the landfill gas taken at the site were benzene, toluene, xylenes, ethyl benzenes, and trimethyl benzenes, while the concentrations of chlorinated compounds were very low. The concentration of benzene in the landfill gas samples ranged from below the detection limit to 20 mg m(-3), and the ratio of benzene to toluene ranged from 0.2 to 8. The higher concentrations of VOCs in landfill gas and in leachates were observed with the samples taken at high temperature areas of the target site. Polystyrene plastic waste was identified as one of the sources of VOCs in solid waste disposal sites at a high temperature condition. The appropriate heat management in landfill sites is an important countermeasure to avoid unusually high emission of VOCs because the heat generated by the biodegradation of organic solid wastes may promote the release of VOCs, especially in the case of sites which receive both biodegradable and plastic wastes.

Urbanek, A. K., et al. (2018). "Degradation of plastics and plastic-degrading bacteria in cold marine habitats." Applied Microbiology and Biotechnology **102**(18): 7669-7678.

Synthetic plastics present in everyday materials constitute the main anthropogenic debris entering the Earth’s oceans. The oceans provide important and valuable resources such as food, energy, and water. They are also the main way of international trade and the main stabilizer of the climate. Hence, changes in the marine ecosystem caused by anthropogenic influences such as plastic pollution can have a dramatic impact on a global scale. Although the problem of plastics still remains unsolved, different ways are being considered to reduce their impact on the environment. One of them is to use microorganisms capable of degradation of plastic. A particularly interesting area is the application of microorganisms isolated from cold regions in view of their unique characteristics. Nevertheless, the interactions between plastic and microorganisms are still poorly known. Here, we present a review of current knowledge on plastic degradation and plastic-microorganism interactions in cold marine habitats. Moreover, we highlight the advantages of microorganisms isolated from this environment for eliminating plastic waste from ecosystems.

Urbanek, A. K., et al. (2017). "Isolation and characterization of Arctic microorganisms decomposing bioplastics." AMB Express **7**(1): 148.

The increasing amount of plastic waste causes significant environmental pollution. In this study, screening of Arctic microorganisms which are able to degrade bioplastics was performed. In total, 313 microorganisms were isolated from 52 soil samples from the Arctic region (Spitsbergen). Among the isolated microorganisms, 121 (38.66%) showed biodegradation activity. The ability of clear zone formation on emulsified poly(butylene succinate-co-adipate) (PBSA) was observed for 116 microorganisms (95.87%), on poly(butylene succinate) (PBS) for 73 microorganisms (60.33%), and on poly(e-caprolactone) (PCL) for 102 microorganisms (84.3%). Moreover, the growth of microorganisms on poly(lactic acid) (PLA) agar plates was observed for 56 microorganisms (46.28%). Based on the 16S rRNA sequence, 10 bacterial strains which showed the highest ability for biodegradation were identified as species belonging to Pseudomonas sp. and Rhodococcus sp. The isolated fungal strains were tested for polycaprolactone films and commercial corn and potato starch bags degradation under laboratory conditions. Strains 16G (based on the analysis of a partial 18S rRNA sequence, identified as Clonostachys rosea) and 16H (identified as Trichoderma sp.) showed the highest capability for biodegradation. A particularly high capability for biodegradation was observed for the strain Clonostachys rosea, which showed 100% degradation of starch films and 52.91% degradation of PCL films in a 30-day shake flask experiment. The main advantage of the microorganisms isolated from Arctic environment is the ability to grow at low temperature and efficient biodegradation under this condition. The data suggest that C. rosea can be used in natural and laboratory conditions for degradations of bioplastics.

Urciuolo, F., et al. (2012). "Novel strategies to engineering biological tissue in vitro." Methods in Molecular Biology **811**: 223-244.

Tissue engineering creates biological tissues that aim to improve the function of diseased or damaged tissues. In this chapter, we examine the promise and shortcomings of "top-down" and "bottom-up" approaches for creating engineered biological tissues. In top-down approaches, the cells are expected to populate the scaffold and create the appropriate extracellular matrix and microarchitecture often with the aid of a bioreactor that furnish the set of stimuli required for an optimal cellular viability. Specifically, we survey the role of cell material interaction on oxygen metabolism in three-dimensional (3D) in vitro cultures as well as the time and space evolution of the transport and biophysical properties during the development of de novo synthesized tissue-engineered constructs. We show how to monitor and control the evolution of these parameters that is of crucial importance to process biohybrid constructs in vitro as well as to elaborate reliable mathematical model to forecast tissue growth under specific culture conditions. Furthermore, novel strategies such as bottom-up approaches to build tissue constructs in vitro are examined. In this fashion, tissue building blocks with specific microarchitectural features are used as modular units to engineer biological tissues from the bottom up. In particular, the attention will be focused on the use of cell seeded microbeads as functional building blocks to realize 3D complex tissue. Finally, a challenge will be the potential integration of bottom-up techniques with more traditional top-down approaches to create more complex tissues than are currently achievable using either technique alone by optimizing the advantages of each technique.

Urraca, J. L., et al. (2014). "Multiresidue analysis of fluoroquinolone antimicrobials in chicken meat by molecularly imprinted solid-phase extraction and high performance liquid chromatography." Journal of Chromatography, A: 1-9.

This paper describes the synthesis of novel molecularly imprinted polymer (MIP) micro-beads for the selective extraction (MISPE) of six fluoroquinolone (FQ) antibiotics (enrofloxacin, ciprofloxacin, lomefloxacin, danofloxacin, sarafloxacin and norfloxacin) from chicken muscle samples and further analysis by high-performance liquid chromatography (HPLC) with fluorescence (FLD) or mass spectrometry (MS) detection. A combinatorial screening approach has been applied to select the optimal functional monomer and cross-linker formulation for polymer synthesis. The MIP prepared using enoxacin (ENOX) as the template - a mixture of methacrylic acid (MAA) and trifluoromethacrylic acid (TFMAA) as functional monomers and ethylene glycol dimethacrylate (EDMA) as the cross-linker - showed superior FQ recognition properties than the rest of the materials generated. MIP spherical particles were prepared using silica beads as sacrificial scaffolds. The polymers were packed in solid phase extraction (SPE) cartridges. The optimized MISPE-HPLC method allows the extraction of the antimicrobials from aqueous samples followed by a selective washing with acetonitrile/water (0.005% TFA, pH=3.0), 20:80 (v/v) and elution with 5% trifluoroacetic acid in methanol. Optimum MISPE conditions led

to recoveries of the target FQs in chicken muscle samples ranging between 68 and 102% and precisions in the 3-4% range (RSD, n=18). The method has been validated according to European Union Decision 2002/657/EC, in terms of linearity, accuracy, precision, selectivity, decision limit (CC alpha) and detection capability (CC beta) by HPLC-FLD and HPLC-MS/MS. The limits of detection were improved using HPLC-MS/MS analysis and ranged between 0.2 and 2.7 micro g kg⁻¹ (S/N=3) for all the FQs tested.

Ushijima, T., et al. (2018). "Occurrence of microplastics in digestive tracts of fish with different modes of ingestion in Japanese bays and Lake Biwa." Journal of Japan Society on Water Environment **41**(4): 107-113.

Microplastics pollution has recently drawn worldwide attention, and may have negative effects on ecosystems. Microplastics are plastic smaller than 5 mm. This study documents microplastics larger than 100 micro m in seven fish species from five Japanese bays and Lake Biwa. 197 fish individuals were examined. A total of 140 microplastics particles were found in the digestive tracts of 37.6% of all fish. All species except Sardinella zunasi had ingested microplastics in all areas. The mean number of microplastics particles was 1.89+or-1.41 per individual fish. Most microplastics were polypropylene (40.7%) and polyethylene (35.0%) as identified by Fourier Transform Infrared Spectrometer (FT-IR). The median of the mean sizes of microplastics was 543 micro m as measured using a microscope and digital camera. The fish species were divided into filter feeders and the others on the basis of modes of ingestion. 54.6% of 97 individuals of filter feeders had ingested microplastics, and the total number of particles was 112. The mean number of microplastics particles in filter feeders was 2.11+or-1.54 per individual fish. 21.0% of 100 individuals of the others group had ingested microplastics, and the total number of particles was 28. The mean number of microplastics particles in the others group was 1.33+or-0.80 per individual fish. These results indicated that modes of ingestion influence the fish's ingestion of microplastics.

Ustabasi, G. S. and A. Baysal (2019). "Occurrence and risk assessment of microplastics from various toothpastes." Environmental Monitoring & Assessment **191**(7): 438.

Microplastics have become a major environmental issue; their release from various products affects the aquatic environment. Personal care products such as toothpastes are recently being considered as a significant source of microplastics released to the aquatic environment. This study aims to assess the presence of microplastics found in toothpastes that are available in the drugstores and markets in Istanbul, Turkey. A total of 20 samples were tested. Following the extraction procedure, obtained particles were quantified and then characterized by microscopic evaluation and surface chemistry analysis. Twenty percent of the samples were found to contain microplastics in the structure of polyethylene at concentrations varying between 0.4 and 1%. In order to evaluate the release to environment, a risk assessment was conducted and yearly microplastic emission caused by toothpaste consumption was calculated based on the results.

Ustabasi, G. S. and A. Baysal (2020). "Bacterial interactions of microplastics extracted from toothpaste under controlled conditions and the influence of seawater." Science of the Total Environment **703**: N.PAG-N.PAG.

• Interactions between bacteria and MPs were investigated in both standard and seawater condition. • Environmental relevancy of the growth media significantly impacts on the toxicity. • MPs were affected different bacterium with the media, while the metabolic pathways were the same. • MPs with higher surface charge induced higher inhibition levels. Microplastics have become a global concern due to their increasing use and discharge into the environment. These ubiquitous particles are known to have extremely low degradation rates and accumulate mostly in the marine environment. The evidence for bioaccumulation and indicators of stress linked to microplastics is also stated in the literature. However, the real environmental impact of microplastics has not yet been revealed. Therefore, it is crucial to understand the interaction mechanisms between microplastics and (micro)organisms under controlled (standard) laboratory conditions and environmentally relevant conditions to reflect the true environmental -situation. In this study, we aimed to understand how microplastics extracted from commercially available toothpaste samples interacted with four types of bacteria under both standard and seawater conditions. For this purpose, bacterial inhibitions were examined, and mechanisms of inhibition were evaluated by biochemical parameters (total protein, lipid peroxidase, total antioxidant capacity, and extracellular carbohydrate levels) of bacteria and physicochemical properties (zeta potential, particle size, surface chemistry) of microplastics. Results showed that gram-positive Bacillus subtilis and gram-negative Pseudomonas aeruginosa were affected in controlled and sea water media, respectively. The inhibition of the bacteria relied on the high zeta potentials of the microplastics, and, biochemically, protein and lipid peroxidase activity of bacteria were important in both media. On the other hand, while biochemical responses were similar in both media, the difference between the cell wall and microplastics surface charge was important only in seawater. [ABSTRACT FROM AUTHOR]

Usui, K., et al. (2016). "Monomerization and fibrillation methods for fibrosis peptides using SPPS microbeads." Journal of Peptide Science **22 (Supplement 2)**: S210-S211.

Protein misfolding diseases including Alzheimer's disease and Parkinson's disease are increasingly common in aging populations. These diseases involve the systematic or tissue-localized deposition of fibrillar, beta-sheet rich protein assemblies (amyloid fibrils). These amyloid fibrils are the principal component of extracellular deposits and are regarded as the causative agents of these diseases. To date, many scientists have investigated amyloid aggregation, but monomerization and fibrillation conditions [1-3] have not yet been standardized . In this study, we attempted to suggest a standardized method for monomerization and aggregation of fibrosis peptides using peptide-immobilized microbeads. Immobilization would prevent peptides from aggregating because the immobilized peptides could not interact with each other. In addition, photolabile linker or chemolabile linker could provide standardization of aggregation condition because aggregation reaction could easily start by irradiation of UV light or addition of a cleavage reagent. After optimization of synthesis of peptide-linker-resin, we have checked the monomerization by gel filteration in comparison with conventional methods. Then the fibrillation reaction was checked by ThT fluorescent assay. Finally, using this system, we demonstrated cellular viability assay using the peptides in comparison with conventional methods. This system with substitution of model sequence for other amyloidogenic sequences could be a powerful and fundamental tool for studying the behavior of amyloidogenic peptides. This system would be one of the most promising method for amyloid-related studies toward medicinal and biochemical research fields.

Usui, K., et al. (2018). "Peptidyl microbeads for modification of a direct peptide reactivity assay (DPRA) in skin sensitization assessment." Journal of Peptide Science **24 (Supplement 2)**: S108.

A direct peptide reactivity assay (DPRA) is one of the most promising method as a robust alternative to animal testing for skin sensitization analysis. In DPRA, a chemical substance is mixed with peptides. After 24 h reaction, HPLC is used to measure unreacted peptides, and skin sensitization is predicted based on the percent decrease in unreacted peptides [1]. Since the test substance and peptides are both in aqueous solutions during DPRA, DPRA cannot appropriately assess poorly water-soluble substances. In addition, HPLC measurement has relatively cumbersome procedures. This precludes the ready assessment of numerous types of samples in a short period of time. In this study, we immobilized the DPRA peptides to amphiphilic microbeads. Then using these peptidyl microbeads, two modified skin sensitization assay systems were developed in order to address these limitations in DPRA. We utilized a photo-labile linker [2, 3] and an unreacted peptide sequence as an internal standard in the first system, and thiol or amino group indicators [4, 5] for detecting amount of unreacted peptides were used in the second system. We examined test chemicals including poorly water-soluble substances by our two modified methods. The results indicated that the both two methods were able to appropriately assess all test chemicals including poorly water-soluble substances that conventional DPRA was unable to assess. Additionally, our method offered easy handling and general versatility, and more reproducibility and accuracy than the conventional DPRA. Thus, these studies successfully improved the conventional DPRA. Our method provides a high-throughput testing for skin sensitization with easy handling.

Uurasjarvi, E., et al. (2020). "Microplastic concentrations, size distribution, and polymer types in the surface waters of a northern European lake." Water Environment Research **92**(1): 149-156.

We examined microplastic concentrations, size distributions, and polymer types in surface waters of a northern European dimictic lake. Two sampling methods, a pump sieving water onto filters with different pore sizes (20, 100, and 300 micro m) and a common manta trawl (333 micro m), were utilized to sample surface water from 12 sites at the vicinity of potential sources for microplastic emissions. The number and polymer types of microplastics in the samples were determined with optical microscopy and muFTIR spectroscopy. The average concentrations were 0.27 +/- 0.18 (mean +/- SD) microplastics/m³ in manta trawled samples and 1.8 +/- 2.3 (>300 mum), 12 +/- 17 (100-300 mum) and 155 +/- 73 (20-100 mum) microplastics/m³ in pump filtered samples. The majority (64%) of the identified microplastics (n = 168) were fibers, and the rest were fragments. Materials were identified as polymers commonly used in consumer products, such as polyethylene, polypropylene, and polyethylene terephthalate. Microplastic concentrations were high near the discharge pipe of a wastewater treatment plant, harbors, and snow dumping site. PRACTITIONER POINTS: Samples were taken with a manta trawl (333 mum) and a pump filtration system (300/100/20 mum) With pump filtration, small 20-300 mum particles were more common than >300 mum particles The average concentration of manta trawled samples was 0.27 +/- 0.18 (mean +/- SD) microplastics/m³ FTIR analysis revealed PE, PP, PET, and PAN to be the most common polymers.

Uurasjärvi, E., et al. (2019). "Microplastic concentrations, size distribution, and polymer types in the surface waters of a northern European lake." Water environment research : a research publication of the Water Environment Federation.

We examined microplastic concentrations, size distributions, and polymer types in surface waters of a northern European dimictic lake. Two sampling methods, a pump sieving water onto filters with different pore sizes (20, 100, and 300 µm) and a common manta trawl (333 µm), were utilized to sample surface water from 12 sites at the vicinity of potential sources for microplastic emissions. The number and polymer types of microplastics in the samples were determined with optical microscopy and µFTIR spectroscopy. The average concentrations were 0.27 ± 0.18 (mean ± SD) microplastics/m3 in manta trawled samples and 1.8 ± 2.3 (>300 µm), 12 ± 17 (100-300 µm) and 155 ± 73 (20-100 µm) microplastics/m3 in pump filtered samples. The majority (64%) of the identified microplastics (n = 168) were fibers, and the rest were fragments. Materials were identified as polymers commonly used in consumer products, such as polyethylene, polypropylene, and polyethylene terephthalate. Microplastic concentrations were high near the discharge pipe of a wastewater treatment plant, harbors, and snow dumping site. PRACTITIONER POINTS: Samples were taken with a manta trawl (333 µm) and a pump filtration system (300/100/20 µm) With pump filtration, small 20-300 µm particles were more common than >300 µm particles The average concentration of manta trawled samples was 0.27 ± 0.18 (mean ± SD) microplastics/m3 FTIR analysis revealed PE, PP, PET, and PAN to be the most common polymers.

Uygun, Z. O., et al. (2019). "Development of molecularly imprinted Acrylamide- Acrylamido phenylboronic acid copolymer microbeads for selective glycosaminoglycan separation in children urine." Turkish Journal of Biochemistry **44**(6): 738-744.

Background: In this study, we synthesized molecularly imprinted copolymers for liquid chromatography columns as a separator for glycosaminoglycan (dermatan sulfate; DS and chondroitin sulfate; CS) in urine. Material(s) and Method(s): Acrylamide and acrylamido phenylboronic acid were used as monomers, acrylamide was used for as base monomer to attract negatively charged groups and acrylamido phenylboronic acid (AAPBA) residues used to form diol bonds between sugar and boronic acid residues to strengthen the attraction. These monomers were synthesized by using precipitation polymerization to form uniform spheres, which are more durable for the pressurized chromatographic systems. Trimethylolpropane trimethacrylate and AIBN were used as crosslinker and starter, respectively. Result(s): These GAG selective polymers were filled by pressurized flow into the steel (4.6 mm x 1.6 mm) columns, then imprinted GAGs were extracted and analyzed to calculate binding capacity of each milligram polymer. Calibration curves of the GAG selective columns were obtained 62.5-1000 ng/mL less than 5% coefficient variation, and lower matrix effect. Conclusion(s): Our imprinted columns separated different GAGs from urine specifically and sensitively. Matrix effect was at an ignorable level thus the challenging use. Copyright © 2019 De Gruyter. All rights reserved.

Uzumkesici, E. S., et al. (1999). Co-processing of single plastic waste streams in low temperature carbonisation, Elsevier Science Ltd., P.O. Box 800 Kidlington Oxford OX5 1DX UK. **78:** 1697-1702.

To investigate the yields of specific compounds and compound classes that can be achieved by co-processing single-stream plastic waste in carbonisation, a series of Gray-King tests have been conducted on blends of Gascoigne Wood (UK high volatile bituminous coal) and both low density polyethene (500 and 600 degree C) and polystyrene (600 degree C). For both polymers the tar yields were found to increase linearly as a function of the amount of polymer used in the coal blend, with the actual and predicted tar yields being identical within experimental error, indicating that no synergism exists between the coal and the polymers under the conditions used. The higher tar yields obtained with increasing polyethene content are accounted for by the increase in the concentration of aliphatics in the tars. Although little variation was evident in the distribution of n-alkanes obtained with increasing polyethene content, average n-alkane/n-alkene ratios for low levels of polymer addition were considerably higher than

predicted, indicating that dehydrogenation of the alkanes may be taking place, with hydrogen transfer to the coal. Furthermore, the presence of coal was found to have a significant effect on the major products derived from polystyrene. Ethylbenzene, as opposed to styrene monomer, was the major product from all coal/polystyrene blends studied, indicating that in the case of coal/polystyrene blends, hydrogen is transferred from the coal to the polymer. A clear advantage of using polyethene and other alkane polymers in low temperature carbonisation processes would be the considerable reductions achieved in the viscosities of the resultant tars which eases handling problems. Further, it was observed in tests that there was no reduction in the quality of the coke (in terms of Gray-King type) until 10 wt% polyethene and 2-3 wt% polystyrene had been added to the coal blend.

Vaclavkova, P., et al. (2006). "A comparison of an anti-CD25 immunotoxin, Ontak and anti-CD25 microbeads for their ability to deplete alloreactive T cells in vitro." Bone Marrow Transplantation **37**(6): 559-567.

Ex vivo depletion of alloreactive CD25(+) T cells from a stem cell transplant (SCT) can reduce the incidence of graft-versus-host disease (GVHD) while preserving antimicrobial and perhaps antileukemia activity. However, the most effective methods for allodepleting T cells prior to transplant have not been determined. In this study, we have compared three agents that deplete CD25(+) activated, alloreactive T cells. These included Ontak (Denileukin Diftitox), an IL-2 fusion toxin, anti-CD25 microbeads (MACS), an anti-CD25 immunotoxin (IT) and a combination of the IT and MACS. Peripheral blood mononuclear cells (PBMCs) activated in a primary mixed lymphocyte reaction (MLR) were allodepleted using optimal amounts of each agent, and the cells were then analyzed by flow cytometry. The treated cells were examined both for remaining alloreactivity and for the preservation of third party reactivity by testing them in a secondary MLR. Our data demonstrate that both the anti-CD25 IT and the anti-CD25 MACS were equally effective in depleting CD4(+)CD25(+) cells and in sparing T cells that were reactive with third party cells. The anti-CD25 IT was, however, superior in depleting alloreactive CD8(+)CD25(+) cells. In contrast, Ontak did not eliminate alloreactive cells and the Ontak-treated cells retained significant reactivity against the original stimulator cells.

Vafajoo, A., et al. (2018). "Multiplexed microarrays based on optically encoded microbeads." Biomedical Microdevices **20**(3): 66.

In recent years, there has been growing interest in optically-encoded or tagged functionalized microbeads as a solid support platform to capture proteins or nucleotides which may serve as biomarkers of various diseases. Multiplexing technologies (suspension array or planar array) based on optically encoded microspheres have made possible the observation of relatively minor changes in biomarkers related to specific diseases. The ability to identify these changes at an early stage may allow the diagnosis of serious diseases (e.g. cancer) at a time-point when curative treatment may still be possible. As the overall accuracy of current diagnostic methods for some diseases is often disappointing, multiplexed assays based on optically encoded microbeads could play an important role to detect biomarkers of diseases in a non-invasive and accurate manner. However, detection systems based on functionalized encoded microbeads are still an emerging technology, and more research needs to be done in the future. This review paper is a preliminary attempt to summarize the state-of-the-art concerning diagnostic microbeads; including microsphere composition, synthesis, encoding technology, detection systems, and applications.

Vafajoo, A., et al. (2018). "Biofunctionalized microbead arrays for early diagnosis of breast cancer."

Biomedical Physics and Engineering Express **4**(6).

A high-performance method is suspension microbead arrays which facilitate HER2 recognition for rapid prognosis in its preliminary stages before cancer reaches to its metastases level or first prevalence of tumor growth. To achieve this goal, we synthesized gelatin microbeads by oil in water (o/w) emulsion method and the size and stability of micro-particles were optimized with different concentrations of glutaraldehyde. The non-toxicity of microbeads was proved by MTT assay. Then the Herceptin was immobilized on the microbeads surface by carbodiimide coupling method. FITC was used as a fluorescent marker for recognizing HER2 receptors on SKBr3 cancer cells (clinical sample) and the recognition was tracked by flow cytometry. Results showed significant discrimination between SKBr3 cancer cells sample concerning HER2 negative cancer cells as a control sample. © 2018 IOP Publishing Ltd.

Vaidya, R., et al. (2010). "Circulating IL-2R, IL-8, IL-15 and CXCL10 levels are independently prognostic in primary myelofibrosis: A comprehensive cytokine profiling study." Blood. Conference: 52nd Annual Meeting of the American Society of Hematology, ASH **116**(21).

Background: Abnormal cytokine expression accompanies the disease process in primary myelofibrosis (PMF) and the levels of proinflammatory cytokines have been shown to be down-regulated by JAK inhibitor therapy. The prognostic relevance of increased cytokine levels in PMF has not been systematically studied. The objectives of the current study were to describe the spectrum of abnormal cytokine expression in PMF and determine its prognostic relevance. Method(s): A multiplex biometric sandwich immunoassay (Invitrogen multiplex assays, Invitrogen Corporation-Carlsbad CA, USA) was used for simultaneous analysis of 30 cytokine levels. Diluted plasma was mixed with fluorescently addressed microbeads bound with anti-cytokine antibodies. Biotin anticytokine secondary antibodies were then added and allowed to bind to cytokine-bead complexes. Total surface fluorescence for each bead was then measured using a Luminex (Luminex Corporation, Austin, TX, USA) fluorescent flow-based detection system. Result(s): Cytokine levels at diagnosis were analyzed for a total of 127 treatment naive patients with PMF, who had stored sera at the time of diagnosis or first referral to the Mayo Clinic. The circulating levels of 30 cytokines in the multiplex assay were compared between PMF patients (n=127) and normal controls (n=31). Significant differences (p<0.05) were evident for 20 of the 30 cytokines: IL-1b, IL-1RA, IL-2R,IL-6, IL-8, IL-10, IL-12, IL-13, IL- 15, TNF-alpha, G-CSF, INF-alpha, INF-gamma, MIP-1alpha, MIP-1beta, HGF, CXCL10, MIG, MCP-1 and VEGF. On univariate analysis, increased levels of 9 of these 20 cytokines were associated with shortened survival (p<0.05): IL-1RA, IL-2R, IL-6, IL-8, IL-12, IL-15, MIP-1alpha, CXCL10 and MIG. On multivariable analysis, 4 of these 9 cytokines maintained their prognostic value for survival: IL-2R (p=0.0011), IL-8 (p<0.0001), IL-15 (p=0.0124) and CXCL10 (p=0.0031). The independent prognostic value of these 4 cytokines was sustained during additional multivariable analysis that included the Dynamic International Prognostic System Score and cytogenetic risk category. Next, we divided the 127 patients into three cytokine risk categories based on the serum levels of IL-2R, IL-8, IL-15 and CXCL10: none elevated, one or two elevated and three or four elevated. The respective median survivals were 69, 37 and 19 months (p=0.01; Figure 1) and such cytokine risk categorization was both DIPSS and cytogenetic risk independent; p values for multivariable analysis including cytokine, DIPSS, cytogenetic risk groups were 0.02, 0.0001 and 0.004, respectively. (Figure Presented) Conclusion(s): Elevated serum levels of IL-2R, IL-8, IL-15 and CXCL10 independently predict shortened survival in PMF and such prognostication appears to be independent of DIPSS and cytogenetic risk category. The current study suggests clinical relevance of multiple cytokines in PMF that could be therapeutically targeted.

Vaidya, S. V., et al. (2007). "Spectral Bar Coding of Polystyrene Microbeads Using Multicolored Quantum Dots." Analytical Chemistry **79**(22): 8520.

This paper focuses on encoding polystyrene microbeads, 10-100 ...m in diameter, with a luminescent spectral bar code composed of mixtures of quantum dots (QDs) emitting at different wavelengths (colors). The QDs are encapsulated in the bead interior during the bead synthesis using a suspension polymerization, and the bar code is constructed by varying both the number of colors included in the bead and, for each color, the number of QDs of that color. Confocal laser scanning microscopy images of the beads demonstrate that the multicolored QDs are pushed together into inclusions within the bead interior. The encoded bead emission spectrum indicates that the peak position of the included colors does not shift relative to the corresponding peaks of the spectra recorded for the nonaggregated QDs at identical loading concentrations. Due to the spatial proximity of the QDs in the inclusions, electronic energy transfer from the lower wavelength emitting QDs to the higher emitting QDs changes the relative intensities of the colors compared to the values in the nonaggregated spectra. We show that this energy transfer does not obscure the spectral uniqueness of the different codes. Ratiometric encoding, in which the bar code is read as relative color intensity, is shown to remove the dependence of the code on the bead size. (ProQuest: ... denotes formulae/symbols omitted.)

Vaidya, V. S., et al. (2009). "A rapid urine test for early detection of kidney injury." Kidney International **76**(1): 108-114.

Kidney injury molecule-1 (Kim-1) has been qualified by the Food and Drug Administration and European Medicines Agency as a highly sensitive and specific urinary biomarker to monitor drug-induced kidney injury in preclinical studies and on a case-by-case basis in clinical trials. Here we report the development and evaluation of a rapid direct immunochromatographic lateral flow 15-min assay for detection of urinary Kim-1 (rat) or KIM-1 (human). The urinary Kim-1 band intensity using the rat Kim-1 dipstick significantly correlated with levels of Kim-1 as measured by a microbead-based assay, histopathological damage, and immunohistochemical assessment of renal Kim-1 in a dose- and time-dependent manner. Kim-1 was detected following kidney injury induced in rats by cadmium, gentamicin, or bilateral renal ischemia/reperfusion. In humans, the urinary KIM-1 band intensity was significantly greater in urine from patients with acute kidney injury than in urine from healthy volunteers. The KIM-1 dipstick also enabled temporal evaluation of kidney injury and recovery in two patients who developed postoperative acute kidney injury following cytoreductive surgery for malignant mesothelioma with intraoperative local cisplatin administration. We hope that future, more extensive studies will confirm the utility of these results, which show that the Kim-1/KIM-1 dipsticks can provide a sensitive and accurate detection of Kim-1/KIM-1, thereby providing a rapid diagnostic assay for kidney damage and facilitating the rapid and early detection of kidney injury in preclinical and clinical studies.

Vajen, T., et al. (2015). "Platelet microvesicles in vascular inflammation." Journal of Thrombosis and Haemostasis **2)**: 895.

Background: Microvesicles are gathering increasing attention as mediators of cell communication and as integral effectors of disease. Platelets present a major source of microvesicles and release these microvesicles either spontaneously or upon activation. Platelet microvesicles (PMVs) retain many features of their parent cells and have been shown to exert modulatory effects on vascular and immune cells. Aim(s): We hypothesize that PMVsinteract with vascular smooth muscle cells (SMCs) and modulate their function in the context of vascular

remodeling. Method(s): PMVs were isolated from stored human platelet-rich plasma by serial centrifugation steps. PMVs were quantified and characterized by flow cytometry using annexin A5/phosphatidylserine and antibodies against CD41a/GPIIb. Size calibrated micro beads were used to quantify the absolute amount of PMVs/mL. Cell migration experiments were performed using a chemotaxis mu-slide. Proliferation of SMCs was measured by the BrdU-cell proliferation kit. Platelet receptors implicated in PMV-SMC interaction were identified by blocking antibodies. Result(s): In the presence of PMVs a gradient was generated that resulted in significant directed migration of the SMCs. Both, the total displacement distance and the velocity of movement of SMCs were significantly increased compared to the control condition without PMVs. The PMV binding to SMCs was specifically abrogated with the integrin alphaIIbbeta3 inhibitor (integrilin) indicating an integrin-dependent mechanism of interaction. A proliferative effect on SMCs was measured after 48 h after incubation with PMVs and this proliferation relied on interactions via integrin alphaMbeta2, CD40 and on P-selectin. Conclusion(s): Isolated PMVs have shown to exert an immunomodulatory activity on various cell types. The present data indicate a role of PMVs in SMC chemotaxis and proliferation, which might contribute to vascular atherogenesis, in particular vascular remodeling.

Vakarelova, M., et al. (2017). "Production of stable food-grade microencapsulated astaxanthin by vibrating nozzle technology." Food Chemistry **221**: 289-295.

Astaxanthin is a carotenoid known for its strong antioxidant and health-promoting characteristics, but it is also highly degradable and thus unsuited for several applications. We developed a sustainable method for the extraction and the production of stable astaxanthin microencapsulates. Nearly 2% astaxanthin was extracted by high-pressure homogenization of dried Haematococcus pluvialis cells in soybean oil. Astaxanthin-enriched oil was encapsulated in alginate and low-methoxyl pectin by Ca²⁺-mediated vibrating-nozzle extrusion technology. The 3% pectin microbeads resulted the best compromise between sphericity and oil retention upon drying. We monitored the stability of these astaxanthin beads under four different conditions of light, temperature and oxygen exposition. After 52weeks, the microbeads showed a total-astaxanthin retention of 94.1+/-4.1% (+4degreeC/-light/+O₂), 83.1+/-3.2% (RT/-light/-O₂), 38.3+/-2.2% (RT/-light/+O2), and 57.0+/-0.4% (RT/+light/+O₂), with different degradation kinetics. Refrigeration, therefore, resulted the optimal storage condition to preserve astaxanthin stability.

Valdespin, C., et al. (2018). "Effect of annexin-V positive sperm-cells removal with magnetic activated cell sorting (MACS) for ICSI procedures in couples with male infertility (teratozoospermia); A randomized controlled trial." Human Reproduction **33 (Supplement 1)**: i28-i29.

Study question: Does the use of MACS and incubation with annexin-V conjugated microbeads (ANMB) before ICSI in couples with male infertility (teratozoospermia) improve the live-birth delivery rate? Summary answer: The use of MACS-ANMB in men with teratozoospermia improves the development and quality of oocytes/embryos, consequently improving fertilization(FR), implantation(IR), pregnancy(PR), and live-birth-delivery rates. What is known already: It is proved that human spermatozoa play an exten-sive role in the reproductive physiology, beginning with the fertilization process, continuing with early and late stages of embryo development, that ultimately impact on implantation and pregnancy rates. The expression of early apoptotic markers as plasma membrane translocation of phosphatidylserine (PS) is associated with abnormal embryo development and suboptimal results of FR, IR and PR. Annexin-V magnetic cell separation of non-apoptotic spermatozoa is simple, fast, inexpensive and highly specific, however, its role in late stages of embryo development and live-birth rate is

unclear. Study design, size, duration: A prospective, randomized, triple-blinded, and controlled trial was conducted using a parallel two-arm study. We included a total of 200 couples with teratozoospermia undergoing ICSI assigned in a 1:1 proportion either to the experimental or the control group. Samples from the study group were prepared by swim-up followed by MACS-ANMB to remove Annexin-V positive sperm cells. The study was conducted from June-2012 to March-2017 in a single reproductive center in Mexico City. Participants/materials, setting, methods: Only those samples exhibiting teratozoospermia (morphology <4% according to Kruger's strict criteria) were included in the study. In addition, patients who presented with poor ovarian response ("Bologna" criteria) were eliminated. Samples were randomized in two groups: i)swim-up followed by MACS-ANMB, and ii)swim-up. All embryos were analyzed until day 5-6 (blastocyst stage) and all transfers were done on the same embryo stage. Statics: Mann-Whitney-test, Fisher-exact-test, and Person's-correlation were done to analyze the results (p < 0.05, significant). Main results and the role of chance: Different results were obtained between groups, however, patients demographics were similar. The Annexin-V positive fraction was negatively correlated with sperm concentration (r =-0.5435 p = <0.0001), progressive motility (r=-0.2975 p = 0.02), and total motility (r =-0.2975 p = 0.02); and was positively correlated with type D morphology (r = 0.4397 p = 0.0006). Regarding embryo development and reproductive results, comparison between MACS-ANMB (n = 100), and control group (n = 100) showed the following results: i) FR of 40.8% (95% IC, 27.4-65.0) versus 45.2% (95% IC, 14.7-69.0) p = 0.04, ii) embryo survival on day-3 of 97.3% (95% IC, 89.7-100) versus 98.9% (95% IC, 96.8-100) Non Significantly (NS), iii) mean quality of embryos on day-3 of 2.9 (95% IC, 2.8-3.0) versus 2.9 (95% IC, 2.9-3.0) NS, iv) blastocyst development on day-5 of 61.2% (95% IC, 51.7-70.6) versus 48.8% (95% IC, 30.2-66.6) p = 0.02, v) quality of embryos on day-5 of 2.8 (95% IC, 2.6-3.1) versus 3.4 (95% IC, 3.3-3.6) p = 0.001, vi) percentage of arrested embryos of 32.9% (95% IC, 23.5-42.3) versus 49.9% (95% IC, 36.8-63.0) p = 0.04, vii) IRof25.5% (95% IC, 12.7-67.1) versus 12.5% (95% IC, 6.2-32.8) p = 0.001, viii) PR of 51.1% (95% IC, 25.5-65.7) versus 26.1% (95% IC, 13.3-34.2) p = 0.001, and ix) live-birth delivery rate 24.5% (95% IC, 12.2-72.0) versus 9.5% (95% IC, 4.7-27.9) p=<0.0001, respectively. Limitations, reasons for caution: In this study, we only included men with teratozoospermia, not evaluating other men with different types of male infertility. Despite the fact that we selected sperm-cells without indicators of apop-tosis and measure its impact on live-birth delivery rate, we didn't evaluate its effect on chromosomal abnormalities. Wider implications of the findings: Through ICSI there is the possibility of injecting a spermatozoon with an apoptotic process that by natural selection would be condemned to die generating suboptimal results in ART; with the help of MACS-ANMB we improve live-birth delivery rate in men with teratozoospermia and type-D motility.

Valente, T., et al. (2019). "Exploring microplastic ingestion by three deep-water elasmobranch species: a case study from the Tyrrhenian Sea." Environmental Pollution **253**: 342-350.

This study analyzes microplastic ingestion by three deep-water elasmobranch species (Galeus melastomus, Scyliorhinus canicula and Etmopterus spinax) from the Tyrrhenian Sea, discriminating between stomach and intestine contents. The absence of significant differences in frequency and abundance of plastic items into stomachs seems to suggest that ecological diversity among the three sharks does not strongly influence the probability of plastic ingestion in the study area. On the other hand, the detected differences in the microplastic content into the intestine might be due to a different retention time of microplastics, suggesting how feeding habits could influence metabolic features, and therefore affect the recovery of ingested plastic items. This information would improve the future development of marine micro-litter monitoring systems, following the MSFD requirements. Moreover, this study shows that all the three examined elasmobranch species can give important information even with relatively small sample sizes (N=30), and they could be used as target species for monitoring micro-litter ingestion in deep-water habitats.

Valenti, G., et al. (2015). "An electrochemiluminescence-supramolecular approach to sarcosine detection for early diagnosis of prostate cancer." Faraday Discussions **185**: 299-309.

Monitoring Prostate Cancer (PCa) biomarkers is an efficient way to diagnosis this disease early, since it improves the therapeutic success rate and suppresses PCa patient mortality: for this reason a powerful analytical technique such as electrochemiluminescence (ECL) is already used for this application, but its widespread usability is still hampered by the high cost of commercial ECL equipment. We describe an innovative approach for the selective and sensitive detection of the PCa biomarker sarcosine, obtained by a synergistic ECL-supramolecular approach, in which the free base form of sarcosine acts as co-reagent in a Ru(bpy)3(2+)-ECL process. We used magnetic micro-beads decorated with a supramolecular tetraphosphonate cavitand (Tiiii) for the selective capture of sarcosine hydrochloride in a complex matrix like urine. Sarcosine determination was then obtained with ECL measurements thanks to the complexation properties of Tiiii, with a protocol involving simple pH changes - to drive the capture-release process of sarcosine from the receptor - and magnetic micro-bead technology. With this approach we were able to measure sarcosine in the muM to mM window, a concentration range that encompasses the diagnostic urinary value of sarcosine in healthy subjects and PCa patients, respectively. These results indicate how this ECL-supramolecular approach is extremely promising for the detection of sarcosine and for PCa diagnosis and monitoring, and for the development of portable and more affordable devices.

Valignat, M. P., et al. (2005). "Reversible self-assembly and directed assembly of DNA-linked micrometer-sized colloids." Proceedings of the National Academy of Sciences of the United States of America **102**(12): 4225-4229.

We present a technique for the directed assembly and self-assembly of micrometer-scale structures based on the control of specific DNA linkages between colloidal particles. The use of DNA links combined with polymer brushes provides an effective way to regulate the range and magnitude of addressable forces between pairs (and further combinations) of different particles. We demonstrate that the autoassembly of alternate microbeads as well as their directed assembly, by using laser tweezers, is reversible. The key to reversibility is preventing the particles from falling into their van der Waals well at close distances. This goal is achieved by the use of adsorbed polymers that limit the number of DNA bridges to one to three between adjacent particles. © 2005 by The National Academy of Sciences of the USA.

Valour, F., et al. (2015). "Delta-toxin production deficiency in Staphylococcus aureus: a diagnostic marker of bone and joint infection chronicity linked with osteoblast invasion and biofilm formation." Clinical Microbiology & Infection **21**(6): 568.e561-511.

Biofilm formation, intra-osteoblastic persistence, small-colony variants (SCVs) and the dysregulation of agr, the major virulence regulon, are possibly involved in staphylococcal bone and joint infection (BJI) pathogenesis. We aimed to investigate the contributions of these mechanisms among a collection of 95 Staphylococcus aureus clinical isolates from 64 acute (67.4%) and 31 chronic (32.6%) first episodes of BJI. The included isolates were compared for internalization rate, cell damage and SCV intracellular emergence using an ex vivo model of human osteoblast infection. Biofilm formation was assessed in a microbead immobilization assay (BioFilm Ring test). Virulence gene profiles were assessed by DNA microarray. Seventeen

different clonal complexes were identified among the screened collection. The staphylococcal internalization rate in osteoblasts was significantly higher for chronic than acute BJI isolates, regardless of the genetic background. Conversely, no differences regarding cytotoxicity, SCV emergence, biofilm formation and virulence gene distribution were observed. Additionally, agr dysfunction, detected by the lack of delta-toxin production using whole-cell matrix-assisted laser desorption ionization time-of-flight (MALDI-TOF) analysis (n = 15; 15.8%), was significantly associated with BJI chronicity, osteoblast invasion and biofilm formation. These findings provide new insights into MSSA BJI pathogenesis, suggesting the correlation between chronicity and staphylococcal osteoblast invasion. This adaptive mechanism, along with biofilm formation, is associated with agr dysfunction, which can be routinely assessed by delta-toxin detection using MALDI-TOF spectrum analysis, possibly providing clinicians with a diagnostic marker of BJI chronicity at the time of diagnosis.

Valpione, S., et al. (2015). "A retrospective analysis of 141 patients with liver metastases from uveal melanoma: A two-cohort study comparing transarterial chemoembolization with CPT-11 charged microbeads and historical treatments." Melanoma Research **25**(2): 164-168.

We retrospectively evaluated the benefit of transarterial chemoembolization with CPT-11 charged microbeads (TACE) in 58 of 141 uveal melanoma patients with liver metastases. This was a retrospective analysis of a prospectively maintained database ranging from September 1990 to April 2014. Statistical analyses adjusting for possible confounding effects of extent of liver metastases were carried out using the Cox regression model under the verified hypothesis of proportional hazards. Among 141 patients with liver metastases, 58 were treated with TACE as first-line therapy and 36 were dead at the time of the analysis; 83 patients received other first-line treatments (deaths = 83). The treatment with TACE conferred a survival advantage (median 16.5 vs. 12.2 months, respectively); when the two cohorts were analyzed comparing the two groups according to the percentage of liver involvement, there was significant evidence that patients with worse hepatic involvement benefited most from the treatment (liver metastases = 20-50%: hazard ratio = 0.50, P = 0.048 and liver metastases >=50%: hazard ratio = 0.17, P = 0.009). Liver function tests (transaminases and gamma-glutamyl-transpeptidase) and age were higher in the historic group, and LDH tended to show higher values. There were no high-grade toxicities with TACE. TACE seems to be a tolerable regimen that confers an improvement in the survival of uveal melanoma patients with liver metastases. Confirmation of the clinical efficacy of TACE is recommended in a phase III trial, possibly with the inclusion of a targeted therapy such as a MEK inhibitor. Copyright © 2015 Wolters Kluwer Health, Inc. All rights reserved.

Valpione, S., et al. (2013). "Intra-arterial hepatic chemoembolization with CPT-11 charged microbeads (TACE) combined with systemic fotemustine in metastatic uveal melanoma." European Journal of Cancer **2)**: S860-S861.

Background: Uveal melanoma (UM) is the most frequent tumor of the eye (70%), and represents 5% to 6% of all melanoma diagnoses. Approximately 50% of patients with UM will develop metastatic disease within 15 years from the treatment of primary tumor and the liver is the first or prevalent site of metastatic disease in up to 95% of the recurring patients. Without treatment the median survival time is generally poor: larger published case series reported a median life expectancy from 3.6 to 15 months, with rare cases of long-term survivors. Notwithstanding the efforts made to improve the outcome of metastatic UM, no standard therapy is established so far. Material(s) and Method(s): A total of 143 patients (73 women and 70 men) were identified from a prospectively maintained database queried under IRB approval for uveal metastatic melanoma patients undergoing clinical treatments and procedures for their disease from September 1990 to October 2012. Data of patients who were treated with TACE combined with systemic fotemustine as first line treatment for stage IV disease were analyzed and compared with data of patients who didn't. (Table presented) Results: Out of 143 patients who were treated for metastatic uveal melanoma, 32 received TACE combined with systemic fotemustine as first line therapy. Fotemustine was administrated as outpatient chemotherapy. TACE was performed in day-hospital regimen, patients were usually discharged after an observation of 24 hours. Discharge was delayed after 1st TACE for 6 patients because of infection (N=1), and pain (N=5). Most frequent adverse event related to the procedure was pain (35 patients experimented pain, any grade), that was mostly epigastric and was eased by ranitidine in patients with mild-moderate pain and needed ranitidine plus morphine solphate (up to 40 mg i.v. per day) administration in 5 patients. Nausea and vomiting were controlled with dopamine antagonists. Most serious adverse event was protracted G4 thrombocytopenia, that required transfusion of platelets for 2 patients. We observed 1 case of fever (peak 38.7degreeC) with normal neutrophil count and augment of C reactive protein, the patient was treated with ceftriaxone and discharged after 3 nights. No life-threatening adverse events or procedure-related deaths were observed. Patients who received the combined treatment of TACE and fotemustine had a survival advantage (18.1 vs 14.6 months, p = 0.039). Conclusion(s): Combined treatment with TACE and systemic fotemustine improves survival in metastatic melanoma patients and is well tolerated. It could be proposed for further studies, also combined with new drugs.

Valpione, S., et al. (2012). "Metastatic uveal melanoma: A 22 years single center experience." Annals of Oncology **9)**: ix371.

Uveal melanoma (UM) is the most frequent eye cancer (annual incidence 0.5-0.7:100000), 40% to 60% of patients develop metastases; of them, up to 95% experience liver involvement. Metastatic disease carries a poor prognosis and no standard therapy is established so far. We retrospectively reviewed the medical records of 127 consecutive patients (M/F:61/65) with metastatic UM treated at our institution from September 1990 to February 2012. We collected: gender, age, TNM stage, data and site of primary UM and metastases; LDH, alkaline phosphatase, gGT, transaminases; treatments and outcome. Mean age at diagnosis of primary UM was 56.4 years (median 59.8, 95% CI 53.7-59.1 years). Mean age at diagnosis of first metastasis was 58.8 years (median 62.4, 95% CI 56.1-61.5 years), with a mean disease-free interval (DFI) of 3.6 years (median 1.9, 95% CI 1.9-5.3 years). Ninetynine (78%) patients had liver metastases (LM), 28 (22%) had local or nodal involvement, 9 (7.1%) had lung metastases and 13 (10.2%) had other visceral metastases (CNS, kidney, spleen, adrenal gland, bone), 30 (23.6%) patients had multiple sites of disease. Lung metastases were more frequent in females (OR 9.17, 95% CI 1.11-75.96, p = 0.037). LDH and gGT levels at the first metastasis onset, were inversely correlated with survival (p < 0.05). Survival was significantly poorer in LM bearers (13% versus 55% 1 year survival, p < 0.01). Longer DFI was a prognostic factor for not hepatic recurrence and better prognosis (logistic regression, OR 0.88, 95% CI 0.78-0.99, p < 0.05). Age at diagnosis correlated with age at recurrence and with longer DFI (p < 0.05). Considering all treatments, almost always combining locoregional and systemic therapy with fotemustine, [hepatic intra-arterial fotemustine, radiofrequency, alcoholization, surgery, intra-arterial hepatic chemoembolization with camptothecin charged microbeads (TACE)], only TACE was associated with an improved prognosis (OR 0.17, 95% CI 0.06-0.46, p < 0.01) and with a longer survival after metastasis diagnosis (p= 0.02). Conclusion(s): TACE can be combined with systemic therapy and provides a clinical benefit in UM metastases, this encourages further prospective studies, also in combination with anti-angiogenic drugs and systemic therapies.

Valpione, S., et al. (2014). "Is transhepatic chemoembolization with CPT-11 charged microbeads in combination with systemic fotemustine (f-TACE) effective in uveal melanoma liver metastases? A retrospective analysis of 127 consecutive patients." Journal of Clinical Oncology. Conference **32**(15 SUPPL. 1).

Background: Uveal melanoma is a rare cancer, it represents 5% to 6% of all melanoma diagnoses (annual incidence approximately 0.5-0.7:100000). Up to 50% of patients with UM will develop metastatic disease within 15 years from the treatment of primary tumor. The preferred spread is hematogenous and the liver is the first or prevalent site of metastatic disease in up to 95% of the recurring patients. The median survival time of metastatic uveal melanoma is generally poor, with reported median life expectancy from 3.6 to 15 months and no standard therapy established so far. Method(s): We retrospectively reviewed our database of patients treated at Veneto Region Oncology Research Institute for metastatic uveal melanoma, grouped by liver replacement percentage, to evaluate the benefit of treatment with transarterial chemoembolization with CPT-11 charged microbeads combined with systemic fotemustine (f-TACE) in this set of patients. From 1990 to 2013, 156 patients were treated for metastatic uveal melanoma in our Centre. Among them, 147 patients had liver metastases and 127 had enough information recorded to perform the study and were analyzed. Result(s): Among 127 patients with liver metastases, 49 were treated with f-TACE as first line-therapy. The cohort of patients treated with f-TACE and the cohort that did not receive f-TACE were not significantly different for prognostic factors. The treatment with f-TACE conferred a survival advantage (20.6 vs 14.7 months, respectively; p=.050); the advantage was maintained when analysis was performed with stratification for liver metastatic substitution (HR= 0.58, p=.002). The treatment was not affected by severe toxicities. Conclusion(s): F-TACE seems a tolerable regimen that confers an improvement in survival of uveal melanoma patients with liver metastases. Our data prompt for the conduction of perspective comparative studies confirming the efficacy of f-TACE and, in the future, we advise combination treatments with targeted drugs.

Valverde, A., et al. (2018). "Electrochemical immunosensor for IL-13 Receptor alpha2 determination and discrimination of metastatic colon cancer cells." Biosensors & Bioelectronics **117**: 766-772.

This work describes the first electrochemical immunosensor reported for the determination of IL-13 receptor Ralpha2 (IL-13Ralpha2), an emerging relevant biomarker in metastatic colon cancer. The approach involves the formation of sandwich immunocomplexes using specific capture (CAb) and biotinylated detector antibodies (BDAb) further labeled with an streptavidin-horseradish peroxidase (Strep-HRP) polymer, onto carboxylic acid-modified magnetic microbeads (HOOC-MBs). Amperometric detection at disposable carbon screen-printed electrodes (SPCEs) using the (H₂O₂)/hydroquinone (HQ) system was employed to monitor the affinity reactions. The developed immunosensor exhibits a linear calibration plot over the 3.9-100ngmL⁻¹ concentration range, a LOD of 1.2ngmL⁻¹ and excellent selectivity against other non-target proteins. The amperometric immunosensor was applied successfully to quantify for the first time the IL-13Ralpha2 expression in raw lysates of colon cancer cells and to discriminate the metastatic potential of intact cells through recognition of this target extracellular receptor. In comparison with the commercial Enzyme-Linked ImmunoSorbent Assay (ELISA) kit involving the same immunoreagents, the immunosensor provides a similar LOD in a half-time for the assay.

Van, A., et al. "Persistent organic pollutants in plastic marine debris found on beaches in San Diego,

California." Chemosphere.

Plastic debris were collected from eight beaches around San Diego County, California. Debris collected include: pre-production pellets and post-consumer plastics including fragments, polystyrene (PS) foam, and rubber. A total of n = 2453 pieces were collected ranging from <5 mm to 50 mm in size. The plastic pieces were separated by type, location, and appearance and analyzed for polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), dichlorodiphenyltrichloroethane (DDT) and its breakdown products, and chlordanes. PAH concentrations ranged from 30 ng g⁻¹ to 1900 ng g⁻¹, PCBs from non-detect to 47 ng g⁻¹, chlordanes from 1.8 ng g⁻¹ to 60 ng g⁻¹, and DDTs from non-detect to 76 ng g⁻¹. Consistently higher PAH concentrations found in PS foam samples (300-1900 ng g⁻¹) led us to examine unexposed PS foam packaging materials and PS virgin pellets. Unexposed PS foam contained higher concentrations of PAHs (240-1700 ng g⁻¹) than PS virgin pellets (12-15 ng g⁻¹), suggesting that PAHs may be produced during manufacturing. Temporal trends of debris were investigated at one site, Ocean Beach, where storm events and beach maintenance were found to be important variables influencing debris present at a given time. © 2011 Elsevier Ltd. All rights reserved.

Van Benthum, W. A. J., et al. (1995). "Solids retention time in heterotrophic and nitrifying biofilms in a biofilm airlift suspension reactor." Water Science and Technology **32 (8)**: 53-60.

The solids retention time in biofilms was determined by using fluorescent microbeads as solid tracers. Attachment to and detachment from the biofilms, as well as surface concentration of the microbeads were measured. The surface concentration depended on the surface characteristics of the biofilms. The attachment rate was equal in three experiments and dependent on hydrodynamic conditions in the reactor. In all cases the detachment rate was much smaller than the attachment rate and larger than the average solids retention time of the active biomass. Release of the beads was determined by local, nonuniform detachment phenomena. Microbeads were observed to penetrate into the biofilms. This is not in accordance with conventional biofilm models. Therefore a new biofilm model concept is proposed. The biofilm is a dynamic structure, in which formation of cracks and fissures is taking place continuously. The crevices are filled with fresh biomass rapidly and particulates which are present are entrapped inside the biofilm.

Van Cauwenberghe, L., et al. (2013). "Assessment of marine debris on the Belgian Continental Shelf." Marine Pollution Bulletin **73**(1): 161-169.

A comprehensive assessment of marine litter in three environmental compartments of Belgian coastal waters was performed. Abundance, weight and composition of marine debris, including microplastics, was assessed by performing beach, sea surface and seafloor monitoring campaigns during two consecutive years. Plastic items were the dominant type of macrodebris recorded: over 95% of debris present in the three sampled marine compartments were plastic. In general, concentrations of macrodebris were quite high. Especially the number of beached debris reached very high levels: on average 6429 +/- 6767 items per 100. m were recorded. Microplastic concentrations were determined to assess overall abundance in the different marine compartments of the Belgian Continental Shelf. In terms of weight, macrodebris still dominates the pollution of beaches, but in the water column and in the seafloor microplastics appear to be of higher importance: here, microplastic weight is approximately 100 times and 400 times higher, respectively, than macrodebris weight. © 2013 Elsevier Ltd.

Van Colen, C., et al. (2020). "Does microplastic ingestion by zooplankton affect predator-prey interactions? An experimental study on larviphagy." Environmental Pollution **256**: 113479.

Litter is omnipresent in the ocean where it can be ingested by marine biota. Although ingestion of microplastics (MPs) is abundantly reported, insights into how MP can influence predator-prey interactions currently limits our understanding of the ecological impact of MPs. Here we demonstrate trophic transfer of MPs from zooplankton to benthic filter feeders, through consumption of contaminated prey (i.e. prey with ingested MP). However, predation rates of contaminated prey were significantly lower as compared to predation rates of prey that had no MPs ingested. As filter feeder clearance rates were not affected by consumption of MPs, the lower predation rates of contaminated prey appear to be primarily explained by disruption in zooplankton swimming behaviour that reduces their filtration risk. This is the first study that shows how MPs can change predator-prey interactions that are involved in the coupling between the pelagic and seabed habitat.

van der Hal, N., et al. (2017). "Exceptionally high abundances of microplastics in the oligotrophic Israeli Mediterranean coastal waters." Marine Pollution Bulletin **116**(1-2): 151-155.

Seasonal sea surface microplastic distribution was recorded at 17 sites along the Israeli Mediterranean coast. Microplastics (0.3-5 mm) were found in all samples, with a mean abundance of 7.68 +/- 2.38 particles/m³ or 1,518,340 particles/km². Some areas had higher abundances of microplastics than others, although differences were neither consistent nor statistically significant. In some cases microplastic particles were found floating in large patches. One of these patches contained an extraordinary number of plastic particles; 324 particles/m³ or 64,812,600 particles/km². Microplastic abundances in Israeli coastal waters are disturbingly high; mean values were 1-2 orders of magnitude higher than abundances reported in other parts of the world. Light-colored (white or transparent) fragments were by far more abundant than all other microplastic colors and types. The results of this study underline the need for action to reduce the flux of plastics to the marine environment. Copyright © 2016 Elsevier Ltd

van der Hal, N., et al. (2020). "Uptake and incorporation of PCBs by eastern Mediterranean rabbitfish that consumed microplastics." Marine Pollution Bulletin **150**: 110697.

Two experiments were executed to assess the feasibility of Polychlorinated Biphenyls (PCBs) transfer to fish tissues via MPs as a vector. PCBs that occur in the marine environment were tested for their adsorption to four different MP types. PCB congeners showed the highest adsorption levels to Polypropylene homo-polymer. The uptake of PCBs through MP ingestion was tested in an outdoor mesocosm using the herbivorous rabbitfish, Siganus rivulatus in the eastern Mediterranean Sea. Polypropylene homo-polymer particles (0.3-5.0mm) pre saturated with 11 PCB congeners, in two concentrations (500ng/g and 5000ng/g), were mixed with dough and offered to the fish. PCBs were identified after two weeks in fish muscle tissues, but not in the liver. These results suggest that ingestion of contaminated MP by rabbitfish might harm them in the long run, and perhaps even those who consume them on a regular basis, e.g. rabbitfish predators and humans.

van der Wel, C., et al. (2017). "Microparticle Assembly Pathways on Lipid Membranes." Biophysical Journal **113**(5): 1037-1046.

Understanding interactions between microparticles and lipid membranes is of increasing importance, especially for unraveling the influence of microplastics on our health and environment. Here, we study how a short-ranged adhesive force between microparticles and model lipid membranes causes membrane-mediated particle assembly. Using confocal microscopy, we observe the initial particle attachment to the membrane, then particle wrapping, and in rare cases spontaneous membrane tubulation. In the attached state, we measure that the particle mobility decreases by 26%. If multiple particles adhere to the same vesicle, their initial single-particle state determines their interactions and subsequent assembly pathways: 1) attached particles only aggregate when small adhesive vesicles are present in solution, 2) wrapped particles reversibly attract one another by membrane deformation, and 3) a combination of wrapped and attached particles form membrane-mediated dimers, which further assemble into a variety of complex structures. The experimental observation of distinct assembly pathways, induced only by a short-ranged membrane-particle adhesion, shows that a cytoskeleton or other active components are not required for microparticle aggregation. We suggest that this membrane-mediated microparticle aggregation is a reason behind reported long retention times of polymer microparticles in organisms.

Van Deun, K., et al. (2008). "Short-chain fatty acids and L-lactate as feed additives to control Campylobacter jejuni infections in broilers." Avian Pathology **37**(4): 379-383.

The usefulness of butyrate, acetate, propionate and l-lactate for the control of Campylobacter jejuni infections in broilers was assessed. For this purpose, the effect of these acids on the growth of C. jejuni in broth and intestinal mucous was determined, as well as their influence on the invasiveness of C. jejuni in intestinal epithelial cells. From these in vitro obtained results, one acid was retained for use as a feed additive in an in vivo trial. Butyrate was the most successful of the short-chain fatty acids, with 12.5 mM being bactericidal for C. jejuni at pH 6.0. Propionate and acetate had a bacteriostatic effect at 50 mM. None of the short-chain fatty acids had a bactericidal effect at pH 7.5 at a maximum concentration of 50 mM. Mucous increased the minimum bactericidal concentration of butyrate, but not the bacteriostatic concentrations of propionate or acetate. When C. jejuni was incubated in growth subinhibitory concentrations of butyrate, acetate or propionate or 25 mM L-lactate, no alteration in the invasive capabilities of C. jejuni in Caco-2 cells was observed. The addition of butyrate-coated micro-beads to the feed was unsuccessful to reduce C. jejuni caecal colonization in a seeder model using 2-week-old broilers. In conclusion, despite the marked bactericidal effect of butyrate towards C. jejuni in vitro, butyrate-coated micro-beads do not protect broilers from caecal colonization with C. jejuni in the applied test conditions. This might be partially ascribed to the protective effect of mucous and the rapid absorption of butyrate by the enterocytes.

Van Dommelen, S., et al. (2016). "Exposure of cancer cells to EGFR-inhibitors changes protein composition of extracellular vesicles." Journal of Extracellular Vesicles **5**: 5-6.

Background: Tumour cell-derived extracellular vesicles (EVs) reflect the status of the parental cells. This makes EVs promising candidates for biomarkers, for example to monitor treatment. In this study, we exposed tumour cells to cetuximab (a monoclonal antibody that blocks the activation of epidermal growth factor receptor (EGFR) and erlotinib (a kinase inhibitor blocking EGFR-signal transduction) and examined the effect on extracellular vesicle composition. Method(s): We exposed A431 human epidermoid carcinoma cells to 1 mM erlotinib or 100 mg/ml cetuximab. In one set-up we used ultracentrifugation to isolate extracellular vesicles followed by western blotting of EGFR and phospho-EGFR (pEGFR) and vesicles markers Alix, TSG101 and CD9. In another set-up we captured the extracellular vesicles with magnetic microbeads and isolated them in a magnetic stand. We used fluorescent antibodies to probe the vesiclesurface for EGFR, CD147 and tetraspanins and analysed fluorescence on a flow cytometer. Result(s): Using the ultracentrifugation set-up, we could demonstrate that both

EGFR and pEGFR on the EVs were reduced after cetuximab treatment, reflecting similar changes in the parental cells. Also the expression of the tetraspanin CD9 was reduced. Using density gradient ultracentrifugation, we could observe that cetuximab bound to EVs. EV-associated cetuximab retained its activity. For the magnetic beads conjugated with anti-CD9 antibody we could capture tumour-derived EVs directly from cell culture medium. Analysis by flow cytometry showed marked loss of CD147 and EGFR for EVs form cetuximab treated cells, which was not the case for cells treated with erlotinib. Discussion(s): Cetuximab treatment alters the composition of EVs, reflecting the parental cell status. This indicates that EVs could serve as biomarkers to monitor cetuximab treatment efficacy.

Van Driessche, W., et al. (1993). "An automatic monitoring system for epithelial cell height." Pflugers Archiv - European Journal of Physiology **425**(1-2): 164-171.

This paper describes an automatic method to measure cell height (h) of epithelia grown as monolayers on transparent filter supports. Tissues are mounted in an Ussing-type chamber enabling solution exchange on both sides. The apical and basal side of the epithelial cells are marked with fluorescent beads. The image of the fluospheres is captured with a video camera and processed by a computer-based video imaging system. One basal reference bead in a gelatin layer on the filter support and up to three beads attached at the apical surface are used to monitor changes in cell height of three cells simultaneously. The focusing of the microbeads is done automatically by moving the objective with a piezoelectric device mounted on the nosepiece of the microscope. The algorithm for locating the bead is based on the changes in fluorescent light intensity emitted by the fluospheres. The method has an accuracy higher than 0.1 micron and a time resolution as low as 6 s if measurements are restricted to one bead at the apical side. The method was tested on artificial model systems and used to measure volume changes in renal cultured epithelia (A6) after exposing the serosal surface to hypotonic solutions and replacing cell-impermeable sucrose by an organic compound (glycerol) with a smaller reflection coefficient. Serosal hypotonicity elicited a rapid volume increase followed by regulatory volume decrease, whereas the organic compound replacement caused a steady increase in cell volume.

van Franeker, J. A., et al. (2011). "Monitoring plastic ingestion by the northern fulmar Fulmarus glacialis in the North Sea." Environmental Pollution **159**(10): 2609-2615.

The abundance of plastics in stomachs of northern fulmars from the North Sea is used in the OSPAR Ecological Quality Objective (EcoQO) for marine litter. The preliminary EcoQO defines acceptable ecological quality as the situation where no more than 10% of fulmars exceed a critical level of 0.1 g of plastic in the stomach. During 2003–2007, 95% of 1295 fulmars sampled in the North Sea had plastic in the stomach (on average 35 pieces weighing 0.31 g) and the critical level of 0.1 g of plastic was exceeded by 58% of birds, with regional variations ranging from 48 to 78%. Long term data for the Netherlands since the 1980s show a decrease of industrial, but an increase of user plastics, with shipping and fisheries as the main sources. The EcoQO is now also used as an indicator for Good Environmental Status in the European Marine Strategy Framework Directive. [Copyright &y& Elsevier] van Franeker, J. A., et al. (2018). "Plastic ingestion by harbour porpoises <italic>Phocoena phocoena</italic> in the Netherlands: Establishing a standardised method." AMBIO - A Journal of the Human Environment **47**(4): 387-397.

Stomach contents of harbour porpoises (<italic>Phocoena phocoena</italic>) collected in the Netherlands between 2003 and 2013 were inspected for the presence of plastic and other man-made litter. In 654 stomach samples the frequency of occurrence of plastic litter was 7% with less than 0.5% additional presence of non-synthetic man-made litter. However, we show that when a dedicated standard protocol for the detection of litter is followed, a considerably higher percentage (15% of 81 harbour porpoise stomachs from the period 2010-2013) contained plastic litter. Results thus strongly depended on methods used and time period considered. Occurrence of litter in the stomach was correlated to the presence of other non-food remains like stones, shells, bog-wood, etc., suggesting that litter was often ingested accidentally when the animals foraged close to the bottom. Most items were small and were not considered to have had a major health impact. No evident differences in ingestion were found between sexes or age groups, with the exception that neonates contained no litter. Polyethylene and polypropylene were the most common plastic types encountered. Compared to earlier literature on the harbour porpoise and related species, our results suggest higher levels of ingestion of litter. This is largely due to the lack of dedicated protocols to investigate marine litter ingestion in previous studies. Still, the low frequency of ingestion, and minor number and mass of litter items found in harbour porpoises in the relatively polluted southern North Sea indicates that the species is not a strong candidate for annual monitoring of marine litter trends under the EU marine strategy framework directive. However, for longer-term comparisons and regional differences, with proper dedicated protocols applied, the harbour porpoise has specific use in quantifying litter presence in the, for that specific objective, poorly studied benthic marine habitat. [ABSTRACT FROM AUTHOR]

van Franeker, J. A. and K. L. Law (2015). "Seabirds, gyres and global trends in plastic pollution." Environmental Pollution **203**: 89-96.

Fulmars are effective biological indicators of the abundance of floating plastic marine debris. Long-term data reveal high plastic abundance in the southern North Sea, gradually decreasing to the north at increasing distance from population centres, with lowest levels in high-arctic waters. Since the 1980s, pre-production plastic pellets in North Sea fulmars have decreased by ~75%, while user plastics varied without a strong overall change. Similar trends were found in net-collected floating plastic debris in the North Atlantic subtropical gyre, with a ~75% decrease in plastic pellets and no obvious trend in user plastic. The decreases in pellets suggest that changes in litter input are rapidly visible in the environment not only close to presumed sources, but also far from land. Floating plastic debris is rapidly “lost” from the ocean surface to other as-yet undetermined sinks in the marine environment. [ABSTRACT FROM AUTHOR]

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van Leusden, P., et al. (2016). "Structure engineering of filled protein microbeads to tailor release of oil droplets in gastric digestion." Food & Function **7**(8): 3539-3547.

Oil-soluble components can be encapsulated in an O/W1/W2 microsystem, in which they are dissolved in oil droplets dispersed in a gelled microbead (W1), which forms a barrier between the oil droplets and the aqueous continuous phase (W2). We investigated the rate and mechanism of breakdown of protein microbeads in a simulated gastric system, and studied the influence of microbead protein concentration, gelling method (cold-set, slow and fast heat-set), and further processing (freeze-drying), on the breakdown process. Breakdown rate decreased with increasing protein content of the beads, for the same method of production. Due to the porosity of the slowly-heated heat-set beads, breakdown occurred evenly throughout the entire bead. Cold-set microbeads of 10% protein broke down slightly slower than the heat-set microbeads of 15%. The denser surface of the 10% beads slowed down the diffusion of the enzymes into the bead's interior, causing the beads to be broken down from the outside inward. All these beads broke down within one hour. Increasing the rate of temperature increase during the heating step dramatically slowed breakdown. There was no significant breakdown of rapidly heated beads within 138 minutes, even though no difference in microstructure between rapidly and slowly heated beads was visible with electron microscopy. Freeze-drying of the beads also slowed their breakdown. After 132 minutes more than half the measured particle volume of were intact beads. Freeze-drying changed the microstructure of the beads irreversibly: rehydrating the dried beads did not result in a breakdown behaviour similar to that of unprocessed beads.

Van Nguyen, Q., et al. (2019). "Improvement of bio-crude oil properties via co-pyrolysis of pine sawdust and waste polystyrene foam." Journal of Environmental Management **237**: 24-29.

Conversion technology of solid biomass to liquid fuel, named bio-crude oil, has been researched widely for the production of renewable energy to replace fossil fuel oil. As the result of many admirable researches, fast pyrolysis technology for bio-crude oil production is close to commercialization. However, bio-crude oil has unsatisfactory properties compared to general petroleum oil, for instance, low heating value, high water content, and high viscosity. In this study, pine sawdust (SD) biomass was co-pyrolyzed with waste polystyrene foam (WPSF), which was expected to improve the bio-crude oil quality due to high heating value and non-oxygen composition of polystyrene. The co-pyrolysis experiment was conducted in a bubbling fluidized bed reactor under the following conditions: temperature of 500 °C which was chosen based on the results from thermogravimetric analysis of SD and WPSF, nitrogen flow rate of 20–25 L/min., and feeding rate of 200 g/hr. Various mixing ratios of SD/WPSF by weight percentage were tested as follows: 100/0, 95/5, 90/10, 85/15, 80/20, 75/25, 70/30, 60/40, 50/50, 25/75, 0/100. Experimental results showed that in case of only SD feeding the bio-crude oil yield and higher heating value (HHV) were 48.83 wt% and 17.81 MJ/kg respectively. By contrast, oil yield and HHV in case of 25% SD with 75% WPSF mixture were 63.31 wt% and 39.65 MJ/kg respectively. Additional analysis showed that water content, and acetic acid concentration of bio-crude oil from co-pyrolysis of SD/WPSF mixture were decreased almost proportionally with the increasing WPSF ratio. Furthermore, measured values of water content, and acetic acid concentration were lower than the calculated values by linear interpolation, which means that the synergistic effect between SD and WPSF was achieved during the co-pyrolysis. In conclusion, co-pyrolysis of SD

and WPSF was found as a promising solution to improve bio-crude oil quality. With this technology, the industrial growth of bio-crude oil area is expected as well as waste plastic. Highlights • Pine sawdust (SD) biomass was co-pyrolyzed with waste polystyrene foam (WPSF). • HHV of bio-crude oil yield was increased for SD/WPSF mixtures. • The water content, and acetic acid concentration of SD/WPSF mixtures were decreased. [ABSTRACT FROM AUTHOR]
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van Raamsdonk, L. W. D., et al. (2020). "Current Insights into Monitoring, Bioaccumulation, and Potential Health Effects of Microplastics Present in the Food Chain." Foods **9**(1): 09.

Microplastics (MPs) are considered an emerging issue as environmental pollutants and a potential health threat. This review will focus on recently published data on concentrations in food, possible effects, and monitoring methods. Some data are available on concentrations in seafood (fish, bivalves, and shrimps), water, sugar, salt, and honey, but are lacking for other foods. Bottled water is a considerable source with numbers varying between 2600 and 6300 MPs per liter. Particle size distributions have revealed an abundance of particles smaller than 25 micro m, which are considered to have the highest probability to pass the intestinal border and to enter the systemic circulation of mammals. Some studies with mice and zebrafish with short- or medium-term exposure (up to 42 days) have revealed diverse results with respect to both the type and extent of effects. Most notable modifications have been observed in gut microbiota, lipid metabolism, and oxidative stress. The principal elements of MP monitoring in food are sample preparation, detection, and identification. Identified data gaps include a lack of occurrence data in plant- and animal-derived food, a need for more data on possible effects of different types of microplastics, a lack of in silico models, a lack of harmonized monitoring methods, and a further development of quality assurance.

Van Ta, T., et al. (2019). "The correlation between clinical manifestations and cytokine concentrations in Vietnamese children with dengue hemorrhagic fever." Systematic Reviews in Pharmacy **10**(2): 15-21.

Background: All over the world, dengue hemorrhagic fever (DHF) causes mortality each year. To determine the development and severity of DHF, healthcare professionals usually record and monitor clinical manifestations and the functioning of the immune system. Nevertheless, many issues remain unclear as to the influence of cytokine concentrations on clinical symptoms. Objective(s): This study was aimed at ascertaining the correlation between clinical manifestations and cytokine concentrations in children with DHF. Material(s) and Method(s): A prospective cohort study was conducted involving 234 patients who were serologically diagnosed with dengue virus infection in Tien Giang Hospital. The patients' clinical symptoms, such as fever duration on hospital admission, vomiting, abdominal pain, mucosal bleeding, bleeding under the skin, hepatomegaly, and high bodily temperature, were documented every day from admission to discharge. Cytokine concentrations were detected and measured via multiplex microbead immunoassay. The correlation between cytokine concentration and each clinical manifestation was then identified. Result(s): Interleukin-6 (IL-6) concentration affected the manifestation of abdominal pain in the patients, and high concentrations of IL-2, IL-4, and IL-13 increased the occurrence of hepatomegaly. Temperature was influenced by IL-5, IL-10, and IL-12 concentrations. Conclusion(s): The findings confirmed the correlation between cytokine van Truong, N. and C. beiPing (2019). "Plastic marine debris: sources, impacts and management." International Journal of Environmental Studies **76**(6): 953-973.

Marine plastic has many negative impacts on coastal countries, including Vietnam. Vietnamese waters face problems of marine pollution owing to plastic waste. There are few studies on controlling marine plastic waste generated by marine-based activities. Therefore, this paper aims to provide a general view of marine plastics based on existing academic articles, and the impacts on marine animals and on human health. The paper includes a brief account of the quantity of marine plastic waste on coastal Vietnam and offers some recommendations for Vietnam to minimise and manage plastic waste generated by ships. [ABSTRACT FROM AUTHOR]

Van Vuren, A. J., et al. (2019). "A unique monocyte transcriptome discriminates sickle cell disease from other hereditary hemolytic anemias and shows the particular importance of lipid and interferon signaling." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Introduction Sickle cell disease (SCD) is a hereditary hemolytic disease characterized by a complex pathophysiology including inflammation and oxidative stress. Intravascular hemolysis leads to release of heme, an erythrocyte-derived Danger Associated Molecular Pattern (e-DAMP) that augments Toll Like Receptor 4 (TLR4) signaling. TLR4 signaling is important in development of acute and chronic complications in SCD. We investigated gene expression profiles of TLR4⁺ cells (by positive selection of its co-receptor CD14) of patients with SCD and other hemolytic anemias to identify differential regulated pathophysiological pathways. Methods Analyses were performed in 60 adults with hereditary hemolytic anemia and 10 healthy controls included in the ZEbRA cohort (UMC Utrecht, [NL5189]). Patients treated with systemic antiinflammatory drugs were excluded (n=1). Deferasirox (DFX)-treated SCD patients were analyzed separately as DFX ameliorated pro-inflammatory effects of heme. CD14⁺ cells were isolated using anti-CD14 microbeads. RNA sequencing was performed on a Nextseq500 platform (Illumina) using a single-end 75bp high-output run. Differentially expressed genes (DEGs) were identified using DESeq2 v1.24.0 in R. To correct for presence of reticulocytes and lymphocytes, data were corrected for expression of 4 hemoglobin (HBA1, HBB, HBG1, HBG2) and 4 T cell specific genes (CD3E, CD3D, CD3G, CD247). A list was constructed from all genes differentially expressed (adj. p<0.01; absolute log2fold change >1) in both the comparisons of SCD without DFX versus other hemolytic anemias and of SCD without DFX versus healthy controls. Pathway enrichment analysis (ReactomePA v1.28.0 in R) was performed with preselected DEGs (adj. p<0.1; absolute log2fold change >0.5). P-values were adjusted with the Benjamini-Hochberg procedure. Results Demographics and hematological values are provided in Table 1. Principal component analysis based on RNA sequencing data separated SCD patients without DFX from hemolytic anemia patients, healthy controls and SCD patients with DFX (Figure 1). Analysis of DEGs discriminating SCD patients from both patients with other hemolytic anemias and healthy controls rendered 29 genes (Figure 2). Heme

oxygenase-1 (HMOX1) was one of these genes (versus healthy controls adj. p=5.6E-13; versus other hemolytic anemias adj. p=3.3E-15) and this is in line with the hypothesis that intravascular free heme is an important effector of gene regulation in monocytes. This sets SCD apart from the other studied hemolytic anemias. The other 28 genes included, PPARG, GUCY1A1, KLF5 and CXCR3 signaling (CXCL9 and CXCL11) which are associated with vascular remodeling and development of pulmonary hypertension. The list of 29 DEGs highlights interesting differences in gene expression of two processes related to immune signaling: CXCR3 signaling by CXCL9 and CXCL11, and lipid metabolism (STARD4, DLC1, SQLE, ME1). Pathway enrichment analysis showed enrichment of genes involved in IFN signaling (type I and II) in SCD versus healthy controls (adj. p=4.4E-16). And, in line with the list of 29 genes, enrichment of genes concerning chemokine signaling in SCD versus both healthy controls and other hemolytic anemias (respectively adj. p=0.06 and adj. p=0.01) and cholesterol biosynthesis in SCD versus other hemolytic anemias (adj. p=0.09). Conclusion Our data shows the unique inflammatory profile of SCD monocytes as opposed to other hemolytic anemias. Moreover, it suggests that lipid metabolism and IFN signaling are important differentiating immune signaling pathways. It is known that alterations in plasma lipid levels in SCD relate to hemolytic severity and vasculopathy. Our data suggests an important role for lipid biology in SCD monocytes. We hypothesize on an important contribution of cholesterol accumulation in enhancement of TLR4 signaling, as lipid rafts accelerated Nf-kB activation in macrophages. (Lee et al., Nat. Commun. 2017; Koseki et al., J. Lip. Res. 2007) The importance of type I and II IFN signaling in SCD sugges s widespread involvement of the immune system. IFNg-inducible cytokines CXCL9 and CXCL11 are associated with Th1 polarization and activation. In summary, the data support the unique role of monocyte immune signaling in SCD. Furthermore, we identified pathways that seem to be relevant for immune regulation and thereby for development of disease complications. (Figure Presented).

van Weert, S., et al. (2019). "Effects of nanoplastics and microplastics on the growth of sediment-rooted macrophytes." Science of the Total Environment **654**: 1040-1047.

Plastic debris of all sizes has been detected in marine, terrestrial and freshwater habitats. Effects of plastic debris on macrophytes have hardly been studied, despite their importance in aquatic ecosystems. We provide the first experimental study exploring nano- and microplastic effects on the growth of sediment-rooted macrophytes. Myriophyllum spicatum and Elodea sp. were exposed to sediments amended with six doses of polystyrene (PS) nanoplastic (50-190nm, up to 3% sediment dry weight) and PS microplastic (20-500mum, up to 10% dry weight) under laboratory conditions. Both macrophyte species were tested for changes in root and shoot dry weight (DW), relative growth rate (RGR), shoot to root ratio (S:R), main shoot length and side shoot length. Microplastics did not produce consistent dose-effect relationships on the endpoints tested, except that main shoot length was reduced for M. spicatum with increasing microplastic concentration. Nanoplastic significantly reduced S:R for both macrophytes as a result of increased root biomass compared to shoot biomass. Nanoplastic also caused a decrease in M. spicatum main shoot length; however, shoot biomass was not affected. Elodea sp. side shoot length, root and shoot biomass and RGR were positively correlated to the nanoplastic concentration. All effects occurred at higher than environmentally realistic concentrations, suggesting no immediate implications for ecological risks. Our study did not aim for the elucidation of the exact mechanistic processes that cause the effects, however, particle size seems to play an important factor. CAPSULE: Nano- and microplastics affect growth of sediment-rooted macrophytes.

van Wezel, A., et al. (2016). "Release of primary microplastics from consumer products to wastewater in the Netherlands." Environmental Toxicology & Chemistry **35**(7): 1627-1631.

The authors estimate the release of primary microplastics from consumer products-cosmetics and personal care products, cleaning agents, and paint and coatings-via sewage effluent as an expected relevant route to the marine environment. Total estimated concentrations in the 3 scenarios are 0.2 mug/L, 2.7 mug/L, and 66 mug/L in sewage-treatment plant (STP) effluent, respectively. All product categories relevantly contribute. Predicted concentrations are compared with reported actual concentrations in STP effluents. Environ Toxicol Chem 2016;35:1627-1631. © 2015 SETAC.

Vancamp, P., et al. (2019). "Gender-specific effects of transthyretin on neural stem cell fate in the subventricular zone of the adult mouse." Scientific Reports **9**(1): 19689.

Choroid plexus epithelial cells produce and secrete transthyretin (TTR). TTR binds and distributes thyroid hormone (TH) to brain cells via the cerebrospinal fluid. The adult murine subventricular zone (SVZ) is in close proximity to the choroid plexus. In the SVZ, TH determines neural stem cell (NSC) fate towards a neuronal or a glial cell. We investigated whether the loss of TTR also disrupted NSC fate choice. Our results show a decreased neurogenic versus oligodendrogenic balance in the lateroventral SVZ of Ttr knockout mice. This balance was also decreased in the dorsal SVZ, but only in Ttr knockout male mice, concomitant with an increased oligodendrocyte precursor density in the corpus callosum. Quantitative RTqPCR analysis following FACS-dissected SVZs, or marked-coupled microbeads sorting of in vitro neurospheres, showed elevated Ttr mRNA levels in neuronal cells, as compared to uncommitted precursor and glial cells. However, TTR protein was undetectable in vivo using immunostaining, and this despite the presence of Ttr mRNA-expressing SVZ cells. Altogether, our data demonstrate that TTR is an important factor in SVZ neuro- and oligodendrogenesis. They also reveal important gender-specific differences and spatial heterogeneity, providing new avenues for stimulating endogenous repair in neurodegenerative diseases.

Vance, D. T., et al. (2013). "Proteomic and functional comparison of phagocytosis by Fc versus oxLDL receptors in human macrophages." FEBS Journal **1)**: 475.

The inflammatory activation of macrophages by solid aggregates of oxidized low density lipoprotein (oxLDL) in the intima of the arteries is a decisive event on the path to coronary artery disease. However the receptor mechanism by which oxLDL aggregates interact with the macrophages to trigger their phagocytosis is not well understood. The role of the receptor signaling complexes in phagocytosis was examined using polystyrene microbeads opsonized with the ligands oxLDL versus immunoglobulin G (IgG). The phagocytosis of 2 lm polystyrene beads opsonized with ox- LDL showed different temporal patterns of internalization and modification by serum factors when compared to that of IgGcoated beads. Actin was observed to polymerize at the site of the ligand-microbead receptors and to form a dense layer that surrounded the particles from the time of binding to engulfment. Liquid chromatography and tandem mass spectrometry were used to characterize the receptor complexes associated with oxLDL- versus IgG-coated beads leading to the identification of a detailed list of actin related proteins, binding factors, and signaling enzymes that were specific to the oxLDL- versus IgGligand. In agreement with the mass spectral results, treatment with pharmacological inhibitors of SRC, PLC and JAK or the actin cytoskeleton prevented the phagocytosis of both oxLDL and IgG microbeads as measured by laser confocal microscopy. Specific isoforms of PI3K, FAK and SYK were strongly associated with the oxLDL receptor complex and the phagocytosis of oxLDL microbeads was more sensitive to inhibition of PI3K, FAK and SYK activity compared to that of IgG. Silencing RNA against SYK inhibited the phagocytosis of oxLDL microbeads but did not inhibit clearance of IgG opsonized beads. The results showed the differential mass spectral analysis of functionally similar receptors and revealed receptor-specific drug targets that were inhibited or silenced to prevent the inflammatory accumulation of oxLDL particles but that did not prevent bacterial clearance by macrophages.

VandenBerg, N. (1991). "Plastic Film Recycling." BioCycle **32**(12): 67.
Film plastics, the thin-gauge plastics used for wrappings and plastic bags, constitue up to 60% of the plastic waste stream and about 3.5% of the solid waste stream, yet little attention has been paid to them in plastic recycling programs. Film plastic recycling efforts must target sources such as commercial and institutional sources, address contamination issues, and develop processing capacities. Final markets for clean film plastic must be developed as well.

Vandermeersch, G., et al. (2015). "A critical view on microplastic quantification in aquatic organisms. (Special Issue: Non-regulated environmental contaminants in seafood: contributions of the ECsafeSEAFOOD EU project.)." Environmental Research **143**(Part B): 46-55.
Microplastics, plastic particles and fragments smaller than 5 mm, are ubiquitous in the marine environment. Ingestion and accumulation of microplastics have previously been demonstrated for diverse marine species ranging from zooplankton to bivalves and fish, implying the potential for microplastics to accumulate in the marine food web. In this way, microplastics can potentially impact food safety and human health. Although a few methods to quantify microplastics in biota have been described, no comparison and/or intercalibration of these techniques have been performed. Here we conducted a literature review on all available extraction and quantification methods. Two of these methods, involving wet acid destruction, were used to evaluate the presence of microplastics in field-collected mussels (Mytilus galloprovincialis) from three different "hotspot" locations in Europe (Po estuary, Italy; Tagus estuary, Portugal; Ebro estuary, Spain). An average of 0.18+or-0.14 total microplastics g⁻¹ w.w. for the Acid mix Method and 0.12+or-0.04 total microplastics g⁻¹ w.w. for the Nitric acid Method was established. Additionally, in a pilot study an average load of 0.13+or-0.14 total microplastics g⁻¹ w.w. was recorded in commercial mussels (Mytilus edulis and M. galloprovincialis) from five European countries (France, Italy, Denmark, Spain and The Netherlands). A detailed analysis and comparison of methods indicated the need for further research to develop a standardised operating protocol for microplastic quantification and monitoring.

Vandermeersch, G., et al. (2015). "Environmental contaminants of emerging concern in seafood--European database on contaminant levels." Environmental Research **143**(Pt B): 29-45.
Marine pollution gives rise to concern not only about the environment itself but also about the impact on food safety and consequently on public health. European authorities and consumers have therefore become increasingly worried about the transfer of contaminants from the marine environment to seafood. So-called "contaminants of emerging concern" are chemical substances for which no maximum levels have been laid down in EU legislation, or substances for which maximum levels have been provided but which require revision. Adequate information on their presence in seafood is often lacking and thus potential risks cannot be excluded. Assessment of food safety issues related to these contaminants has thus become urgent and imperative. A database (www.ecsafeseafooddbase.eu), containing available information on the levels of contaminants of emerging concern in seafood and providing the most recent data to scientists and regulatory authorities, was developed. The present paper reviews a selection of contaminants of emerging concern in seafood including toxic elements,

endocrine disruptors, brominated flame retardants, pharmaceuticals and personal care products, polycyclic aromatic hydrocarbons and derivatives, microplastics and marine toxins. Current status on the knowledge of human exposure, toxicity and legislation are briefly presented and the outcome from scientific publications reporting on the levels of these compounds in seafood is presented and discussed.

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European countries (France, Italy, Denmark, Spain and The Netherlands). A detailed analysis and comparison of methods indicated the need for further research to develop a standardised operating protocol for microplastic quantification and monitoring. [ABSTRACT FROM AUTHOR]

Vang, D. P., et al. (2013). "Induction of invasive transitional cell bladder carcinoma in immune intact human MUC1 transgenic mice: a model for immunotherapy development." Journal of Visualized Experiments(80): e50868.

A preclinical model of invasive bladder cancer was developed in human mucin 1 (MUC1) transgenic (MUC1.Tg) mice for the purpose of evaluating immunotherapy and/or cytotoxic chemotherapy. To induce bladder cancer, C57BL/6 mice (MUC1.Tg and wild type) were treated orally with the carcinogen N-butyl-N-(4-hydroxybutyl)nitrosamine (OH-BBN) at 3.0 mg/day, 5 days/week for 12 weeks. To assess the effects of OH-BBN on serum cytokine profile during tumor development, whole blood was collected via submandibular bleeds prior to treatment and every four weeks. In addition, a MUC1-targeted peptide vaccine and placebo were administered to groups of mice weekly for eight weeks. Multiplex fluorometric microbead immunoanalyses of serum cytokines during tumor development and following vaccination were performed. At termination, interferon gamma (IFN-gamma)/interleukin-4 (IL-4) ELISpot analysis for MUC1 specific T-cell immune response and histopathological evaluations of tumor type and grade were performed. The results showed that: (1) the incidence of bladder cancer in both MUC1.Tg and wild type mice was 67%; (2) transitional cell carcinomas (TCC) developed at a 2:1 ratio compared to squamous cell carcinomas (SCC); (3) inflammatory cytokines increased with time during tumor development; and (4) administration of the peptide vaccine induces a Th1-polarized serum cytokine profile and a MUC1 specific T-cell response. All tumors in MUC1.Tg mice were positive for MUC1 expression, and half of all tumors in MUC1.Tg and wild type mice were invasive. In conclusion, using a team approach through the coordination of the efforts of pharmacologists, immunologists, pathologists and molecular biologists, we have developed an immune intact transgenic mouse model of bladder cancer that expresses hMUC1.

Vangipuram, S. D. and W. D. Lyman (2010). "Ethanol alters cell fate of fetal human brain-derived stem and progenitor cells." Alcoholism: Clinical & Experimental Research **34**(9): 1574-1583.

BACKGROUND: Prenatal ethanol (ETOH) exposure can lead to fetal alcohol spectrum disorder (FASD). We previously showed that ETOH alters cell adhesion molecule gene expression and increases neurosphere size in fetal brain-derived neural stem cells (NSC). Here, our aim was to determine the effect of ETOH on the cell fate of NSC, premature glial-committed precursor cells (GCP), and premature neuron-committed progenitor cells (NCP).

METHODS: NSC, GCP, and NCP were isolated from normal second-trimester fetal human brains (n = 3) by positive selection using magnetic microbeads labeled with antibodies to CD133 (NSC), A2B5 (GCP), or PSA-NCAM (NCP). As a result of the small percentage in each brain, NSC were cultured in mitogenic media for 72 hours to produce neurospheres. The neurospheres from NSC and primary isolates of GCP and NCP were used for all experiments. Equal numbers of the 3 cell types were treated either with mitogenic media or with differentiating media, each containing 0 or 100 mM ETOH, for 120 hours. Expression of Map2a, GFAP, and O4 was determined by

immunoflourescence microscopy and western blot analysis. Fluorescence intensities were quantified using Metamorph software by Molecular Devices, and the bands of western blots were quantified using densitometry.

RESULTS: ETOH in mitogenic media promoted formation of neurospheres by NSC, GCP, and NCP. Under control conditions, GCP attached and differentiated, NSC and NCP formed neurospheres that were significantly smaller in size than those in ETOH. Under differentiating conditions, Map2a expression increased significantly in NSC and GCP and reduced significantly in NCP, and GFAP expression reduced significantly in GCP and NCP, and Gal-C expression reduced significantly in all 3 cell types in the presence of ETOH compared to controls.

CONCLUSIONS: This study shows that ETOH alters the cell fate of neuronal stem and progenitor cells. These alterations could contribute to the mechanism for the abnormal brain development in FASD.

Vani, K., et al. (2017). "Analytic Response Curves of Clinical Breast Cancer IHC Tests." Journal of Histochemistry & Cytochemistry **65**(5): 273-283.

An important limitation in the field of immunohistochemistry (IHC) is the inability to correlate stain intensity with specific analyte concentrations. Clinical immunohistochemical tests are not described in terms of analytic response curves, namely, the analyte concentrations in a tissue sample at which an immunohistochemical stain (1) is first visible, (2) increases in proportion to the analyte concentration, and (3) ultimately approaches a maximum color intensity. Using a new immunostaining tool (IHControls), we measured the analytic response curves of the major clinical immunohistochemical tests for human epidermal growth factor receptor type II (HER-2), estrogen receptor (ER), and progesterone receptor (PR). The IHControls comprise the analytes HER-2, ER, and PR at approximately log concentration intervals across the range of biological expression, from 100 to 1,000,000 molecules per test microbead. We stained IHControls of various concentrations using instruments, reagents, and protocols from three major IHC vendors. Stain intensity at each analyte concentration was measured, thereby generating an analytic response curve. We learned that for HER-2 and PR, there is significant variability in test results between clinical kits for samples with analyte concentrations of approximately 10⁴ molecules/microbead. We propose that the characterization of immunostains is an important step toward standardization.

Vanitha, V., et al. (2010). "Polychlorinatedbiphenyls in milk and rumen liquor of stray cattle in Chennai." Tamilnadu Journal of Veterinary and Animal Sciences **6**(2): 71-74.

In this study, milk and rumen liquor of stray cattle were found to contain measurable concentration of PolyChlorinatedBiphenyls (PCB). A notable finding in this study is that stray cattle have high level of PCBs where as the PCB in control group can not be detected. Since, reduction in space in the urban areas has pushed the cattle population to fend themselves in the streets, bovine milk act as a potential source of PCBs for residents in Chennai. To our knowledge, this is the first comprehensive study on exposure of stray cattle to PCBs by intake of plastic waste in India.

Vannela, R. (2012). "Are We "Digging Our Own Grave" Under the Oceans?" Environmental Science & Technology **46**(15): 7932-7933.

The article discusses the threat that plastic debris in marine environments poses to life on earth. Topics include the estimated amount of plastic debris produced annually that ends up in the world's oceans, the expansion of the Great Pacific Garbage Patch, which is an area of intense ocean currents in the Pacific Ocean that accumulates marine debris, and the ecological impact of marine debris on benthic organisms. Also discussed is the allocation of resources to identify pollution sources, compounding effects of El Nino, and the threat of plastic marine debris to earth's entire food chain. The importance of focusing on socio-economic impacts, awareness, and education programs to reduce marine plastic debris is presented.

Varbanov, P. S. (2019). "The policy debate on sustainability: issues and strategy." Clean Technologies & Environmental Policy **21**(8): 1515-1516.

It has been argued in a previous Editorial (Varbanov, P.S., Sikdar, S. & Lee, C.T., Contributing to sustainability: addressing the core problems, Clean Techn Environ Policy (2018) 20: 1121. Of similar magnitude are microplastics pollution (de Souza Machado AA, Kloas W, Zarfl C, et al. (2018) Microplastics as an emerging threat to terrestrial ecosystems. The vertical reef-based facilities for open-sea mussel farming create integrated micro-ecosystems, taking as food the excessive nutrients in the seawater. [Extracted from the article]

Vardar, E., et al. (2018). "Microfluidic production of bioactive fibrin micro-beads embedded in crosslinked collagen used as an injectable bulking agent for urinary incontinence treatment." Acta Biomaterialia **67**: 156-166.

Endoscopic injection of bulking agents has been widely used to treat urinary incontinence, often due to urethral sphincter complex insufficiency. The aim of the study was to develop a novel injectable bioactive collagen-fibrin bulking agent restoring long-term continence by functional muscle tissue regeneration. Fibrin micro-beads were engineered using a droplet microfluidic system. They had an average diameter of 140mum and recombinant fibrin-binding insulin-like growth factor-1 (alpha₂PI₁₋₈-MMP-IGF-1) was covalently conjugated to the beads. A plasmin fibrin degradation assay showed that 72.5% of the initial amount of alpha₂PI₁₋₈-MMP-IGF-1 loaded into the micro-beads was retained within the fibrin micro-beads. In vitro, the growth factor modified fibrin micro-beads enhanced cell attachment and the migration of human urinary tract smooth muscle cells, however, no change of the cellular metabolic activity was seen. These bioactive micro-beads were mixed with genipin-crosslinked homogenized collagen, acting as a carrier. The collagen concentration, the degree of crosslinking, and the mechanical behavior of this bioactive collagen-fibrin injectable were comparable to reference samples. This novel injectable showed no burst release of the growth factor, had a positive effect on cell behavior and may therefore induce smooth muscle regeneration in vivo, necessary for the functional treatment of stress and other urinary incontinences.

STATEMENT OF SIGNIFICANCE: Urinary incontinence is involuntary urine leakage, resulting from a deficient function of the sphincter muscle complex. Yet there is no functional cure for this devastating condition using current treatment options. Applied physical and surgical therapies have limited success. In this study, a novel bioactive injectable bulking agent, triggering new muscle regeneration at the injection site, has been evaluated. This injectable consists of cross-linked collagen and fibrin micro-beads, functionalized with bound insulin-like growth factor-1 (alpha₂PI₁₋₈-MMP-IGF-1). These bioactive fibrin micro-beads induced human smooth muscle cell migration in vitro. Thus, this injectable bulking agent is apt to be a good candidate for regeneration of urethral sphincter muscle, ensuring a long-lasting treatment for urinary incontinence.

Vargas, E., et al. (2018). "Single-Step Incubation Determination of miRNAs in Cancer Cells Using an Amperometric Biosensor Based on Competitive Hybridization onto Magnetic Beads." Sensors **18**(3): 15.

This work reports an amperometric biosensor for the determination of miRNA-21, a relevant oncogene. The methodology involves a competitive DNA-target miRNA hybridization assay performed on the surface of magnetic microbeads (MBs) and amperometric transduction at screen-printed carbon electrodes (SPCEs). The target miRNA competes with a synthetic fluorescein isothiocyanate (FITC)-modified miRNA with an identical sequence for hybridization with a biotinylated and complementary DNA probe (b-Cp) immobilized on the surface of streptavidin-modified MBs (b-Cp-MBs). Upon labeling, the FITC-modified miRNA attached to the MBs with horseradish peroxidase (HRP)-conjugated anti-FITC Fab fragments and magnetic capturing of the MBs onto the working electrode surface of SPCEs. The cathodic current measured at -0.20 V (versus the Ag pseudo-reference electrode) was demonstrated to be inversely proportional to the concentration of the target miRNA. This convenient biosensing method provided a linear range between 0.7 and 10.0 nM and a limit of detection (LOD) of 0.2 nM (5 fmol in 25 muL of sample) for the synthetic target miRNA without any amplification step. An acceptable selectivity towards single-base mismatched oligonucleotides, a high storage stability of the b-Cp-MBs, and usefulness for the accurate determination of miRNA-21 in raw total RNA (RNA_t) extracted from breast cancer cells (MCF-7) were demonstrated.

Vargas, L. F., et al. (2009). "Effect of electron beam treatments on degradation kinetics of polylactic acid (PLA) plastic waste under backyard composting conditions." Packaging Technology & Science **22**(2): 97-106.

The effects of electron beam irradiation on backyard composting behaviour of polylactic acid (PLA) polymer were evaluated. Samples (10 mm² x 0.75 mm) from thermoformed PLA drinking cups were exposed to 10 MeV electron beam irradiation at doses of 0, 72, 144 and 216 kGy. Irradiated PLA samples were placed in heat-sealed, plastic screen and added to organic feedstock in a rotating composter within a computer-controlled environmental chamber for 10 weeks at 35 degrees C. Changes in weight, structural integrity and molecular weight were assessed over time. Results show that irradiation enhanced PLA breakdown. PLA weight decreased by increasing amounts as irradiation dose increased. Sample brittleness increased with irradiation dose and composting time. Finally, PLA molecular weight decreased as irradiation dose and compost time increased. Molecular weight D values for irradiated PLA were found to be about 430 kGy. After 1 week in a typical backyard composter, molecular weight D values increased to about 560 kGy and then fell to about 380 kGy after 2 weeks of composting. Samples irradiated at 216 kGy showed a reduction in weight of 9.4% after 10 weeks of composting, and a reduction of weight-average molecular weight of 93.7% after 6 weeks.

Varney, M. D., et al. (2012). "Methods for diagnostic HLA typing in disease association and drug hypersensitivity." Methods in Molecular Biology **882**: 27-46.

This chapter describes the application of diagnostic HLA typing for disease association and five methods used for specific HLA genotypes. The methods utilise a combination of polymerase chain reaction (PCR) amplification to detect sequence polymorphism by the presence or absence of amplification, nucleotide sequencing of the PCR product, and hybridisation of the PCR product with labelled probes. The probes are specific for sequence polymorphism associated with the genotype and are attached to either a Micro Bead or a Solid Phase. In addition, the

detection of single nucleotide polymorphism(s) which "tag" for the genotype using a real-time PCR is described.

Varo, I., et al. (2019). "Time-dependent effects of polystyrene nanoparticles in brine shrimp Artemia franciscana at physiological, biochemical and molecular levels." Science of the Total Environment **675**: 570-580.

Micro- (<5 mm) and nanoplastics (<1 micro m) are emerging threats for marine ecosystems worldwide. Brine shrimp Artemia is recognized as a suitable model among planktonic species for studying the impact of polystyrene nanoparticles (PS NPs) through short and long-term bioassays. Our study aims to evaluate the time-dependent effects of cationic amino-modified PS-NH₂ (50 nm) in A. franciscana after short- (48 h) and long-term exposure (14 days). For this purpose, nauplii were exposed to a concentration range of PS-NH₂ (0.1, 1, 3 and 10 micro g/mL) in natural sea water (NSW), and physiological, biochemical and molecular responses were investigated. Short-term exposure to PS-NH₂ caused a decrease in nauplii growth and affected the development in a concentration-dependent manner, long-term exposure impaired the survival, but not the growth and feeding behavior. Oxidative stress was detected after short term exposure as the decrease in the activity of antioxidant enzymes, and was fully evident in the long-term as lipid peroxidation, suggesting an accumulative effect. The decrease in Cholinesterase (ChE) activity observed indicates possible neurotoxic action of PS-NH₂. Also, Carboxylesterase (CbE) inhibition by PS-NH_{2,} described for the first time in this study, anticipates potential effects in biotransformation of exogenous and endogenous compounds, being the crustacean juvenile hormone methyl farnesoate (MF) that regulates development and molting, one candidate. Furthermore, short- and long-term exposure to PS-NH₂ affect the expression of genes involved in cell protection, development and molting. Overall, our results reveal that low PS-NH₂ concentrations induce physiological, biochemical and molecular (changes in gene expression) alterations in Artemia, and point at their potential risk for this model organism, supporting the general concern about nanoplastics occurrences in aquatic environments and their ability to represent an ecological threat for aquatic zooplanktonic species.

Varsha, Y. M. and R. Savitha (2011). "Overview on polyhydroxyalkanoates: A promising biopol." Journal of Microbial and Biochemical Technology **3**(5): 99-105.

Plastic pollution is creating the significant environmental and economic burdens since they consume the natural fuels (energy) and other natural resources. Beside this, they have long shelf time, debasing the environment in the numerous ways. The only way to trim down the hazards of plastic pollution is to decrease the use of plastic and thereby reducing its production. Degradations and recycling steps followed to diminish these plastic was of no use since it takes abundant stress (mechanical and chemical) to do so and also considered being costly. Biodegradable plastics became major approach to solve this issue and also became eminent since 1970s. From the inventory of biopolymers acting as bioplastics, PHA has gained major importance because of its analogous behavior to that of petro based plastics. PHAs are the linear polymers produced by the microbes to store energy and carbon. Present review discusses about the PHA production method, recent advances in producing, its degradation and applications of PHA which elucidates the gaining importance in today's industrial world. © 2011 Varsha YM, et al.

Varshney, M. (2006). Immunomagnetic particles and microfluidics based biosensors for rapid detection

of foodborne pathogenic bacteria.

This research investigated immunomagnetic particles and microfluidics based impedance and optical biosensors for detection of foodborne pathogenic bacteria. Magnetic nanoparticles-antibody conjugates (MNAC) based sampling method was developed for the separation and concentration of Escherichia coli O157:H7 in food samples. In pure culture of E. coli O157:H7, MNAC presented minimum capture efficiency (CE) of 94% for bacterial cells ranging from 1.6 x 10 super(1) to 7.2 x 10 super(7) CFU ml super(-1) with an immunoreaction time of 15 min without any enrichment. There was no significant effect (P > 0.05) of mixing on the capture of bacterial cells by MNAC. A label-free, microfluidics and interdigitated array microelectrode (IDAM) based impedance biosensor in combination with MNAC immunoseparation was developed for detection of Escherichia coli O157:H7 in food samples. Flow cell with embedded IDAM was studied to improve the detection limit as compared to open IDAM chip. The open IDAM chip was successfully used for the detection of 7 x 10 super(2) and 6 x 10 super(3) cells of E. coli O157:H7 in pure culture and ground beef samples in a detection volume of 2 kl, respectively. Using a flow cell with embedded IDAM, a minimum of 1.6 x 10 super(2) and 1.2 x 10 super(3) cells of E. coli O157:H7 was detected in pure culture and ground beef samples, respectively, in a detection volume of 60 nl. The total detection time from sampling to measurement in both cases was 35 min. In order to detect low numbers of cells, the bacterial cell growth was measured inside a double IDAM based flow cell. The system could detect a range of E. coli O157:H7 from 8.0 to 8.2 x 10 super(8) CFU ml super(-1) after an enrichment time of 14.7 and 0.8 h, respectively. A chemiluminescence biosensing method combined with microfluidic stepped filter-biochip and immunomagnetic microbeads was investigated and evaluated for detection of E. coli O157:H7. Horseradish peroxidase enzyme labeled anti-E. coli antibodies were used for the generation of chemiluminescence signal. With multi-batch sampling, the filter biochip could detect as few as 34 cells of E. coli O157:H7 inside the reaction microchamber of 12 nl. The total detection time was 90 min. Microfluidics and immunomagnetic separation were effectively synergized for the detection of low numbers of E. coli O157:H7. Moreover, microfluidics based biosensors have the potential to be developed into hand-hold or portable biosensors.

Varshney, M., et al. (2005). "Magnetic nanoparticle-antibody conjugates for the separation of Escherichia coli O157:H7 in ground beef." Journal of Food Protection **68**(9): 1804-1811.

The immunomagnetic separation with magnetic nanoparticle-antibody conjugates (MNCs) was investigated and evaluated for the detection of Escherichia coli O157:H7 in ground beef samples. MNCs were prepared by immobilizing biotin-labeled polyclonal goat anti-E. coli antibodies onto streptavidin-coated magnetic nanoparticles. For bacterial separation, MNCs were mixed with inoculated ground beef samples, then nanoparticle-antibody-E. coli O157:H7 complexes were separated from food matrix with a magnet, washed, and surface plated for microbial enumeration. The capture efficiency was determined by plating cells bound to nanoparticles and unbound cells in the supernatant onto sorbitol MacConkey agar. Key parameters, including the amount of nanoparticles and immunoreaction time, were optimized with different concentrations of E. coli O157:H7 in phosphate-buffered saline. MNCs presented a minimum capture efficiency of 94% for E. coli O157:H7 ranging from 1.6x10¹ to 7.23x10⁷ CFU/ml with an immunoreaction time of 15 min without any enrichment. Capture of E. coli O157:H7 by MNCs did not interfere with other bacteria, including Salmonella enteritidis, Citrobacter freundii, and Listeria monocytogenes. The capture efficiency values of MNCs increased from 69 to 94.5% as E. coli O157:H7 decreased from 3.4x10⁷ to 8.0x10⁰ CFU/ml in the ground beef samples prepared with minimal steps (without filtration and centrifugation). An enrichment of 6 h was done for 8.0x10⁰ and 8.0x10¹ CFU/ml of E. coli O157:H7 in ground beef to increase the number of cells in the sample to a detectable level. The results also indicated that capture efficiencies of MNCs for E. coli O157:H7 with and without mechanical mixing during immunoreaction were not significantly different (P>0.05). Compared with microbeads based immunomagnetic separation, the magnetic nanoparticles showed their advantages in terms of higher capture efficiency, no need for mechanical mixing, and minimal sample preparation.

Vasiadi, M., et al. (2010). "Rupatadine inhibits proinflammatory mediator secretion from human mast cells triggered by different stimuli." International Archives of Allergy and Immunology **151**(1): 38-45.

Background: Mast cells are involved in allergy and inflammation by secreting multiple mediators including histamine, cytokines and platelet-activating factor. Certain histamine 1 receptor antagonists have been reported to inhibit histamine secretion, but the effect on cytokine release from human mast cells triggered by allergic and other stimuli is not well known. We investigated the ability of rupatadine, a potent histamine 1 receptor antagonist that also blocks platelet-activating factor actions, to also inhibit mast cell mediator release. Method(s): Rupatadine (1-50 muM) was used before stimulation by: (1) interleukin (IL)-1 to induce IL-6 from human leukemic mast cells (HMC-1 cells), (2) substance P for histamine, IL-8 and vascular endothelial growth factor release from LAD2 cells, and (3) IgE/anti-IgE for cytokine release from human cord blood-derived cultured mast cells. Mediators were measured in the supernatant fluid by ELISA or by Milliplex microbead arrays. Result(s): Rupatadine (10-50 muM) inhibited IL-6 release (80% at 50 muM) from HMC-1 cells, whether added 10 min or 24 h prior to stimulation. Rupatadine (10-50 muM for 10 min) inhibited IL-8 (80%), vascular endothelial growth factor (73%) and histamine (88%) release from LAD2 cells, as well as IL-6, IL-8, IL-10, IL-13 and tumor necrosis factor release from human cord blood-derived cultured mast cells. Conclusion(s): Rupatadine can inhibit histamine and cytokine secretion from human mast cells in response to allergic, immune and neuropeptide triggers. These actions endow rupatadine with unique properties in treating allergic inflammation, especially perennial rhinitis and idiopathic urticaria. © 2009 S. Karger AG, Basel.

Vasiadi, M., et al. (2013). "Neurotensin serum levels and skin gene expression are increased in atopic dermatitis." British Journal of Dermatology **169**(3): 695-699.

BACKGROUND: Neurotensin (NT) participates in immune responses, but the mechanisms are not known. We have previously shown that NT augments the ability of corticotropin-releasing hormone (CRH) to increase mast-cell-dependent vascular permeability in rodents. We also showed that NT stimulates human mastcell release of vascular endothelial growth factor, and that CRH is increased in the serum of patients with atopic dermatitis (AD), an inflammatory skin condition involving mast cells.

OBJECTIVES: To measure serum levels of NT, and lesional skin expression of NT and the main NT receptor (NTR-1) in AD, and to compare it with skin expression in chronic urticaria (CU) and urticaria pigmentosa (UP).

METHODS: Serum NT was measured with a Milliplex microbead array. Skin NT and NTR-1 gene expression was determined with quantitative polymerase chain reaction. Immunohistochemistry was performed using a mouse monoclonal antibody for NT, and a rabbit polyclonal antibody for NTR-1. Mast cells were counterstained with Leder dye.

RESULTS: Neurotensin is significantly elevated in the serum of patients with AD compared with healthy controls (P = 0.0001). NT gene expression is also significantly increased in lesional skin of patients with AD compared with controls (P = 0.0194). Moreover, immunohistochemistry of AD lesions shows NT > NTR-1 staining of perivascular cells, many of which are identified as mast cells after staining with Leder dye. There was no statistically significant difference in NT and NTR-1 lesional skin gene expression in patients with either CU or UP.

CONCLUSIONS: These results suggest that interactions between NT and mast cells may occur and contribute to AD pathogenesis.

Vasiadi, M., et al. (2012). "Serum neurotensin (NT) is increased in psoriasis and NT induces vascular endothelial growth factor release from human mast cells." British Journal of Dermatology **166**(6): 1349-1352.

BACKGROUND: Psoriasis involves skin inflammation that often worsens with stress, but the mechanism of this effect remains obscure. We have shown that corticotropin-releasing hormone (CRH) is increased in the serum of patients with psoriasis. A peptide, neurotensin (NT), can trigger skin histamine release and augment the ability of CRH to increase skin vascular permeability.

OBJECTIVES: To investigate the serum level of NT, and the expression of genes for NT and NT receptor-1 (NTR-1) in lesional and nonlesional skin of patients with psoriasis, compared with normal controls. Also, to study the effect of NT on human mast cell release of vascular endothelial growth factor (VEGF), which is increased in psoriatic skin.

METHODS: Serum was obtained from patients with psoriasis (n = 56) and controls (n = 33); NT levels were measured with the Milliplex microbead assay. Biopsies were obtained from the lesional and nonlesional skin of patients with chronic plaque psoriasis (n = 40), who had not received any treatment for at least 15 days and were free of any systemic inflammatory diseases. Control skin samples were obtained from healthy subjects (n = 30). Expression of genes for NT and NTR-1 in the skin was evaluated by quantitative reverse transcriptase-polymerase chain reaction. LAD2 human mast cells were stimulated by NT (1 mumol L(-1)) for 24 h and VEGF was measured by enzyme-linked immunosorbent assay.

RESULTS: Serum NT was increased in patients with psoriasis, while expression of genes for NT and NTR-1 in lesional skin was decreased compared with controls. NT induced VEGF release from mast cells and was augmented by interleukin-33.

CONCLUSION: NT may play a role in psoriasis pathogenesis and its worsening by stress, at least in part through activation of skin mast cells.

Vasicek, J., et al. (2011). "Elimination of apoptotic spermatozoa from rabbit insemination dose using annexin V associated with the MACS technique. A preliminary study." Folia Biologica **59**(1/2): 65-69.

The aim of this study was to verify whether the separation and elimination of the apoptotic fraction in rabbit semen using a MACS technique may improve sperm fertility potential and consequently rabbit kindling rate. Semen samples from 25 New ZealandWhite (NZW) rabbit males were collected using an artificial vagina and evaluated using the CASA system for concentration and motility. For artificial insemination the best 11 bucks were chosen based on motility parameters. Their ejaculates were mixed to make a heterospermic pool and routinely diluted in a commercial insemination diluent (MiniTub, Tiefenbach, Germany) at a ratio of 1:6. Diluted heterospermic spermatozoa were filtered through a Sartorius filter to wash out seminal plasma, re-diluted in binding buffer (Annexin V Microbead Kit, Miltenyi Biotec, Germany) at a ratio of 1:3.66 and divided into two groups: an experimental group intended for MACS separation and control group without MACS separation. Then hormonally treated females of NZW rabbits were inseminated with fresh doses of filtered heterospermic semen (n=27; 0.5 ml I.D. per female) and MACS separated semen (n=28; 0.5 ml I.D. per female). Separation and subsequent elimination of apoptotic spermatozoa (positive selection) fromthe insemination dose (after negativeMACS selection) was verified under in vivo conditions on the basis of increased kindling rate in the experimental group in comparison with kindling rate in the control group (81.3% vs. 73.8%). In conclusion, elimination of apoptotic spermatozoa by the use of the MACS technique results in a slight improvement in kindling rate of rabbit does.

Vasileiou, S., et al. (2016). "Evaluation of chimerism in bone marrow enriched CD34+ cells for monitoring of minimal residual disease after allogeneic stem cell transplantation." Bone Marrow Transplantation **1)**: S449-S450.

Introduction: Monitoring of minimal residual disease (MRD) after allogeneic hematopoietic stem cell transplantation (allo- SCT) has become mandatory in the effort to predict the risk of hematologic relapse. The purpose of this study was the evaluation of CD34+ cell donor chimerism as a means of MRD assessment in patients transplanted for myeloid malignancies that lack a reliable molecular marker. Material (or patients) and methods: The study enrolled 10 patients that underwent allo-SCT for myelodysplastic syndrome (MDS, n = 4), de novo/secondary acute myeloid leukemia (AML, n = 5), or myelofibrosis (n = 1). A total of 16 chimerism assays were performed in CD34+ cells, which were enriched from bone marrow (BM) samples either by use of magnetic microbeads coated with anti-CD34 monoclonal antibody (n = 14) or by fluorescence-activated cell sorting (FACS, n = 2). Percentage of CD34+ cells in initial BM samples as well as purity of the resulting CD34+ cell populations were analyzed by flow cytometry. Chimerism was measured by PCRbased analysis of Short Tandem Repeats (STRs). Result(s): The median percentage of CD34+ cells in unprocessed BM mononuclear cells was 0.73% (range: 0.06-3.65%). Enrichment of CD34+ cells resulted in a median purity of 71% (range: 40-93%). Regarding immunomagnetic CD34+ cell separation, purity was superior for BM samples with initial concentrations of CD34+ cells >=1% compared to <1% (88-93% versus 40-73%, respectively). Starting from 1-3 ml whole BM specimens, the yield of total CD34 + cells for chimerism studies ranged from 103 to 2.8x10⁵ (median: 3.7x10⁴). High-level donor CD34+ cell chimerism (94.7-99.4%, median: 97%) was observed in 7 patients, none of whom developed relapse at a median follow-up of 5 (range: 3-17) months. On the other hand, a decline in donor CD34+ cell chimerism was encountered in the 3 remaining patients at a median of 3 (range: 2-5) months post transplant. In one of those 3 patients, low donor CD34+ cell chimerism (5.5%) coincided with early relapse of AML (BM blasts: 12%). In the other 2 patients, decreased values of donor CD34+ cell chimerism (49.5 and 46.4%) were detected while in hematologic complete remission (CR) of the disease (secondary AML and MDS, respectively). All the above 3 patients were treated with salvage or preemptive azacitidine, and showed a response in CD34+ cell donor chimerism (64-95.6%) with achievement or maintenance of hematologic CR. Conclusion(s): Donor chimerism of BM CD34+ cells is a relevant marker of the activity of myeloid malignancies following allo- SCT and may guide to early interventions in the aim of preventing hematologic relapse, particularly with high-risk AML or MDS. Relatively simple and time sparing immunomagnetic selection techniques usually allow for considerable CD34+ cell purity and informative chimerism results, thereby facilitating routine clinical application of the procedure.

Vasylevska, A. S., et al. (2007). "Novel coumarin-based fluorescent pH indicators, probes and membranes covering a broad pH range." Analytical & Bioanalytical Chemistry **387**(6): 2131-2141.

A new family of coumarin-based pH indicators was synthesized. They are sensitive to pH in either weakly acidic or weakly basic solution. The indicators possess moderate to high brightness, excellent photostability and compatibility with light-emitting diodes. The indicators were covalently immobilized on the surface of amino-modified polymer microbeads which in turn were incorporated into a hydrogel matrix to obtain novel pH-sensitive materials. When a mixture of two different microbeads is used, the membranes are capable of optical pH sensing over a very wide range comparable to the dynamic range of the glass electrode (pH 1-11).

Vats, A. and K. Pathak (2013). "Exploiting microspheres as a therapeutic proficient doer for colon delivery: A review." Expert Opinion on Drug Delivery **10**(4): 545-557.

Introduction: Colon-specific drug delivery systems have recently gained importance for delivering a variety of therapeutic agents via oral route. This mode offers the feasibility of treating colonic pathologies with less risk of bioburden to other organs/tissues and has been widely researched for the delivery of challenging drugs. Microspheres targeted to colon have occupied central position on drug delivery due to their small size that offers characteristic intrinsic properties attributable to the carrier. Areas covered: The present deliberation precariously covers the capacious usage of microspheres for the treatment of local colonic pathologies like colon carcinomas, inflammatory bowel disease and parasitic diseases using natural as well as synthetic carriers. The write up also encompasses clinical application of microspheres. Expert opinion: Microspheres have comprehensive potential to be marketed as the patient-friendly formulation, as it would provide direct treatment at the disease site and, consequently, lower dosing and reducing systemic side effects. Wherefore, the major obstacles in delivering drugs to the colon like the absorption and degradation pathways in the proximal part of GIT could be easily overcome, and also a range of pathologies from constipation and diarrhea to the exhaustive inflammatory bowel diseases and colon carcinoma could be cured. © 2013 Informa UK, Ltd.

Vaughan, R., et al. (2017). "Microplastics in the sediments of a UK urban lake." Environmental Pollution **229**: 10-18.

While studies on microplastics in the marine environment show their wide-distribution, persistence and contamination of biota, the freshwater environment remains comparatively neglected. Where studies on freshwaters have been undertaken these have been on riverine systems or very large lakes. We present data on the distribution of microplastic particles in the sediments of Edgbaston Pool, a shallow eutrophic lake in central Birmingham, UK. These data provide, to our knowledge, the first assessment of microplastic concentrations in the sediments of either a small or an urban lake and the first for any lake in the UK. Maximum concentrations reached 25-30 particles per 100 g dried sediment (equivalent to low hundreds kg⁻¹) and hence are comparable with reported river sediment studies. Fibres and films were the most common types of microplastic observed. Spatial distributions appear to be due to similar factors to other lake studies (i.e. location of inflow; prevailing wind directions; propensity for biofouling; distribution of macroplastic debris) and add to the growing burden of evidence for microplastic ubiquity in all environments.

Vazquez, C. M. and R. Pruneda (1978). "Estimation of free intake in grazing animals, comparison of two techniques for estimating digestibility." Ciencia y Tecnica en la Agricultura. Pastos y Forrajes **1**(2): 97-103.

Four Holstein cows grazing on pangola grass were given daily a gel capsule with soluble Cr2O3. Pasture samples were taken from a bull with a rumen fistula to estimate the lignin content and digestibility in vitro. The excreta were identified individually by means of coloured plastic particles, and combined over periods of 5 and 7 days. The digestibility was 53.9 and 69.2% for estimation in vitro and with lignin, respectively. There were no significant differences in faecal production. There were significant differences in consumption, according to the lignin method, and differences among periods. Collection of excreta for 5 and 7 days and digestibility in vitro are recommended.

Vazquez Juiz, M. L., et al. (2018). "Humic acids modify the pulse size distributions in the characterization of plastic microparticles by Tunable Resistive Pulse Sensing." Journal of Contaminant Hydrology **218**: 59-69.

Tunable Resistive Pulse Sensing, TRPS, is an emerging technique used in quantification and measuring the size (particle-by-particle) of viruses, exosomes and engineered colloidal spheres in biological fluids. We study the features of TRPS to enhance size characterization and quantification of submicron-sized microplastics, also called plastic microparticles, MP, in freshwater environments. We report alterations on the detection of the resistive pulses in the TRPS caused by humic acids, HA, during the size measurement of polystyrene microspheres used as MP surrogate. We discuss the alteration of the electric field in the measuring channel of the TRPS apparatus induced by the passage of HA. TRPS is a fast and precise technique for counting and size determination of MP but needs the evaluation of the influence of the organic matter on the current blockades. We show that statistical clustering models of the magnitude distribution of the resistive pulses can help to detect and quantify changes in the pulse size distributions induced by flocculation of humic acids. Conclusions of this study indicate that TRPS can be a valuable tool to improve the knowledge of the MP fate in surface waters, in the vadose zone and groundwater.

Vazquez, Y. and S. Barbosa (2017). "Compatibilization Strategies for Recycling Applications of High Impact Polystyrene/Acrylonitrile Butadiene Blends." Journal of Polymers & the Environment **25**(3): 903-912.

Plastic waste from electrical and electronic equipment (WEEE) is growing up exponentially fast during the last two decades, mainly due to short lifetime of technological products like cellphones or computers. This situation entailed an increase in the accumulation of specific plastic materials such Acrylonitrile-Butadiene-Styrene (ABS), High Impact Polystyrene (HIPS), Polycarbonate, among others. These plastics can be recycled by themselves but their separation by type is neither easy nor economically viable, then recycling them together as a blend is the most economically viable alternative. However, mechanical properties suffer a deterioration and to enhance phase adhesion and add value to this WEEE blend, an adequate compatibilization is needed. To choose a compatibilization route an accurate comprehension of blends behavior has to be done. In this work, a systematical study of the addition compatibilization of HIPS/ABS blends was performed. Besides results were focus to WEEE recycling, in order to comprehend this complex system, virgin base materials were used. Relative amount effect on self-compatibilization was analyzed by two different HIPS/ABS blends, one with major content of HIPS and other with major content of ABS. Also, two different copolymers were used as compatibilizer, Styrene-Acrylonitrile (SAN) and Styrene-Butadiene-Styrene and the concentrations chosen were 2 and 20 wt%. The best performance was achieved for blend with major content of ABS by using 2 % of SAN, obtaining a compatibilized blend with a general improvement of mechanical properties specially toughness in a 350 % and elongation in a 77 % respect to the physical blend. [ABSTRACT FROM AUTHOR]

Vazquez, Y. V. and S. E. Barbosa (2016). "Recycling of mixed plastic waste from electrical and electronic equipment. Added value by compatibilization." Waste Management **53**: 196-203.

Plastic waste from electrical and electronic equipment (WEEE) grows up exponentially fast in the last two decades. Either consumption increase of technological products, like cellphones or computers, or the short lifetime of this products contributes to this rise generating an accumulation of specific plastic materials such ABS (Acrylonitrile-Butadiene-Styrene), HIPS (High impact Polystyrene), PC (Polycarbonate), among others. All of they can be recycled by themselves. However, to separate them by type is neither easy nor economically viable, then an alternative is recycling them together as a blend. Taking into account that could be a deterioration in final properties, to enhance phase adhesion and add value to a new plastic WEEE blend a compatibilization is needed. In this work, a systematical study of different compatibilizers for blends of HIPS and ABS from WEEE was performed. A screening analysis was carried out by adding two different compatibilizer concentration (2wt% and 20wt%) on a HIPS/ABS physical blend 80/20 proportion from plastic e-waste. Three copolymers were selected as possible compatibilizers by their possible affinity with initial plastic WEEE. A complete characterization of each WEEE was performed and compatibilization efficiency was evaluated by comparing either mechanical or morphological blends aspects. Considering blends analyzed in this work, the best performance was achieved by using 2% of styrene-acrylonitrile rubber, obtaining a compatibilized blend with double ultimate strength and modulus respect to the physical blend, and also improve mechanical properties of initial WEEE plastics. The proposed way is a promise route to improve benefit of e-scrap with sustainable, low costs and easy handling process. Consequently, social recycling interest will be encouraged by both ecological and economical points of view.

Vazquez-Tello, A., et al. (2010). "Expression of IL-17a and IL-17F cytokines in B lymphocytes." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **181**(1 MeetingAbstracts).

INTRODUCTION IL-17A and F cytokines are regarded as promoters of autoimmune conditions such as inflammatory bowel disease, rheumatoid arthritis, and multiple sclerosis. There is a body of evidence suggesting that IL-17A and F are produced primarily by CD4⁺ Th-17 lymphocytes. However, recent reports suggest that other cells including CD8⁺, NKT and Treg cells also express IL-17A and IL-17F and may contribute to the production of these cytokines in immunologically-mediated diseases. B lymphocytes are known to be important cytokine sources in inflammation and play a significant role in a number of chronic immunological diseases including allergic and autoimmune diseases. We therefore investigated the potential of human B lymphocytes to produce IL-17A and IL-17F. METHODS Tonsillar and peripheral B lymphocytes were purified by a procedure that included the sequential removal of contaminating T lymphocytes and monocytes, followed by a positive selection of CD19+ cells using magnetic microbeads coated with anti-CD19 antibodies. The purified CD19+ cells were confirmed to be >97% positive for the CD20 B cell marker by flow cytometry. The CD19+/CD20+ B cells in culture were stimulated with IL-4, IFN-gamma, IL-6, IL-23, and TGF-beta and analyzed the expression of both IL-17A and F in response to stimulation by real-time RT-PCR, western blot, immunocytochemistry and ELISA. RESULTS Freshly purified B cells from tonsils and from blood express detectable amounts of the mRNA and protein of IL-17A and F. When B cells were stimulated with IL-6, IL-23 and TGF-beta, the mRNA and protein expression of both IL-17A and F was significantly increased. (n=3; P<=0.001) In contrast, stimulation with IL-4 alone or in

combination with anti-CD40 antibody, decreased the expression of IL-17A and F in cultured B cells (n=3; P<=0.001). CONCLUSIONS These novel findings provide evidence that B lymphocytes could be a significant source of IL-17A and IL-17F cytokines and support the notion that B lymphocytes actively participate in immune responses via a mechanism in addition to the classic release of antibodies. Moreover, our results also set the stage for investigating the role of the B cells-IL-17 interaction in autoimmune diseases.

Vecchiatini, R., et al. (2015). "Effect of dynamic three-dimensional culture on osteogenic potential of human periodontal ligament-derived mesenchymal stem cells entrapped in alginate microbeads." Journal of Periodontal Research **50**(4): 544-553.

BACKGROUND AND OBJECTIVE: Bioreactors are devices that efficiently create an environment that enables cell cultures to grow in a three-dimensional (3D) context mimicking in vivo conditions. In this study, we investigate the effect of dynamic fluid flow on the osteogenic potential of human mesenchymal stem cells obtained from periodontal ligament and entrapped in alginate microbeads.

MATERIAL AND METHODS: After proper immunophenotyping, cells were encapsulated in barium alginate, cultured in 3D static or 3D dynamic conditions represented by a bioreactor system. Calcein-AM/propidium iodide staining was used to assess cellular viability. Quantitative real-time polymerase chain reaction was used to analyze the expression of osteogenic markers (Runx2 and COL1). Alizarin Red S staining and the Fourier transform infrared spectroscopy were used to assess mineral matrix deposition.

RESULTS: Optimal encapsulation procedure, in terms of polymer pumping rate, distance from droplet generator to the gelling bath and atomizing airflow was assessed. Cell viability was not affected by encapsulation in alginate microbeads. Bioreactor cell exposure was effective in anticipating osteogenic differentiation and improving mineral matrix deposition.

CONCLUSION: For the first time human mesenchymal stem cells obtained from periodontal ligaments encapsulated in alginate microbeads were cultured in a bioreactor system. This combination could represent a promising strategy to create a cell-based smart system with enhanced osteogenic potential useful for many different dental applications.

Vedolin, M. C., et al. (2018). "Spatial variability in the concentrations of metals in beached microplastics." Marine Pollution Bulletin **129**(2): 487-493.

Heavy metals and microplastics have been considered as threats to the marine environment and the interactions between these two pollutants are poorly understood. This study investigates the interactions between metals adsorbed in pellets collected randomly from 19 beaches along the coast of Sao Paulo State in southeastern Brazil, comparing these levels with those in virgin pellets. The samples were analyzed for Al, Cr, Cu, Fe, Mn, Sn, Ti and Zn by inductively coupled plasma optical emission spectroscopy (ICP-OES). The polymers were solubilized via acid digestion. The highest levels occurred with Fe (227.78 mg kg^{- 1} - Itaguare) and Al (45.27 mg kg^{- 1} - Guarau) in the same areas, which are closer to the Port of Santos. The metal adsorption on pellets collected is greater than that on virgin pellets. In this context, pellets can be considered to be a carrier for the transport of metals in the environment, even in small quantities. Copyright © 2017 Elsevier Ltd

Veerasingam, S., et al. (2016). "Characteristics, seasonal distribution and surface degradation features of microplastic pellets along the Goa coast, India." Chemosphere **159**: 496-505.

Microplastic pellets (MPPs) are ubiquitous contaminants, recognised as a serious threat to the biota in coastal, estuarine and marine environment. The distribution, abundance, weathering and chemical characteristics of MPPs on the beaches of Goa, and their transport to the coast during the southwest (SW) monsoon are discussed in this paper. MPP samples collected from six sandy beaches were categorised based on colour and polymer types using Stereoscope microscope and FTIR-ATR spectroscopy, respectively. White colour MPPs were the most abundant, and Polyethylene (PE) and Polypropylene (PP) were the dominant polymer types of MPPs deposited on all the beaches. Carbonyl index values showed that MPPs collected in June 2015 (representing SW monsoon) were 'new', whereas the MPPs collected in January 2015 were 'aged', showing that MPPs are arriving at Goa coast only during SW monsoon due to conducive hydrodynamic conditions. Characteristics of MPPs suggest that they could be originated primarily from ocean-based sources. The winds and surface currents during SW monsoon are the driving forces for the transportation and deposition of MPPs on the Goa beaches. The results of this study will be useful to the National 'Clean India' program for effective plastic debris removal management.

Vehlow, J., et al. (2003). "Bromine in waste incineration: partitioning and influence on metal volatilisation." Environmental Science & Pollution Research **10**(5): 329-334.

INTENTION, GOAL, SCOPE, BACKGROUND: The halogen bromine is far less abundant than chlorine, but it can be found at high concentrations in special materials like flame retarded plastics. The fate and effects of Br in waste incineration are not well understood. It may have similar implications like Cl for the volatilisation of heavy metals and the formation of low volatile organic compounds. Due to its lower oxidation potential, there is a risk of formation of elementary Br_2 in the offgas.

OBJECTIVE: Co-combustion tests of different types of Br containing plastic waste materials (up to 22%) and MSW in the TAMARA pilot plant for waste incineration were conducted to investigate the Br partitioning and the influence of Br on metal volatilisation.

METHODS: The Br inventory of the fuel mix was elevated to approx. 1 wt-%. All input and output mass flows of the furnace have been sampled and the partitioning of Cl, Br, S, and a number of heavy metals, has been calculated on the basis of closed mass balances.

RESULTS AND DISCUSSION: Organically-bound Br was typically released to more than 90% into the raw gas. Elementary Br_2 was detected at high Br levels. Its presence was always analysed when all SO_2 in the raw gas was oxidised to SO_3. Br enhances the volatilisation of metals like K, Zn, Cd, Sn, Sb, and Pb out of the fuel bed principally in the same way as Cl. The tests gave strong indication that the promoting influence of the halogens on metal volatilisation is more pronounced than that of the fuel bed temperature. The volatilised metals are condensated on the fly ashes and are discharged along with the filter ashes.

CONCLUSIONS: As long as a surplus of SO_2 is present in the raw gas no Br_2 is formed. Although the halogen induced transfer out of the fuel bed causes high concentrations of volatile metals in the filter ashes, a recovery is not economically feasible for the time being. The volatilisation gives no rise to metal emission problems as long as efficient dedusting is achieved.

RECOMMENDATION AND OUTLOOK: If there is a risk of Br_2 formation, in wet scrubbing a reducing agent has to be added to the neutral scrubber for efficient abatement. Filter ashes should be disposed of in a way that enables access for recovery in the future. The exact volatilisation characteristics of the various metals have to be studied in future using specifically tailored experiments.

Vejerano, E. P., et al. (2013). "Emissions of Polycyclic Aromatic Hydrocarbons, Polychlorinated Dibenzo-p-Dioxins, and Dibenzofurans from Incineration of Nanomaterials." Environmental Science & Technology **47**(9): 4866-4874.

Disposal of some nanomaterial-laden waste through incineration is inevitable, and

nanomaterials' influence on combustion byproduct formation under high-temperature, oxidative conditions is not well understood This work reports the formation of polycyclic aromatic hydrocarbons (PAHs) and polychlorinated-dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) from incineration of paper and plastic waste containing various nanomaterials, including titania, nickel oxide, silver, ceria, iron oxide, quantum dots, and CgQ-fullerene, in a laboratory-scale furnace. The presence of nanomaterials in the waste stream resulted in higher emissions of some PAH species and lower emissions of others, depending on the type of waste. The major PAH species formed were phenanthrene and anthracene, and emissions were sensitive to the amount or nanomaterials in the waste, tienerally, there were no significant duterences in emission factors for the larger PAH species when nanomaterials were added to the waste. The total PAH emission factors were on average ∼6 times higher for waste spiked widi nanomaterials v. uSeir bulk counterparts. Emissions of chlorinated dioxins from poly(vinyl chloride) (PVC) waste were not detected; however, chlorinated furans were formed at elevated concentrations with wastes containing silver and titania nanomaterials, and toxicity was attributable mainly to 2,3,4,7,8-pentachlorodibenzofuran. The combination of high specific surface area and catalytic, including electrocatalytic, properties of nanomaterials might be responsible for affecting die formation of toxic pollutants during incineration. [ABSTRACT FROM AUTHOR]

Velez, J. F. M., et al. (2018). "Considerations on the use of equilibrium models for the characterisation of HOC-microplastic interactions in vector studies." Chemosphere **210**: 359-365.

The association of hydrophobic organic contaminants (HOCs) to microplastics (MPs) in the aquatic environment and the possible perturbation of how biota and HOCs interact (i.e. 'MP vector effect') is a much researched topic in the emergent field of aquatic MP pollution. Consensus on whether the vector-effect is relevant can in part be ascertained using laboratory experimentation. Such studies, of which there are now many examples, have as a mandatory component a characterisation of the HOC-MP interaction. However, important considerations must be made when planning and executing such laboratory experiments, and subsequently when choosing equilibria models to fit sorption curves, as it is necessary to recognize that simplified conceptual models (i.e. Freundlich or Langmuir models) do not fit all HOC-MP interactions under all circumstances. The sorption equilibrium of HOCs to most plastic particles occurs as a combination of surface adsorption in the crystalline regions of the polymer (typically characterized by Langmuir models) and internal partition into amorphous regions (modelled with Freundlich relations), but this is rarely recognized. In this discussion we highlight some considerations needed when both characterizing the interactions between MPs and HOCs and improving the environmental realism of vector studies through the use of, for instance, weathered particles, adequate time for HOC-MP equilibria to be reached and working at lower concentrations. Increasing environmental realism of vector studies corresponds to a greater complexity in the equilibria model, but ultimately allows better understanding of any potential HOC-MP vector effect in nature. Copyright © 2018 Elsevier Ltd

Velez, N., et al. (2019). "A baseline assessment of beach macrolitter and microplastics along

northeastern Atlantic shores." Marine Pollution Bulletin **149 (no pagination)**(110649).

Marine litter is widely dispersed throughout coastal environments. Assessing the distribution and accumulation of such contaminants is crucial to understand their environmental impacts. This study presents a baseline for the monitoring of litter and microplastics in intertidal sediments along the Atlantic shores of southern Portugal and Morocco and identifies potential sources of contamination. Although variable, distribution and composition of both litter and microplastics did not follow a latitudinal pattern. Most of the litter had an undifferentiated source. Within the identifiable sources of litter, food packaging, fishing and tobacco were the most abundant, with variable contributions among sites. Over 97% of marine litter retrieved was plastic. Fragments and filaments were the most abundant categories of plastics at sites with the highest and lowest microplastic abundance respectively. Filaments were mainly made of Polypropylene (PP,50%) and Polyethylene terephthalate (PET,29%) while the predominant polymers for fragments were Polyethene (PE, 75%) and PP (25%). Copyright © 2019 Elsevier Ltd

Vélez, S. L. P. and A. R. Vélez (2017). "RECYCLING ALTERNATIVES TO TREATING PLASTIC WASTE, ENVIRONMENTAL, SOCIAL AND ECONOMIC EFFECTS: A LITERATURE REVIEW." The Journal of Solid Waste Technology and Management(2).

Plastic waste is a problem not only for the environment, but also for the municipal solid waste management. In order to get new raw materials, further natural resources are being exploited. Moreover, plastic refuse that could be reintroduced into the production process is wasted. One important strategy to treat this waste is recycling. The importance lies in the fact that the plastic recycling process reduces the amount of waste going to landfills, and also because it permits a reduction in the consumption of virgin material and resources used to produce original polymers. Recycled plastic could be used as an input in the cycle production of new products, which is the case for concrete, car industry and textiles. Therefore, recycling could be considered an ecofriendly method for the treatment of plastic waste and a good opportunity for reducing the environmental impact, considering that the energy demands of recycling and reusing plastics are much lower than the energy inputs required to deal with virgin materials. This paper carries out a review of the relevant scientific research in the field of plastic recycling in order to make an overview of this practice and its impact on the environment.

Veli, M. and A. Ozcan (2018). "Computational Sensing of Staphylococcus aureus on Contact Lenses Using 3D Imaging of Curved Surfaces and Machine Learning." Acs Nano **12**(3): 2554-2559.

We present a cost-effective and portable platform based on contact lenses for noninvasively detecting Staphylococcus aureus, which is part of the human ocular microbiome and resides on the cornea and conjunctiva. Using S. aureus-specific antibodies and a surface chemistry protocol that is compatible with human tears, contact lenses are designed to specifically capture S. aureus. After the bacteria capture on the lens and right before its imaging, the captured bacteria are tagged with surface-functionalized polystyrene microparticles. These microbeads provide sufficient signal-to-noise ratio for the quantification of the captured bacteria on the contact lens, without any fluorescent labels, by 3D imaging of the curved surface of each lens using only one hologram taken with a lens-free on-chip microscope. After the 3D surface of the contact lens is computationally reconstructed using rotational field transformations and holographic digital focusing, a machine learning algorithm is employed to automatically count the number of beads on the lens surface, revealing the count of the captured bacteria. To demonstrate its proof-of-concept, we created a field-portable and cost-effective holographic microscope, which weighs 77 g, controlled by a laptop. Using daily contact lenses that are spiked with bacteria, we demonstrated that this computational sensing platform provides a detection limit of ~16

bacteria/muL. This contact-lens-based wearable sensor can be broadly applicable to detect various bacteria, viruses, and analytes in tears using a cost-effective and portable computational imager that might be used even at home by consumers.

Velzeboer, I., et al. (2014). "Strong sorption of PCBs to nanoplastics, microplastics, carbon nanotubes, and fullerenes." Environmental Science & Technology **48**(9): 4869-4876.

The presence of microplastic and carbon-based nanoparticles in the environment may have implications for the fate and effects of traditional hydrophobic chemicals. Here we present parameters for the sorption of 17 CB congeners to 10-180 mum sized polyethylene (micro-PE), 70 nm polystyrene (nano-PS), multiwalled carbon nanotubes (MWCNT), fullerene (C60), and a natural sediment in the environmentally relevant 10(-5)-10(-1) mug L(-1) concentration range. Effects of salinity and sediment organic matter fouling were assessed by measuring the isotherms in fresh- and seawater, with and without sediment present. Sorption to the "bulk" sorbents sediment organic matter (OM) and micro-PE occurred through linear hydrophobic partitioning with OM and micro-PE having similar sorption affinity. Sorption to MWCNT and nano-PS was nonlinear. PCB sorption to MWCNT and C60 was 3-4 orders of magnitude stronger than to OM and micro-PE. Sorption to nano-PS was 1-2 orders of magnitude stronger than to micro-PE, which was attributed to the higher aromaticity and surface-volume ratio of nano-PS. Organic matter effects varied among sorbents, with the largest OM fouling effect observed for the high surface sorbents MWCNT and nano-PS. Salinity decreased sorption for sediment and MWCNT but increased sorption for the polymers nano-PS and micro-PE. The exceptionally strong sorption of (planar) PCBs to C60, MWCNT, and nano-PS may imply increased hazards upon membrane transfer of these particles.

Venancio, C., et al. (2019). "The effects of nanoplastics on marine plankton: a case study with polymethylmethacrylate." Ecotoxicology and Environmental Safety **184**(109632).

Marine biota is currently exposed to plastic pollution. The biological effects of plastics may vary according to polymer types (e.g. polystyrene, polyethylene, acrylate), size of particles (macro, micro or nanoparticles) and their shape. There is a considerable lack of knowledge in terms of effects of nanoplastics (NP) to marine biota particularly of polymers like polymethylmethacrylate (PMMA). Thus, this study aimed to assess its ecotoxicological effects using a battery of standard monospecific bioassays with four marine microalgae (Tetraselmis chuii, Nannochloropsis gaditana, Isochrysis galbana and Thalassiosira weissflogii) and a marine rotifer species (Brachionus plicatilis). The tested PMMA-NP concentrations allowed the estimation of median effect concentrations for all microalgae species. T. weissflogii and T. chuii were respectively the most sensitive (EC_{50,96 h} of 83.75 mg/L) and least sensitive species (EC_{50,96 h} of 132.52 mg/L). The PMMA-NP were also able to induce mortality in rotifers at concentrations higher than 4.69 mg/L with an estimated 48 h median lethal concentration of 13.27 mg/L. A species sensitivity distribution curve (SSD), constructed based on data available in the literature and the data obtained in this study, reveal that PMMA-NP appears as less harmful to marine biota than other polymers like polystyrene.

Vendel, A. L., et al. (2017). "Widespread microplastic ingestion by fish assemblages in tropical estuaries subjected to anthropogenic pressures." Marine Pollution Bulletin **117**(1/2): 448-455.

Our aim was to quantify microplastic ingestion by fish assemblages in two tropical Brazilian estuaries and to evaluate whether biological and ecological factors influence the ingestion of microplastics by fish species. Of 2233 fish from both estuaries (from 69 species) examined in this study, 9% of the individuals (24 species) had microplastics in their gut contents. Microplastic

ingestion occurred irrespective of fish size and functional group. The diet of fish species was analyzed based on prey items identified in the fish's full stomach contents and five feeding guilds were defined. Microplastics were common throughout all feeding guilds. Low (average ingestion values 1.06+or-0.30 items/total fish) but widespread occurrence among estuaries also indicates proliferation of microplastic pollution. Our findings highlight the need to focus on assemblage level studies to understand the real magnitude of the problem and emphasize the urgency of mitigation measures directed at microplastic pollution in estuarine ecosystems.

Veneman, W. J., et al. (2017). "Pathway analysis of systemic transcriptome responses to injected polystyrene particles in zebrafish larvae." Aquatic Toxicology **190**: 112-120.

Microplastics are a contaminant of emergent concern in the environment, however, to date there is a limited understanding on their movement within organisms and the response of organisms. In the current study zebrafish embryos at different development stages were exposed to 700 nm fluorescent polystyrene (PS) particles and the response pathway after exposure was investigated using imaging and transcriptomics. Our results show limited spreading of particles within the larvae after injection during the blastula stage. This is in contrast to injection of PS particles in the yolk of 2-day old embryos, which resulted in redistribution of the PS particles throughout the bloodstream, and accumulation in the heart region. Although injection was local, the transcriptome profiling showed strong responses of zebrafish embryos exposed to PS particle, indicating a systemic response. We found several biological pathways activated which are related to an immune response in the PS exposed zebrafish larvae. Most notably the complement system was enriched as indicated by upregulation of genes in the alternative complement pathway (e.g. cfhl3, cfhl4, cfb and c9). The fact that complement pathway is activated indicates that plastic microparticles are integrated in immunological recognition processes. This was supported by fluorescence microscopy results, in which we observed co-localisation of neutrophils and macrophages around the PS particles. Identifying these key events can be a first building block to the development of an adverse outcome pathway (AOP). These data subsequently can be used within ecological and human risk assessment.

Venkata Ramana Reddy, K. and M. V. Nagabhushanam (2019). "STudy on the effect of alginate, type of cross linkers, and mucoadhesive polymers on drug release from lovastatin-loaded mucoadhesive cross-linked microbeads." Asian Journal of Pharmaceutical and Clinical Research **12**(12): 246-256.

Objective: The aim of the current study is to prepare and lovastatin-loaded alginate microbeads were prepared using emulsification gelation internal method by the use of different cross-linking agents, polymer effect in different concentrations on drug release and its combination with hydrophilic polymers on drug release. Method(s): The effect of sodium alginate concentration and its combination with other hydrophilic polymers on particle size and shape, scanning electron microscopy (SEM) studies, entrapment efficiency, Fourier transform infrared (FTIR) analysis (FTIR), differential scanning calorimetry (DSC) studies, and X-ray diffraction (XRD) studies conducted to determine compatibility of drug and used excipients and in vitro drug release was studied. The efficiency of mucoadhesion strength of microbeads is determined by wash-off study. Result(s): The optimum condition for preparation alginate beads and produces sustained release manner was occurred at 3% polymer mixture. Infrared spectroscopic study confirmed the presence of compatibility between drug-polymer additives, good drug entrapment, and SEM studies prove microbeads were in spherical and rough particles. XRD and DSC were used to confirm successful entrapment of drugs into the alginates microbeads. The in vitro release profile could be altered notably by changing formulation parameters to give a sustained release of drug from the microbeads. Conclusion(s): The kinetic modeling of the release data indicate that drug release from the microbeads follow anomalous transport mechanism and super Case-II transport mechanism and drug release is controlled by both swelling and relaxation of the polymer chains. It was found to be drug release is pH dependent. This will help in overcoming the drawbacks of lovastatin with a short half-life, improves the bioavailability. The release kinetics of drug from the alginate beads followed zero order. Copyright © 2019 The Authors.

Venkatesh, D. N., et al. (2019). "Enhanced oral bioavailability of tenofovir from ionotropically gelled microbeads." International Journal of Applied Pharmaceutics **11**(4): 242-250.

Objective: The main objective of the present investigation was to develop the microbeads of tenofovir. Tenofovir, a BCS class III drug has a poor bioavailability of 25%, and it is administered 300 mg once a day. By incorporating the drug into a microparticulate carrier, it is expected that the dissolution profile and the oral bioavailability may be increased. Method(s): Reinforced gellan-chitosan and calcium chloride beads of tenofovir were prepared by ionotropic gelation method employing various different concentrations of gellan, chitosan, calcium chloride and tenofovir. The beads were evaluated for various physicochemical parameters such as particle size determination, drug entrapment efficiency, swelling studies, infrared spectroscopy study, differential scanning calorimetry, x-ray diffraction analysis, scanning electron microscopy, in vitro drug release study, cytotoxicity study and in vivo oral bioavailability studies. Result(s): From the results, it can be concluded that the formulation TB-III exhibited higher drug entrapment efficiency (46.09+/-0.21), a higher swelling index, sustained drug release for a period of 24 h. The pharmacokinetic profile of the drug from microbeads exhibited an increased oral bioavailability (1.25 times higher than that of the pure drug), decreased elimination rate (1.32 times lesser for the drug in microbeads) with prolonged elimination half-life (1.32 times higher than pure tenofovir). Conclusion(s): Tenofovir loaded microbeads demonstrated as a better delivery system for the modified release of drug and also to navigate the drawbacks associated with conventional therapy. Copyright © 2019 The Authors.

Venkateshwar Reddy, A. and S. Maduri (2012). "Formulation and evaluation of low cost sustained release floating alginate beads." International Journal of Research in Pharmaceutical Sciences **3**(3): 398-403.

Floating beads are the micro-beads/ spheres prepared by ionic gelation technique. They can be either of sustained release or immediate release type. Sustained release type of floating drug delivery systems generally employ a high viscosity polymer like the hydroxyl propyl methyl cellulose (HPMC) or ethyl cellulose as the matrixing agent. These polymers are generally very expensive, and their use in the formulation leads to increased cost of the for-mulation, which is the main reason that limits the wide-spread usage of this dosage form. In this study, we have tried to produce low cost floating alginate beads by substituting high-cost polymers like HPMC with low cost po-lymer like carboxy methyl cellulose (CMC). Comparative studies were carried out to determine the efficacy of for-mulations containing CMC with that of formulations containing HPMC as the matrixing agent. We have also stu-died the effect of physicochemical properties of the drugs on the drug release pattern of the dosage form i.e. floating alginate beads. © JK Welfare & Pharmascope Foundation.

Venugopal, S. P. (2017). "A survey of marine pollution based on oil spill, air and land pollutions." Journal of Engineering and Applied Sciences **12**(16): 4161-4164.

In this study, the marine ecosystem polluted by a huge amount of oil spills, industries outlet

wastages to rivers, lakes and those toxic evaporation polluting sea living organisms like penguins, birds, mammals, etc., even air polluting marine ecosystem by carrying lot of dusts from industries which outlets burned gases in open atmosphere. Most ships offshore may sink sometime with a load of oil or leakage happens on the sea, these spreads oil surrounding environment of sea and shores where animals get affected due to oil coated with furs and cause liver or lung damage, poison, die within 2 days. Oil spilling not only affected marine ecosystem animal but it also evaporates toxic gas in open atmosphere which is inhaled by human beings, cause liver, respiratory diseases. Land junks, plastic wastes, ship wastages are all thrown in seas to make them more polluted which leads to the toxic environment where no one will survive the environment is completely out of hands. © Medwell Journals, 2017.

Verdesoto, S., et al. (2015). "Plasma cells negative selection technique in samples of plasma cell dyscrasia patients." Haematologica **1)**: 500-501.

Background:A 15-20% of plasma cells (PCs) is the main prerequisite for diagnosis of genetic abnormalities by FISH techniques in bone marrow interphase plasma cell dyscrasia patients. Plasma cells (PCs) enrichment from bone marrow samples patients are frequently performed by the traditional method of immunomagnetic separation (magnetic activated cell sorting, MACS) using anti-CD138 MicroBeads. The main inconveniences of the MACS method are: its high cost, it is unsuccessful if the percentage of PCs in the initial sample is less than 5% and the PCs positive selection affect to the quality of the cells. RosetteSep Human Multiple Myeloma Enrichment Cocktail The RosetteSep enrichment cocktail cross-links unwanted cells in human bone marrow to multiple red blood cells (RBCs) using Tetrameric Antibody Complexes (TAC), forming immunorosettes. This increases the density of the unwanted cells, in such a way that they pellet along with the free RBCs when centrifuged over Ficoll- Paque PLUS. Desired cells are never labeled with antibodies and are easily collected as a highly enriched population at the interface between the plasma and Ficoll-Paque PLUS. With this above negative selection cells technique, it obtain a great quantity and high quality cells. Aim(s): The aim of this paper is to find the optimal algorithm, results and advantages in cost and pure and quality cell populations of the RosetteSep separation technique for samples of 50 bone marrow plasma cell dyscrasia patients with various percentages of neoplastic cells for applying FISH methods in these diseases. Method(s): Specimens: We analysed 76 heparinized bone marrow aspirates with known PCs dyscrasias for FISH diagnosis of genetic abnormalities. The percentage of monoclonal PCs varied between 0.48 and 73.5% (mean 14.39%) according to flow cytometry analysis on the previous study before PCs selection. The cytology analysis was used when the percentage was between 3 to 4%, to determine the PCs infiltration, when there was an infiltration >=7% or presence of cell nests the sample was processed. Cell separation: RosetteSep technique was used for separation of PCs in all specimens. Briefly, we added RosetteSep Multiple Myeloma Enrichment Cocktail at 50 mul/ml of bone marrow aspirate sample, incubated 20 minutes at room temperature and diluted it with an equal volume of Ficoll-Paque PLUS. After centrifuging for 20 minutes at 1200xg at room temperature we removed and washed the enriched cells from the density medium (plasma interface). For all cases, enrichment was accomplished. Flow cytometry analysis: It was proved the percentage of PCs before and after the separation. Enriched sample was stained with CD38-FITC and CD45-V450 and acquired using a BD FACSCanto II. Percentage of PCs among non-erythroid cells was obtained by Infinicyt software (Cytognos). FISH analysis: FISH analysis was carried out following standard procedures on interphase cells. The number of interphase cells analyzed were 200. Result(s): 76 bone marrow samples were analyzed from patients with a range age between 38-89 years old (mean 67 years old). 19 sample patients with <=5% of preselected PCS by flow cytometry (0.48%>4.9%) showed

hemodilution (1 cases). Cytology analysis were carried out in spite of do the PCs selection in the rest of the bone marrow samples with <=5% PCs (6 cases); the PCs selection was realized when the samples showed a >=7% of PCs and/or nest cells by cytology. All samples were successfully separated. The median of PCs after enrichment was 60.5% (range 45.93- 86.75%). We obtained results in all of 77 FISH samples analyzed. Summary and Conclusion(s): The introduction of RosetteSep contributed markedly in increasing the effectiveness of plasma cell separation from bone marrow samples, mainly in samples with low plasma cell content where the MACS method is not unsuccessful (<5%), its negative selection strategy enabled us to obtain sufficient amounts of highly purified and quality PCs required for subsequent diagnosis techniques proposed. On the other hand, the above technique has a low cost as opposed to MACS. The increase in the PCs concentration permits better FISH results incrementing the genetic abnormality detections which have a high prognosis value in these pathologies.

Verespej, M. (2009). "ASTM: Changes likelyfor SPI resin ID codes." Plastics News **21**(34): 1-1NULL.
The article informs that some possible changes have been developed by ASTM International Inc. to the plastics industry resin identification code. The code was developed in 1988 by Society of the Plastics Industry (SPI), but the task of possibly changing elements of the code has been given to ASTM. The resin identification code is used by consumers and municipalities to identify plastic products for recycling.

Verespej, M. (2012). "Center petition seeking to set plastic pollution limits in water." Plastics News **24**(24): 0004-0004.
The article reports that the U.S. Center for Biological Diversity has requested that the U.S. Environmental Protection Agency (EPA) issue regulations limiting plastic pollution in ocean waters. Topics include the Clean Water Act of the EPA and the health risks to marine life posed by plastics pollution.

Verespej, M. (2012). "Health-care recycling council begins study." Plastics News **24**(23): 0020-0020.
The article discusses a 2012 study that will be conducted by the Healthcare Plastics Recycling Council (HPRC) to analyze the types and amount of plastic waste generated at Stanford Hospital & Clinics healthcare facility in Palo Alto, California. According to the article, the HPRC also released Design for Recycling hospital plastics recycling guidelines in November, 2011.

Verma, S. B., et al. (1979). "A comparison of temperature fluctuations measured by a microbead thermistor and a fine wire thermocouple over a crop surface." Agricultural Meteorology **20**(4): 281-289.
A microbead thermistor and a fine wire thermocouple were tested for rapid-response air temp. measurements over a lucerne crop. The turbulent statistics (the standard deviations of temp. fluctuations, and the covariances of temp. and vertical velocity fluctuations) and spectra measured with the 2 sensors under different thermal stratification conditions compared reasonably well. Coherence computations also indicated a fairly high degree of agreement between the time series measured with the microbead thermistor and the fine wire thermocouple.

Vertova, A., et al. (2019). "Chlorine Dioxide Degradation Issues on Metal and Plastic Water Pipes Tested in Parallel in a Semi-Closed System." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(22): 19.
Chlorine dioxide (ClO₂) has been widely used as a disinfectant in drinking water in the past but its effects on water pipes have not been investigated deeply, mainly due to the

difficult experimental set-up required to simulate real-life water pipe conditions. In the present paper, four different kinds of water pipes, two based on plastics, namely random polypropylene (PPR) and polyethylene of raised temperature (PERT/aluminum multilayer), and two made of metals, i.e., copper and galvanized steel, were put in a semi-closed system where ClO₂ was dosed continuously. The semi-closed system allowed for the simulation of real ClO₂ concentrations in common water distribution systems and to simulate the presence of pipes made with different materials from the source of water to the tap.

Verykiou, S., et al. (2017). "Modulation of autophagy reduces survival of trametinib-resistant, CD271-expressing melanoma subpopulations." British Journal of Dermatology **176 (4)**: e44.

Acquired resistance of BRAF-mutant melanoma to targeted BRAF/mitogen-activated protein kinase kinase (MEK) inhibition is associated with increased expression of the neurotrophin receptor CD271 and the activation of prosurvival mechanisms including autophagy. The aim of the present study was to further define the relationship between CD271 expression and autophagy, and to determine the impact of CD271 inhibition or autophagy modulation on the potential resensitization of metastatic melanoma cells to MEK inhibition with trametinib. Semiquantitative immunohistochemical analysis (IHC) of CD271 expression in five benign naevi and 17 primary cutaneous melanomas of differing American Joint Committee on Cancer stages with 13 patient-matched metastatic lymph node tumours demonstrated a significant stepwise increase in CD271 expression with disease progression (P = 0.002). Additionally, autophagic activity (assessed by p62 IHC analysis) was increased in metastatic lymph nodes compared with patient-matched primary melanomas. Treatment of WM35/A375 BRAF^{V600E} mutant melanoma cell lines with trametinib for 9 days resulted in increased CD271 expression, as well as LC3-II accumulation and reduced p62 expression (P < 0.001), both hallmarks of increased autophagy. Inhibition of autophagy using the lysosomal inhibitor chloroquine in trametinib-resistant CD271-expressing WM35/A375 cells resulted in significant inhibition of cell viability and reduction in colony-forming capacity, suggesting a prosurvival role of autophagy in the development of drug resistance. Furthermore, chloroquine also specifically inhibited the viability of CD271-positive WM35/A375 cells following selection with magnetic microbeads, indicating a direct correlation between CD271 expression and prosurvival autophagic activity. Alternatively, promoting cytotoxic autophagy in trametinibresistant CD271-expressing melanoma subpopulations with D9- tetrahydrocannabinol also resulted in significant inhibition of cell viability (P < 0.05). Therefore, collectively these data underpin the prosurvival role of autophagy and suggest that targeting autophagy modulation represents a viable therapeutic strategy through which to overcome MEK inhibitor-induced, CD271-mediated drug resistance of metastatic melanoma.

Vethaak, A. D. and H. A. Leslie (2016). "Plastic Debris Is a Human Health Issue." Environmental Science & Technology **50**(13): 6825-6826.

Viana, K. F., et al. (2013). "Analysis using canine peripheral blood for establishing in vitro conditions for monocyte differentiation into macrophages for Leishmania chagasi infection and T-cell subset purification." Veterinary Parasitology **198**(1/2): 62-71.

Canine visceral leishmaniasis (CVL) is a parasitic disease endemic in many countries, and dogs present as the major natural reservoir of the parasite, Leishmania chagasi (syn. L. infantum). Biomarkers in the canine immune system is an important technique in the course of developing vaccines and treatment strategies against CVL. New methodologies for studying the immune response of dogs during Leishmania infection and after receiving vaccines and treatments against CVL would be useful. In this context, we used peripheral blood mononuclear cells (PBMCs) from healthy dogs to evaluate procedures related to (i) establishment of in vitro conditions of monocytes differentiated into macrophages infected with L. chagasi and (ii) purification procedures of T-cell subsets (CD4⁺ and CD8⁺) using microbeads. Our data demonstrated that after 5 days of differentiation, macrophages were able to induce significant phagocytic and microbicidal activity after L. chagasi infection and also showed increased frequency of parasitism and a higher parasite load. Although N-acetyl- beta -D-glucosaminidase (NAG) levels presented similar levels of macrophage culture and L. chagasi infection, a progressive decrease in myeloperoxidase (MPO) levels was a hallmark over 5 days of culture. High purity levels (>90%) of CD4 and CD8 T cells were obtained on a magnetic separation column. We concluded that monocytes differentiated into macrophages at 5 days and displayed an intermediate frequency of parasitism and parasite load 72 h after L. chagasi infection. Furthermore, the purification system using canine T-lymphocyte subsets obtained after 5 days of monocyte differentiation proved efficient for CD4 or CD8 T-cell purification (>=90%). The in vitro analysis using L. chagasi-infected macrophages and purified T cells presented a prospective methodology that could be incorporated in CVL vaccine and treatment studies that aim to analyze the microbicidal potential induced by specific CD4⁺ and/or CD8⁺ T cells.

Vianello, A., et al. (2018). "First evaluation of floating microplastics in the Northwestern Adriatic Sea." Environmental science and pollution research international **25**(28): 28546-28561.

Plastic pollution in the marine environment is becoming a problem of global concern, and the Mediterranean is believed to be one of the worst affected regional seas. The present study presents data on floating microplastics in the Northwestern Adriatic Sea in order to evaluate the possible contribution of two significant potential sources: the lagoon of Venice and the Po River. Samples were collected in March and April 2014 along two transects located off Pellestrina Island (Venice) and the Po Delta, each consisting of four sampling stations at 0.5, 3, 10, and 20 km from the shoreline. Microplastics were quantified and classified according to their colors and shapes and analyzed by micro-attenuated total reflection-FT-IR. Microplastics were found in all samples, albeit with high spatial and temporal variability. The highest concentrations were observed in March at the offshore station of the Pellestrina transect (10.4 particles m−2) and the two landward stations off the Po Delta (2.1 and 4.3 particles m−2), highlighting the influence of various factors, such as surface circulation and river discharges, in determining specific accumulation patterns. The most common polymers were polyethylene and polypropylene, and most of the particles were secondary microplastics (83.5%). The patchy distribution of microplastics observed in the study area is driven by hydrodynamic and meteorological factors acting on short time scales.

Vianello, A., et al. (2019). "Simulating human exposure to indoor airborne microplastics using a Breathing Thermal Manikin." Scientific Reports **9**(1): 8670.

Humans are potentially exposed to microplastics through food, drink, and air. The first two pathways have received quite some scientific attention, while little is known about the latter. We address the exposure of humans to indoor airborne microplastics using a Breathing Thermal Manikin. Three apartments were investigated, and samples analysed through FPA-micro FTIR-Imaging spectroscopy followed by automatic analyses down to 11 micro m particle size. All samples were contaminated with microplastics, with concentrations between 1.7 and 16.2 particles m⁻³. Synthetic fragments and fibres accounted, on average, for 4% of the total identified particles, while nonsynthetic particles of protein and cellulose constituted 91%

and 4%, respectively. Polyester was the predominant synthetic polymer in all samples (81%), followed by polyethylene (5%), and nylon (3%). Microplastics were typically of smaller size than nonsynthetic particles. As the identified microplastics can be inhaled, these results highlight the potential direct human exposure to microplastic contamination via indoor air.

Vicentini, D. S., et al. (2019). "Toxicological Evaluation and Quantification of Ingested Metal-Core Nanoplastic by Daphnia magna Through Fluorescence and Inductively Coupled Plasma-Mass Spectrometric Methods." Environmental Toxicology & Chemistry **38**(10): 2101-2110.

There are few studies on nanoplastic that propose quantification of the amount ingested combined with evaluation of the toxic effects on aquatic organisms. We propose 2 methods to quantify the amount of polystyrene nanoplastic (PSNP) ingested by Daphnia magna: fluorescence intensity, where a fluorescent monomer (F) is added to the PSNP and quantified through fluorescence light microscopy, and total aluminum quantification, where PSNP is synthesized with Al2O3 metal-core nanoparticles and used for quantification of the nanoplastic ingested by the organism Daphnia magna using inductively coupled plasma-mass spectrometry. In addition, the PSNP was functionalized with palmitic acid to simulate the environmental conditions leading to biological and chemical transformations. Acute and chronic toxicity tests were performed with fluorescent PSNP (PSNP/F) and palmitic acid-functionalized PSNP/F (PSNP/F-PA). The ingestion quantified was higher by factors of 2.8 and 3.0 for PSNP/F-PA and 1.9 and 1.7 for PSNP/F applying the fluorescence intensity and total Al quantifying methods, respectively, when compared to PSNP. These results are consistent with the data obtained in the toxicity tests, which showed an approximately 3 times increase in the adverse effect of PSNP/F-PA on the mobility and reproduction of the organisms. Thus, the strong inhibition of D. magna reproduction caused by PSNP/F-PA in the chronic toxicity tests could be associated with a greater amount of this nanoplastic being ingested by the organisms. Environ Toxicol Chem 2019;38:2101–2110. © 2019 SETAC. [ABSTRACT FROM AUTHOR]

Vicentini, D. S., et al. (2019). "Toxicological Evaluation and Quantification of Ingested Metal-Core Nanoplastic by Daphnia magna Through Fluorescence and Inductively Coupled Plasma-Mass Spectrometric Methods." Environmental Toxicology & Chemistry **38**(10): 2101-2110.

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Al quantifying methods, respectively, when compared to PSNP. These results are consistent with the data obtained in the toxicity tests, which showed an approximately 3 times increase in the adverse effect of PSNP/F-PA on the mobility and reproduction of the organisms. Thus, the strong inhibition of D. magna reproduction caused by PSNP/F-PA in the chronic toxicity tests could be associated with a greater amount of this nanoplastic being ingested by the organisms. Environ Toxicol Chem 2019;38:2101-2110. © 2019 SETAC.

Vidal, J. C., et al. (2012). "An electrochemical immunosensor for ochratoxin A determination in wines based on a monoclonal antibody and paramagnetic microbeads." Analytical and bioanalytical chemistry **403**(6): 1585-1593.

We report a direct competitive immunosensor for the rapid determination of ochratoxin A (OTA) in wine samples. Magnetic beads (1+or-0.5 micro m diameter) covered with streptavidin were functionalized with a monoclonal antibody against OTA, and then left to incubate in a solution of tracer (ochratoxin conjugated to the enzyme peroxidase) and a range of OTA concentrations (10⁻⁴ to 1,000 ng mL⁻¹). After washing and separation steps helped with a magnetic field, a volume of the dispersion was put on screen-printed electrodes under a magnet, and after adding the substrate the p-benzoquinone generated enzymatically was detected by differential-pulse voltammetry. Wine samples (2 mL) were easily prepared simply by adjusting to pH=7.5 with diluted NaOH and by adding polyvinylpyrrolidone for complexing polyphenols, without any other clean-up or preconcentration steps. The limit of detection for detecting OTA in wines was of 0.11+or-0.01 ng L⁻¹, well below the permitted content of the mycotoxin by the European Union (<2 ng mL⁻¹). Spiked wines were subjected to immunosensor calibrations to study the matrix effects. OTA concentrations measured with the immunosensor were compared with those obtained by high-performance liquid chromatography coupled to fluorescence detection (AOAC official method 2001.01). The OTA levels from two red wines of "Campo de Borja", Spain, ranged from about 0.027 to 0.033 ng mL⁻¹ of OTA.

Vidyasakar, A., et al. (2018). "Macrodebris and microplastic distribution in the beaches of Rameswaram Coral Island, Gulf of Mannar, Southeast coast of India: A first report." Marine Pollution Bulletin **137**: 610-616.

This is the first study on the distribution and characteristics of plastic debris found in the sediments of Rameswaram Island, Gulf of Mannar, India. Studies on the distribution of plastics and microplastic content in highly populated coral islands and their impact on the coral ecosystem are very scarce. For this purpose, marine sediment samples were collected from 20 locations along the coastal areas of the study region. The distribution and characterization study was carried out by visual examination followed by FTIR spectroscopy. The results showed abundance of white-colored and irregular-shaped plastic debris in this study area. Polypropylene was identified as a dominant polymer variety, followed by polyethylene, polystyrene, nylon, and polyvinyl chloride. Tourist activities and fishing practices were found to be the possible sources of the microplastic debris. Additionally, the distribution of the plastics was found to be dominantly controlled by the aeolian process and the nature of the coast. Copyright © 2018

Vigneron, A., et al. (2019). "Immune Defenses of a Beneficial Pest: The Mealworm Beetle, Tenebrio molitor." Frontiers in Physiology **10**: 138.

The mealworm beetle, Tenebrio molitor, is currently considered as a pest when infesting stored grains or grain products. However, mealworms are now being promoted as a beneficial insect because their high nutrient content makes them a viable food source and because they are capable of degrading polystyrene and plastic waste. These attributes make T. molitor attractive for mass rearing, which may promote disease transmission within the insect colonies. Disease resistance is of paramount importance for both the control and the culture of mealworms, and several biotic and abiotic environmental factors affect the success of their anti-parasitic defenses, both positively and negatively. After providing a detailed description of T. molitor's anti-parasitic defenses, we review the main biotic and abiotic environmental factors that alter their presentation, and we discuss their implications for the purpose of controlling the development and health of this insect.

Viirlaid, E., et al. (2019). "Immunoassay for rapid on-site detection of glyphosate herbicide." Environmental Monitoring & Assessment **191**(8): 507.

Glyphosate is the most widespread herbicide and its global use is steadily increasing. Although glyphosate is considered to have low toxicity, its wide application has raised concerns about its effects on human health. The extensive use of glyphosate has risen a need of its continuous monitoring in drinking and surface waters to assure in accordance with the set standards. Within the present study, we have developed a novel assay for the on-site detection of glyphosate by combining flow-through technology with the high specificity of immunorecognition. The proposed biosensing system was based on the detection of fluorescence signal generated by the quantitative replacement of glyphosate in antigen-antibody complex with IgY-type anti-glyphosate antibodies on microbeads by synthetic 5-carboxytetramethylrhodamine (5-TAMRA) conjugated glyphosate. The working range of this assay was in low millimolar range and the time required for glyphosate detection around 0.5 h. The applicability of the immunoassay for glyphosate detection in surface water was tested and the biosensor results were validated with high-performance liquid chromatography.

Villaret, J., et al. (2018). "Adaptation of a microbead assay for the easy evaluation of traditional anti-sickling medicines: application to DREPANOSTAT and FACA." Pharmaceutical Biology **56**(1): 385-392.

CONTEXT: Sickle cell disease is a common inherited blood disorder affecting millions of people worldwide. Due to lack of progress in drug discovery for a suitable treatment, sufferers often turn to traditional medicines that take advantage of the plant extracts activity used by traditional healers.

OBJECTIVE: This study optimizes an anti-sickling screening test to identify preparations capable of reverting sickle cells back to the morphology of normal red blood cells. We focused on the miniaturization and practicability of the assay, so that it can be adapted to the laboratory conditions commonly found in less developed countries.

MATERIALS AND METHODS: We tested two traditional anti-sickling herbal medicines, FACA and DREPANOSTAT, composed of Zanthoxylum zanthoxyloides (Lam.) Zepern. & Timler (Rutaceae) and Calotropis procera (Aiton) Dryand. (Apocynaceae) at screening concentrations of hydroethanol extracts from 0.2 to 1 mg/mL. Potential bioactive molecules present in the extracts were profiled using Ultra High Performance Liquid Chromatography coupled with High Resolution Mass Spectrometry (UHPLC-HRMS/MS) method, identified through HRMS, MS/MS spectra and in silico fragmentation tools.

RESULTS: Hydroethanol extracts of FACA and DREPANOSTAT showed low anti-sickling activity, inhibiting less than 10% of the sickling process. The UHPLC-HRMS/MS profiles identified 28 compounds (18 in FACA and 15 in DREPANOSTAT, including common compounds) among which l-phenylalanine is already described as potential anti-sickling agent. When used as positive control, 7 mg/mL

phenylalanine reduced the sickled RBC to 52%.
DISCUSSION AND CONCLUSIONS: This assay has been optimized for the easy screening of plant extracts or extracted compounds from bioassay guided fractionation, valuable to laboratories from less developed countries.

Vinatzer, B. A., et al. (1998). "Construction and characterization of a bacterial artificial chromosome library of apple." Theoretical and Applied Genetics **97**(7): 1183-1190.
A bacterial artificial chromosome (BAC) library has been constructed from apple (Malus x domestica [M. pumila]) using the variety Florina, which is resistant to scab (Venturia inaequalis) by virtue of the Vf gene. Since apple leaves are rich in polyphenols, high-molecular-weight DNA was extracted from leaf nuclei with a protocol adapted to apple. The nuclei were then embedded in agarose microbeads and partially digested by varying ratios of EcoRI to EcoRI methylase. The resulting DNA fragments were size-selected by pulsed-field gel electrophoresis, ligated to the BAC cloning vector pECBAC1 and transformed into Escherichia coli cells by electroporation. A total of 36 864 recombinant clones (BACs) were obtained. The library has an average insert size of 120 kb and represents approximately 5 x apple haploid-genome equivalents. It was screened with six cDNA probes using the chemiluminescent DIG system. An average of 4.4 clones was detected for each locus. The apple BAC library will be used to isolate the Vf scab resistance gene through map-based cloning. In this connection the library was screened with a marker closely linked to the Vf gene and six positive clones have been isolated. This library should thus be well suited for map-based gene cloning, in particular for the isolation of the Vf gene and for the construction of a physical map of the apple genome.

Vinson, B. T., et al. (2017). "Laser direct-write based fabrication of a spatially-defined, biomimetic construct as a potential model for breast cancer cell invasion into adipose tissue." Biofabrication **9**(2): 025013.
Epithelial-adipose interaction is an integral step in breast cancer cell invasion and progression towards lethal metastatic disease. Understanding the physiological contribution of obesity, a major contributor to breast cancer risk and negative prognosis in post-menopausal patients, on cancer cell invasion requires detailed co-culture constructs that reflect mammary microarchitecture. Using laser direct-write, a laser-based CAD/CAM bioprinting technique, we have demonstrated the ability to construct breast cancer cell-laden hydrogel microbeads into spatially defined patterns in hydrogel matrices containing differentiated adipocytes. Z-stack imaging confirmed the three-dimensional nature of the constructs, as well as incorporation of cancer cell-laden microbeads into the adipose matrix. Preliminary data was gathered to support the construct as a potential model for breast cancer cell invasion into adipose tissue. MCF-7 and MDA-MB-231 breast cancer cell invasion was tracked over 2 weeks in an optically transparent hydrogel scaffold in the presence of differentiated adipocytes obtained from normal weight or obese patient tissue. Our model successfully integrates adipocytes and gives us the potential to study cellular and tissue-level interactions towards the early detection of cancer cell invasion into adipose tissue.

Virsek, M. K., et al. (2017). "Microplastics as a vector for the transport of the bacterial fish pathogen species Aeromonas salmonicida." Marine Pollution Bulletin **125**(1-2): 301-309.
Microplastics is widespread in the marine environment where it can cause numerous negative effects. It can provide space for the growth of organisms and serves as a vector for the long distance transfer of marine microorganisms. In this study, we examined the sea surface concentrations of microplastics in the North Adriatic and characterized bacterial communities

living on the microplastics. DNA from microplastics particles was isolated by three different methods, followed by PCR amplification of 16S rDNA, clone libraries preparation and phylogenetic analysis. 28 bacterial species were identified on the microplastics particles including Aeromonas spp. and hydrocarbon-degrading bacterial species. Based on the 16S rDNA sequences the pathogenic fish bacteria Aeromonas salmonicida was identified for the first time on microplastics. Because A. salmonicida is responsible for illnesses in fish, it is crucial to get answers if and how microplastics pollution is responsible for spreading of diseases. Copyright © 2017 Elsevier Ltd

Visani, G., et al. (2009). "Identification of novel cryptic chromosomal abnormalities in primary myelofibrosis by single-nucleotide polymorphism oligonucleotide microarray." Blood. Conference: 51st Annual Meeting of the American Society of Hematology, ASH. New Orleans, LA United States. Conference Publication: **114**(22).

Background.: Primary myelofibrosis (PMF) is a clonal myeloproliferative neoplasm (MPN) characterised by a proliferation of predominantly megakaryocytes and granulocytes in bone marrow that in fully developed disease is replaced by fibrous tissue. At molecular level, no specific defect has been identified yet. Cytogenetic abnormalities occur in up to 30% of patients, the commonest including del(13)(q12-22), der(6)t(1;6)(q21-23;p21.3), del (20q), and partial trisomy 1q. In addition, approximately 50% of patients with PMF exhibit a single, recurrent, somatic mutation in the gene encoding the cytoplasmic tyrosine kinase Janus kinase 2 (JAK2). However, such mutation is not specific, also occurring in other MPN. Recently a couple of reports dealt with single-nucleotide polymorphism (SNP) array karyotyping of MPD, including some PMF. Importantly, such studies could identify previously uncovered genetic lesions, highlighting the importance of novel high resolution technologies for the detection of formerly unknown, cryptic aberrations. In this study we performed high resolution karyotyping by SNP oligonucleotide microarray by using the most updated Affymetrix array (Genome-Wide Human SNP Array 6.0) in 20 cases of myelofibrosis (MF) in order to identify novel cryptic genomic aberrations. Methods.: DNA (500 ng) was extracted from peripheral blood cells (PBMNC) of 14 primary and 6 secondary MF patients. PBMNC were depleted from lymphocytes by magnetic beads. Briefly, CD3+ cells were labeled with anti-CD3 MoAb directly coupled to magnetic microbeads (Miltenyi Biotech), washed and subsequently purified using Mini-MACS technology. After selection, cell present in the positive (CD3) and negative (PBMNC) fractions were counted and submitted to flow cytometry analysis. DNA was processed and hybridized to the Affymetrix SNP arrays 6.0 as for manufacturer instruction. A whole-genome copy number variation (CNV), genotyping, loss of heterozygosity (LOH) and uniparental disomy (UPD) analyses were performed using the Partek Suite 6.0. Ten lab-specific as well as 90 HapMap samples relative to Caucasian healthy donor were used as control reference. Genomic abnormalities were defined as recurrent when occurring in at least 25% of cases. JAK2 mutational status was assessed as reported, by alle-specific PCR. Clinical information and complete follow up were retrieved for all cases. Direct sequencing, FISH, qPCR and immunohistochemistry (IHC) has been chosen for validation. Results.: In all patients we could detect several CNV. The median number of CNV was 60 (range, 34-72), including 46 amplifications (A) and 14 deletions (D). All commonest previously described abnormalities were detected. In addition, several formerly uncovered recurrent lesions were identified, mainly involving 1p, 1q, 2p, 4p, 4q, 5q, 6p, 6q, 7q, 8p, 9q 10q, 11p 11q, 12p, 14q, 15q, 16p, 16q, 17q, 18q, 19q, 20p, 22q. The median size of such CNV was 424,582 Kbp (1,379 Kbp-71,277 Mbp). We then compared JAK2+ vs. JAK2- cases. Of note, we found numerous definite aberrations (A or D) distinguishing the two groups and specifically affecting 16q23.1, 1p36.13, 3q26, 14q13.2, 5q33.2, 6q14.1, 7q33, 8p23.1, and 9p11.2. Grippingly, several

genes of potential interest for PMF pathogenesis were identified within the involved loci, including RET, SCAPER, WWOX and SIRPB1. Among others, the product of such genes has been selected for validation by IHC. Similarly, many miRNA were recognized, which may deserve further investigation. Conclusions.: By using a newly developed highly sensitive array we identified novel cryptic lesions in patients affected by MF. Future studies on larger series, as well as functional analyses will definitely assess their role in the pathogenesis of the disease. Of note, consistent differences were recorded in JAK2+ vs. JAK2-, supporting the hypothesis of different genetic mechanisms occurring in the two sub-groups.

Viscidi, R. and F. Rossi (2013). "Are B lymphocytes a reservoir of JC virus?" Journal of NeuroVirology **19 (3)**: 300-301.

Whether B cells are a reservoir for JC virus (JCV) is controversial, with widely ranging reports of JCV DNA detection in B cells/PBMC and conflicting data on susceptibility of B cell lines to JCV infection, the association of natalizumab with PML and the perturbations of B cell populations by the drug have stimulated renewed interest in the question whether B cells are susceptible to JCV infection. We purified primary B cells from healthy donor PBMC using flow cytometry cell sorting into naive (CD19+/CD27-/CD38-) and memory (CD19+ /CD27+/CD38-) B cells, transitional B cells (CD19+/CD27-/CD24+ /CD38+) and differentiated plasma-like cells (CD19+/CD27+/CD38+ /CD24-). Purified populations were transfected with pBJC (rearranged) or pJCCY (archetype) plasmid DNA (gift of Jennifer Gordon) using the Amaxa B cell Nucleofector kit. In addition, the cells were infected with JCV from lysates of 293TT cells cultured for 7 days after transfection with the above plasmids, following the method of Broekema and Imperiale for production of infectious JC virus. Four days posttransfection and 7 days post-infection, we did not detect JCVearly gene mRNAexpression by TaqMan PCR.However, the cells were negative for GFP expression using a control plasmid, raising concerns about efficiency of transfection of sorted cells. As an alternative approach, B cells were purified by Miltenyi microbead separation into CD19+/CD27-/CD10- cells (naive), CD19+/CD27-/CD10+ (transitional), CD19+/CD27+ /CD138- (memory), and CD19+/CD27+/CD138+ (plasma) sub populations. Cells recovered by microbead separation were capable of being transfected with a GFP control plasmid. Results of transfection/infection experiments with JC virus plasmids/TT293 lysates will be reported.

Vladisavljevic, G. T. and R. A. Williams (2005). "Recent developments in manufacturing emulsions and particulate products using membranes." Advances in Colloid & Interface Science **113**(1): 1-20.

Membrane emulsification (ME) is a relatively new technique for the highly controlled production of particulates. This review focuses on the recent developments in this area, ranging from the production of simple oil-in-water (O/W) or water-in-oil (W/O) emulsions to multiple emulsions of different types, solid-in-oil-in-water (S/O/W) dispersions, coherent solids (silica particles, solid lipid microspheres, solder metal powder) and structured solids (solid lipid microcarriers, gel microbeads, polymeric microspheres, core-shell microcapsules and hollow polymeric microparticles). Other emerging technologies that extend the capabilities into different membrane materials and operation methods (such as rotating membranes, repeated membrane extrusion of coarsely pre-emulsified feeds) are introduced. The results of experimental work carried out by cited researchers in the field together with those of the current authors are presented in a tabular form in a rigorous and systematic manner. These demonstrate a wide range of products that can be manufactured using different membrane approaches. Opportunities for creation of new and novel entities are highlighted for low throughput applications (medical diagnostics, healthcare) and for large-scale productions (consumer and personal products). [References: 133]

Vlietstra, L. S. and J. A. Parga (2002). "Long-term changes in the type, but not amount, of ingested plastic particles in short-tailed shearwaters in the southeastern Bering Sea." Marine Pollution Bulletin **44**(9): 945-955.

We report the current (1997-1999, 2001) incidence and amount of ingested plastic in short-tailed shearwaters (Puffinus tenuirostris) in the southeastern Bering Sea and compare our results with plastic reported in shearwaters during 1970-1978. We also examine correlations between plastic loads and shearwater body mass. We found that 84% (N = 330) of shearwaters sampled in 1997-1999 and 2001 contained plastic. The incidence and amount of ingested plastic have not significantly changed since the 1970s. In contrast, the predominant type of plastic has changed over time, from industrial plastic to user plastic. S,asonal patterns in the incidence and amount of ingested plastic also changed from peak levels during early and late summer in the 1970s to mid summer in the late 1990s and 2001. We suggest that the availability of neuston plastic to seabirds in the Bering Sea has undergone a shift in composition since the 1970s. Shearwater body mass appears little if at all impaired by plastic, at least at present levels of consumption.

Volkmann, E. R., et al. (2018). "Specific pneumoproteins predict progression of interstitial lung disease in systemic sclerosis patients undergoing treatment with immunosuppression." Arthritis and Rheumatology **70 (Supplement 9)**: 2093-2094.

Background/Purpose: Interstitial lung disease (ILD) is the leading cause of death in systemic sclerosis (SSc). While some SSc-ILD patients are stable or improve with immunosuppressive therapy, others have progressive decline and currently available clinical parameters do not reliably predict outcomes. We investigated whether two specific pneumoproteins, Krebs von den Lungen-6 [KL-6] and CC chemokine ligand 2 [CCL18]) predict response to immunosuppression with cyclophosphamide (CYC) and mycophenolate(MMF) in SSc-ILD. Method(s): 142 patients in Scleroderma Lung Study (SLS) II were randomized to receive either mycophenolate (MMF) for 2 years or oral CYC for 1 year followed by 1 year of placebo. All available serum baseline and 12-month samples were investigated. CCL18 was assayed by commercially available ELISA while KL-6 was measured using antibody coated latex microbeads and an automated analyzer. The forced vital capacity (FVC) and the diffusing capacity for carbon monoxide (DLCO) were measured every 3 months. Quantitaive Lung fibrosis (QLF) and Quantitative ILD (QILD) scores for whole lung (WL) and zone of maximum involvement (ZM) were measured at baseline. To investigate the relationship between baseline CCL18 and KL-6 and progression of ILD, joint models were created with the outcomes of the course of the FVC and DLCO over 1 year. Result(s): Baseline serum KL-6 and CCL18 correlated with extent of ILD. KL-6 levels correlated with (r, P-value):DLCO (- 0.3; 0.0002) QLF-WL (0.5; <0.0001) QLF-ZM(0.4; <0.0001), and QILD-WL(0.5; <0.0001), QILD-ZM (0.5; <0.0001); Baseline CCL18 levels were correlated with QILD-WL (r=0.2; p=0.04) and QILD-ZM (r=0.3; p=0.009), but not with the FVC or DLCO. CCL18 and KL6 levels declined significantly in the first year in both arms (Figure 1). After adjusting for baseline disease severity, higher baseline KL6 levels predicted progression of ILD as measured by the course of the FVC (CYC/MMF: Estimate-0.31/-0.74; P=0.024/<0.001) and DLCO (CYC/MMF: Estimate -1.30/-1.29; P<0.001/<0.001) over 1 year for both treatment arms. Similarly, higher baseline CCL18 levels predicted progression of ILD as measured by the course of the FVC (CYC/MMF: Estimate -1.24/-0.35; P<0.001; 0.007) and DLCO (CYC/MMF: Estimate -1.87/-1.24; P=0.001/0.002) over 1 year for both treatment arms. Conclusion(s): In the context of a rigorously conducted clinical trial for SSc-ILD, baseline KL-6 and CCL18 levels correlated with several surrogate measures of ILD severity. Patients with higher baseline KL-6 and CCL18 levels

were more likely to experience disease progression despite treatment with CYC and MMF. KL-6 and CCL18 could be used to identify patients with progressive ILD that require closer monitoring in clinical practice. KL-6 and CCL18 may also be used to enrich SSc- ILD clinical trials with those at risk of accelerated ILD progression with conventional immunosuppressive therapy. (Figure Presented).

Volkov, V. A., et al. (2014). "Preparation of segmented microtubules to study motions driven by the disassembling microtubule ends." Journal of Visualized Experiments **85**: 15.

Microtubule depolymerization can provide force to transport different protein complexes and protein-coated beads in vitro. The underlying mechanisms are thought to play a vital role in the microtubule-dependent chromosome motions during cell division, but the relevant proteins and their exact roles are ill-defined. Thus, there is a growing need to develop assays with which to study such motility in vitro using purified components and defined biochemical milieu. Microtubules, however, are inherently unstable polymers; their switching between growth and shortening is stochastic and difficult to control. The protocols we describe here take advantage of the segmented microtubules that are made with the photoablatable stabilizing caps. Depolymerization of such segmented microtubules can be triggered with high temporal and spatial resolution, thereby assisting studies of motility at the disassembling microtubule ends. This technique can be used to carry out a quantitative analysis of the number of molecules in the fluorescently-labeled protein complexes, which move processively with dynamic microtubule ends. To optimize a signal-to-noise ratio in this and other quantitative fluorescent assays, coverslips should be treated to reduce nonspecific absorption of soluble fluorescently-labeled proteins. Detailed protocols are provided to take into account the unevenness of fluorescent illumination, and determine the intensity of a single fluorophore using equidistant Gaussian fit. Finally, we describe the use of segmented microtubules to study microtubule-dependent motions of the protein-coated microbeads, providing insights into the ability of different motor and nonmotor proteins to couple microtubule depolymerization to processive cargo motion.

Vollenkle, C., et al. (2004). "Construction of a functional S-layer fusion protein comprising an immunoglobulin G-binding domain for development of specific adsorbents for extracorporeal blood purification." Applied & Environmental Microbiology **70**(3): 1514-1521.

The chimeric gene encoding a C-terminally-truncated form of the S-layer protein SbpA from Bacillus sphaericus CCM 2177 and two copies of the Fc-binding Z-domain was constructed, cloned, and heterologously expressed in Escherichia coli HMS174(DE3). The Z-domain is a synthetic analogue of the B-domain of protein A, capable of binding the Fc part of immunoglobulin G (IgG). The S-layer fusion protein rSbpA(31-1068)/ZZ retained the specific properties of the S-layer protein moiety to self-assemble in suspension and to recrystallize on supports precoated with secondary cell wall polymer (SCWP), which is the natural anchoring molecule for the S-layer protein in the bacterial cell wall. Due to the construction principle of the S-layer fusion protein, the ZZ-domains remained exposed on the outermost surface of the protein lattice. The binding capacity of the native or cross-linked monolayer for human IgG was determined by surface plasmon resonance measurements. For batch adsorption experiments, 3-microm-diameter, biocompatible cellulose-based, SCWP-coated microbeads were used for recrystallization of the S-layer fusion protein. In the case of the native monolayer, the binding capacity for human IgG was 5.1 ng/mm(2), whereas after cross-linking with dimethyl pimelimidate, 4.4 ng of IgG/mm(2) was bound. This corresponded to 78 and 65% of the theoretical saturation capacity of a planar surface for IgGs aligned in the upright position,

respectively. Compared to commercial particles used as immunoadsorbents to remove autoantibodies from sera of patients suffering from an autoimmune disease, the IgG binding capacity of the S-layer fusion protein-coated microbeads was at least 20 times higher. For that reason, this novel type of microbeads should find application in the microsphere-based detoxification system.

von Friesen, L. W., et al. (2019). "An efficient and gentle enzymatic digestion protocol for the extraction of microplastics from bivalve tissue." Marine Pollution Bulletin **142**: 129-134.

Standardized methods for the digestion of biota for microplastic analysis are currently lacking. Chemical methods can be effective, but can also cause damage to some polymers. Enzymatic methods are known to be gentler, but often laborious, expensive and time consuming. A novel tissue digestion method with pancreatic enzymes and a pH buffer (Tris) is here presented in a comparison to a commonly applied digestion protocol with potassium hydroxide. The novel protocol demonstrates a highly efficient removal of bivalve tissue (97.7 +/- 0.2% dry weight loss) already over-night. Furthermore, it induces no impairment in terms of ability to correctly identify four pre-weathered plastic polymers and six textile fiber polymers by Fourier transform infrared spectroscopy after exposure. The high-throughput protocol requires minimal handling, is of low cost and does not pose risk to the performer or the environment. It is therefore suggested as a candidate for a standardized digestion protocol, enabling successful analysis of microplastics ingested by bivalves. Copyright © 2019 Elsevier Ltd

Von Keudell, G., et al. (2013). "Pilot study of regulatory T cell depletion in the setting of autologous stem cell transplantation for multiple myeloma." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Although autologous stem cell transplantation (ASCT) is effective for patients with multiple myeloma (MM), disease relapse remains problematic. Despite significant advances in therapeutics for MM, it remains mostly incurable. Following ASCT, a majority of MM patients are in a minimal residual disease state, at which time delivery of immunotherapy may be most effective. Regulatory T cells (Tregs) are a naturally-suppressive CD4+ T cell population (CD4+CD25+FoxP3+ T cells) that expand in MM patients, and strongly inhibit anti-tumor immune responses. In pre-clinical models Treg depletion enhanced the function of tumor antigen-specific T cells. Effective strategies to deplete Tregs in humans are being investigated. We initiated pilot study to test 2 methods of Treg depletion in MM patients undergoing ASCT. In the first approach, an anti-CD25 monoclonal antibody (basiliximab) was administered day +1 following ASCT (in vivo Treg depletion). The second method involved depleting CD4+CD25+ Tregs from autologous stem cell (ASC) grafts with clinical-grade anti-CD25 microbeads and the CliniMACS device (Miltenyi) (ex vivo Treg depletion). A control arm consisted of patients in which no Treg-depleting maneuver was performed. To date, 10 patients with symptomatic MM have been enrolled and randomly assigned to 1 of 3 study arms (arm 1 - standard ASCT; arm 2 - in vivo Treg depletion; arm 3 - ex vivo Treg depletion). Primary endpoints included: a) efficacy of ex vivo Treg depletion from ASC grafts, b) kinetics of Treg depletion and recovery in each study arm, and c) assessment of toxicity associated with Treg depletion. Secondary endpoints included time to engraftment following ASCT and disease response. The overall goal of the study was to identify a superior strategy with regard to depth and durability of Treg depletion. Ten patients (median age 59; range 46-68) have been enrolled. 4 were enrolled onto arm 1, 3 onto arm 2 and 3 onto arm 3. One patient enrolled on arm 2 was removed from study due to ASC mobilization failure. ASC were collected following neupogen and plexifor, and conditioning for ASCT consisted of melphalan (200mg/m2). Typical serious adverse events associated with ASCT were observed in

all study arms, with neutropenic fever being the most common (n=2 arm 1, n=1 arm 2 and n=2 arm 3). Autoimmune complications, such as autologous graft-versus-host disease, were not observed. All patients engrafted post-ASCT with normal kinetics. Too few patients have been treated to make conclusions regarding clinical efficacy. Depletion of CD4+CD25+ Tregs from ASC grafts in arm 3 (ex vivo Treg depletion) was effective. As shown in Figure 1, 90.1% +/- 6% of CD4+25+ Tregs were depleted from 3 ASC grafts following the procedure. Baseline frequencies of peripheral blood (PB) CD4+FoxP3+ Tregs were similar between patients in all arms (p = n.s.). At least a 2-fold reduction in PB Treg frequency was observed at days +28 and + 60 following ASCT (Figure 2). At day +28, mean numbers (+/- SD) of CD4+FoxP3+ PB Tregs were 8.58% +/- 4.52%, 2.48% +/- 1.77%, and 3.28% +/- 1.12% in arms 1, 2 and 3, respectively (p = 0.08 arm 1 vs arm 2; p = 0.05 arm 1 vs arm 3; p = .57 arm 2 vs arm 3). These data suggest that both the in vivo and ex vivo Treg depletion may be effective at mediating effective and durable Treg depletion (Figure Presented) Treg are effectively depleted ex vivo with CD25 microbeads and the Clinimacs device. A FACS plots showing frequency of CD4 +CD25 + Tregs before (left) and after (right) ex vivo Treg depletion procedure (arm 3). B Mean CD4+CD25+ Treg frequencies before and after ex vivo Treg depletion (*p= 0.05). Kinetics of Treg depletion following ASCT. Mean (+/- SD) frequency of CD4+FoxP3+ Tregs before and after ASCT in each study arm are displayed. In conclusion, both the in vivo or ex vivo method of Treg depletion appear to be effective based on small patient numbers. Treg depletion in MM patients undergoing ASCT is safe and does not delay engraftment. Additional patients will need to be treated to make conclusions regarding clin cal efficacy. Future studies of Treg depletion in combination with other immunotherapeutic strategies are being considered.

Vonk, G., et al. (2019). "Analysis of pollutants in the product gas of a pilot scale downdraft gasifier fed with wood, or mixtures of wood and waste materials." Biomass and Bioenergy **125**: 139-150.

Small scale gasification of Solid Recovered Fuels (SRF) in downdraft reactors could be an alternative to large scale waste-to-energy schemes. In this perspective, the assessment of the pollutant emissions at pilot scale is necessary. This work compares pollutant emissions from wood and SRF air gasification in a downdraft fixed bed gasifier. Five fuels have been studied: Poplar wood, SRF wood, and three different mixtures containing mass fractions of 80% SRF wood with 20% of either tire, plastic waste or sewage sludge. Air gasification was performed in a pilot scale reactor in fed-batch mode using a fuel mass ranging from 5 to 8 kg and an air inlet flow of 170-180 L min⁻¹ (at 0 degrees C and 101 325 Pa). Depending on the fuel, Equivalence Ratios (ER) ranged from 0.22 to 0.29 and gasification temperatures from 690 to 850 degrees C. Emissions analyses were performed on product gas, condensable species and remaining chars, with a particular focus on sulfur, nitrogen and heavy metals. Regarding sulfur, wood and SRF wood led to low H₂S contents (6-8 micro mol mol⁻¹), when SRF mixes led to higher concentrations (44-96 micro mol mol⁻¹) in addition to of up to 11 heavier sulfur compounds. Regarding nitrogen, SRF produced higher ammonia concentrations (2.1-7.6 mmol mol⁻¹) than Wood (619 micro mol mol⁻¹), as a result of initial nitrogen mass fractions 17 to 27 times higher in the SRF mixes. Heavy metals analyzed in remaining solids after gasification showed low recovery rates (<0.4%), and tend to accumulate in fine particles, as a result of their volatility.

Vos, A. C., et al. (2012). "Anti-TNF induced regulatory macrophages display high levels of autophagy." Gastroenterology **1)**: S889.

Background One of the most exciting developments in IBD therapy has been the introduction of anti-TNF agents. Although originally believed to function through neutralization of soluble TNF,

we have previously shown that anti-TNF agents induce regulatory macrophages which have immune-suppressive and wound healing capacity (Vos et al, Gastroenterology 2010). How these cells exert their effects has not been established thus far. Over the past few years, genome-wide association studies have shown a correlation between Crohn's Disease (CD) and a number of autophagy-related genes, implicating a role for autophagy dysfunction in the pathogenesis. We evaluated the induction of autophagy in anti-TNF induced macrophages. Methods Mixed lymphocyte reactions were established using PBMC from two healthy donors in a 1:1 ratio and treated with anti-TNF or IgG control. Subsequently, macrophages were isolated from the cultures using CD14-microbeads. Levels of autophagy were determined by enumeration of LC3+ spots and quantification of LC3-I/LC3-II ratio's. In addition, expression levels of various autophagy-related genes were studied by gene array. Results Anti- TNF induced regulatory macrophages displayed increased numbers of autophagosomes as indicated by LC3+ spots. In addition, conversion of the autophagosomal protein LC3 was increased in anti-TNF treated cultures compared to IgG treated cultures. Finally, expression of a number of autophagy related genes including atg5, atg7, atg9 and atg16l2 were upregulated in the induced regulatory macrophages in comparison to inflammatory M1 type macrophages. Conclusion Regulatory macrophages induced by anti-TNF therapy display increased levels of autophagy compared to IgG-induced or inflammatory macrophages. Given the role for impaired autophagy in the pathogenesis of CD, this may be an addition mechanism by which anti-TNF compounds exert their beneficial effects.

Vos, J. G. M. and N. Sumarni (1997). "Integrated crop management of hot pepper (Capsicum spp.) under tropical lowland conditions: effects of mulch on crop performance and production." Journal of Horticultural Science **72**(3): 415-424.

The effects of mulches were investigated within integrated crop management (ICM) of hot pepper at tropical lowland sites in Indonesia. Mulching materials consisted of rice straw and white or silvery plastic film. Mulches affected soil temperature, light reflection, and soil nutrient concentrations after the last harvest. Rice straw mulch reduced soil temperature, induced faster plant growth, advanced mid-fruiting time, and resulted in higher K contents in leaves, but had no effect on yield. Plastic mulches increased soil temperature, induced faster plant growth and earlier fruiting, reduced P concentration in leaves and fruits, and increased N concentration in leaves and fruits. Yield and mean fruit weight of healthy fruits were increased and earliness of harvesting was enhanced. Improved crop performance and production with increase in fertilizer efficiency, control of evaporation, leaching and soil erosion makes plastic mulches suitable for use in ICM. To minimize the negative side-effect of plastic waste on the environment, further improvement of mulch technology is required. Preliminary field results and a tentative cost-benefit analysis are in favour of the application of plastic mulch in hot pepper under tropical lowland conditions.

Vossier, L., et al. (2019). "Combining culture and microbead-based immunoassay for the early and generic detection of bacteria in platelet concentrates." Transfusion **59**(1): 277-286.

BACKGROUND: Despite current preventive strategies, bacterial contamination of platelets is the highest residual infectious risk in transfusion. Bacteria can grow from an initial concentration of 0.03-0.3 colony-forming units (CFUs)/mL up to 10⁸ to 10⁹ CFUs/mL over the product shelf life. The aim of this study was to develop a cost-effective approach for an early, rapid, sensitive, and generic detection of bacteria in platelet concentrates.

STUDY DESIGN AND METHODS: A large panel of bacteria involved in transfusion reactions, including clinical isolates and reference strains, was established. Sampling was performed 24 hours after

platelet spiking. After an optimized culture step for increasing bacterial growth, a microbead-based immunoassay allowed the generic detection of bacteria. Antibody production and immunoassay development took place exclusively with bacteria spiked in fresh platelet concentrates to improve the specificity of the test.
RESULTS: Antibodies for the generic detection of either gram-negative or gram-positive bacteria were selected for the microbead-based immunoassay. Our approach, combining the improved culture step with the immunoassay, allowed sensitive detection of 1 to 10 CFUs/mL for gram-negative and 1 to 10² CFUs/mL for gram-positive species.
CONCLUSION: In this study, a new approach combining bacterial culture with immunoassay was developed for the generic and sensitive detection of bacteria in platelet concentrates. This efficient and easily automatable approach allows tested platelets to be used on Day 2 after collection and could represent an alternative strategy for reducing the risk of transfusion-transmitted bacterial infections. This strategy could be adapted for the detection of bacteria in other cellular products.

Vossier, L., et al. (2019). "Combining culture and microbead-based immunoassay for the early and generic detection of bacteria in platelet concentrates." Transfusion **59**(1): 277-286.

BACKGROUNDDespite current preventive strategies, bacterial contamination of platelets is the highest residual infectious risk in transfusion. Bacteria can grow from an initial concentration of 0.03–0.3 colony-forming units (CFUs)/mL up to 108 to 109 CFUs/mL over the product shelf life. The aim of this study was to develop a cost-effective approach for an early, rapid, sensitive, and generic detection of bacteria in platelet concentrates.STUDY DESIGN AND METHODSA large panel of bacteria involved in transfusion reactions, including clinical isolates and reference strains, was established. Sampling was performed 24 hours after platelet spiking. After an optimized culture step for increasing bacterial growth, a microbead-based immunoassay allowed the generic detection of bacteria. Antibody production and immunoassay development took place exclusively with bacteria spiked in fresh platelet concentrates to improve the specificity of the test.RESULTSAntibodies for the generic detection of either gram-negative or gram-positive bacteria were selected for the microbead-based immunoassay. Our approach, combining the improved culture step with the immunoassay, allowed sensitive detection of 1 to 10 CFUs/mL for gram-negative and 1 to 102 CFUs/mL for gram-positive species.CONCLUSIONIn this study, a new approach combining bacterial culture with immunoassay was developed for the generic and sensitive detection of bacteria in platelet concentrates. This efficient and easily automatable approach allows tested platelets to be used on Day 2 after collection and could represent an alternative strategy for reducing the risk of transfusion-transmitted bacterial infections. This strategy could be adapted for the detection of bacteria in other cellular products.

Vox, G., et al. (2016). "Mapping of agriculture plastic waste." Agriculture and Agricultural Science Procedia **8**: 583-591.

The current intensification of the use of plastic materials in agriculture, although has increased significantly the productivity, is also generating growing adverse effects on the environment of the agro-ecosystem. The agriculture is responsible for a massive use of plastic materials, in addition to energy and water inputs, chemical fertilizer and pesticides. Besides the pollution generated during the manufacture, at the end of their lifetime plastic materials used for crop covering, soil mulching, packaging, containers, pots, irrigation and drainage pipes, may became a pollution source when improperly disposed, leaved on the ground or burned. Instead the agricultural plastic waste (APW), if correctly collected, can be used as a new secondary raw material or as an energy source. An adequate APW management can prevent economical losses and environmental damages. The territory of the Barletta, Andria, Trani Province (BAT), in the Apulia Region, South Italy, is an agricultural area characterized by vineyards, olive groves, orchards and vegetables; it represents an area of intense production of plastic wastes and with a widespread problem linked to the application of unacceptable disposal practices. The goal of this study is to define and quantify the different types of plastic waste produced by the agricultural practice in a restricted area of the municipal area of Trani and Barletta, to localize the points where the most remarkable quantities of them are generated, and to provide the local Authorities and the decision makers of a useful tool for implementing an efficient and effective waste management. A dedicated geo-referenced database was designed using land use maps in a GIS environment and applying a methodology that can be functional for any kind of agricultural plastic waste. The resulting database gives updated and complete information on the plastic waste generation, over the land, related to the cultivation kind.

Vral, A., et al. (2001). "A higher micronucleus yield in B-versus T-cells after low-dose gamma-irradiation is not linked with defective Ku86 protein." International Journal of Radiation Biology **77**(3): 329-339.

PURPOSE: To elaborate the B-cell micronucleus (MN) response in the low-dose region in detail and to investigate the postulated deficiency in DNA-PK in B-cells.

MATERIALS AND METHODS: Lymphocytes of five healthy volunteers were irradiated with low LET gamma-rays and high LET fast neutrons with doses ranging between 0.01 and 2 Gy. After post-irradiation incubation, B- and T-cells were isolated via CD3 and CD19 immunomagnetic microbeads. MN were analysed in both subpopulations. To study the underlying mechanism of chromosomal radiosensitivity, cell extracts prepared from purified B- and T-cells were subjected to SDS-electrophoresis and electroblotting using antibodies directed against the DNA-PK repair enzymes Ku70/86 and DNA-PKcs. Activity measurements were performed using the SignaTECT DNA-dependent protein kinase assay. DNA double-strand break (DSB) induction and rejoining was determined using constant-field gel electrophoresis.

RESULTS: For low LET gamma-rays a higher MN yield was observed in B-cells than in T-cells, but only in those samples exposed to doses < 1 Gy. For 1 Gy, the MN yields were comparable and for 2Gy even lower in B-cells compared with T-cells. After high LET neutron irradiation no significant differences in MN yields were observed between both subsets. The results of the DNA-PK experiments demonstrate that there is no difference between T- and B-cells in the basal expression and activity of DNA-PK repair proteins. No differences in DNA DSB induction and rejoining were found between T- and B-cells using constant-field gel electrophoresis.

CONCLUSIONS: From the results, it was concluded that the enhanced chromosomal radiosensitivity in B-cells is restricted to low doses (<1 Gy) of low LET radiation and that the chromosomal behaviour of B-cells to low LET radiation cannot be attributed to aberrant forms of the DNA-PK components. A type of chromosomal induced radioresistance (IRR) may be a possible explanation for the observed effect.

Vrana, N. E., et al. (2011). "Hybrid titanium/biodegradable polymer implants with an hierarchical pore structure as a means to control selective cell movement." PLoS ONE [Electronic Resource] **6**(5): e20480.

UNLABELLED: In order to improve implant success rate, it is important to enhance their responsiveness to the prevailing conditions following implantation. Uncontrolled movement of inflammatory cells and fibroblasts is one of these in vivo problems and the porosity properties of the implant have a strong effect on these. Here, we describe a hybrid system composed of a macroporous titanium structure filled with a microporous biodegradable polymer. This polymer matrix has a distinct porosity gradient to accommodate different cell types (fibroblasts and

epithelial cells). The main clinical application of this system will be the prevention of restenosis due to excessive fibroblast migration and proliferation in the case of tracheal implants.
METHODOLOGY/PRINCIPAL FINDINGS: A microbead-based titanium template was filled with a porous Poly (L-lactic acid) (PLLA) body by freeze-extraction method. A distinct porosity difference was obtained between the inner and outer surfaces of the implant as characterized by image analysis and Mercury porosimetry (9.8+/-2.2 micro m vs. 36.7+/-11.4 micro m, p<=0.05). On top, a thin PLLA film was added to optimize the growth of epithelial cells, which was confirmed by using human respiratory epithelial cells. To check the control of fibroblast movement, PKH26 labeled fibroblasts were seeded onto Titanium and Titanium/PLLA implants. The cell movement was quantified by confocal microscopy: in one week cells moved deeper in Ti samples compared to Ti/PLLA.
CONCLUSIONS: In vitro experiments showed that this new implant is effective for guiding different kind of cells it will contact upon implantation. Overall, this system would enable spatial and temporal control over cell migration by a gradient ranging from macroporosity to nanoporosity within a tracheal implant. Moreover, mechanical properties will be dependent mainly on the titanium frame. This will make it possible to create a polymeric environment which is suitable for cells without the need to meet mechanical requirements with the polymeric structure.

Vroom, R. J. E., et al. (2017). "Aging of microplastics promotes their ingestion by marine zooplankton." Environmental Pollution **231**(Part 1): 987-996.

Microplastics (<5 mm) are ubiquitous in the marine environment and are ingested by zooplankton with possible negative effects on survival, feeding, and fecundity. The majority of laboratory studies has used new and pristine microplastics to test their impacts, while aging processes such as weathering and biofouling alter the characteristics of plastic particles in the marine environment. We investigated zooplankton ingestion of polystyrene beads (15 and 30 micro m) and fragments (<=30 micro m), and tested the hypothesis that microplastics previously exposed to marine conditions (aged) are ingested at higher rates than pristine microplastics. Polystyrene beads were aged by soaking in natural local seawater for three weeks. Three zooplankton taxa ingested microplastics, excluding the copepod Pseudocalanus spp., but the proportions of individuals ingesting plastic and the number of particles ingested were taxon and life stage specific and dependent on plastic size. All stages of Calanus finmarchicus ingested polystyrene fragments. Aged microbeads were preferred over pristine ones by females of Acartia longiremis as well as juvenile copepodites CV and adults of Calanus finmarchicus. The preference for aged microplastics may be attributed to the formation of a biofilm. Such a coating, made up of natural microbes, may contain similar prey as the copepods feed on in the water column and secrete chemical exudates that aid chemodetection and thus increase the attractiveness of the particles as food items. Much of the ingested plastic was, however, egested within a short time period (2-4 h) and the survival of adult Calanus females was not affected in an 11-day exposure. Negative effects of microplastics ingestion were thus limited. Our findings emphasize, however, that aging plays an important role in the transformation of microplastics at sea and ingestion by grazers, and should thus be considered in future microplastics ingestion studies and estimates of microplastics transfer into the marine food web.

Vu, D., et al. (2018). A system designed to convert plastic waste product into utilitarian artifacts. 125th ASEE Annual Conference and Exposition, June 23, 2018 - December 27, 2018, Salt Lake City, UT, United states, American Society for Engineering Education.

The paper expounds a senior design project that was undertaken to convert plastic waste into utilitarian artifacts. The paper presents here the practice followed by the authors in their respective Department of Electrical Engineering Technology at Duy Tan University, Da Nang, Vietnam and Purdue University Northwest, Hammond, Indiana. This paper describes the following promising solution: (a) set up and organize a system for collecting plastic used for water and soda bottles, (b) design and manufacture production line for automatically processing plastic bottles to make plastic ribbons of various sizes, (c) use the plastic ribbon to make a prototype of useful products like tables, chairs, roofing, decorations, etc. This paper covers the design details of three machines that are core in the successful implementation of the project. The first machine converts waste plastic into plastic ribbon. The second machine is for the straightening of the plastic ribbon. The third machine is for kneading straight plastic ribbon into various artifacts of choice. The paper brings forth the projects economic and social benefits. On the economical side, this will minimize all expenditures for waste processing related to disposition of the plastic waste, create more jobs, especially in rural areas, and providing plastic products with reasonable price for low income population. On the social side, this will improve environmental conditions, reduce landfill waste, and eliminate spreading of disease due to contamination from burning and melting of plastics. The project enhances students' awareness of ecology, and the environmental protection of community. The pedagogy of the course delivery is based on "Interactive Learning Model". The paper elaborates the benefits derived through the pedagogical approaches of keeping the learner actively engaged in all aspects of discovery and design. The course interactively involves the learner in directing and defining the material under discourse. The paper presents the fine points of pedagogical approach that were implemented in successful completion of this course. American Society for Engineering Education, 2018.

Wadhwa, A., et al. (2012). "Bead-based microfluidic immunoassay for diagnosis of Johne's disease." Journal of Immunological Methods **382**(1-2): 196-202.

Microfluidics technology offers a platform for development of point-of-care diagnostic devices for various infectious diseases. In this study, we examined whether serodiagnosis of Johne's disease (JD) can be conducted in a bead-based microfluidic assay system. Magnetic micro-beads were coated with antigens of the causative agent of JD, Mycobacterium avium subsp. paratuberculosis. The antigen-coated beads were incubated with serum samples of JD-positive or negative serum samples and then with a fluorescently-labeled secondary antibody (SAB). To confirm binding of serum antibodies to the antigen, the beads were subjected to flow cytometric analysis. Different conditions (dilutions of serum and SAB, types of SAB, and types of magnetic beads) were optimized for a large degree of differentiation between the JD-negative and JD-positive samples. Using the optimized conditions, we tested a well-classified set of 155 serum samples from JD-negative and JD-positive cattle by using the bead-based flow cytometric assay. Of 105 JD-positive samples, 63 samples (60%) showed higher antibody binding levels than a cut-off value determined by using antibody binding levels of JD-negative samples. In contrast, only 43-49 JD-positive samples showed higher antibody binding levels than the cut-off value when the samples were tested using commercially-available immunoassays. Microfluidic assays were performed by magnetically immobilizing a number of beads within a microchannel of a glass microchip and detecting antibody on the collected beads using laser-induced fluorescence. Antigen-coated magnetic beads treated with the bovine serum sample and fluorescently-labeled SAB were loaded into a microchannel to measure the fluorescence (reflecting level of antibody binding) on the beads in the microfluidic system. When the results of five bovine serum samples with the microfluidic system were compared to those analyzed with the flow cytometer, a high level of correlation (linear regression, r²=0.994) was observed. In a further experiment, we magnetically immobilized antigen-coated beads in a microchannel, reacted the beads with serum and SAB in the channel, and detected antibody binding to the beads in the microfluidic system. A strong antibody binding in JD-positive serum was detected, whereas there was only negligible binding in negative control experiments. Our data suggest that the bead-based microfluidic system may form a basis for development of an on-site serodiagnosis of JD. © 2012 Elsevier B.V.

Wagner, J., et al. (2019). "Nondestructive Extraction and Identification of Microplastics from Freshwater Sport Fish Stomachs." Environmental Science & Technology **53**(24): 14496-14506.

Microplastics were extracted from freshwater sport fish stomachs containing substantial biomass and identified using optical microscopy, scanning electron microscopy plus energy-dispersive X-ray spectroscopy (SEM/EDS), and Fourier transform infrared (FTIR) micro-spectroscopy with automated spectral mapping. An extraction method is presented that uses a negatively pressurized sieve stack and purified water to preserve plastic surface characteristics and any adsorbed persistent organic pollutants (POPs). This nondestructive extraction method for large predators' stomachs enables multiple trophic-level studies from one fish sampling event and provides other dietary and behavioral data. FTIR-identified microplastics 50-1500 mum, including polyethylene (two with plastic additive POPs), styrene acrylonitrile, polystyrene, and nylon and polyethylene terephthalate fibers 10-50 mum wide. SEM/EDS revealed characteristic surface weathering on the plastic surfaces. The nylon fibers appear to be from human fishing activities, suggesting options for management. Some particles visually identified as potential plastics were revealed by micro-spectroscopy to be mineralized, natural polyamide proteins, or nonplastic shell pieces. A low-cost, reflective sample preparation method with stable particle mounting was developed to enable automated mapping, improved FTIR throughput, and lower detection size limit. This study yielded 37 intact prey items set aside for future analyses.

Wagner, M., et al. (2014). "Microplastics in freshwater ecosystems: what we know and what we need to know." Environmental Sciences Europe **26**(1): 12.

BACKGROUND: While the use of plastic materials has generated huge societal benefits, the 'plastic age' comes with downsides: One issue of emerging concern is the accumulation of plastics in the aquatic environment. Here, so-called microplastics (MP), fragments smaller than 5 mm, are of special concern because they can be ingested throughout the food web more readily than larger particles. Focusing on freshwater MP, we briefly review the state of the science to identify gaps of knowledge and deduce research needs.

STATE OF THE SCIENCE: Environmental scientists started investigating marine (micro)plastics in the early 2000s. Today, a wealth of studies demonstrates that MP have ubiquitously permeated the marine ecosystem, including the polar regions and the deep sea. MP ingestion has been documented for an increasing number of marine species. However, to date, only few studies investigate their biological effects. The majority of marine plastics are considered to originate from land-based sources, including surface waters. Although they may be important transport pathways of MP, data from freshwater ecosystems is scarce. So far, only few studies provide evidence for the presence of MP in rivers and lakes. Data on MP uptake by freshwater invertebrates and fish is very limited.

KNOWLEDGE GAPS: While the research on marine MP is more advanced, there are immense gaps of knowledge regarding freshwater MP. Data on their abundance is fragmentary for large and absent for small surface waters. Likewise, relevant sources and the environmental fate remain to be investigated. Data on the biological effects of MP in freshwater species is completely lacking. The accumulation of other freshwater contaminants on MP is of special interest because

ingestion might increase the chemical exposure. Again, data is unavailable on this important issue.

CONCLUSIONS: MP represent freshwater contaminants of emerging concern. However, to assess the environmental risk associated with MP, comprehensive data on their abundance, fate, sources, and biological effects in freshwater ecosystems are needed. Establishing such data critically depends on a collaborative effort by environmental scientists from diverse disciplines (chemistry, hydrology, ecotoxicology, etc.) and, unsurprisingly, on the allocation of sufficient public funding.

Wagner, S., et al. (2018). "Tire wear particles in the aquatic environment - A review on generation, analysis, occurrence, fate and effects." Water Research **139**: 83-100.

Tire wear particles (TWP), generated from tire material during use on roads have gained increasing attention as part of organic particulate contaminants, such as microplastic, in aquatic environments. The available information on properties and generation of TWP, analytical techniques to determine TWP, emissions, occurrence and behavior and ecotoxicological effects of TWP are reviewed with a focus on surface water as a potential receptor. TWP emissions are traffic related and contribute 5-30% to non-exhaust emissions from traffic. The mass of TWP generated is estimated at 1,327,000 t/a for the European Union, 1,120,000 t/a for the United States and 133,000 t/a for Germany. For Germany, this is equivalent to four times the amount of pesticides used. The mass of TWP ultimately entering the aquatic environment strongly depends on the extent of collection and treatment of road runoff, which is highly variable. For the German highways it is estimated that up to 11,000 t/a of TWP reach surface waters. Data on TWP concentrations in the environment, including surface waters are fragmentary, which is also due to the lack of suitable analytical methods for their determination. Information on TWP properties such as density and size distribution are missing; this hampers assessing the fate of TWP in the aquatic environment. Effects in the aquatic environment may stem from TWP itself or from compounds released from TWP. It is concluded that reliable knowledge on transport mechanism to surface waters, concentrations in surface waters and sediments, effects of aging, environmental half-lives of TWP as well as effects on aquatic organisms are missing. These aspects need to be addressed to allow for the assessment of risk of TWP in an aquatic environment. Copyright © 2018 Elsevier Ltd

Wagner, S., et al. (2019). "Relationship between Discharge and River Plastic Concentrations in a Rural and an Urban Catchment." Environmental Science & Technology **53**(17): 10082-10091.

Rivers play a major role in the transport of plastic debris from inland sources such as urban areas into the marine environment. The present study examined plastic particle concentrations and loads (>500 mum) upstream and downstream of an urban subcatchment over 15 months and investigated the relationship between river water discharge (Q) and plastic concentration (C). The plastic particle concentration increases by 0.8 g/1000 m³ or 79 n/1000m³ from the rural to the urban subcatchment. In the rural subcatchment, C does not increase with increasing Q (p = 0.57), whereas a positive relationship between C and Q exists downstream of the urban catchment (p = 0.00003). Combined sewer overflows likely contribute additional plastic loads during high flow conditions. Based on the C-Q relationship, we estimate the total plastic export in 2016 from the entire catchment to be 3.0 x 10⁶ n/year or 2.6 x 10⁴ n/(km² year) and 15 n/(cap year). Because of the positive C-Q relationship, 90% of the plastic load is transported during 20% of the time. The analysis of time-resolved plastic concentration data in rivers provides a data-driven tool to better estimate plastic loads and to better understand the catchment controls of plastic

in rivers.

Wahlqvist, M. L. (2017). "Enabling and disabling health systems through food systems." Annals of Nutrition and Metabolism **71 (Supplement 2)**: 14-15.

Health is more dependent on the prevailing food system than acknowledged. This is for several reasons. First, it may or may not be available Second, it may not be safe. Third, it may not be acceptable. Fourth, it may not be affordable. Fifth, food itself is much more complicated than nutrient composition would suggest or aberrant nutrient intake might contribute to pathophysiology (Wahlqvist Food & Function 2016). Sixth, food plays a sociological as well as physiological role. Seventh, it is eaten at the end of an intricate system of production, transport, processing, packaging, storage and marketing any one of which may have health effects downstream. Eighth, it has effects on every body organ and system, not just the cardiovascular, gastrointestinal, musculoskeletal or immune system, for example. Ninth, it alters gene expression (epigenetics), and heretofore we have over-stated what is genetic inheritance and underestimated the intra-and inter-generational effects of food. Tenth, the growing understanding of our microbiomes provides for explanatory models of food-health associations previously arcane. Finally, we are ecological creatures and not separate from our environment whether through biorhythms, sensory inputs, energy regulation, microbiomic pathways, endocrine-phytonutrient linkages, locomotor activity, eco-immunology, and more (Wahlqvist ML ,Ann Nutr Metab 2016). The recognition of these food system inputs into human biology offers potentially greater cost-effectiveness in health care systems. We now know that a greater emphasis on plant-derived foods and food biodiversity reduces the prevailing burden of disease and its costs (Lo et al Amer J Managed Care 2013). In addition, the availability of public open space (POS) and gardens is associated with better mental health, longer lives and less so-called chronic disease (Mitchell and Popham, Lancet 2014). Better health outcomes are possible even in the face of risk factors like cognitive impairment, hypertension and obesity with a biodiverse diet, physical activity and POS (Wahlqvist APJCN, 2014). A deeper understanding of food and health would be represented by an ecosystem health disorder nomenclature (EHD) (Wahlqvist, APJCN, 2014). It has been suggested that we increasingly suffer what might be termed 'nature deficit disorders'. Given that modest exercise is necessary to access nature, and is associated with healthier and longer lives (Wen CP et al Lancet, 2011), the combination of a biodiverse diet, the social role of food and walking among nature and gardens has the prospects of health and economic advantage. Yet new health risks and costs loom as ecosystems are lost and food systems compromised. One of the most pressing is that of oceanic contamination with microplastics, much of it derived from food and beverage packaging. They are now found in deep sea and coastal seafood whose health risk and benefit must therefore come under review. An innovative food and health workforce with systems awareness could take a more socio-ecological approach to mitigate the challenges of climate change. Axiomatic will be that we need to appreciate how little we need and not seek how much we can get, in the interests of our ecological selves and a habitable planet.

Waite, H. R., et al. (2018). "Quantity and types of microplastics in the organic tissues of the eastern oyster Crassostrea virginica and Atlantic mud crab Panopeus herbstii from a Florida estuary." Marine Pollution Bulletin **129**(1): 179-185.

This study determined the quantity and diversity of microplastics in water and soft tissues of eastern oysters (Crassostrea virginica) and Atlantic mud crabs (Panopeus herbstii) in Mosquito Lagoon, a shallow, microtidal estuary along the east coast of central Florida. One-liter water samples had an average of 23.1 microplastic pieces (n=15). Crabs (n=90) had an average of 4.2

pieces in tissues/individual plus an average of 20.3 pieces/individual temporarily entangled in exposed surfaces and released within 5 days in tanks. Adult oysters (n=90) had an average of 16.5 microplastic pieces/individual. Fibers, mostly royal/dark blue in color, dominated our collections. When compared per gram of tissue, crabs had two orders of magnitude more microplastic pieces than oysters. Our numbers were higher than previous studies on invertebrate microplastics; this is potentially the result of extensive urbanization, limited flushing, and intensive recreational usage of Mosquito Lagoon.

Waldschlager, K. and H. Schuttrumpf (2019). "Erosion Behavior of Different Microplastic Particles in Comparison to Natural Sediments." Environmental Science & Technology **53**(22): 13219-13227.
Microplastic (MP) has been detected in marine, limnic, terrestrial, and atmospheric environments. However, rivers are often only seen as transport paths for MPs from inland sources to the oceans, although transport rates in rivers can hardly be determined yet. MP in rivers can either be transported, or it settles to the bottom of the river and either remains there or is remobilized again at higher flow velocities. This remobilization, also known as erosion, depends on the critical shear stress of a particle and is influenced by the particle properties and the sediment bed. In this study, the critical shear stresses of 14 MP particles with different shapes, densities, and particle sizes on different sediment beds were experimentally determined and subsequently compared with the basic principles of erosion from sediment transport. Critical shear stresses of the MP particles were between 0.002 and 0.233 N/m², depending on particle and sediment properties. Furthermore, the hiding-exposure effect was transferred to MPs and an equation was developed to determine the critical shear stress of different MP particles on natural sediment beds.

Waldschläger, K. and H. Schüttrumpf (2019). "Effects of Particle Properties on the Settling and Rise Velocities of Microplastics in Freshwater under Laboratory Conditions." Environmental Science & Technology **53**(4): 1958.
Microplastic (MP) contaminates terrestrial, aquatic, and atmospheric environments. Although the number of river sampling studies with regard to MP concentrations is increasing, comprehension of the predominant transport processes of MP in the watercourse is still very limited. In order to gain a better process understanding, around 500 physical experiments were conducted to shed more light on the effects of particle shape, size and density on the rise and settling velocities of MP. The determined velocities ranged between 0.39 cm/s for polyamide fibers (settling) and 31.4 cm/s for expanded polystyrene pellets (rise). Subsequently, the determined velocities were compared with formulas from sediment transport and, as there were large differences between theoretically and experimentally determined velocities, own formulas were developed to describe settling and rise velocities of MP particles with a large variety of shapes, sizes and densities. This study shows that MP differs significantly from sediment in its behavior and that a transfer of common sediment transport formulas should be treated with caution. Furthermore, the established formulas can now be used in numerical simulations to describe the settling and rising of MP more precisely.

Walek, K. M., et al. (2011). "The assessment of autoantibodies from patients with primary immune thrombocytopenia using platelet phagocytosis assay." Transfusion Medicine and Hemotherapy **1)**: 7-8.
Background: Primary Immune thrombocytopenia (ITP) is a bleeding disorder caused by platelet specific autoantibodies (PLT-AAbs). Although PLT-Abs are frequently detected using serological laboratory investigations, little is know about the effector function of these antibodies. In this study, the phagocytic activity of PLT-AAbs was analyzed in vitro using phagocytosis assay.

Method(s): Monocytes were isolated from healthy donors using CD 14-microbeads. Autologous PLTs were isolated by centrifugation and labeled using an intra- cellular FITC-dye. Labeled PLTs were then opsonized with purified IgG from ITP- and non-immune thrombocytopenic patients and introduced to isolated monocytes. After incubation, antibody phagocytic activity was determined using flow cytometry as the percentage of FITC-positive monocytes out of all gated monocytes. To exclude non-specific positive signal from antibody- independent PLT-monocytes interactions, investigations using confocal microscope were performed in parallel. Result(s): By testing IgG-fraction from non-immune thrombocytopenic patients, no phagocytic activity was observed (median: 3.1%) indicating the high specificity of the phagocytosis assay. The phagocytosis induced by AAbs was significantly higher using platelets obtained from citrated than from EDTA- blood samples (21,33% vs. 10,33%, p = 0.0013). The phagocytic activity of AAbs was largely, but not completely, inhibited by adding ivIgG at high concentration (660 [xg/ml), suggesting that other mechanisms than engaging Fc gamma receptors may contribute to platelet destruction in ITP-patients. Conclusion(s): Better conditions for the effector function of PLT-AAbs can be provided using citrated blood samples. This finding could have a huge impact on laboratory investigations of ITP where a better sensitivity may be obtained using citrated blood samples. The phagocytosis assay allows better understanding of the pathophysiology of ITP and may be used to investigate new therapies.

Walker, T. R. (2018). "China's ban could curb plastic waste." Nature **553**(7689): 405.

Walkinshaw, C., et al. (2020). "Microplastics and seafood: lower trophic organisms at highest risk of contamination." Ecotoxicology & Environmental Safety **190**: 110066.

Microplastic debris is a prevalent global pollutant that poses a risk to marine organisms and ecological processes. It is also suspected to pose a risk to marine food security; however, these risks are currently poorly understood. In this review, we seek to understand the current knowledge pertaining to the contamination of commercially important fished and farmed marine organisms with microplastics, with the aim of answering the question "Does microplastic pollution pose a risk to marine food security?". A semi-systematic review of studies investigating the number of microplastics found in commercially important organisms of different trophic levels suggests that microplastics do not biomagnify, and that organisms at lower trophic levels are more likely to contaminated by microplastic pollution than apex predators. We address the factors that influence microplastic consumption and retention by organisms. This research has implications for food safety and highlights the risks of microplastics to fisheries and aquaculture, and identifies current knowledge gaps within this research field.

Wall, T., et al. (2017). "Optofluidic Lab-on-a-Chip Fluorescence Sensor Using Integrated Buried ARROW (bARROW) Waveguides." Micromachines **8**(8).

Optofluidic, lab-on-a-chip fluorescence sensors were fabricated using buried anti-resonant reflecting optical waveguides (bARROWs). The bARROWs are impervious to the negative water absorption effects that typically occur in waveguides made using hygroscopic, plasma-enhanced chemical vapor deposition (PECVD) oxides. These sensors were used to detect fluorescent microbeads and had an average signal-to-noise ratio (SNR) that was 81.3% higher than that of single-oxide ARROW fluorescence sensors. While the single-oxide ARROW sensors were annealed at 300 degreeC to drive moisture out of the waveguides, the bARROW sensors required no annealing process to obtain a high SNR.

Waller, C. L., et al. (2017). "Microplastics in the Antarctic marine system: An emerging area of research."

Science of the Total Environment **598**: 220-227.

It was thought that the Southern Ocean was relatively free of microplastic contamination; however, recent studies and citizen science projects in the Southern Ocean have reported microplastics in deep-sea sediments and surface waters. Here we reviewed available information on microplastics (including macroplastics as a source of microplastics) in the Southern Ocean. We estimated primary microplastic concentrations from personal care products and laundry, and identified potential sources and routes of transmission into the region. Estimates showed the levels of microplastic pollution released into the region from ships and scientific research stations were likely to be negligible at the scale of the Southern Ocean, but may be significant on a local scale. This was demonstrated by the detection of the first microplastics in shallow benthic sediments close to a number of research stations on King George Island. Furthermore, our predictions of primary microplastic concentrations from local sources were five orders of magnitude lower than levels reported in published sampling surveys (assuming an even dispersal at the ocean surface). Sea surface transfer from lower latitudes may contribute, at an as yet unknown level, to Southern Ocean plastic concentrations. Acknowledging the lack of data describing microplastic origins, concentrations, distribution and impacts in the Southern Ocean, we highlight the urgent need for research, and call for routine, standardised monitoring in the Antarctic marine system.

Waller, C. L. and K. A. Hughes (2018). "Plastics in the Southern Ocean." Antarctic Science **30**(5): 269.

With the CCAMLR beach survey documenting plastics litter now for many years, and published reports of ingestion of plastics by a range of birds from petrels to albatross and penguins, there has already been a major attempt to report on the problem. The recent Greenpeace Antarctic cruise found microplastics in most of their limited number of water samples but the much more wide-ranging Antarctic Circumpolar Expedition of 2016–17 recorded microplastics in every surface sample taken all around the Antarctic, and even in remote locations like the Mertz Polynya. The cross disciplinary group will assess the occurrence, distribution, source and fates of plastics in the Southern Ocean and the impacts on physical environments and biological communities, co-ordinating with other groups like CCAMLR, IAATO and SCOR.

Walpitagama, M., et al. (2019). "Additives migrating from 3D-printed plastic induce developmental toxicity and neuro-behavioural alterations in early life zebrafish (Danio rerio)." Aquatic Toxicology **213**(105227).

The environmental impact of exposure to 3D-printed plastics as well as potential migration of toxic chemicals from 3D-printed plastics remains largely unexplored. In this work we applied leachates from plastics fabricated using a stereolithography (SLA) process to early developmental stages of zebrafish (Danio rerio) to investigate developmental toxicity and neurotoxicity. Migration of unpolymerized photoinitiator, 1-hydroxycyclohexyl phenyl ketone (1-HCHPK) from a plastic solid phase to aqueous media at up to 200 mg/L in the first 24 h was detected using gas chromatography-mass spectrometry. Both plastic extracts (LC₅₀ 22.25% v/v) and 1-HCHPK (LC₅₀ 60 mg/L) induced mortality and teratogenicity within 48 h of exposure. Developmental toxicity correlated with in situ generation of reactive oxygen species (ROS), an increase in lipid peroxidation and protein carbonylation markers and enhanced activity of superoxide dismutase (SOD) and glutathione-S-transferase (GST) in embryos exposed to concentrations as low as 20% v/v for plastic extracts and 16 mg/L for 1-HCHPK. ROS-induced cellular damage led to induction of caspase-dependent apoptosis which could be pharmacologically inhibited with both antioxidant ascorbic acid and a pan-caspase inhibitor. Neuro-behavioral analysis showed that exposure to plastic leachates reduced spontaneous embryonic movement in 24-36 hpf embryos. Plastic extracts in concentrations above 20% v/v induced rapid retardation of locomotion, changes in photomotor response and habituation to photic stimuli with progressive paralysis in 120 hpf larvae. Significantly decreased acetylcholinesterase (AChE) activity with lack of any CNS-specific apoptotic phenotypes as well as lack of changes in motor neuron density, axonal growth, muscle segment integrity or presence of myoseptal defects were detected upon exposure to plastic extracts during embryogenesis. Considering implications of the results for environmental risk assessment and the growing usage of 3D-printing technologies, we speculate that some 3D-printed plastic waste may represent a significant and yet very poorly uncharacterized environmental hazard that merits further investigation on a range of aquatic and terrestrial species.

Walter, P., et al. (2013). "Innate immune cell expression of pattern recognition receptors from transfused thalassemia major patients during intensive combination chelation therapy." American Journal of Hematology **88 (5)**: E95.

Introduction: Despite improved chelation therapies, thalassemia major patients endure iron overload, chronic inflammation, organ failure, infection and oxidative stress, resulting in elevated levels of pro- and anti-inflammatory proteins and pro-apoptotic proteins. Infection is the second most common cause of death in thalassemia. The innate immune system provides the first line of defense against infection and its specificity depends on pattern recognition receptors (PRRs) specific to microbial pathogens. One class of PRR called the toll-like receptors (TLRs) interacts with CD14 on innate immune cells transducing the signal for bacterial Lipopolysaccharide (LPS), resulting in cytokine production. The role iron plays in thalassemia in determining expression level of PRRs is unknown. Thus, the goal in these studies is to investigate the relationship of iron overload and chelation to innate immune cell expression of PRRs in thalassemia. Patients and Methods: Eighteen transfusion dependent thalassemia patients (11 - 29 yrs old) participating in the combination trial of deferasirox and deferoxamine (Novartis sponsored CICL670AUS24T) were enrolled in a substudy investigating innate immunology (Novartis sponsored CICL670AUS42T). Fasting blood samples were obtained i) at baseline after a 72 hr. washout of chelator, and ii) at 6 and 12 months on study. Fourteen healthy controls (10 - 35 yrs old) were also enrolled. Peripheral blood mononuclear cells (PBMCs) were isolated from blood samples and then monocytes and granulocytes were purified using antibody-linked magnetic microbeads (Miltenyi Biotec Inc). Highly enriched populations of CD14+ monocytes and CD15+ granulocytes were verified by flow cytometry. CD15 is not a PRR, but a trisaccharide adhesion molecule, used by granulocytes to mediate phagocytosis and chemotaxis. The expression level of CD14 and CD15 in PBMCs and TLR4 in purified cells was determined and reported as the median fluorescent intensity (MFI). Liver iron concentration (LIC) was determined by biomagnetic susceptibility ("SQUID", Ferritometer) in patients with thalassemia; healthy controls were shown to have normal ferritin. Result(s): In PBMCs from thalassemia patients at baseline, the expression of monocyte CD14 and TLR4 were significantly increased 22% and 27% respectively compared to healthy controls ($p < 0.05$). Granulocytes from patients with thalassemia were also found to have a 50% and 23% higher expression of TLR4 and CD15 respectively at baseline compared to controls. In longitudinal analysis markers of iron burden and the expression of TLR4 on granulocytes all significantly decreased in the follow-up period in thalassemia patients receiving intensive combination chelator therapy ($p<0.05$). Conclusion(s): These studies support the hypothesis that iron burden influences the innate immune response in thalassemia as demonstrated by the increased monocyte and granulocyte expression of TLR4 at baseline. Also increased at baseline were the expression of monocyte CD14 and granulocyte CD15. All of these changes are likely to contribute to the chronic inflammation in thalassemia and could also contribute to the commonly observed susceptibility to infection. After intensive chelation, the levels of TLR4 decreased, indicating that decreased iron overload with chelation may improve chronic inflammation in thalassemia. These changes in CD14 and TLR4 may be able to restore proper innate immune function in thalassemia patients.

Walter, P. B., et al. (2012). "Innate immune cell expression of pattern recognition receptors from beta-thalassemia patients during intensive combination chelation therapy." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Introduction: Thalassemia major patients endure chronic RBC transfusions, high levels of tissue iron, iron chelation and organ injury. Patients with thalassemia also have reduced immune function and are at risk for infection. Infection is in fact the second most common cause of death in thalassemia. The innate immune system provides the first line of defense against infection and it specificity depends on pattern recognition receptors (PRRs) specific to microbial pathogens. One class of PRR called the toll-like receptors (TLRs) interact with CD14 on innate immune cells transducing the signal for bacterial Lipopolysaccharide (LPS), resulting in cytokine production. The role iron plays in thalassemia in determining expression level of PRRs is unknown. Thus, the goal in these studies is to investigate the relationship of iron overload and its chelation to innate immune cell expression of PRRs in thalassemia. Patients and Methods: Eighteen transfusion dependent thalassemia patients (11 - 29 yrs old) participating in the combination trial of deferasirox and deferoxamine (Novartis sponsored CICL670AUS24T) were enrolled in a substudy investigating innate immunology (Novartis sponsored CICL670AUS42T). Fasting blood samples were obtained i) at baseline after a 72 hr. washout of chelator, and ii) at 6 and 12 months on study. Fourteen healthy controls (10 - 35 yrs old) were also enrolled. Peripheral blood mononuclear cells (PBMCs) were isolated from blood samples and then from these cells monocytes and granulocytes were purified using antibody-linked magnetic microbeads (Miltenyi Biotec Inc). Highly enriched populations of CD14+ monocytes and CD15+ granulocytes were verified by flow cytometry. The expression level of CD14 and CD15 in PBMCs and TLR4 in purified cells were determined and reported as the median fluorescent intensity (MFI). Liver iron concentration (LIC) was determined by biomagnetic susceptibility ("SQUID", Ferritometer) in patients with thalassemia; healthy controls were shown to have normal ferritin. Result(s): In PBMCs from thalassemia patients at baseline, the expression of monocyte CD14 and TLR4 were significantly increased 22% and 6.5% respectively compared to healthy controls ($p < 0.05$). Granulocytes from patients with thalassemia at baseline were also found to have a 50% higher expression of TLR4 compared to controls. Markers of iron burden, such as LIC and ferritin also significantly correlated with the expression of monocyte TLR4. In longitudinal analysis markers of iron burden, the expression of TLR4 on monocytes and granulocytes all significantly decreased in the follow-up period in thalassemia patients receiving intensive combination chelator therapy ($p<0.05$). Conclusion(s): These studies support the hypothesis that iron burden influences the innate immune response in thalassemia as demonstrated by the increased monocyte expression of both CD14 and TLR4 at baseline, both of which likely contribute to the commonly observed susceptibility to infection. After intensive chelation, the levels of CD14 and TLR4 decreased, indicating that decreased iron overload with chelation may improve innate immune responsiveness. These changes in CD14 and TLR4 may be able to restore proper innate immune function in thalassemia patients.

Walter, P. B., et al. (2009). "Iron overload diminishes the effectiveness of the innate immune response in thalassemia major: A possible mechanism for increased infection risk." Blood. Conference: 51st Annual Meeting of the American Society of Hematology, ASH. New Orleans, LA United States. Conference

Publication: **114**(22).

Introduction: Infection is the second most common cause of death in thalassemia. The innate immune system provides a first line of defense against infection and specificity depends on pattern recognition receptors (PRRs) specific to microbial pathogens. One class of PRR called the toll-like receptors (TLRs) are important for transducing the signal for bacterial Lipopolysaccharide (LPS), resulting not only in cytokine production, but also in the control of extracellular iron levels through production of neutrophil gelatinase associated Lipocalin (NGAL). However, the exact role that NGAL plays and the expression level of PRRs are unknown in thalassemia. Thus, the goal in these studies is to investigate the relationship of iron overload to the innate immune cell expression of PRRs and NGAL in thalassemia. Patients and Methods: Fifteen transfusion dependent thalassemia patients (11 - 29 yrs old) participating in the combination trial of deferasirox (an oral iron chelator) and deferoxamine were enrolled (Novartis sponsored CICL670AUS24T). Fasting blood samples were obtained i) at baseline after a 72 hr washout of chelator, and ii) at 6 and 12 months on study. Five healthy controls (13 - 18 yrs old) were also enrolled. Fresh monocytes were isolated using antibody-linked magnetic microbeads (Miltenyi Biotec Inc). Highly enriched populations of CD14+ monocytes were verified by flow cytometry. The expression of TLR4, also examined by flow cytometry is reported as the mean fluorescent intensity (MFI). In patients with thalassemia, liver iron concentration (LIC) was analyzed by biomagnetic susceptibility ("SQUID", Ferritometer). The plasma levels of NGAL were analyzed by ELISA. Result(s): At baseline the expression of monocyte TLR4 (mean 18.8 +/- 3.5 MFI) was reduced 30% compared to the healthy controls (mean 26.9 +/- 7.6 MFI, p<0.05). The expression of TLR4 over the follow-up period of 52 weeks in patients receiving intensive combination chelator therapy significantly increased 27% / year (7 MFI / year, p=0.005). Interestingly the expression of monocyte TLR4 was negatively correlated with LIC (r=-0.6, p=0.04). Finally, thalassemia patients at baseline have significantly higher levels of NGAL (80 +/- 20 ng/ml) compared to controls (42 +/- 15 ng/ml, p=0.01). Conclusion(s): These preliminary studies support the hypothesis that iron burden has a negative impact on the innate immune response in thalassemia as demonstrated by the decreased expression of TLR4. After intensive chelation, the levels of TLR4 increased, indicating that decreased iron overload with chelation may improve innate immune responsiveness. Finally, the iron transport protein NGAL is significantly elevated in thalassemia possibly acting to prevent essential iron uptake by pathogenic bacteria.

Walter, P. B., et al. (2013). "Association of cardiac iron by T2* with innate immune markers in transfusion-dependent thalassemia patients undergoing combined chelation therapy." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Introduction The thalassemias are inherited anemias sometimes characterized by severe transfusion dependence that can lead to extra-hepatic cardiac iron overload, causing cardiomyopathy. Despite improved chelation therapies, patients with transfusion-dependent thalassemia still endure cardiomyopathy and chronic inflammation. The innate immune system provides the first line of defense against infection and specificity depends on pattern recognition receptors (PRRs) specific to microbial pathogens. One class of PRR called the toll-like receptors (TLRs) interacts with CD14 on innate immune cells transducing the signal for bacterial lipopolysaccharide. Another cell surface protein that is not a PRR, but aids phagocytosis and is important in granulocytes function and chemotaxis is the adhesive polysaccharide antigen, CD15. The role that excess iron plays in determining expression level of these innate immune proteins is unknown. Thus, the goal in these studies is to investigate the relationship of cardiac iron overload and its chelation to innate immune cell expression of TLR4 and CD15 in patients

with transfusion-dependent thalassemia. Patients and Methods Eighteen patients with transfusion dependent thalassemia (11 - 29 years old) (participating in the Novartis sponsored CICL670AUS24T) were enrolled in a substudy investigating innate immunology (Novartis sponsored CICL670AUS42T). Patients were investigated at baseline, then after 6 months and one year of combined chelation therapy with deferasirox and deferoxamine. Fasting blood samples were obtained after a 72 hr washout with no chelators. Fourteen healthy controls (10 - 35 yrs old) were also enrolled. Changes in LIC (ferritometer), cardiac function (MRI) and myocardial iron (MRI T2*) were monitored. Peripheral blood mononuclear cells (PBMCs) and granulocytes were isolated from blood samples using density gradients. Monocytes and granulocytes were further purified using antibody-linked magnetic microbeads. Highly enriched populations of CD14+ monocytes and CD15+ granulocytes were verified by flow cytometry. The expression level of CD15 and TLR4 was determined. Results Previously we found that transfusion-dependent thalassemia patients had 37% higher TLR4+ neutrophils than control patients and a smaller percentage of CD15+ neutrophils. We have also observed a decrease in TLR4 expression during the course of combined chelation therapy on neutrophils but not monocytes, indicating that TLR4 is differentially modulated on neutrophils compared to monocytes. Now we find that these flow cytometry parameters show significant relationships to markers of iron burden. The percentage of TLR4+ monocytes was related to liver iron concentration ($r=- 0.49$, $p = 0.039$), ferritin concentration ($r=-0.47$, $p = 0.049$), serum iron level ($r=0.61$, $p = 0.008$), and total iron binding capacity (TIBC; $r=0.51$, $p = 0.021$), while the percentage of CD15 positive neutrophils predicted myocardial iron, as measured by MRI T2* ($r= 0.69$, $p<0.001$), and left ventricular ejection fraction (LVEF; $r=0.50$, $p = 0.022$). Lastly, analysis of covariance, controlling for age and gender, revealed that the number of CD15+ neutrophils increased significantly from baseline (90.84%) to 52 weeks (95.09%) of combined chelation therapy ($p = 0.007$). Conclusions This study found evidence that the innate immune system may be modulating iron trafficking not only to the liver but to the heart as well. The negative correlation between LIC and TLR4 expression suggests that severe iron overload may lead to heptocellular damage causing monocyte dysfunction, the pathology of which could be due to altered TLR4 expression. This relationship may also be driving the positive correlation observed between TLR4 expression and TIBC. CD15 seems to play an important role in cardiac health as it is positively correlated to LVEF and MRI T2*. This relationship is further validated by our previous finding that transfusion-dependent thalassemia patients had a smaller percentage of CD15+ neutrophils, which we now show improved during one year of combi ation chelation therapy. Taken together, this suggests that chelation therapy may enhance cardiac health by increasing the percentage of CD15+ neutrophils.

Walther, B. A., et al. (2018). "Type and quantity of coastal debris pollution in Taiwan: A 12-year nationwide assessment using citizen science data." Marine Pollution Bulletin **135**: 862-872.

Man-made coastal debris pollution is a growing concern for Taiwan. In 2004, Taiwanese environmental organizations led by the "Society of Wilderness" began gathering data on 19 categories of debris items collected during cleanup events. We present our analysis of the resulting 12-year dataset collated from 541 events held between October 2004 and December 2016. In total, 904,302 items weighing 131,358.3kg were collected, and 63.6% and 27.2% of items were made of either plastic or plastic mixed with other materials, respectively. The five most commonly recorded debris categories were plastic shopping bags, plastic bottle caps, disposable tablewares, fishing equipment, and plastic drinking straws. We estimated that during the 12-year period on average between 3.7 and 7.9 million items weighing 560-1110metrictons polluted Taiwan's coastline. We offer recommendations for improving the quality of data

collected during Taiwan's cleanup events and report some policy changes due partly to previous reports of this dataset.

Wan, T., et al. (2019). "A spectroscopic and theoretical investigation of interaction mechanisms of tetracycline and polystyrene nanospheres under different conditions." Environmental Pollution **249**: 398-405.

Interaction mechanisms of tetracycline (TC, as a typical antibiotic) on polystyrene microsphere (PSs, as a typical nanoplastic) were conducted by the batch, spectroscopic and theoretical techniques. The batch results showed that Na⁺ and K⁺ had no obvious effects on TC adsorption towards PSs, whereas Mg²⁺ significantly inhibited TC adsorption at pH>5.0 due to its induced aggregations of PSs. The maximum TC adsorption capacity of PSs in the presence of humic acid (50.99mg/g) was higher than that of PSs (44.77mg/g) at pH 6.0. The highly effective adsorption was attributed to electrostatic attraction, pi-pi interaction and hydrophobic effect, which was determined by FT-IR and XPS analysis. According to DFT (density functional theory) calculations, the adsorption energy of TC/TC⁺ on PSs (1.52eV) was significantly higher than that of negative TC⁻ (0.57eV), whereas minimum distance of TC on PSs (3.684A) was shorter than that of TC⁻ on PSs (3.988A). The results of theoretical calculations indicated that TC was more preferably adsorbed on PSs with more stable configuration compared to TC⁻. These findings indicated that PSs can be used as a promising adsorbent for immobilization and pre-concentration of TC from aqueous solutions.

Wan, W., et al. (2016). "Occurrence and distribution of organophosphorus esters in soils and wheat plants in a plastic waste treatment area in China." Environmental Pollution **214**: 349-353.

This study for the first time reported the occurrence, distribution and concentrations of organophosphate esters (OPEs) in soils caused by plastic waste treatment, as well as their influence on OPE accumulation in wheat (Triticum aestivum L.). Eight OPEs were detected with the total concentrations of 38-1250 ng/g dry weight in the soils from the treatment sites, and tributoxyethyl phosphate and tri(2-chloroethyl) phosphate present as the dominant OPEs. There were similar distribution patterns of OPEs and significant correlations between the total OPE concentrations in the soils from the plastic waste treatment sites with those in the nearby farmlands (P < 0.005), indicating that plastic waste treatment caused the OPE contamination of farmland soils. The uptake and translocation of OPEs by wheat were determined, with OPEs of high hydrophobicity more easily taken up from soils and OPEs with low hydrophobicity more liable to be translocated acropetally.

Wan, Y., et al. (2019). "Effects of plastic contamination on water evaporation and desiccation cracking in soil." Science of the Total Environment **654**: 576-582.

Environmental contamination of plastics is becoming an issue of concern globally. Detection of plastics, particularly microplastics, has been increasingly reported in both marine environments and inland waters. Recent work has indicated that soil in terrestrial environments has also been contaminated by plastics. Research has also shown that plastics can have adverse effects on soil biota. However, the impact of plastics on soil physical properties is still unclear. In this work, effects of plastic film of different sizes at environmental relevant concentrations on water evaporation and desiccation cracking in two clay soils were studied. The results showed that the presence of plastics in soil significantly increased the rate of soil water evaporation by creating channels for water movement. The effect was more pronounced in soils treated with 2mm plastics than in soils treated with 5 and 10mm plastics, and increased with increasing plastic

content. Desiccation cracking was observed on the surface of soil treated with 5 and 10mm plastics likely due to the destruction of soil structural integrity. While 2mm plastics increased the rate of desiccation shrinkage, the shrinkage ratio was reduced at the residual stage.

Wan, Z., et al. (2019). "Effects of polystyrene microplastics on the composition of the microbiome and metabolism in larval zebrafish." Chemosphere **217**: 646-658.

Microplastics are major pollutants in marine environment and may have health effects on aquatic organisms. In this study, we used two sizes (5 and 50 micro m diameter) of fluorescent and virgin polystyrene microplastics to analyze the adverse effects on larval zebrafish. In our study, we evaluated the effects on larval zebrafish after exposure to 100 and 1000 micro g/L of two sizes of polystyrene microplastics for 7 days. Our results show that polystyrene microplastics could cause alterations in the microbiome at the phylum and genus levels in larval zebrafish, including changes in abundance and diversity of the microbiome. In addition, metabolomic analysis suggested that exposure to polystyrene microplastics induced alterations of metabolic profiles in larval zebrafish, and differential metabolites were involved in energy metabolism, glycolipid metabolism, inflammatory response, neurotoxic response, nucleic acid metabolism, oxidative stress. Polystyrene microplastics also significantly decreased the activities of catalase and the content of glutathione. In addition, the results of gene transcription analysis showed that exposure to polystyrene microplastics induced changes in glycolysis-related genes and lipid metabolism-related genes, confirming that polystyrene microplastics disturbed glycolipid and energy metabolism. Taken together, the results obtained in the present study indicated that the potential effects of environmental microplastics on aquatic organisms should not be ignored.

Wang, A. R., et al. (2015). "Fatal fulminant accelerated rejection in a cardiac transplant recipient with natural killer cell infiltrate." Journal of Heart and Lung Transplantation **1)**: S18-S19.

Introduction: Accelerated rejection is uncommon in cardiac transplantation. The mechanism is believed to be mediated by cytotoxic T cells and/or anti-HLA alloantibodies resulting from a memory response to the donor allograft in sensitized patients. However, animal studies suggest a role for innate immune responses in rejection. We report a case of fatal fulminant accelerated rejection with a predominant natural killer (NK) cell infiltrate in a woman five days after orthotopic heart transplantation. Case Report: A 37-year-old, gravida 4, para 2, female with peripartum cardiomyopathy underwent a bicaval orthotopic heart transplant with a blood group compatible donor. No donor specific anti-HLA class I or class II antibodies were detected prior to transplant using flow cytometry microbead assays and Flow cytometry T and B cell crossmatches. Her initial postoperative course was uneventful. However, on postoperative day five, she was found unresponsive, pulseless, and expired despite extensive resuscitative measures. An autopsy revealed left ventricular subendocardial and intramyocardial hemorrhage with diffuse lymphocytic infiltrates and myocyte damage, consistent with ISHLT Grade 4 rejection. Immunohistochemistry demonstrated CD57+ cytotoxic lymphocytes, consistent with a predominant NK cell population. Recipient genotyping of the killer IgG receptor (KIR) revealed the presence of activating KIR (2DS2, and 2DS3 of KIR B haplotypes), and 2DS4 with its cognate HLA-C1 and C2 ligands in the donor. Summary: This is the first case report of a fatal, accelerated rejection occurring in the context of a predominantly natural killer cell infiltrate in a transplant recipient following a peripartum cardiomyopathy. Since activating KIRs can decrease the influence of the 'strong' inhibitory forms of KIR carried by A haplotypes, this case suggests that the interaction of patient's activating KIR with donor HLA-C1/C2 ligands may have contributed to NK cell activation and allograft rejection. In support of this hypothesis, recent studies indicated that KIR2DS4/HLA-C ligands increase the risk of early acute rejection in liver transplant recipients. Several mechanisms exist by which NK cell activation may have led to rejection in this case, including ischemia time, viral pathogens, and KIR/HLA class I ligands interaction.

Wang, B., et al. (2019). "Gold-nanorod-enhanced Raman spectroscopy encoded micro-quartz pieces for the multiplex detection of biomolecules." Analytical & Bioanalytical Chemistry **411**(21): 5509-5518.

The rapid analysis and detection of biomolecules has become increasingly important in biological research. Hence, here we propose a novel suspension array method that is based on gold nanorod (AuNR)-enhanced Raman spectroscopy and uses micro-quartz pieces (MQPs) as microcarriers. AuNRs and Raman reporter molecules are coupled together by Au-S bonds to obtain surface-enhanced Raman scattering labels (SERS labels). The SERS labels are then assembled on the surfaces of the MQPs via electrostatic interactions, yielding encoded MQPs. Experimental results showed that the encoded MQPs could be decoded using a Raman spectrometer. A multiplex immunoassay experiment demonstrated the validity and specificity of these encoded MQPs when they were used for bioanalysis. In concentration gradient experiments, the proposed method was found to give a linear concentration response to the target biomolecule at target concentrations of 0.46875-30 nM, and the detection limit was calculated to be 1.78 nM. The proposed method utilizes MQPs as carriers rather than conventional microbeads, which allows the interference caused by the background fluorescence of microbeads to be eliminated. The fluorescence of the encoded MQPs can be simply, rapidly, and inexpensively quantified using fluorescence microscopy. By dividing the quantitative and qualitative detection of biomolecules into two independent channels, crosstalk between the encoded signal and the labeled signal is averted and high decoding accuracy and detection sensitivity are guaranteed. Graphical abstract.

Wang, B. D., et al. (2019). "[Effects of Microplastics on Membrane Fouling During a Shortened Ultrafiltration Membrane Process]." Huanjing Kexue/Environmental Science **40**(11): 4996-5001.

Microplastics have garnered much attention worldwide as a new emerging pollutant. As they are gradually detected in freshwaters, understanding how microplastics will behave during current drinking water treatment processes is urgently needed. In recent years, the shortened process with an ultrafiltration (UF) membrane has shown excellent performance because of its low land use and high water purification efficiency. In this work, the membrane performance induced by microplastics was investigated with a shortened UF membrane process. The results showed that membrane fouling was always induced by the cake layer before and after coagulating with microplastics. Owing to the small UF membrane pore size (d<0.1 mum), slight membrane fouling was caused by microplastics (d<5 mm) alone. However, although the loose cake layer was formed because of the existence of flocs, the cyberspace formed by flocs was easily entered by small microplastics with increasing coagulant dosage. As a result, server membrane fouling was induced because of the formation of a dense cake layer. It was shown that the specific membrane flux induced by flocs alone was 0.82 and 0.76 in the presence of 0.1 mmol.L⁻¹ and 0.9 mmol.L⁻¹ FeCl₃.6H₂O, respectively. However, after coagulation the specific membrane fouling induced by the 0.1 g small microplastics (d<0.5 mm) was 0.76 and 0.62 with 0.1 mmol.L⁻¹ and 0.9 mmol.L⁻¹ FeCl₃.6H₂O, respectively. In addition, microplastics were always negatively charged in water. In comparison with alkaline conditions, Fe-based flocs were positively charged under acidic conditions, which were also much smaller. Therefore, microplastics were more easily adsorbed by Fe-based flocs under acidic conditions, leading to severe membrane fouling because of the dense cake layer formed. After coagulating

with 0.3 mmol.L⁻¹ FeCl₃.6H₂O, the specific membrane flux induced by 0.1 g small microplastics (d<0.5 mm) was 0.55 and 0.79 at pH 6.0 and 8.0, respectively.

Wang, C., et al. (2018). "Review of microplastics detection from marine organisms and their harms." Journal of Food Safety and Quality **9**(11): 2678-2683.

Microplastic (or mesoplastic) in the ocean is the general term for all plastics with dimensions less than 5 mm. The microplastic widely exists in various sea areas and has become a pollutant in the global marine ecological environment system. Marine organisms are also polluted with microplastics, which has seriously affected the safety of seafood. This paper reviewed the existing national and international researches from the following 4 aspects: the species of marine organisms containing microplastic, the extraction methods of microplastic, the appearance characteristics of microplastic, and the nondestructive identification methods of microplastic. At the same time, the harms caused by microplastics to marine organisms were summarized. In view of the existing problems of the microplastics testing standards could not be unified, the main directions of future researches were also proposed.

Wang, C., et al. (2020). "Structure of the global plastic waste trade network and the impact of China's import Ban." Resources, Conservation & Recycling **153**: N.PAG-N.PAG.

• Global plastic waste trade networks (GPWTNs) from 1988 to 2017 are established. • The spatiotemporal evolution of the GPWTNs is analyzed. • The direct and indirect impacts of China's import ban on the GPWTNs are evaluated. • Practical implications are given according to analysis of the GPWTNs. Millions of tonnes (teragrams) of plastic waste are traded around the world every year, which plays an important role in partially substituting virgin plastics as a source of raw materials in plastic product manufacturing. In this paper, global plastic waste trade networks (GPWTNs) from 1988 to 2017 are established using the UN-Comtrade database. The spatiotemporal evolution of the GPWTNs is analyzed. Attention is given to the country ranks, inter- and intra-continental trade flows, and geo-visual communities in the GPWTNs. We also evaluate the direct and indirect impacts of China's plastic waste import ban on the GPWTNs. The results show that the GPWTNs have small-world and scale-free properties and a core-periphery structure. The geography of the plastic waste trade is structured by Asia as the dominant importer and North America and Europe as the largest sources of plastic waste. China is the unrivaled colossus in the global plastic waste trade. After China's import ban, the plastic waste trade flows have been largely redirected to Southeast Asian countries. Compared with import countries, export countries are more important for the robustness of GPWTNs. Clearly, developed countries will not announce bans on plastic waste exports; these countries have strong motivation to continue to shift plastic waste to poorer countries. However, the import bans from developing countries will compel developed countries to build new disposal facilities and deal with their plastic waste domestically. [ABSTRACT FROM AUTHOR]

Wang, C. W., et al. (2015). "Integration of acoustic radiation force and optical imaging for blood plasma clot stiffness measurement." PLoS ONE [Electronic Resource] **10**(6): e0128799.

Despite the life-preserving function blood clotting serves in the body, inadequate or excessive blood clot stiffness has been associated with life-threatening diseases such as stroke, hemorrhage, and heart attack. The relationship between blood clot stiffness and vascular diseases underscores the importance of quantifying the magnitude and kinetics of blood's transformation from a fluid to a viscoelastic solid. To measure blood plasma clot stiffness, we have developed a method that uses ultrasound acoustic radiation force (ARF) to induce micron-scaled displacements (1-500 mum) on microbeads suspended in blood plasma. The displacements were detected by optical microscopy and took place within a micro-liter sized clot region formed within a larger volume (2 mL sample) to minimize container surface effects. Modulation of the ultrasound generated acoustic radiation force allowed stiffness measurements to be made in blood plasma from before its gel point to the stage where it was a fully developed viscoelastic solid. A 0.5 wt % agarose hydrogel was 9.8-fold stiffer than the plasma (platelet-rich) clot at 1 h post-kaolin stimulus. The acoustic radiation force microbead method was sensitive to the presence of platelets and strength of coagulation stimulus. Platelet depletion reduced clot stiffness 6.9 fold relative to platelet rich plasma. The sensitivity of acoustic radiation force based stiffness assessment may allow for studying platelet regulation of both incipient and mature clot mechanical properties.

Wang, D., et al. (2012). "A liquid optical phantom with tissue-like heterogeneities for confocal microscopy." Biomedical Optics Express **3**(12): 3153-3160.

Phantoms play an important role in the development, standardization, and calibration of biomedical imaging devices in laboratory and clinical settings, serving as standards to assess the performance of such devices. Here we present the design of a liquid optical phantom to facilitate the assessment of optical-sectioning microscopes that are being developed to enable point-of-care pathology. This phantom, composed of silica microbeads in an Intralipid base, is specifically designed to characterize a reflectance-based dual-axis confocal (DAC) microscope for skin imaging. The phantom mimics the scattering properties of normal human epithelial tissue in terms of an effective scattering coefficient and a depth-dependent degradation in spatial resolution due to beam steering caused by tissue micro-architectural heterogeneities.

Wang, D., et al. (2014). "A CD8 T cell/indoleamine 2,3-dioxygenase axis is required for mesenchymal stem cell suppression of human systemic lupus erythematosus." Arthritis & Rheumatology **66**(8): 2234-2245.

OBJECTIVE: Allogeneic mesenchymal stem cells (MSCs) exhibit therapeutic effects in human autoimmune diseases such as systemic lupus erythematosus (SLE), but the underlying mechanisms remain largely unknown. The aim of this study was to investigate how allogeneic MSCs mediate immunosuppression in lupus patients.

METHODS: The effects of allogeneic umbilical cord-derived MSCs (UC-MSCs) on inhibition of T cell proliferation were determined. MSC functional molecules were stimulated with peripheral blood mononuclear cells from healthy controls and SLE patients and examined by real-time polymerase chain reaction. CD4+ and CD8+ T cells were purified using microbeads to stimulate MSCs in order to determine cytokine expression by MSCs and to further determine which cell subset(s) or which molecule(s) is involved in inhibition of MSC-mediated T cell proliferation. The related signaling pathways were assessed. We determined levels of serum cytokines in lupus patients before and after UC-MSC transplantation.

RESULTS: Allogeneic UC-MSCs suppressed T cell proliferation in lupus patients by secreting large amounts of indoleamine 2,3-dioxygenase (IDO). We further found that interferon-gamma (IFNgamma), which is produced predominantly by lupus CD8+ T cells, is the key factor that

enhances IDO activity in allogeneic MSCs and that it is associated with IFNGR1/JAK-2/STAT signaling pathways. Intriguingly, bone marrow-derived MSCs from patients with active lupus demonstrated defective IDO production in response to IFNgamma and allogeneic CD8+ T cell stimulation. After allogeneic UC-MSC transplantation, serum IDO activity increased in lupus patients.

CONCLUSION: We found a previously unrecognized CD8+ T cell/IFNgamma/IDO axis that mediates the therapeutic effects of allogeneic MSCs in lupus patients.

Wang, D., et al. (2013). "A CD8 T cell-IFN-gamma-IDO axis is required for mesenchymal stem cell suppression of human SLE." Arthritis and Rheumatism **10)**: S674-S675.

Background/Purpose: Stem cell-based regenerative medicine is a promising approach in tissue reconstruction. Mesenchymal stem cells (MSC) show therapeutic effects on human autoimmune diseases including systemic lupus erythematosus (SLE), but the underlying mechanisms remain largely unknown. Method(s): The effects on inhibiting T cell proliferation by allogenic umbilical cord derived MSC were determined. Then MSC functional molecules were examined by real-time PCR under the stimulation of peripheral blood mononuclear cells (PBMC) from healthy controls and SLE patients, respectively. CB4+ and CB8+T cell were purified by microbeads to stimulate MSC, respectively, to determine IDO expression as well as supernatant cytokines, to further get to know which cell subset(s) or which molecule(s) involved in MSC mediated T cell proliferation inhibition. Meanwhile, the possible signaling pathways were assessed. Moreover, we analyzed the correlation between baseline serum cytokines and clinical response of MSC transplantation (MSCT). Result(s): UC MSC efficiently inhibited T cell proliferation in both healthy controls and lupus patients, with a more inhibitory effect in lupus T cell. In vitro activated lupus PBMC significantly induced MSC to secret TGF-beta1, IDO, HGF and IL-6, with a more than 200-fold increase of IDO. The addition of IDO inhibitor could almost completely abrogate MSC mediated T cell proliferation inhibition. Moreover, we found that lupus peripheral CB8+T cell markedly stimulated MSC to secret IDO and supernatant IFN-gamma significant increased. The addition of anti-IFN-gamma monoclonal antibody could inhibit IDO activity and similarly abrogate inhibition of T cell proliferation by MSC. We further found that lupus CB8+T cell secreted predominant intracellular IFN-gamma compared to CB4+T cell or compared to healthy CB8+ or CB4+T cell subsets. Furthermore, in the presence of lupus CB8+T cell, IFNGR/JAK/ STATs signaling pathways were activated, then to induce MSC to secret IDO and upregulate IDO activity. However, bone marrow MSC from lupus patients are less response to allogenic CB8+T cell or recombinant IFN-gamma stimulation and produce far less IDO, consequently fail to efficiently inhibit T cell proliferation. In the last, clinical analysis showed that lupus patients had significant higher proportion and absolute number of CB3+CD4-CB8+T cell than healthy controls, and serum IFN-gamma markedly increased. Predominant IFN-gamma in lupus patients was mainly secreted by CB8+T cell. Baseline serum IFN-gamma as well as CB8+T cell levels were significant higher in good responders than in poor responders who underwent UC MSC transplantation. Conclusion(s): We uncovered a previously unrecognized CB8+T cell-IFN- gamma-IDO axis that mediates the immunotherapy by allogenic MSC in lupus patients.

Wang, D., et al. (2012). "Regulatory role of umbilical cord mesenchymal stem cells on Treg and Th17 cells in patients with systemic lupus erythematosus." International Journal of Rheumatic Diseases **1)**: 26-27.

Objective: To investigate the regulatory effect of umbilical cord mesenchymal stem cells (UC-MSC) on regulatory T cells (Treg) and Th17 cells in patients with systemic lupus erythematosus (SLE). Method(s): Human UC-MSC were isolated, expanded, identified and infused into 15 refractory SLE patients (NCT00698191, phase II). Clinical efficacy was evaluated. The percentages of Treg and Th17 cells in peripheral blood were detected by flow cytometry. Peripheral cytokines were determined by ELISA and real time PCR, respectively. Peripheral blood mononuclear cells (PBMC) from 11 active SLE were co-cultured with UC-MSC to examine the changes of Treg and Th17 cells and supernatant cytokines. Patient peripheral blood naturally occurring Treg (nTreg) were isolated and co-cultured with UC-MSC in vitro in the presence of anti CD3/28 microbeads and recombinant IL-2. Result(s): Significant clinical efficacy was found by UC-MSC transplantation. Peripheral blood CD4+CD25+Foxp3+T cells percentage showed obvious increase at 1 week (2.32 +/- 1.40%), 1 month (2.03 +/- 1.30%), 3 months (2.41 +/- 2.06%) and 6 months (2.81 +/- 0.69%) visit (all P < 0.05 versus pre-MSCT 1.58 +/- 1.02%), in parallel with significant decline of CD3+CD8-IL17A+T cells after MSCT (1.30 +/- 1.02% at 1 week, 0.73 +/- 0.60% at 1 month, 0.56 +/- 0.60% at 3 months, 0.52 +/- 0.40% at 6 months, all P < 0.05 versus pre- MSCT 1.69 +/- 1.13%). Real time PCR showed that gene expression of RORct decreased, while TGF-b1 increased significantly 1 week after transplantation. Plasma concentration of TNF-alpha and IL17A decreased while TGF-b1 increased. The co-culture of UC-MSC with SLE PBMC resulted in a statistical increase of CD4+CD25+Foxp3+T cells and reduce of CD3+CD8-IL17A+T cells (all P < 0.05 at UC-MSC: PBMC 1:1, 1:10, 1:50 ratio), but without a dose dependent manner. Supernatant TGF-b1 and IL-6 increased but TNF-alpha decreased significantly in the co-culture system. The addition of TGF-b1 or PGE2 inhibitor to the culture system statistically abrogated the upregulation of Treg, while only PGE2 inhibitor significantly abrogated inhibitory role of Th17 cells by UC MSC. The addition of IL-6 or IDO inhibitor in the co-culture system had no effect on Treg and Th17 cells percentage. The absolute number of nTreg in the presence of UC-MSC increased compared to that of nTreg alone, and showed significant enhanced expression of Foxp3 and GITR. Additionally, CFSE dilution suggested that UC-MSC can obviously promote the proliferation of SLE nTreg in vitro. Conclusion(s): UC-MSC transplantation markedly and PGE2 dependently regulate Treg and Th17 cells in SLE patients, which may be one of the mechanisms for its therapeutic potential in refractory SLE.

Wang, D., et al. (2009). "[Detection of multiple gene mutations in non-small-cell lung cancer by suspension microarray]." Chung-Hua i Hsueh Tsa Chih [Chinese Medical Journal] **89**(48): 3393-3396.

OBJECTIVE: To construct a high-throughput suspension microarray for detecting the hotspot gene mutations of p53, p16, retinoblastoma (Rb) and epidermal growth factor receptor (EGFR) and to investigate the significance of this multimarker panel in molecular diagnosis of non-small-cell lung cancer (NSCLC).

METHODS: The specific probes of normal or mutated sequences targeting the hotspot mutation sites of p53, p16, Rb and EGFR were designed and immobilized to carboxylated Luminex microspheres (micro-beads). Genomic DNA was extracted from 65 specimens of cancer tissues and 20 adjacent normal lung tissues. p53, p16, Rb and EGFR genes were amplified by PCR, hybridized with the specific probes on the beads and measured using Luminex 100.

RESULTS: The single gene mutations of p53, p16, Rb or EGFR in NSCLC specimens were 53.8% (35/65), 20.0% (13/65), 7.7% (5/65) or 35.4% (23/65) respectively. The para-tumor normal tissue specimens were 5.0% (1/20), 5.0%(1/20), 0 and 0 respectively. For combined detections of four genes, the sensitivity, specificity and accuracy were 81.5% (53/65), 90.0% (18/20) and 83.5%(71/85) respectively. The mutation rates of this panel in stage I, stage II and stage III were 78.3% (18/23), 80.0% (16/20) and 86.4% (19/22) respectively.

CONCLUSIONS: A high-throughput suspension microarray with a higher specificity and sensitivity has been built. It may be used to simultaneously detect the gene mutations of p53, p16, Rb or EGFR in NSCLC specimens. This suspension microarray is helpful to improve the sensitivity of

molecular diagnosis of NSCLC and guide the molecular targeting therapy of NSCLC.

Wang, D.-E., et al. (2015). "Polydiacetylene liposome-encapsulated alginate hydrogel beads for Pb2+ detection with enhanced sensitivity." Journal of materials chemistry. A, Materials for energy and sustainability **3**(43): 21690-21698.

The development of a novel and simple method to trace lead ions (Pb2+) has received great attention due to its high toxicity to human health and the environment. In this paper, we describe a new polydiacetylene (PDA)-based liposome sensor for the colorimetric and fluorometric detection of Pb2+ in aqueous solution and in alginate hydrogel microbeads. In the sensor system, a dopamine group was rationally introduced into a diacetylene monomer to work as a strong binding site for Pb2+. The dopamine-functionalized monomer and 10,12-pentacosadiynoic acid (PCDA) were then incorporated into PDA liposomes in aqueous solution. After UV light-induced polymerization, deep blue colored liposome solutions were obtained. Upon the addition of various metal ions into the liposome solution, only Pb2+ could cause a distinct color change from blue to red and a dramatic fluorescence enhancement. To further improve its sensitivity and address its intrinsic aggregation, we then developed a liposome-immobilized detection system by encapsulating PDA-DA liposomes into alginate hydrogel beads through a microfluidic droplet-based method. The results showed that the PDA-DA liposome-containing hybrid hydrogel beads possessed excellent stability and high sensitivity. These interesting findings demonstrated that the PDA liposome system developed in the current study may offer a new method for Pb2+ recognition in a more efficient manner.

Wang, D. I., et al. (1984). "Penicillin fermentation in a 200-liter tower fermentor using cells confined to microbeads." Applied Biochemistry & Biotechnology **9**(1): 105-116.

The scale-up of the penicillin fermentation through cell confinement in a 200-L tower fermentor is described. P. chrysogenum spores were adsorbed into Celite microbeads having diameters greater than 180 microns. Fed-batch fermentations were performed using both free and confined cells. Cell growth and penicillin concentrations were measured during the fermentation. In addition, the oxygen transfer rate, the aeration rate, and the level of dissolved oxygen were also measured. Significant improvement in the mass transfer coefficient was found when the cells were anchored onto the microbeads. This improved oxygen transfer rate was accompanied by higher production of penicillin at a lower aeration rate. Besides the improved oxygen transfer rate into the mycelial broth, a reduction of the energy input for the oxygen transfer was observed. The confinement of the cells to this microcarrier furthermore allowed the intermittent harvesting of fermentation broth without reducing the cell mass in the fermentor.

Wang, F., et al. (2015). "The partition behavior of perfluorooctanesulfonate (PFOS) and perfluorooctanesulfonamide (FOSA) on microplastics." Chemosphere **119**: 841-847.

Microplastics have been recognized as transport vectors for heavy metals and organic pollutants to marine animals. Thus, the sorption behavior of contaminant on microplastic is crucial to their transport in marine system. In this study, the sorption behavior of PFOS and FOSA (two perfluorochemicals) on three kinds of microplastics (PE, PS, and PVC) are reported. The isotherm study showed that the sorption of PFOS and FOSA on microplastics is highly linear, and it indicated that partition by hydrophobic interaction is the predominant sorption mechanism. The K_d values of FOSA on three kinds of microplastics are all higher than those of PFOS, and the reason is attributed to their different functional groups. The K_d value of FOSA on three types of microplastics followed the order as: PE > PVC > PS. Such finding may

indicate that the molecule composition and structure of microplastics play important roles in their sorption processes of organic pollutants. The PFOS sorption levels on PE and PS particles were increased with the increase of NaCl and CaCl₂ concentrations, while the ion concentrations have no effect on FOSA sorption. The study on the pH effects on PFOS and FOSA sorption indicated FOSA could partition under various pH conditions on three types of microplastics while PFOS sorption on PE and PS were favored with lower pH.

Wang, F., et al. (2019). "Adsorption characteristics of cadmium onto microplastics from aqueous solutions." Chemosphere **235**: 1073-1080.

As one of emerging contaminants, microplastics (MPs) can enter the environment and adsorb toxic metals such as cadmium (Cd), thereby causing potential environmental risks. However, adsorption characteristics of MPs are poorly understood. Herein, batch experiments were performed to investigate the adsorption characteristics of Cd onto high-density polyethylene (HDPE) MPs with different particle sizes, that is, 1-2mm, 0.6-1mm, and 100-154mum. The adsorption of Cd was quite rapid initially, and the equilibrium time was approximately 90min. An increase in the pH of the Cd solution led to an increase in Cd adsorption. MPs with particle size of 100-154mum had the highest adsorption capacity. Addition of 1, 10, and 100mg/L NaCl all significantly decreased Cd adsorption. Adsorption kinetics fitted the pseudo-second-order model. Adsorption isotherm followed the Langmuir model and, to a lesser extent, the Freundlich model, with estimated maximum adsorption capacity of 30.5mug/g. The adsorbed Cd easily desorbed from the MPs. Energy-dispersive X-ray spectroscopy (EDS) analysis confirmed Cd adsorption to and desorption from MPs. Fourier transform infrared (FTIR) spectroscopy analysis showed no new functional groups formed during the adsorption and desorption processes, suggesting physical interaction may dominate the Cd adsorption onto MPs. The present study findings provide evidence that MPs can accumulate Cd, and the adsorbed Cd may be highly available, thus posing risks to the organisms exposed to these MPs.

Wang, G., et al. (2012). "Molecular distribution and stable carbon isotopic composition of dicarboxylic acids, ketocarboxylic acids, and alpha-dicarbonyls in size-resolved atmospheric particles from Xi'an City, China." Environmental Science & Technology **46**(9): 4783-4791.

Size-resolved airborne particles (9-stages) in urban Xi'an, China, during summer and winter were measured for molecular distributions and stable carbon isotopic compositions of dicarboxylic acids, ketocarboxylic acids, and alpha-dicarbonyls. To our best knowledge, we report for the first time the size-resolved differences in stable carbon isotopic compositions of diacids and related compounds in continental organic aerosols. High ambient concentrations of terephthalic (tPh, 379 +/- 200 ng m(-3)) and glyoxylic acids (omegaC(2), 235 +/- 134 ng m(-3)) in Xi'an aerosols during winter compared to those in other Chinese cities suggest significant emissions from plastic waste burning and coal combustions. Most of the target compounds are enriched in the fine mode (<2.1 mum) in both seasons peaking at 0.7-2.1 mum. However, summertime concentrations of malonic (C(3)), succinic (C(4)), azelaic (C(9)), phthalic (Ph), pyruvic (Pyr), 4-oxobutanoic (omegaC(4)), and 9-oxononanoic (omegaC(9)) acids, and glyoxal (Gly) in the coarse mode (>2.1 mum) are comparable to and even higher than those in the fine mode (<2.1 mum). Stable carbon isotopic compositions of the major organics are higher in winter than in summer, except oxalic acid (C(2)), omegaC(4), and Ph. delta(13)C of C(2) showed a clear difference in sizes during summer, with higher values in fine mode (ranging from -22.8 to -21.9) and lower values in coarse mode (-27.1 to -23.6). The lower delta(13)C of C(2) in coarse particles indicate that coarse mode of the compound originates from evaporation from fine mode and subsequent condensation/adsorption onto pre-existing coarse particles. Positive linear

correlations of C(2), sulfate and omegaC(2) and their delta(13)C values suggest that omegaC(2) is a key intermediate, which is formed in aqueous-phase via photooxidation of precursors (e.g., Gly and Pyr), followed by a further oxidation to produce C(2).

Wang, G., et al. (2019). "Occurrence and pollution characteristics of microplastics in surface water of the Manas River Basin, China." Science of the Total Environment **710**: 136099.

Microplastics, as a new type of pollutant, are widely found in various environmental media, and their effects on organisms are of great concern to society. However, research on the characteristics of microplastic pollution in inland rivers in China is still rare. The Manas River, which is located in the interior of Northeast China, was selected as the research object. The occurrence and pollution characteristics of microplastics in the surface water of the river were explored. The range of abundance of microplastics in the Manas River Basin was 21 +/- 3-49 +/- 3 items/L. Fibrous microplastics were dominant in all sites (88.0%); their size was mainly distributed between 0.1 and 1.0 mm (82.6%), and white and black were the dominant colours (82.9%). In addition, the size range of flaky-type microplastics were investigated in this study, which was principally between 2.5 x 10³-9.0 x 10⁴ mum² (84.5%). Infrared spectral analysis revealed that most of the selected particles were identified as microplastics, and polymer types of microplastics were dominated by polypropylene and polyethylene terephthalate (48.3%). This study can be used as a reference to better understand the contamination features of microplastics in inland rivers.

Wang, G., et al. (2017). "Comparison of the purity and vitality of natural killer cells with different isolation kits." Experimental & Therapeutic Medicine **13**(5): 1875-1883.

Natural killer (NK) cells are innate lymphocytes that aid in the protection of the host from infectious diseases and cancer. In vitro studies of NK cells have provided a foundation for developing clinical adoptive NK-cell transferred immunotherapy against human tumors. To elucidate the functions and mechanisms of NK cell populations, it is important to develop an optimal, highly reproducible and reliable isolation method. The present comparative study was performed with four different NK cell isolation kits of magnetic bead labeling made by Miltenyi and Stemcell companies, including positive selection kits [cluster of differentiation (CD)-49b, using the monoclonal antibody DX5) MicroBeads] and negative selection kits. In addition, the viability of NK cells isinterleukin-2 (IL-2)-dependent in vitro and thus the concentration of IL-2 is critical for maintaining longer cell viability of NK cells. NK cell purity and viability after culturing, for 24, 48 or 72 h, with or without IL-2 (0, 100, 300 or 500 U/ml) was investigated in the present study. Purity of NK cells varied depending on the purification kit used, despite the same method being applied. Furthermore, more granulocytes were present in purified NK cells using Miltenyi sorting kits, particularly when using the negative selection kit. The main disadvantage of DX5-positive selection using the Stemcell and Miltenyi kits was that a high percentage of CD3epsilon⁺ cells were mixed into the isolated NK cells. Additionally, a significant difference of NK cell purity (P=0.003) was observed while purification was performed using different surface markers. As a consequence, the use of the positive selection kit was modified and subsequently a significantly higher purity (P=0.002) and yield (P=0.004) of NK cells was obtained. Moreover, the purity of NK cells and viability with or without a range of concentrations of IL-2 was compared.

Wang, H., et al. (2019). "Diagnosis of Invasive Nonfunctional Pituitary Adenomas by Serum Extracellular Vesicles." Analytical Chemistry **91**(15): 9580-9589.

The invasiveness evaluation of nonfunctional pituitary adenoma (NFPAs) is crucial for the prediction of the malignant potential and for making surgical plans of NFPAs. Current invasiveness evaluation of NFPAs is based on neuroimaging, which can hardly predict the invasive potential and dynamically monitor disease progress. Here we used microbead-assisted flow cytometry to detect and analyze the serum extracellular vesicles (EVs) from 30 NFPAs patients (15 invasive and 15 noninvasive). Lower expressions of folate receptor 1 (FOLR1) and epithelial cell adhesion molecule (EpCAM) were found in serum EVs from the invasive NFPAs patients compared to the noninvasive ones [area under the curve (AUC) of 0.94 for FOLR1 and 0.88 for EpCAM]. Meanwhile, increased mRNA expression of vimentin and N-cadherin, two mesenchymal markers, was found in serum EVs from the invasive NFPAs patients compared to the noninvasive ones. Consistent results were observed in the tumor tissue that invasive NFPAs have lower expression of the epithelial markers while higher expression of the mesenchymal markers. These results suggested the possible role of epithelial-mesenchymal transition (EMT) in the invasiveness of NFPAs. Pituitary tumor transforming gene 1 (PTTG1) mRNA in serum EVs was also found to be an indicator for invasive NFPAs and is related with EMT. These results provide a method for the blood-based diagnosis and invasiveness evaluation of NFPAs and would be beneficial to the diagnosis, prognosis prediction, and surgical risk evaluation of NFPAs.

Wang, H., et al. (2012). "Application of dissolved air flotation on separation of waste plastics ABS and PS." Waste Management **32**(7): 1297-1305.

The aim of this research was to separate waste plastics acrylonitrile butadiene styrene (ABS) and polystyrene (PS) by dissolved air flotation in a self-designed dissolved air flotation apparatus. The effects of wetting agents, frother, conditioning time and flotation time on flotation behavior of waste plastics ABS (w-ABS) and PS (w-PS) were investigated and the optimized separation conditions were obtained. The results showed that when using 25 mgL(-1) tannic acid, 5 mgL(-1) terpineol, 15 min conditioning time and 15 min flotation time, mixtures of w-ABS and w-PS were separated successfully by dissolved air flotation in two stages, the results revealed that the purity and recovery rate of w-PS in the floated products were 90.12% and 97.45%, respectively, and the purity and recovery rate of w-ABS in the depressed products were 97.24% and 89.38%, respectively. Based on the studies of wetting mechanism of plastic flotation, it is found that the electrostatic force and hydrophobic attraction cannot be the main factor of the interaction between wetting agent molecules and plastic particles, which can be completed through water molecules as a mesophase, and a hydrogen bonding adsorption model with hydration shell as a mesophase was proposed.

Wang, H., et al. (2019). "Exposure to microplastics lowers arsenic accumulation and alters gut bacterial communities of earthworm Metaphire californica." Environmental Pollution **251**: 110-116.

Ubiquitous contamination of microplastics and arsenic in soil ecosystems can induce many health issues to nontarget soil organisms, and will also cause many potential threats to the gut bacterial communities of soil fauna. However, the changes in the gut bacterial communities of soil fauna after exposure to both microplastics and arsenic remain unknown. In this study, the toxicity and effects on the gut microbiota of earthworm Metaphire californica caused by the combined exposure of microplastics and arsenic were examined by using arsenic species analysis and high throughput sequencing of gut microbiota. Results showed that total arsenic and arsenic species in the earthworm gut and body tissues after exposure to combination of microplastics with arsenate (As(V)) were significantly different from that treated with As(V) alone. Microplastics lessened the accumulation of total arsenic and the transformation rate of As(V) to arsenite (As(III)). Microplastics alleviated the effect of arsenic on the gut microbiota possibly via adsorbing/binding As(V) and lowering arsenic bioavailability, thus prevented the reduction of As(V) and accumulation of total arsenic in the gut which resulted in a lower toxicity on the earthworm. The study broadens our understanding of the ecotoxicity of microplastics with other pollutants on the soil animals and on their gut microbiota.

Wang, H., et al. (2019). "Evaluation of serum extracellular vesicles as noninvasive diagnostic markers of glioma." Theranostics **9**(18): 5347-5358.

Rationale: Glioma is the most common malignant primary brain tumor in the central nervous system (CNS). The lack of reliable noninvasive diagnostic and prognostic methods is one of the main reasons for the high mortality of glioma. Serum has become a useful biomarker for the diagnosis and prognosis prediction of glioma because extracellular vesicles (EVs) carry molecular components from their parental cells. Method(s): To detect EVs and perform molecular analysis of serum EVs, we established and optimized a microbead-assisted method based on flow cytometry and estimated the efficacy of EGFR protein expression and NLGN3 and PTTG1 mRNA in serum EVs from glioma patients (n=23) and healthy individuals (n=12). We evaluated the ability of EGFR⁺ EVs to differentiate high-grade and low-grade glioma patients and checked the correlation between EGFR in EVs and the ki-67 labeling index (LI) in the tumor tissue. Result(s): We demonstrated that EGFR⁺ EVs are effective diagnostic and prognostic markers of glioma. The expression of EGFR in serum EVs can accurately differentiate high-grade and low-grade glioma patients, and EGFR in EVs positively correlates with ki-67 LI in the tumor tissue. We also showed the potential of NLGN3 and PTTG1 mRNA in EVs for detecting glioma patients. Conclusion(s): We demonstrate that the protein expression of EGFR in serum EVs is an effective diagnostic marker of glioma. EGFR in EVs highly correlates with the malignancy of glioma. We also show the potential of NLGN3 and PTTG1 in EVs for detecting glioma. The optimized flow cytometry with the aid of microbead-based EV enrichment show its potential as a noninvasive method for the detection of glioma and will be beneficial to the management of glioma. Copyright © The author(s).

Wang, H., et al. (2014). "Multiplex profiling of glycoproteins using a novel bead-based lectin array." Proteomics **14**(1): 78-86.

Lectin array is becoming important in profiling targeted glycan/glycoprotein, but weak interaction between lectin and glycan causes low sensitivity of the approach. This study aims to develop a bead-based lectin array for improving the sensitivity of glycosylation profiling. Lectins are chemically coupled to fluorescent dye coated microbeads, and glycan-lectin recognition is carried out three dimensionally. The performance of this platform was evaluated, and the LOD of lectin Ricinus communis agglutinin 120 (RCA120) was 50 pg/mL (1 pM) of asialofetuin, providing the bead-based lectin microarray with the highest sensitivity among the reported lectin microarrays. Furthermore, multiplexed assay was performed, which allowed the simultaneous detection of multiple carbohydrate epitopes in a single reaction vessel. The glycosylation patterns of hepatocellular carcinoma associated immunoglobulin G were analyzed, and increased (alpha-1,6) core fucosylation and (alpha-2,6) sialylation patterns were observed, which may provide significant clinical evidence for disease diagnosis.

Wang, H., et al. (2001). "[Non-invasive prenatal diagnosis of fetal Down syndrome by dual-color fluorescence in situ hybridization with co-denaturation]." Chung-Hua Fu Chan Ko Tsa Chih [Chinese Journal of Obstetrics & Gynecology] **36**(6): 338-340.

OBJECTIVE: To explore the possibility of non-invasive prenatal diagnosis of Down syndrome by dual color fluorescence in situ hybridization with co-denaturation.

METHODS: Fetal nucleated red blood cells labeled by anti-glycophorin a monoclonal immunomagnetic

microbeads were enriched from maternal peripheral blood by magnetic activated cell sorting. The ploidy of chromosome 21 and sex of fetuses were determined using two-color fluorescence in situ hybridization with 21 and Y chromosome probes denatured by codenaturation. The accuracy of prediction was verified according to the karyotype of fetuses by analysis of amniotic cells.

RESULTS: The ploidy of chromosome 21 of fetuses from 11 pregnant women was predicted normal. The results were correctly identified by the fetal karyotypes. 5 pregnant women were predicted carrying male fetuses. The number and mean number of male fetal nucleated red blood cells were 9-65 and 25 per 2 ml, respectively. The purity of male fetal erythrocytes enriched from maternal peripheral blood was 1.4%-18.8%; 6 pregnant women were predicted carrying female fetuses, and no male fetal nucleated red blood cell was found. The results of sex prediction were consistent with the kayotypes of fetuses by analysis of amniotic cells.

CONCLUSION: It is possible to predict the ploidy of chromosome 21 and the sex of fetuses when fetal nucleated erythrocytes enriched by direct immunomagnetic labeling followed by magnetic activated cell sorting are analyzed using two-color fluorescence in situ hybridization with Y and 21 chromosome probes through codenaturation.

Wang, H., et al. (2019). "Insights into removal mechanisms of bisphenol A and its analogues in municipal wastewater treatment plants." <u>Science of the Total Environment</u> **692**: 107-116.

The occurrence and removal mechanisms of bisphenol A (BPA) and its analogues in municipal WWTPs were critically reviewed in this article. BPA appeared to be the dominant bisphenol, and the removal efficiency of bisphenols was in the order of bisphenol AP > bisphenol P > bisphenol F > bisphenol Z > bisphenol C > bisphenol S > bisphenol B > BPA > bisphenol E > bisphenol AF. It was also found that BPA removal showed linear relationships to those of its analogues, which have been proven by BPA vs BPS or BPF. BPA removal performances in different treatment processes ranked from low to high are primary treatment, lagoon process, biological aerated filter, and activated sludge. Lab-scale studies showed that >50% BPA can be removed by sewage sludge estimated with the BPA solid water distribution coefficients, which showed that sludge adsorption played an important role on BPA removal. The theoretically predicted removal of BPA in municipal WWTP showed that it is readily biodegradable, which deviate from its on-site investigations. Existence of BPA conjugates in raw municipal wastewater as well as newly produced BPA degraded or migrated from microplastic materials are possible two main reasons. Copyright © 2019 Elsevier B.V.

Wang, H., et al. (2011). "The separation, purification and identification of mouse interstitial dendritic cells in lung." <u>Chinese Journal of Immunology</u> **27**(9): 814-817.

Objective: To establish the methods to separate and purify pulmonary interstitial dendritic cells (DCs) of mice in order to provide experimental base for the related study on them.

Wang, H., et al. (2018). "Visible-light-driven removal of tetracycline antibiotics and reclamation of hydrogen energy from natural water matrices and wastewater by polymeric carbon nitride foam." <u>Water Research</u> **144**: 215-225.

Water and energy are key sustainability issues that need to be addressed. Photocatalysis represents an attractive means to not only remediate polluted waters, but also harness solar energy. Unfortunately, the employment of photocatalysts remains a practical challenge in terms of high cost, low efficiency, secondary pollution and unexploited water matrices influence. This study investigated the feasibility of photocatalysis to both treat water and produce hydrogen with practical water systems. Polymeric carbon nitride foam (CNF) with large surface area and

mesoporous structure was successfully prepared via the bubble-template effect of ammonium chloride decomposition during thermal condensation. The reaction kinetics, mechanisms, and effect of natural water matrices and wastewater on CNF-based photocatalytic removal of tetracycline hydrochloride (TC-HCl) were systematically investigated. Furthermore, the efficiency of clean hydrogen energy from natural water matrices and wastewater was also evaluated. It was found that the photocatalytic performance of CNF for TC-HCl removal was principally affected by calcination temperature in the presence of NH₄Cl. The degradation rates of CNF-4 (calcined at 550degreeC) were approximately 1.84, 2.49 and 7.47 times than that of the CNF-2 (calcined at 600degreeC), CNF-1 (calcined at 500degreeC) and GCN (without NH₄Cl), respectively.

Wang, H., et al. (2012). "Identification of env-specific monoclonal antibodies from Chinese HIV-1 infected person by B cell activation and RT-PCR cloning." Chinese Journal of Virology **28**(4): 358-365.
To obtain protective human monoclonal antibody from HIV-1 infected person, we adapted a technology for isolating antigen specific monoclonal antibody from human memory B cells through in vitro B cell activation coupled with RT-PCT and expression cloning. Human B cells were purified by negative sorting from PBMCs of HIV-1 infected individuals and memory B cells were further enriched using anti-CD27 microbeads. Two hundred memory B cells per well were cultured in 96-well round-bottom plates with feeder cells in medium containing EBV and CpG. Env-specific antibodies in supernatants were screened by ELISA after 1-2 weeks' culture. Cells from positive wells of Env-specific antibody were harvested and total RNA was isolated. Human VH and V kappa or V lambda genes were amplified by RT-PCR and cloned into IgG1 and kappa or lambda expressing vectors. Functional VH and V kappa or V lambda were identified by cotransfecting 293T cells with individual heavy chain and light chain clones followed by analysis of culture supernatants by ELISA for Env-specific antibodies. Finally, corresponding mAb was produced by transient transfection of 293T cells with the identified VH and V kappa / lambda pair and purified by protein A affinity chromatography. Purified monocolonal antibodies were used for HIV-1 specific antibody-dependent cell-mediated cytotoxicity (ADCC) and neutralizing activity assay. Four monocolonal Env-specific antibodies were isolated from one HIV-1 subtype B' infected individual. Two of them showed strong ADCC activity and one showed weak neutralizing activity against HIV-1. Its further studies on their application in therapeutic or prophylactic vaccines against HIV-1 should be grounded.

Wang, H. Q., et al. (2007). "A feasible and quantitative encoding method for microbeads with multicolor quantum dots." Journal of Fluorescence **17**(2): 133-138.
Multicolor encoded beads were achieved by incorporating two color core-shell quantum dots (QDs) (CdSe/ZnS) to commercial polystyrene (PS) beads. By controlling the concentration ratios of the two quantum dots (QDs) in doping solutions, a series of codes with different intensity ratios were obtained. Based on the multiple encoded carboxylic modified polystyrene beads, fluorescent dyes labeled antibodies were distinguished successfully on the beads' surface. It suggests that the encoded beads from this method have the practicability in biological applications and chemical analysis.

Wang, J., et al. (2019). "Negligible effects of microplastics on animal fitness and HOC bioaccumulation in earthworm Eisenia fetida in soil." Environmental Pollution **249**: 776-784.
As one type of the most widespread and long-lasting anthropogenic contaminants, microplastics have become a global environmental concern. While numerous studies have demonstrated effects of microplastics on aquatic organisms, the potential influence on terrestrial faunas is

relatively less known, even though soil is a primary recipient and sink of plastics. In this study, earthworm Eisenia fetida was exposed to different levels (0, 1, 5, 10, and 20% d.w.) of polyethylene (PE, <=300 micro m) and polystyrene (PS, <=250 micro m) particles in an agricultural soil to evaluate the oxidative stress. Fluorescence imaging, after dying with Nile Red, clearly indicated the ingestion of PE and PS particles by E. fetida. Exposure to PE or PS particles at the highest rate (20%) for 14 d significantly (p<0.05) increased the activity of catalase and peroxidase and the level of lipid peroxidation, while inhibited the activity of superoxide dismutase and glutathione S-transferase in E. fetida. However, no discernible effect was detected at amendment rates <=10% for the majority of biochemical endpoints, suggesting that microplastic-induced oxidative stress would not occur in E. fetida under most environmental conditions. The influence of microplastics on bioaccumulation of PAHs and PCBs was also evaluated in E. fetida exposed to different levels (0, 0.1, 1, 5, and 10% d.w.) of PE and PS particles. The tissue concentrations of PAHs and PCBs were reduced in the presence of microplastics at amendment rates >=1%, suggesting that microplastics did not act as a carrier to enhance contaminant uptake. This was attributed to competitive sorption of microplastics for contaminants and the specific feeding behavior of earthworm. Biodynamic model analysis confirmed that ingestion of microplastics contributed negligibly to contaminant bioaccumulation. Findings of this study suggested that under environmentally relevant conditions, microplastics should not cause significant toxic effects to E. fetida, nor enhance its accumulation of hydrophobic contaminants.

Wang, J., et al. (2014). "[Investigation and analysis of factors that affect the health of children in the plastic recycling and regeneration processing region]." Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi/Zhonghua Laodong Weisheng Zhiyebing Zazhi/Chinese Journal of Industrial Hygiene & Occupational Diseases **32**(9): 690-692.

OBJECTIVE: To investigate the main influential factors for the health of children in the plastic waste recovery and recycling area.

METHODS: A cross-sectional survey was performed among children aged 9~17 years from three natural villages engaged in plastic waste recovery and recycling and four control villages engaged in planting. The health status of children was investigated by random household survey using a face-to-face questionnaire, and the main influential factors were analyzed accordingly.

RESULTS: The incidence rates of respiratory symptoms (cough and expectoration, nasal congestion, and sore throat) (78.4%, 69/88) and digestive diseases (gastrointestinal disease and liver disease) (14.8%, 13/88) in the waste processing area were significantly higher than those in the control area (64.0%, 71/111; 6.3%, 7/111) (P < 0.05).

CONCLUSION: Multivariate logistic regression analysis indicated that skin diseases are related to whether plastic can be smelt around the residential area.

Wang, J., et al. (2019). "Polystyrene microplastics cause tissue damages, sex-specific reproductive disruption and transgenerational effects in marine medaka (Oryzias melastigma)." Environmental Pollution **254**(Part B).

The ubiquity of microplastics in the world's ocean has aroused great concern. However, the ecological effects of microplastics at environmentally realistic concentrations are unclear. Here we showed that exposure of marine medaka (Oryzias melastigma) to environmentally relevant concentrations of 10 micro m polystyrene microplastics for 60 days not only led to microplastic accumulation in the gill, intestine, and liver, but also caused oxidative stress and histological changes. Moreover, 2, 20, and 200 micro g/L microplastics delayed gonad maturation and decreased the fecundity of female fish. Alterations of the hypothalamus-pituitary-gonadal (HPG)

axis were investigated to reveal the underlying mechanisms, and gene transcription analysis showed that microplastic exposure had significantly negative regulatory effects in female HPG axis. Transcription of genes involved in the steroidogenesis pathway in females were also downregulated. This disruption resulted in decreased concentrations of 17 beta -estradiol (E₂) and testosterone (T) in female plasma. Furthermore, parental exposure to 20 micro g/L microplastics postponed the incubation time and decreased the hatching rate, heart rate, and body length of the offspring. Overall, the present study demonstrated for the first time that environmentally relevant concentrations of microplastics had adverse effects on the reproduction of marine medaka and might pose a potential threat to marine fish populations.

Wang, J., et al. (2018). "Separation of acrylonitrile-butadiene-styrene and polystyrene waste plastics after surface modification using potassium ferrate by froth flotation." Waste Management **78**: 829-840.

This work develops a simple and practical process for separation of acrylonitrile–butadienestyrene (ABS) and polystyrene (PS) waste plastics by froth flotation after surface modification using potassium ferrate. ABS plastics containing brominated flame retardants (BFRs) can release hazardous emissions during the process of disposal. Moreover, ABS and PS are typical styrene plastics with similar properties, posing severe restrictions on their separation for recycling. Thus, potassium ferrate modification was investigated and found to decrease selectively the floatability of ABS, providing available process for separation of ABS and PS. Contact angle measurements, FT-IR, XPS and SEM characterization analysis confirmed that potassium ferrate modification can induce the desired changes in the surface properties of ABS. With consideration to separation of ABS and PS, the optimum conditions are potassium ferrate concentration 0.15 M/L, modification time 15 min, temperature 60 °C, stirring rate 200 rpm, frother concentration 14.50 mg/L and flotation time 2 min. Under optimum conditions, separation of ABS and PS with different mixing ratios was accomplished with a recovery and purity of 98.60% and 98.62% respectively. Moreover, reusing of potassium ferrate solution is feasible, further eliminating emissions and cost of this process. Consequently, surface modification using potassium ferrate can be applied for facilitating flotation separation of ABS and PS waste plastics. © 2018 Elsevier Ltd

Wang, J., et al. (2019). "Microplastics as contaminants in the soil environment: A mini-review." Science of the Total Environment **691**: 848-857.

Microplastics (MPs) have become a global environmental concern because of their ubiquitous presence. While extensive microplastic researches have focused on the marine environment, pervasive MPs contamination in soil and their detrimental impacts have been largely overlooked. Excessive concentrations of MPs and additives have been found in soil derived from the use of plastic mulches and the application of sewage sludge to fields. They may pose directly or indirectly as adverse effects on flora and fauna. The objectives of this review are (1) to summarize the abundance, sources, and properties of MPs in soil; (2) to analyze combined effects of MPs and various other environmental pollutants on soil system; and (3) to discuss the possible risks posed by MPs to soil biodiversity, food safety and human health. This review will highlight key future research areas for scientists and policymakers, and increase overall understanding of soil MPs pollution and its potential environmental impacts.

Wang, J., et al. (2019). "Sorption behaviors of phenanthrene, nitrobenzene, and naphthalene on mesoplastics and microplastics." Environmental science and pollution research international **26**(12): 12563-12573.

The occurrence of plastic particles in aquatic environment has led to enormous concern in the past few years. The sorption behaviors of harmful organic compounds by plastic particles can increase their concentrations by several orders of magnitude influencing their global transport in the marine environment. Five types of mesoplastics (5–20 mm) and five types of microplastics (< 5 mm) were selected to investigate the sorption behaviors of three typical organic compounds (phenanthrene, nitrobenzene, and naphthalene). For phenanthrene, most microplastics have stronger sorption ability than that of mesoplastics due to the higher specific surface area (SSA). However, the sorption ability of nitrobenzene on low-density polyethylene (LDPE) mesoplastics was higher than that on LDPE microplastics, and the sorption ability of naphthalene on polyvinyl chloride (PVC) mesoplastics was higher than that on PVC microplastics, which were attributed to the presence of functional groups on the surface of mesoplastics, induced by adding slip agents, lubricant, plasticizer, stabilizer, etc. during film production. Talcum-filled polypropylene (PP) microplastics had strongest sorption ability to nitrobenzene and naphthalene due to the presence of talcum and high SSA. For unmodified microplastics, the sorption abilities of phenanthrene, nitrobenzene, and naphthalene were all followed the order of high-density polyethylene (HDPE) > polystyrene (PS) > LDPE > PVC after SSA normalization. Thus, SSA and the functional groups on the surface of plastic particles should be considered when the sorption behaviors of harmful organic compounds on plastic particles are studied.

Wang, J., et al. (2019). "Size effect of polystyrene microplastics on sorption of phenanthrene and nitrobenzene." Ecotoxicology and Environmental Safety **173**: 331-338.

Microplastics can have strong sorption capacity for many contaminants, thus greatly influencing the fate, transport and bioavailability of those contaminants in the environment. However, the effect of particle size on contaminant sorption by microplastics is still poorly understood. This study investigated the sorption of phenanthrene and nitrobenzene to micron-, submicron- and nano-sized polystyrene microplastics of 170 micro m, 102 micro m, 50 micro m, 30 micro m, 800 nm, 235 nm or 50 nm. All phenanthrene sorption isotherms and most nitrobenzene sorption isotherms were linear because of the strong sorption capacity of microplastics and the hydrophobic partitioning. The log K_d values ranged between 3.07-4.20 and 1.58-3.14 log (L/kg) for phenanthrene and nitrobenzene, respectively. The log K_d values of phenanthrene and nitrobenzene both increased with decreasing particle size for micron-sized polystyrenes (micro-polystyrene) and submicron-sized polystyrenes (submicro-polystyrene). However, in comparison with 235 nm submicro-polystyrene, the log K_d values of 50 nm nano-polystyrene were significantly lower for phenanthrene and comparable for nitrobenzene because its aggregation greatly reduced the effective surface area accessible for sorption. The results improved our understanding of the fate and risks of microplastics associated with the two typical organic contaminants in the micrometer to nanometer scale.

Wang, J., et al. (2019). "Typhoons increase the abundance of microplastics in the marine environment and cultured organisms: a case study in Sanggou Bay, China." Science of the Total Environment **667**: 1-8.

Microplastic contamination in the ocean has emerged as an environmental issue of global importance. The most effective strategy to control microplastic pollution is to reduce the terrestrial input, but severe weather conditions make it difficult. This study investigated microplastic abundance and characteristics in the seawater, sediments, and cultured oysters (Crassostrea gigas) of Sanggou Bay (China) before and after two typhoons with an average rainfall of 19.2 mm/d over 8 days. Prior to the typhoons, microplastic levels in the seawater, sediment, and oysters were 63.6+or-37.4 items/L, 2178+or-369 items/kg, and 41.0+or-15.5 items/individual, with fibers being the predominant shape. Typhoons increased the average

concentrations of microplastics in the seawater and sediments by approximately 40%, and the proportions of fragments, spherules, and granules in the sediments increased by 9.6%, 4.0%, and 4.3%, respectively. The majority of microplastics in seawater, sediments, and oysters collected before the typhoons could be grouped into sizes of 0.1-0.5 mm (36.7%), 0.05-0.1 mm (42.6%), and 0.1-0.5 mm (47.1%), respectively. After the typhoons, the most abundant size classes of microplastics in the three environmental compartments were 0.05-0.1 mm (39.2%) for seawater, 0.1-0.5 mm (37.1%) for sediments, and 0.05-0.1 mm (29.9%) for oysters. The typhoons also altered color distribution of microplastics and increased the proportions of polypropylene, polystyrene, and polyethylene terephthalate in seawater. Scanning electron microscopy/energy dispersive spectroscopy showed that organic matter and heavy metals were present on the microplastics collected from oysters. Our results suggest that weather conditions should be considered when investigating marine microplastics.

Wang, J., et al. (2019). "A simple protocol for isolating mouse lung endothelial cells." Scientific Reports **9**(1): 1458.

Endothelial dysfunction is the common molecular basis of multiple human diseases, such as atherosclerosis, diabetes, hypertension, and acute lung injury. Therefore, primary isolation of high-purity endothelial cells (ECs) is crucial to study the mechanisms of endothelial function and disease pathogenesis. Mouse lung ECs (MLECs) are widely used in vascular biology and lung cell biology studies such as pulmonary inflammation, angiogenesis, vessel permeability, leukocyte/EC interaction, nitric oxide production, and mechanotransduction. Thus, in this paper, we describe a simple, and reproducible protocol for the isolation and culture of MLECs from adult mice using collagenase I-based enzymatic digestion, followed by sequential sorting with PECAM1 (also known as CD31)- and ICAM2 (also known as CD102)-coated microbeads. The morphology of isolated MLECs were observed with phase contrast microscope. MLECs were authenticated by CD31 immunoblotting, and immunofluorescent staining of established EC markers VE-cadherin and von Willebrand factor (vWF). Cultured MLECs also showed functional characteristics of ECs, evidenced by DiI-oxLDL uptake assay and THP-1 monocyte adhesion assay. Finally, we used MLECs from endothelium-specific enhancer of zeste homolog 2 (EZH2) knockout mice to show the general applicability of our protocol. To conclude, we describe here a simple and reproducible protocol to isolate highly pure and functional ECs from adult mouse lungs. Isolation of ECs from genetically engineered mice is important for downstream phenotypic, genetic, or proteomic studies.

Wang, J., et al. (2017). "Microplastics in the surface sediments from the Beijiang River littoral zone: Composition, abundance, surface textures and interaction with heavy metals." Chemosphere **171**: 248-258.

While large quantities of studies on microplastics in the marine environment have been widely carried out, few were available in the freshwater environment. The occurrence and characteristics, including composition, abundance, surface texture and interaction with heavy metals, of microplastics in the surface sediments from Beijiang River littoral zone were investigated. The concentrations of microplastics ranged from 178 ± 69 to 544 ± 107 items/kg sediment. SEM images illustrated that pits, fractures, flakes and adhering particles were the common patterns of degradation. Chemical weathering of microplastics was also observed and confirmed by μ-FTIR. EDS spectra displayed difference in the elemental types of metals on the different surface sites of individual microplastic, indicating that some metals carried by microplastics were not inherent but were derived from the environment. The content of metals (Ni, Cd, Pb, Cu, Zn and Ti) in microplastics after ultrasonic cleaning has been analyzed by ICP-MS.

Based on data from the long-term sorption of metals by microplastics and a comparison of metal burden between microplastics, macroplastics and fresh plastic products, we suggested that the majority of heavy metals carried by microplastics were derived from inherent load. [ABSTRACT FROM AUTHOR]

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Wang, J., et al. (2016). "The behaviors of microplastics in the marine environment." Marine Environmental Research **113**: 7-17.

Despite the pollution of microplastics being internationally recognized, the understanding of their behaviors in marine environment is still developing. Microplastics are ubiquitous in the marine environment, with the potential to cause harm to marine ecosystem. Here, we would classify the behaviors of microplastics as physical behaviors (i.e. migration, sedimentation and accumulation), chemical behaviors (i.e. degradation and adsorption) and biobehaviors (i.e. ingestion, translocation and biodegradation), and a further discussion on their behavioral mechanisms were presented to better understand their impacts for the marine environment. Copyright © 2015 Elsevier Ltd.

Wang, J., et al. (2019). "High levels of microplastic pollution in the sediments and benthic organisms of the South Yellow Sea, China." Science of the Total Environment **651**(Part 2): 1661-1669.

Microplastics, emerging contaminants in the ocean, are thought to sink and accumulate in sediments, and thus may pose a potential ecological risk to benthic communities. In this study, abundances and characteristics of microplastics in sediments and benthic organisms from the South Yellow Sea were investigated. First, we optimized the sediment sampling for microplastic analysis and found that the top layer (0-5 cm) had the highest abundance, and microplastic abundances decreased significantly with increase in sediment depth. The abundance of microplastics was 560-4205 n/kg dry weight in the surface sediments (the topmost 3 cm) of 14 sites and 1.7-47.0 n/g wet weight in the tissues of benthic organisms. Moreover, microplastic abundances in sediments and benthic organisms were both positively correlated with water depth. Fibers, transparent microplastics, and small microplastics (<0.5 mm) were the most dominant types in sediments and organisms. FTIR analysis showed that polypropylene (PP, 31%), polyester (PE, 24%), nylon (19%), and polystyrene (PS, 15%) were the most abundant polymers in sediments. The results of SEM showed rough surfaces and obvious cracks on the microplastics isolated from sediments. In addition, characteristics of microplastics in Ophiura sarsii, Crangon affinis, and Acila mirabilis were compared. Our results demonstrate that a comprehensive investigation of microplastics in sediments and benthic communities will help to fully understand the ecological risk of microplastic pollution.

Wang, J., et al. (2009). "Carboxylated magnetic microbead-assisted fluoroimmunoassay for early biomarkers of acute myocardial infarction." Colloids & Surfaces B: Biointerfaces **72**(1): 112-120.

A carboxylated superparamagnetic microbead-assisted sandwich fluoroimmunoassay was successfully demonstrated for the analysis of the early protein markers, myoglobin and human heart-type fatty acid-binding protein (H-FABP), associated with acute myocardial infarction. This assay approach consisted of the preparation of superparamagnetic polymer microbeads using a dispersion polymerization, followed by grafting of capture antibodies (monoclonal anti-H-FABP 10E1 and anti-myoglobin 7C3) onto the polymer microbeads using EDC-NHS protocol, and then a sequential sandwich fluoroimmunoassay using detection antibodies (FITC-labeled anti-H-FABP 9F3 and FITC-labeled anti-myoglobin 4E2). The Fe(3)O(4) nanoparticles and carboxylated Fe(3)O(4)-polymer microbeads were characterized by scanning electron microscopy, transmission electron microscopy, Fourier transform infrared spectrophotometry, vibrating sample magnetometry, and X-ray diffraction. The fluoroimmunoassay images were recorded using a confocal laser-scanning microscope, and the average fluorescence intensity of the microbeads was found to correspond to the concentration of each cardiac marker, in agreement with the results obtained by a spectrofluorophotometer. The carboxylated magnetic microbead-assisted protocol could be utilized to semi-quantitatively detect both myoglobin and H-FABP.

Wang, J., et al. (2018). "A critical review on the sources and instruments of marine microplastics and prospects on the relevant management in China." Waste Management & Research **36**(10): 898-911.

The world's oceans are suffering a constant and unprecedented accumulation of emerging plastic contaminants known as microplastics with a particle diameter smaller than 5mm. Microplastics exhibit a widespread distribution in various habitats from land to the oceans, and even reach the most remote regions - the deep sea and the polar, receiving attention exponentially in the past few years. Owing to their small size, marine species risk getting ingested and entangled in microplastics, causing suffocation, starvation, physical trauma or damage from chemicals, which poses vast and growing threats to biodiversity and the food web. This review article focuses on the various sources attributed to marine microplastics, the latest international, regional and national countermeasures to combat marine litter, as well as the status quo of microplastics pollution, legislation and regulations in China, and furthermore provides improving proposals/solutions on key research gaps, governance and management for future environmental control and policymaking in China.

Wang, J. C., et al. (2018). "Label-Free Monitoring of Microorganisms and Their Responses to Antibiotics Based on Self-Powered Microbead Sensors." ACS Sensors **3**(10): 2182-2190.

Rapid detection of bacteria and their susceptibility to specific antibiotics plays a vital role in microbial infection treatments. Antimicrobial susceptibility testing (AST) is a common measure to select effective drugs. However, the conventional practices, such as broth dilution, E-test, and disk diffusion, in clinical applications require a long turnaround time (~3 days), thereby compromising treatments and increasing mortality. This study presents self-powered sensors for on-site microorganism monitoring and rapid AST based on functionalized microbeads. The microbead sensors are driven by Brownian motion, rendering external power unnecessary. Fluorescent microbeads (d_p = 2 mum) were coated with vancomycin to capture bacteria. The growth and responses of Gram-negative Escherichia coli and Gram-positive Staphylococcus aureus under antibiotic treatment were evaluated. The method showed stable selective binding despite the presence of some interferential substances, such as proteins and cells. Diffusivity change was strongly related to bacterial concentration. Accordingly, the diffusivity values of microbeads bound with motile and nonmotile bacteria exhibited specific patterns because of extra motility from microbes and increased particle diameter. Only a drop of microbead-bacteria suspension (~5 muL) was needed in a microchip for each measurement. The microchip provided a steady environment for measurement over a few hours. By distinguishing the slope of the last four data points in the temporal diffusivity curve, bacterial susceptibility or resistance to specific antibiotics could be determined within a time frame of 2

h. The study provides insights into saving more lives by using a fast and robust AST technique in future clinical practice.

Wang, J. L. and L. L. Wang (2011). "Catalytic Pyrolysis of Municipal Plastic Waste to Fuel with Nickel-loaded Silica-alumina Catalysts." Energy Sources Part A: Recovery, Utilization & Environmental Effects **33**(21): 1940-1948.

Three nickel-loaded silica-alumina (Ni/Si-Al) catalysts of varying Si/Al molar ratio (Si/Al ratio) were prepared for catalytic pyrolysis of municipal waste plastic. Acid properties of the catalysts have been analyzed by Fourier transform infrared spectroscopy, and the results showed that the total acid amount increased with the decrease of Si/Al ratio. The temperature and the catalyst acidity have a significant effect on the lump (gas, gasoline fraction, heavy oil fraction, and residue) yields. In addition, the gasoline fraction products that evolved have been analyzed by gas chromatography spectrometer. It showed that the gasoline fraction has higher iso-paraffins and a smaller concentration of olefins and aromatics for a lower Si/Al ratio and higher acidity of catalyst. These results suggested that the proper selection of the Si/Al ratio makes it possible to control the composition distribution, yields, and gasoline fractions of fuel. [ABSTRACT FROM AUTHOR]

Wang, J. W. (2013). "Starch-Based Biodegradable Packaging Materials of Antimicrobial." Applied Mechanics and Materials **457-458**(Frontiers of Mechanical Engineering and Materials Engineering II): 231-235.

With the gradual increase of the global environmental awareness and environmentally friendly voice rising, the deal with the problem of plastic waste has become the focus of public opinion around the world has also become a hot topic of scientific research. This paper can be made of polystyrene as main raw material, adding starch and antibacterial agents containing silver nanoscale titanium dioxide, and by the synthesis of biodegradable packaging materials performance. The results showed that: 0.25mm sheet of polystyrene made of the thickness of the main raw material by injection molding process, and factors affecting the performance of the sheet, the better the performance of the film material process parameters. According to the definition of the GB/T1040-92 national standards of the People's Republic of China "plastic tensile properties of test methods and GB/T20197-2006 degradable plastics, classification, marking, and degradation of the performance requirements" and GB4789.3-94 "State Microbiological examination of coli form bacteria in the standard of food hygiene as determined by experimental methods for testing. The orthogonal experiment results show that the expandable polystyrene Dosage: 80%; starch dosage: 2%; toluene, acetone and put ratio: 3:2 .The mechanics of materials, degradation, and antimicrobial properties.

Wang, J. Y., et al. (2019). "Sensitive tear screening of diabetic retinopathy with dual biomarkers enabled using a rapid electrokinetic patterning platform." Lab on a Chip **18**: 18.

Bead-based immunosensors have intrigued the scientific community over the past decades due to their rapid and multiplexed capabilities in the detection of various biological targets. Nevertheless, their use in the detection of low-abundance analytes remains a continuing

challenge because of their limited number of active enrichment approaches. To this end, our research presents a delicate microbead enrichment technique using an optoelectrokinetic platform, followed by the detection of dual biomarkers for the sensitive screening of an eye disease termed diabetic retinopathy (DR). In this study, microbeads turned fluorescent as their surfaces formed sandwiched immunocomplexes in the presence of target antigens. The tiny fluorescent dots were then concentrated using the optoelectrokinetic platform for the enhancement of their signals. The signal rapidly escalated in 10 s, and the optimal limit of detection was nearly 100 pg mL-1. For practical DR screening, two biomarkers, lipocalin 1 (LCN1) and vascular endothelial growth factor (VEGF), were used. Approximately 20 muL of analytes were collected from the tear samples of the tested patients. The concentrations of both biomarkers showed escalating trends with the severity of DR. Two concentration thresholds of LCN1 and VEGF that indicate proliferative DR were determined out of 24 clinical samples based on the receiver operating characteristic curves. For verification, a single-blind test was conducted with additional clinical tear samples from five random subjects. The final outcome of this evaluation showed an accuracy of >80%. This non-invasive screening provides a potential means for the early diagnosis of DR and may increase the screening rate among the high-risk diabetic population in the future.

Wang, L., et al. (2017). "Enhancing anti-microbial properties of wood-plastic composites produced from timber and plastic wastes." Environmental Science & Pollution Research **24**(13): 12227-12237.

Considering the resource waste and environmental burden for timber and plastic materials ending up at landfills, this study proposed upcycling wood and plastic waste into value-added wood-plastic composites (WPCs), complying with the standard requirements of flexural strength, thickness swelling, water absorption and thermal insulation. Biological deterioration is a major concern of WPCs. Bacterial survival, fungal attack and algal growth of bactericide-treated WPCs were holistically analysed. Melamine resin was adopted for impregnating anti-microbial agents on the surface. All the agents showed excellent bactericidal rate (Escherichia coli), yet poly-diallyl-dimethyl-ammonium chloride (PolyDADMAC) and silver had the lowest minimum inhibitory concentrations. In terms of weight loss and strength reduction due to fungal decay (Coriolus versicolor), PolyDADMAC, silver and cetyltrimethylammonium bromide (CTAB) imparted the highest resistance on the WPCs. Moreover, PolyDADMAC and copper provided the most protection against algal growth (Chlorella vulgaris), and the former presented durable inhibitory effect. This study presents a value-added solution to wood/plastic waste recycling.

Wang, L., et al. (2019). "Photocatalytic TiO₂ Micromotors for Removal of Microplastics and Suspended Matter." Acs Applied Materials & Interfaces **11**(36): 32937-32944.

Environmental contamination is a major global challenge, and the effects of contamination are found in most habitats. In recent times, the pollution by microplastics has come to the global attention and their removal displays an extraordinary challenge with no reasonable solutions presented so far. One of the new technologies holding many promises for environmental remediation on the microscale are self-propelled micromotors. They present several properties that are of academic and technical interest, such as the ability to overcome the diffusion limitation in catalytic processes, as well as their phoretic interaction with their environment. Here, we present two novel strategies for the elimination of microplastics using photocatalytic Au@Ni@TiO₂-based micromotors. We show that individual catalytic particles as well as assembled chains show excellent collection and removal of suspended matter and microplastics from environmental water samples.

Wang, L., et al. (2008). "A MEMS Thermal Biosensor for Metabolic Monitoring Applications." Journal of Microelectromechanical Systems **17**(2).

This paper presents a microelectromechanical systems (MEMS) differential thermal biosensor integrated with microfluidics for metabolite measurements in either flow-injection or flow-through mode. The MEMS device consists of two identical freestanding polymer diaphragms, resistive heaters, and a thermopile between the diaphragms. Integrated with polymer-based microfluidic measurement chambers, the device allows sensitive measurement of small volumes of liquid samples. Enzymes specific to a metabolic analyte system are immobilized on microbeads packed in the chambers. When a sample solution containing the analyte is introduced to the device, the heat released from the enzymatic reactions of the analyte is detected by the thermopile. The device has been tested with glucose solutions at physiologically relevant concentrations. In flow-injection mode, the device demonstrates a sensitivity of approximately 2.1 muV/mM and a resolution of about 0.025 mM. In flow-through mode with a perfusion flow rate of 0.5 mL/h, the sensitivity and resolution of the device are determined to be approximately 0.24 muV/mM and 0.4 mM, respectively. These results illustrate that the device, when integrated with subcutaneous sampling methods, can potentially allow for continuous monitoring of glucose and other metabolites.

Wang, L., et al. (2018). "Interpretation of safety standard and inspection of plastic packaging products for food contact." Journal of Food Safety and Quality **9**(24): 6345-6354.

Plastic products for food contact are closely related to health and safety. After the release of the new version of food safety standards, some issues related to safety standards and the inspection process of their products have attracted people's attention. This paper compared and analyzed the main differences between old and new versions of food safety standards of plastic products for food exposure, elaborated the main technical requirements and inspection items of GB 4806.6-2016 National standard for food safety plastic resin for food exposure and GB 4806.7-2016 National standard for food safety plastic materials and products for food exposure. Taking polyethylene terephthalate (PET) without steam beverage bottles, polyethylene (PE) food bags, and melamine sauce cans as examples, the selection of transfer test conditions during the inspection process was discussed in detail, so as to provide references for the production enterprises and inspection agencies of plastic products for food contact.

Wang, L., et al. (2011). "Increased oxidative DNA damage in workers exposed to external environmental di(2-ethylhexyl) phthalate (DEHP) in a waste plastic recycle area in China." Epidemiology **1)**: S296-S297.

Background/Aims: Di(2-ethylhexyl)phthalate (DEHP) is a generalpurpose plasticizer for polyvinyl chloride and has become a ubiquitous environmental contaminant. It is suspected to be an endocrine disrupting/modulating substance in humans. China has already been the second county of plastic production and consumption in the whole world. As the universal application and high-out rates of plastics in our daily life, plastics recycling and processing industry have emerged. A large number of abandoned plastic products have been collected and transport to waste plastic recycle areas. According to statistics, the number of plastics recycling businesses in China is up to 10,000 or so, developing a number of large-scale plastics recycling markets and processing areas. The amount of recycling waste plastics of an annual is about more than 600 million tons. However, with the lack of effective market regulation, backward technology and poorly equipped of plastics recycling businesses, the aggravation environment problems and people's health in these areas have become a social issue of common concern, especially burning and depositing plastic waste. The aims of the study were to perform the monitoring of

levels ofDEHP in the water samples and 5 PAEs in the soil samples, which were collected from the exposure region and the control region; to measure the levels of oxidative stress and the extent of deoxyribonucleic acid DNA oxidative damage by the biomarkers including levels of malondialdehyde (MDA), super oxide dismutase (SOD), and glutathione peroxides in sera samples and 8-OHdG in the urine samples from the workers who engaged plastic recycle and plastic reclaim, and to analyze the risk factors relating to these biomarkers. Method(s): The exposure region was a plastic recycling centers in the Southern city where has had over 20 years in plastics recycle and the control region was 50 km far away from exposure region where it is without known sources of pollution related. The 157 workers in exposure region and 157 residents in control region were selected based on gender and age matched, and the basic information was collected by uniform questionnaire. DEHP levels of collected water samples from the sites (including the river, wells, ponds, tap water, and industrial effluent) in the exposure region and the control region were detected using the solidphase extraction and gas chromatography method. The column chromatography and gas chromatography techniques were applied to determine the concentrations of DEHP and other PAEs in soil samples. The chemical colorimetric was used to determine serum MDA, glutathione peroxides, and SOD in exposure and control population, which is served as an oxidative stress index of DNA damage. The electrochemical-high performance liquid chromatography was applied to test the level of urinary 8-OHdG, which is served as an index of the extent of DNA oxidative damage. The demography data and related medical index in exposure and control were analyzed by using significance test. Logistic regression was performed to analyze the DNA damage. Result(s): The average DEHP level in the river water samples from the polluted section (mean: 2.05 mug/L) was 6.4 fold compared with that from the control section (0.32 mug/L). Average DEHP level in the pond (135.68 mug/L) and the well (14.20 mug/L) water samples from the exposure region were 18 fold and 215 fold compared with those (0.79 mug/L and 0.37 mug/L) in the control region, respectively. The DEHP level in industrial effluent sample ranged from 0.36 mug/L to 161.86 mug/L. The dibutyl phthalate (DBP) (0.94 -24.09 mg/kg) and DEHP (0.85-37.23 mg/kg) were indentified in all soil samples from exposure and control regions. In 5 PAEs determined, the DEHP and DBP concentration is the highest one, following by diethyl phthalate, di-n-octyl phthalate (DnOP), and dimethyl phthalate. The average of 5 PAEs in soil of exposure region was 1-19 times of that in control region. The contents of DBP (mean: 9.46 mg/kg) and DEHP (mean: 13.07 mg/kg) in exposure region soil were the 19 and 16 times of that in control region. The detection rate of DBP (range, 0.94 -24.09 mg/kg) and DEHP (range, 0.85-37.23 mg/kg) in the exposed soil are 100%. The medians of serum SOD in exposed population and control population were 111.80 U/mL (range, 31.71-167.69 U/mL) and 124.16 U/mL (range, 78.88 -181.46 U/mL) respectively, with a significant difference between the 2 groups (P < 0.01). Conclusion(s): The study results showed that DEHP exposure concentrations in water and soil samples in plastic recycling centers where occupational workers lived were higher than that where the control residents live. The demological study results showed that the occupational exposure was the main factor, which affects the levels of serum SOD, MDA, GAH-Px, and urine 8-OHdG. Although Urine 8-OHdG levels may be affected by other pollutants from plastic recycling center, the exposure population has shown the oxidative DNA damage.

Wang, M., et al. (2013). "Minimizing the severity of rhBMP-2-induced inflammation and heterotopic ossification with a polyelectrolyte carrier incorporating heparin on microbead templates." Spine **38**(17): 1452-1458.

STUDY DESIGN: A rodent model of posterior spinal fusion.
OBJECTIVE: The aim of this study was to evaluate the efficacy of low-dose recombinant human bone

morphogenetic protein-2 (rhBMP-2) delivered with a heparin based polylectrolyte complex (PEC) carrier in facilitating posterior spinal fusion while concurrently minimizing seroma and heterotopic ossification.

SUMMARY OF BACKGROUND DATA: rhBMP-2 is being used to augment spinal fusion. However, complications such as heterotopic ossification and local soft tissue swellings have been reported. These are attributed to supraphysiological amount of rhBMP-2 and the poor modulation capacity of absorbable collagen sponge.

METHODS: Forty rats were randomized into 6 groups as follows. Group I: absorbable collagen sponge without rhBMP-2 (n = 4); group II: positive control, absorbable collagen sponge + 10 mug rhBMP-2 (n = 4); group III: alginate-(poly-L-lysine)-heparin (PEC) without rhBMP-2 (n = 8); group IV: PEC + 4.5 mug rhBMP-2 (n = 8); group V: PEC + 1.5 mug rhBMP-2 (n = 8); group VI: PEC + 0.5 mug rhBMP-2 (n = 8).

RESULTS: Between postoperative days 5 and 7, seroma was observed in all rhBMP-2 implanted groups irrespective of carrier and dose. However, the rate and size of seroma differed considerably. Although all animals (100%) in positive control group showed seroma, only one animal (12.5%) in group VI developed seroma at the implant site. The size of seroma in group VI was significantly smaller than that in positive control group. Micro-computed tomography evaluation revealed comparable mean fusion scores in all rhBMP-2 implanted groups. More importantly, although new bone was well contained within the cage in group VI, heterotopic ossification beyond the cage was observed in positive control group.

CONCLUSION: A new carrier has demonstrated capacity to minimize seroma formation as well as heterotopic ossification associated with rhBMP-2 by reducing the efficacious dose needed for consistent fusion. The results of this study indicate that PEC alginate microbeads may represent a new opportunity to define an efficient rhBMP-2 carrier.

Wang, M., et al. (2015). "Pipette-tip solid-phase extraction by use of a sol-gel hybrid adsorbent: a new pretreatment strategy for rapid screening of cucumbers for cyanazine and atrazine." Analytical and bioanalytical chemistry **407**(4): 1231-1239.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis A pipette-tip solid-phase extraction (PT-SPE) method using a sol-gel hybrid adsorbent has been developed. The method could be used for rapid screening of vegetable matrices for cyanazine and atrazine; assay of cucumbers is reported as an example. The sol-gel hybrid adsorbent was synthesized from tetraethyl orthosilicate (TEOS) as the precursor and γ-(methacryloyloxy)propyltrimethoxysilane (KH570) as both surface modifying agent and monomer for the polymerization. Under the optimized conditions, good calibration linearity was obtained in the range 0.022-1.65 [mu]g g^sup -1^ with correlation coefficients (r) [greater than or equal to]0.9996. Recovery at three spike levels ranged from 87.6 to 93.8 % with relative standard deviations [less than or equal to]7.8 %. This extraction strategy has several advantages, for example ease of assembly, low cost, and high extraction efficiency, and is a potential pretreatment strategy for rapid screening of cyanazine and atrazine in vegetables. [Figure not available: see fulltext.]

Wang, M. H., et al. (2019). "Research and management of plastic pollution in coastal environments of China." Environmental Pollution **248**: 898-905.

Marine plastic waste has become an ever-increasing environmental threat in the world's ocean largely due to their unique properties and ubiquitous occurrence. They include diverse forms of land- and ocean-based sources of plastics and are estimated to account for up to 85% of marine debris worldwide. As secondary pollutants, marine microplastic particles (<5mm) are derived from pellet loss and degradation of macroplastics. Up to now, several reports have proposed negative impacts of both macro-sized and micro-sized plastics on marine biota. As one of the rapidly growing economies, China is the topmost contributor of plastic waste in the world. China's massive impact on the plastic levels of the ocean are a definite cause of concern and is developing multiple economic, environmental and biological complications. The research of plastics impact on coastal environments in China is only incipient. Here we review the available information on plastic waste, their impacts on marine biota and human health, and Chinese government policies and management initiatives. Although Chinese coastal environments (surface water, coastal sediments, water column) are affected by microplastics pollution, both from land-based and sea-based activities, their impacts on marine biota remain to be elucidated. Though national-level policies are modern and well suited for minimizing the impacts of plastic pollution, there is hardly any legislation for containment of microplastic pollution. Our objective is to review and summarize the information about the occurrence, impacts, and management of plastic pollution in the Chinese coastal environments in order to comprehend their widespread repercussions. MAIN FINDING: Microplastics are increasingly being detected and quantified in Chinese coastal environments and legislation for containment of such pollution is highly recommended.

Wang, M.-X., et al. (2012). "A portable instrument for rapid field test of E. coli based on bioluminescent magnetic immunoassay." Nami Jishu yu Jingmi Gongcheng/Nanotechnology and Precision Engineering **10**(6): 514-519.

A portable instrument was designed for rapid field specific test of Escherichia coli (E. coli) based on bioluminescent magnetic immunoassay, which consisted of photon counting unit, central processing unit, temperature control unit and power supply unit. The temperature control unit supplied a constant temperature of 37C, which is suitable for incubation and convenient for field test. An improved simplified coupling method was presented, in which immunomagnetic microbeads coupled with biotinylated rabbit-anti-E. coli antibody could capture E. coli directly by one step. The detecting result of E. coli showed a good linear relationship in lg-lg domain between the intensity of luminescence and the concentration of E. coli obtained through plate counting in the range from 23.00 CFU/mL to 2.25 107 CFU/mL, with a correlation coefficient of 0.9657. The sensitivity of the detecting system was 0.4787. In the reproducibility test, the coefficient of variation was 4.48%. The instrument integrated with constant temperature control is portable, easy to operate and low in cost, which will provide potential applications in food hygiene and safety, environmental monitoring and disease diagnosis.

Wang, Q., et al. (2011). "Increased urinary 8-hydroxy-2'-deoxyguanosine levels in workers exposed to di-(2-ethylhexyl) phthalate in a waste plastic recycling site in China." Environmental Science & Pollution Research **18**(6): 987-996.

BACKGROUND: Di-(2-ethylhexyl) phthalate (DEHP) is a common plasticizer used in industrial and diverse consumer products. Animal studies indicate DEHP caused developmental, reproductive, and hepatic toxicities. However, human studies of the potential effects of DEHP are limited.

METHODS: The exposed site with a history of over 20 years of waste plastic recycling was located in Hunan Province, China. The reference site without known DEHP pollution source was about 50 km far away from the exposed site. In this study, 181 workers working in plastic waste recycling and 160 gender-age matched farmers were recruited. DEHP concentrations in water and cultivated soil samples, serum thyroid-stimulating hormone, malondialdehyde (MDA), superoxide dismutase (SOD), urinary 8-hydroxy-2'-deoxyguanosine (8-OHdG), and micronuclei

frequency in human capillary blood lymphocytes were analyzed.
RESULTS: Mean levels of DEHP were greater in environment at the recycling site than at reference site (industry wastewater for the exposed: 42.43 mug/l; well water: 14.20 vs. 0.79 mug/l, pond water: 135.68 vs. 0.37 mug/l, cultivated soil: 13.07 vs. 0.81 mg/kg, $p < 0.05$ for all). The workers had higher median levels of MDA (3.80 vs. 3.14 nmol/ml) and urinary 8-OHdG (340.37 vs. 268.18 mumol/mol creatinine) and decreased SOD activities (112.15 vs. 123.82 U/ml) than the reference group ($p < 0.01$ for all). Multivariate analysis revealed that the history of working in waste plastic recycling was an independent risk factor for the increased urinary 8-OHdG levels in the male workers ($p < 0.01$).
CONCLUSIONS: The occupational DEHP exposure might contribute to oxidative deoxyribonucleic acid damage in the male workers.

Wang, Q., et al. (2017). "Plastic Classification with X-ray Absorption Spectroscopy Based on Back Propagation Neural Network." Applied Spectroscopy **71**(11): 2538-2548.

Currently, spectral analysis methods used in the classification of plastics have limitations that do not apply to opaque plastics or the stability of experimental results is not strong. In this paper, X-ray absorption spectroscopy (XAS) has been applied to classify plastics due to its strong penetrability and stability. Fifteen kinds of plastics are selected as specimens. X-ray, which is excited by a voltage of 60 kV, penetrated these specimens. The spectral data acquired by CdTe X-ray detector are processed by principal component analysis (PCA) and other data analysis methods. Then the back propagation neural networks (BPNN) algorithm is used to classify the processed data. The average recognition rate reached 96.95% and classification results of all types of plastic results were analyzed in detail. It indicates that XAS has the potential to classify plastics and that XAS can be used in some fields such as plastic waste sorting and recycling. At the same time, the technology of XAS, in the future, can also be used to classify more substances.

Wang, S., et al. (2020). "Selectively enrichment of antibiotics and ARGs by microplastics in river, estuary and marine waters." Science of the Total Environment **708**: 134594.

The partition of antibiotics and antibiotic resistant genes (ARGs) between the microplastics (MPs) and the surrounding water with various salinity are still unclear. In this study, we hypothesized that adsorption of antibiotics on MPs might cause a significant change of the structure of microbial communities, diversity and abundance of ARGs on MPs and this might be further affected by change of salinity. In this study, we investigated adsorption of four common antibiotics (sulfamerazine, tetracycline, chloramphenicol and tylosin) to polyethylene (PE) MPs in river, estuary and marine waters, and the differences of antibiotic resistant genes (ARGs) and bacterial communities on MPs and in the three waters. The results showed that MPs can enrich antibiotics, ARGs and microbes from the surrounding water. Elevated salinity could reduce adsorption of antibiotics to MPs and the abundance of ARGs. For example, MPs can concentrate more antibiotics and ARGs in the fresh river water than in the estuary and the marine waters. In addition, ARGs and bacterial communities on MPs at various salinity were significantly different under the pressure of four antibiotics. On MPs, sul1, sulA/folP-01, tetA, tetC, tetX and ermE increased significantly but a few new ARGs such as sulA/folP-01 and tetA appeared. The structure of the bacterial communities on MPs was different from the surrounding water since some bacteria species found on MPs were barely detected in the surrounding water while some genera on MPs vanished after exposure to antibiotics. As the antibiotics adsorbed and the ARGs on MPs decreased with the water salinity, the structure of the communities on MPs thus varied with salinity change. These findings are important to understand the effects of MPs on the

transport, fate and ecological risk of antibiotics and ARGs in different aquatic environments.

Wang, S.-c., et al. (2019). "Toxicity research progress of microplastics on microalgae." Haiyang Huanjing Kexue = Marine Environmental Science(2): 192.

Microplastics(MPs) pollution has become a global environmental problem. A few papers reported that MPs could have toxic effect on microalgae. Moreover,due to their strong binding ability,MPs may induce joint toxicity with other contaminants. As microalgae are the most primary producers in water system,the toxic effect is likely to influence the stability of food chains in water and further bring potential risks to human beings. The present paper reviewed the current research achievements and possible toxicity mechanisms,including physical damage,shielding effect,oxidative stress,adsorption and hetero-aggregation. In addition,future research directions were also proposed and discussed.

Wang, S. Y., et al. (2018). "Research on principle of benzoxazole derivative PO-291 inhibiting T cell proliferation. [Chinese]." Chinese Pharmacological Bulletin **34**(7): 925-933.

Objective To investigate the immunosuppressive activity of benzoxazole derivative PO-291 in inhibiting human activated T cell proliferation and function. Methods Human T cells were isolated and purified by the immunomagnetic microbeads and activated by anti-CD3/anti-CD28 mAbs or alloantigen. Cell proliferation, the expression of CD25 and CD69, cell cycle and apoptosis were measured by flow cytometry. Secretion levels, including IL-2, IL-4, IL-6, IL-10, IL-17 and IFN-7 were determined by ELISA. The expression and phosphorylation of STAT5 and p70S6K of activated T cells were detected by Western blot. Results PO-291 significantly inhibited human T cell proliferation with anti-CD3/anti-CD28 mAbs or alloantigen stimulation without obvious cytotoxicity. PO-291 did not affect CD25, CD69 and IL-2 expression, but induced T cell cycle arrest in G0/G, phase. PO-291 significantly inhibited IL-17, IFN-7 and IL-6 expression, but not IL-2, ILA and IL-10. PO-291 did not affect STAT5 and p70S6K expression, but inhibited STAT5 phosphorylation and enhanced p70S6K phosphorylation. Conclusions PO-291 inhibits human activated T cell proliferation by affecting the JAK3/STAT5 pathway. PO-291 represents a potential lead compound for the design and development of new immunosuppressive drugs for the treatment of organ transplantation and autoimmune diseases. Copyright © 2018 Publication Centre of Anhui Medical University. All rights reserved.

Wang, T., et al. (2018). "The research progress in migration, distribution, biological effects and analytical methods of microplastics." Kexue Tongbao/Chinese Science Bulletin **63**(4): 385-395.

Microplastics (MPs) are synthetic organic polymers. The particle sizes of MPs range from approximately 0.01 to 5 nm. The photodegradation of MPs is more difficult than that of bulk plastics. Therefore, MPs are regarded as potential persistent organic pollutants. Researches of MPs have become a hot spot, and lots of MPs studies were reported recently. Although there are a lot of studies on the migration, distribution, biological effects and analytical methods of MPs in natural environments, systematic and comprehensive review articles are emergent, especially for the recent literatures. The present work summarized the researches involving the migration, distribution, biological effects and analytical methods of MPs in recent years. MPs are generally divided into two types, primary MPs and secondary MPs. Primary MPs are intentionally designed and produced for certain purposes, while secondary MPs generate from the fragmentations of bulk plastics and the breakage of clothes fibers. Currently, researches of MPs distribution focus on in marine environments, and found that MPs distributed throughout the ocean, even in the north and south poles, driven by the flow of sea water. However, researches of on MPs distribution in fresh water and terrene are limited. Researches also showed that MPs could migrate among terrestrial, freshwater and marine environments, where freshwater environments affected the migration and interaction of MPs between terrene and marine environments. Studies of biological effects of MPs focus on two parts, ingestion effects and combined effects with organic contaminants. Ingestion of MPs damages living beings and then MPs transfer through food chains. The responses of living beings to MPs are mainly related to sublethal effects at environmental-relevant concentrations. The inhibition of individual growth and reproduction, disturbance of proteins and genes, and reduction of nutrition uptake were reported for specific physiological effects of MPs. Some researches proposed that MPs could be accumulated in living organisms. Therefore, humans, as a part of the food chains, will inevitably be affected by MPs. The organic contaminants combine with the MPs released from the plasticizers in the production of MPs and then are adsorbed in the natural environments. MPs have been found in seafood. As a result, MPs become one medium of human exposure to organic pollutants. The analysis and identification of MPs are critical to other researches, such as environmental behaviors and toxicity. In general, the analytical methods of plastic include physical and chemical characterizations. Physical characterizations involve visual, microscopy and spectroscopy methods. Chemical characterization methods, such as differential scanning calorimetry (DSC), gas chromatography mass spectrometry (GC-MS), scanning electron microscope and energy disperse spectroscopy (SEM-EDS), and thermal desorption gas chromatography mass spectrometry (TDS-GC-MS) are frequently used in chemical characterizations. Although lots of analytical methods were proposed by researchers, there are still some shortcomings and limitations, for example, the influence from environmental or biological matrices. It is necessary to develop effective and accurate methods for the analysis of MPs. Through many researches of MPs were reported recently, the information of source, migration, distribution, biological effects and analytical methods of MPs is not enough to scientifically evaluate their environmental and health risks. Consequently, the present review also proposes some perspectives for MPs researches. It is worth to study the distribution of MPs in terrestrial and freshwater environments, the biological effects at individual level, the prevention and control of MPs pollution and the environmental behavior of nanoplastics. Integrating the data of MPs source, distribution, behavior and toxicity is necessary to the scientific evaluations of MPs risks. This review provides insights in the control techniques and theoretical researches of MPs. 2018, Science Pr ss. All right reserved.

Wang, T., et al. (2019). "Emission of primary microplastics in mainland China: Invisible but not negligible." Water Research **162**: 214-224.

Primary microplastics are mostly produced as part of the daily plastic product use. The emission process is often invisible but poses potential ecological hazards. Thus, primary microplastics deserve public attention. Due to China's huge population base and its rapid economic development, primary microplastics emissions are of both regional and global significance. This study is the first to establish the emission inventory of primary microplastics in mainland China. It was estimated that the primary microplastic waste from mainland China amounts to 737.29 Gg, and one-sixth of this amount entered the aquatic environment in 2015. The highest proportion of this waste was attributable to tire dust and synthetic fiber, accounting for 53.91% and 28.77% of the total respectively, in mainland China. The primary microplastics emissions mainly depend on the population, followed by the level of economic development. It was roughly estimated that 538 g of microplastics is produced by each person in China. At the grid scale, the spatial difference in the total primary microplastics emissions in mainland China primarily depends on the population density distribution and transportation network. We studied the entire life cycle of several sources of microplastics, from production to discharge into the aquatic environment. We suggested different control measures under different nodes. Increasing microplastics treatment in sewage treatment plants should be a short-term viable way to achieve some measure of reduction in their entry to the environment in mainland China. Our research can not only raise public awareness about primary microplastics, but can also guide the development of environmental policies to reduce plastic pollution. Copyright © 2019 Elsevier Ltd

Wang, T., et al. (2019). "Adsorption behavior and mechanism of five pesticides on microplastics from agricultural polyethylene films." Chemosphere **244**: 125491.

Polyethylene (PE) agricultural soil films are easily embrittled and decomposed to microplastics (MPs) in environment. As widely used pesticides in vegetable farmland, carbendazim, dipterex, diflubenzuron, malathion, difenoconazole have potential environmental and human safety risks. They are often coexisting with MPs in the environment, and may cause consequential pollution to the ecosystem. Studying the adsorption behavior between pesticides and PE agricultural soil films MPs would be helpful for the risk assessment of co-exposure of pesticides and MPs. Herein, a systematic study on batch adsorption experiments was performed to determine the adsorption process of pesticides on MPs, the environmental factors on adsorption capacity were evaluated, and the adsorption mechanisms were discussed.

Wang, W., et al. (2010). "Target ultrasonography detection of IBMIR induced by pig islets." Transplantation **1)**: 1008.

Introduction: Islet transplantation will induce immediately blood-mediated inflammatory reaction (IBMIR) when grafts are exposed to recipient's blood. IBMIR is a critical reason resulting to portal vein thrombosis and graft failure. Thrombus can be a mark of extent and degree of IBMIR.The aim of this study is to develop a KGDS-target ultrasound contrast agent(MBK) to bind to GPIIb/IIIa on activated platelets specifically and assess its specificity of binding effect on thrombus in IBMIR models in vitro and in vivo. Material(s) and Method(s): Neonatal Porcine islet(NPI) was mixed with human blood in tubing loops as IBMIR model in vitro. Affinity of MBK to GPIIb/IIIa receptors in activated platelets was assessed with immunocytochemical and immunofluorescence technique. Contrast-enhanced US imaging was performed with MBK and non-target microbubbles(MBN) respectively. Twenty SD rats were divided into 4 groups. Contrast-enhanced US imaging with MBK or MBN was performed in 4 groups of rats respectively (Group A: transplantation of NPI via portal vein + MBK , Group B: NPI +MBN ; Group C: implantation of alginate microbeads via portal vein +MBK, Group D: alginate microbead +MBN). The size of alginate microbeads was similar as NPI. Result(s): NPIs trigged the activation of coagulation system and platelets in tubing loops IBMIR model after islet mixed with human blood. The MBK was shown high affinity to the GPIIb/IIIa in platelets activated by NPI in IMBIR model in vitrol. Adherence of MBk on thrombus was significantly higher than that of MBN($P<0.001$). Contrast-enhanced US imaging showed high-echo ring surrounding the thrombus with MBk. Otherwise, MBN was just shown thrombus as anechoic filling defect in tubing loops IMBIR model, no enhancement of thrombus was shown in US image with MBN. Further more, the liver of rats in Group A was shown contrast-enhanced US image with MBK, average video intensity was significantly higher than Group B ($P<0.001$). Both MBK and MBN not showed ultrasonic contrast enhancement in alginate microbeads groups (Group C and D). Results of immunohistochemical assay confirmed GPIIb/IIIa expression of thrombus surrounding NPI, and fluorescence assay also shown MBK attached to thrombus surrounding NPI. Conclusion(s): US with GPIIb/IIIa targeted contrast agent shown a potential ability of real-time and dynamic detection for IBMIR in pig islet xenotransplantation.

Wang, W., et al. (2019). "The ecotoxicological effects of microplastics on aquatic food web, from primary producer to human: A review." Ecotoxicology & Environmental Safety **173**: 110-117.

The prevalence of microplastics in global waters raises the concern about their potential effects on aquatic biota. In aquatic environment, microplastics are almost ubiquitously present in all compartments from surface water to benthic sediment, making them accessible to a wide range of aquatic biota occupying different habitats. Exposure to microplastics may induce detrimental implications to the health of aquatic organisms. This review describes the wide occurrence of microplastics ingestion by aquatic fauna and evaluates the ecotoxicological effects of microplastics as well as the associated chemicals on aquatic biota including phytoplankton and fauna from both freshwater and marine environments. Trophic transfer of microplastics and associated contaminants along the aquatic food chain and potential impacts on human health are also discussed. Finally, this review emphasizes the current knowledge gaps and gives recommendations for the future work.

Wang, W., et al. (2020). "Bioavailability and toxicity of microplastics to fish species: A review." Ecotoxicology & Environmental Safety **189**: 109913.

The prevalence of microplastics in aquatic environments has raised concerns about their availability and risks to aquatic biota. Since fish is an important source of animal protein for human beings, the occurrence and potential impacts of microplastics in fishes deserve special attention. Although there have been an increasing number of studies concerning microplastics ingestion and effects in fish, review papers specifically focusing on this issue are few. This review summarized the current knowledge about the bioavailability and toxicity of microplastics to fish species. By collating literatures, it can be concluded that microplastics contamination could occur in almost all types of aquatic habitats around the globe. Both field and laboratory studies suggest that fishes are very susceptible to microplastics ingestion. Compared with marine species, freshwater fishes have been less studied. Microplastics alone or in combination with other contaminants could cause various health problems to fish after exposure. There still exist some debates over the environmental relevance of the laboratory-based effect studies and the relative contribution of microplastics in increasing the exposure of fish to hazardous chemicals. Hopefully, this review could extend the current knowledge on the ecotoxicological impacts of microplastics contamination to fish and provide guidance for future research.

Wang, W., et al. (2020). "Environmental fate and impacts of microplastics in soil ecosystems: Progress and perspective." Science of the Total Environment **708**: 134841.

The wide and intensive application of plastics and their derived products has resulted in global environmental contamination of plastic waste. Large-sized plastic litter can be fragmented into microplastics (<5 mm), which have attracted increasing concerns from the general public and scientific communities worldwide. Until recently, the majority of microplastics research reported in literatures has been focusing on the aquatic settings, especially the marine environment, while information about microplastics contamination in terrestrial soil systems is highly insufficient. In this paper, we reviewed the latest data regarding the occurrence of microplastics in terrestrial soils and discussed their potential pathways into the soil environment. We also summarized the currently used methodologies for extraction and characterization of microplastics in soil matrices and evaluated their advantages and limitations. Additionally, we assessed the ecotoxicological consequences of microplastics contamination on soil ecosystems, including the effects on soil physiochemical properties, terrestrial plants, soil fauna, and soil microbes. Finally, based on the most current progress summarized in this review, we suggested several directions for future research on microplastics in soil ecosystems.

Wang, W., et al. (2017). "Microplastics pollution in inland freshwaters of China: A case study in urban surface waters of Wuhan, China." Science of the Total Environment **575**: 1369-1374.

Microplastics have been considered as an emerging pollutant in the aquatic environment. However, research about microplastic pollution in inland freshwaters of China is insufficient. The present study investigated the levels of microplastics in surface water of 20 urban lakes and urban reaches of the Hanjiang River and Yangtze River of Wuhan, the largest city in central China. Microplastic concentrations ranged from 1660.0+/-639.1 to 8925+/-1591n/m³ for the studied waters, with the highest concentration found in Bei Lake. Microplastic abundance in lakes varied markedly in space, and negatively correlated with the distance from the city center (p<0.001), which confirmed the important role of anthropogenic factors in microplastic distribution. Urban reaches of the Hanjiang River and Yangtze River were found to have relatively lower levels of microplastics than most of the studied lakes. The major type of microplastics among the studied waters was colored plastic, with fiber being the most frequent shape. More than 80% of microplastics in number had a size of <2mm. Polyethylene terephthalate and polypropylene were the dominant polymer-types of microplastics analyzed. This study provided important reference for better understanding microplastic levels in inland freshwaters.

Wang, W. and J. Wang (2018). "Different partition of polycyclic aromatic hydrocarbon on environmental particulates in freshwater: Microplastics in comparison to natural sediment." Ecotoxicology & Environmental Safety **147**: 648-655.

Microplastics pollution in the aquatic ecosystems has aroused increasing concerns in recent years. Though microplastics are known to sorb organic contaminants from water, the interaction mechanisms between microplastics and organic chemicals are not yet well understood. Here we investigated the partition characteristics of phenanthrene (Phe) in three mass-produced plastic particles, including polyethylene (PE), polystyrene (PS) and polyvinylchloride (PVC), and one natural sediment, as a comparison. The sorption kinetics of Phe onto microplastics and natural sediment were successfully described by the pseudo-second-order model (R² > 0.992), while the equilibrium data were best-fitted to the Langmuir isotherm (R² > 0.995). Compared with natural sediment, microplastics exhibited higher capacities for Phe which followed an order of PE > PS > PVC. As the aqueous concentration of pyrene (Pyr) increased, both uptakes and distribution coefficients (K_d) of Phe within the solids decreased, with natural sediment giving the largest decline. Although proportions of Phe desorbed from the contaminated microplastics were low, due to the high Phe uptake, microplastics released larger amounts of the sorbed Phe to water than the natural sediment during the desorption process. Given their minimal abundance relative to natural sediment, microplastics may play a less important role in the transport of organic pollutants in a natural aquatic environment.

Wang, W., et al. (2013). "Co-extrusion encapsulation of canola oil with alginate: effect of quercetin addition to oil core and pectin addition to alginate shell on oil stability." Food Research International **54**(1): 837-851.

This study investigates the feasibility of encapsulating antioxidant-fortified canola oil via co-extrusion using 0.67% alginate (0.67%A), 1% alginate (1%A) or high methoxyl (HM) pectin-enhanced alginate (A-P) as the encapsulant. Results show that encapsulation conditions especially the core-shell flow rates and shell wall formulation, influenced oil bead characteristics, core oil stability and retained phenolic content. Optical and scanning electron

microscopy revealed that the 3 types of co-extruded oil beads were spherically shaped with the A-P beads having the largest bead size. All beads were physically and chemically robust, and remained intact after being treated in acidified water at pH 3 for 2 h. Storage trials at 20 and 38 degrees C for 30 or 60 days revealed the interplay between shell formulations and storage conditions on oil primary and secondary oxidation, hydrolytic rancidity and total phenolic content of the encapsulated canola oils. Quercetin added to the oil core was more effective than vitamin E or BHT in suppressing oil oxidation at 38 degrees C. High performance liquid chromatography analyses indicated different decomposition pathways for quercetin in these beads during storage. FT-IR studies confirmed the chemical composition and chemical stability of the 3 types of quercetin-containing oil beads. 1%A and A-P shells are both acceptable and comparable for preserving quercetin-containing canola oil, with A-P and 1%A being slightly better for 30 and 60 day storage periods, respectively. Thus, it is feasible and beneficial to deliver unsaturated oil and phenolic antioxidants in the form of pectin fibre-enhanced alginate microbeads.

Wang, W., et al. (2018). "Microplastics in surface waters of Dongting Lake and Hong Lake, China." Science of the Total Environment **633**: 539-545.

Microplastics pollution is an environmental issue of increasing concern. Much work has been done on the microplastics pollution in the marine environments. Although freshwaters are potential sources and transport pathways of plastic debris to the oceans, there is a lack of knowledge regarding the presence of microplastics in freshwater systems, especially in China, the world's largest producer of plastics. This study investigated the occurrence and properties of microplastics in surface waters of two important lakes in the middle reaches of the Yangtze River. The concentration ranges of microplastics in Dongting Lake and Hong Lake were 900-2800 and 1250-4650n/m³, respectively. Fiber was the dominant shape. Colored items occupied the majority. Particles with a size of <330mum comprised >20% of total microplastics collected in both lakes. Most of the selected particles were identified as plastics, with polyethylene (PE) and polypropylene (PP) being the major components. This study can provide valuable reference for better understanding the microplastics pollution in inland freshwater ecosystems.

Wang, W.-l., et al. (2019). "Microplastics characteristic in Yundang Wastewater Treatment Plant of Xiamen." Haiyang Huanjing Kexue = Marine Environmental Science(2): 205.

Wastewater treatment plants in coastal cities is a main source for microplastics in the ocean. Characteristic of microplastics can improve our understandings of the impacts of human activities on the marine environment. However,there is a lack of such information in China. In this study,microplastic pollution in Xiamen Yundang Wastewater Treatment Plant was studied. We designed an improved sampling device and an experimental method to study the characteristics of microplastics in the influent,effluent and sludge. The results show that the microplastic abundance in the influent,primary and secondary treatment discharge is 1. 703,1. 090 and 0. 324 pieces/L,respectively. The microplastic removal rates in the primary and secondary treatment discharge are 35. 99% and 80. 97% respectively. The concentrations of microplastics in primary and secondary sludge are 2. 14 × 103 and 6. 62 × 103 pieces/kg,respectively. The shape of microplastics are dominated by 43. 89% of fiber and 32. 85% of pellet in the wastewater and 68. 9% of fragment and 34. 78% of pellet in the sludge. The primary colors are white(34. 95%),followed by transparent(22. 74%) in the wastewater. While it is dominated by yellow(39. 13%),black(17. 39%),and white(13. 04%)in the sludge. The chemical composition is primarily composed of 21. 17% of PP and 18. 39% PS in the wastewater

and 34. 78% of PP and 26. 09% of PE in the sludge. It is estimated that ～ 9. 72 × 104 pieces of microplastics are discharged into the Xiamen West Sea each day. Our findings show that waste water treatment plants play an important role in reducing urban microplastic pollutants entering the ocean,but it requires higher microplastic removal efficiency.

Wang, X., et al. (2011). "Increased MAPK and NF-kappaB expression of Langerhans cells is dependent on TLR2 and TLR4, and increased IRF-3 expression is partially dependent on TLR4 following UV exposure." Molecular Medicine Reports **4**(3): 541-546.

Toll-like receptors (TLRs) and epidermal Langerhans cells (LCs) play a crucial role in innate and adaptive immunity. To date, the pattern of TLR expression has not been fully analyzed. The effects of ultraviolet (UV) light on TLR expression and the downstream signaling cascades of human LC have not been examined. In this study, we purified human epidermal LCs using a density gradient centrifugation method and an immunomagnetic microbead method. We found that cultured purified LCs from human skin express mRNAs encoding TLR2, TLR4, TLR5 and TLR7-9. The expression of TLR2 and TLR4 protein was confirmed by Western blot analysis. The results showed for the first time that UV exposure up-regulated the mRNA and protein expression of TLR2 and TLR4 in human LCs. We also found that UV exposure-induced up-regulated MAPK and NF-kappaB/p65 expression was dependent on TLR2 and TLR4, and up-regulated IRF-3 expression was partially dependent on TLR4. In conclusion, UV light up-regulates the expression of TLR2, TLR4 and downstream signaling molecules MAPK, NF-kappaB/p65 and IRF-3 in human LCs. This suggests that UV light has a significant effect on skin immune responses.

Wang, X., et al. (2019). "Sensitive and multiplexed detection of antibiotics using a suspension array platform based on silica-agarose hybrid microbeads." Journal of Hazardous Materials **373**: 115-121.

A multiplex suspension array detection platform of antibiotics has been developed based on silica-agarose hybrid microbeads (SAHMs). Chloramphenicol (CAP), sulfamethoxazole (SMX), metronidazole (MTZ) and amoxicillin (AMX) were employed as model analytes. The antigens (the antibiotics conjugated with BSA) were immobilized on the surface of four different types of SAHMs. Based on an indirect competition immunoassay, the selected antibiotics are detected through the competition of the specific monoclonal antibodies between the multiple antibiotics and the antigens. Due to high resistance to nonspecific protein absorption of SAHMs, the proposed method exhibited wide linear ranges (0.4~72.9 ng/mL for CAP, 2.0~108.5 ng/mL for SMX, 2.6~142.2 ng/mL for MTZ, 1.0~63.3 ng/mL for AMX) and low detection limits of 0.09~0.8 ng/mL. Recoveries for spiked tap water samples were from 82% to 113%, with relative standard deviation lower than 14%, demonstrating the accuracy of the measurements performed with the developed method. This work offered a high-throughput, flexible and accurate tool, which provides a good platform for simultaneous detection of antibiotics.

Wang, X., et al. (2019). "Microplastics impair digestive performance but show little effects on antioxidant activity in mussels under low pH conditions." Environmental Pollution: 113691.

In the marine environment, microplastic contamination and acidification may occur simultaneously, this study evaluated the effects of ocean acidification and microplastics on oxidative stress responses and digestive enzymes in mussels. The thick shell mussels Mytilus coruscus were exposed to four concentrations of polystyrene microspheres (diameter 2 mum, 0, 10, 10⁴ and 10⁶ particles/L) under two pH levels (7.7 and 8.1) for 14 days followed by a 7-day recovery acclimation. Throughout the experiment, we found that microplastics and ocean acidification exerted little oxidative stress to the digestive gland. Only catalase (CAT) and glutathione (GSH) showed a significant increase along with increased microplastics during the experiment, but recovered to the control levels once these stressors were removed. No significant effects of pH and microplastics on glutathione peroxidase (GPx) and superoxide dismutase (SOD) were observed. The responses of digestive enzymes to both stressors were more pronounced than antioxidant enzymes. During the experiment, pepsin (PES), trypsin (TRS), alpha-amylase (AMS) and lipase (LPS) were significantly inhibited under microplastics exposure and this inhibition was aggravated by acidification conditions. Only PES and AMS tended to recover during the recovery period. Lysozyme (LZM) increased significantly under microplastic exposure conditions, but acidification did not exacerbate this effect. Therefore, combined stress of microplastics and ocean acidification slightly impacts oxidative responses but significantly inhibits digestive enzymes in mussels.

Wang, X., et al. (2012). "Diagnostic performance of multiplex cytokine and chemokine assay for tuberculosis." Tuberculosis **92**(6): 513-520.

Simultaneous detection of multiple biomarkers might lead to improved diagnostic performance for Mycobacterium tuberculosis infection. In this study, we screened soluble biomarkers that had significant differences in patients with active tuberculosis and healthy controls and evaluated the diagnostic performance of the multiplex cytokine/chemokine assay. Overall, 178 patients with active pulmonary tuberculosis, 156 healthy individuals and 35 patients with bacterial pneumonia or lung cancer were evaluated. Among the 16 soluble biomarkers screened by the microbead-based multiplex assay, five cytokines/chemokines including IFN-gamma, IP-10, MIG, TNF-alpha and IL-2 that showed most significant differences between active pulmonary tuberculosis patients and healthy controls were selected for further analysis. When analyzed individually, both IP-10 and MIG had sensitivity and specificity comparable to IFN-gamma in detection of active TB. Combined detection of IFN-gamma, IP-10 and MIG had significantly improved sensitivity and specificity as compared with individual cytokine and chemokine detection. The responsive levels of IFN-gamma, IP-10, MIG, TNF-alpha and IL-2 were significantly lower in re-treatment pulmonary tuberculosis patients than in new tuberculosis patients. It is concluded that combined IFN-gamma, IP-10, MIG multiplex detection had better diagnostic performance for tuberculosis than the individual cytokine/chemokine assays. The re-treatment pulmonary tuberculosis patients had poor responses to ESAT-6/CFP-10 peptides stimulation.

Wang, X., et al. (2019). "Microbial Poly-3-Hydroxybutyrate (PHB) as a Feed Additive for Fishes and Piglets." Biotechnology Journal **14**(12): e1900132.

The large-scale use of petrochemical-based plastics is damaging our environment. Discarded plastics are harmful to both marine and land animals, sometimes causing death when ingested. Biodegradable plastics have gained attentions from the public and the academia to reduce environmental burdens. Poly-3-hydroxybutyrate (PHB), the simplest and the best-studied bioplastic member of the polyhydroxyalkanoate (PHA) family synthesized by many bacteria, has been studied as a feed additive for large yellow croaker fish and weaned piglets. The fish grow faster and gain more weight when 1% and 2% PHB is added as a feed additive, accompanied by increased survival rates. Weaned piglets are found to grow normally and showed no significant change in average daily weight gains, average daily feed intakes, feed efficiency, and organ developments when 0.5% PHB is added to the feed. It can therefore be concluded that biodegradable and biocompatible PHB is not harmful as a feed additive for marine large yellow croakers and sensitive weaned piglets. PHB therefore holds great promise as a plastic that combines biodegradability and biocompatibility with good tolerability as a feed supplement for animals.

Wang, X., et al. (2019). "Synergistic effect of biomass and polyurethane waste co-pyrolysis on soot formation at high temperatures." Journal of Environmental Management **239**: 306-315.

Soot is an important toxic pollutant generated during high-temperature incineration of solid waste (i.e., biomass and plastic waste) under air-lean conditions, and has a great impact on flame radiation. The main objective of this work is to study the synergistic effect of biomass and polyurethane co-pyrolysis on soot formation at high temperatures (1100-1250degreeC). The effects of temperature, biomass species, and co-pyrolysis ratio on the yield, morphology, composition and reactivity of soot particles are studied.

Wang, X., et al. (2015). "Intravitreal delivery of human NgR-Fc decoy protein regenerates axons after optic nerve crush and protects ganglion cells in glaucoma models." Investigative Ophthalmology & Visual Science **56**(2): 1357-1366.

PURPOSE: Glaucoma is a major cause of vision loss due to retinal ganglion cell (RGC) degeneration. Therapeutic intervention controls increased IOP, but neuroprotection is unavailable. NogoReceptor1 (NgR1) limits adult central nervous system (CNS) axonal sprouting and regeneration. We examined NgR1 blocking decoy as a potential therapy by defining the pharmacokinetics of intravitreal NgR(310)-Fc, its promotion of RGC axonal regeneration following nerve crush, and its neuroprotective effect in a microbead glaucoma model.

METHODS: Human NgR1(310)-Fc was administered intravitreally, and levels were monitored in rat vitreal humor and retina. Axonal regeneration after optic nerve crush was assessed by cholera toxin beta anterograde labeling. In a microbead model of glaucoma with increased IOP, the number of surviving and actively transporting RGCs was determined after 4 weeks by retrograde tracing with Fluro-Gold (FG) from the superior colliculus.

RESULTS: After intravitreal bolus administration, the terminal half-life of NgR1(310)-Fc between 1 and 7 days was approximately 24 hours. Injection of 5 mug protein once per week after optic nerve crush injury significantly increased RGCs with regenerating axons. Microbeads delivered to the anterior chamber increased pressure, and caused 15% reduction in FG-labeled RGCs of control rats, with a 40% reduction in large diameter RGCs. Intravitreal treatment with NgR1(310)-Fc did not reduce IOP, but maintained large diameter RGC density at control levels.

CONCLUSIONS: Human NgR1(310)-Fc has favorable pharmacokinetics in the vitreal space and rescues large diameter RGC counts from increased IOP. Thus, the NgR1 blocking decoy protein may have efficacy as a disease-modifying therapy for glaucoma.

Wang, X., et al. (2020). "Polystyrene microplastics impaired the feeding and swimming behavior of mysid shrimp Neomysis japonica." Marine Pollution Bulletin **150**: 110660.

Growing evidences revealed the deleterious impacts of microplastics (MPs) on marine organisms. However, the effects of MPs on the movement behavior of marine crustacean is poorly understood. Therefore, this study aims to evaluate the physiological and behavioral responses of mysid shrimp (Neomysis japonica) larvae to polystyrene (PS) and carboxylated polystyrene (PS-COOH). PS-COOH presented a greater physiological toxicity to shrimp larvae compared to PS, causing significant lethal and growth inhibition effect, owing to bioaccumulation of MPs inside stomach. Both two MPs decreased the feeding efficiency of larvae, showing weakened predation competence. Moreover, reduced hunting and/or explorative ability of shrimps caused by MPs was also identified, which was evidenced by an overall decrease in swimming activity, range and frequency after exposure. Our study firstly highlighted that micron-sized polystyrene particles had the negative effects on the movement behavior of mysid shrimp larvae, thus posing potential hazard to population dynamics and

ecological function of marine crustacean.

Wang, X., et al. (2014). "Insulin regulates proangiogenic signaling by downregulating Cited2 in endothelial cells." Diabetes **1)**: A447.

Impaired neovascularization of ischemic tissue in the myocardium and lower limb affects both recovery and survival from complications of diabetes. FoxO transcription factors, which are inhibited by insulin, are known to be potently antiangiogenic. Our aim was to identify genes involved in angiogenesis and regulated by insulin through FoxO in endothelial cells. FoxO1/3/4 knockout mice develop hemangiomas in liver but not in lung. A previous study identified FoxO targets among genes that were changed by FoxO1/3/4 knockout in liver endothelial cells but unchanged in lung endothelial cells, as assayed by gene arrays. We now measured expression of these FoxO target genes by real-time PCR in endothelial cells after adenoviral-mediated expression of wild-type FoxO1 or a constitutively active FoxO1 mutant combined with insulin treatment (10 nM for 4, 8, or 16 hours). Cited2, Ctgf, and Adm mRNA were upregulated by wildtype or mutant FoxO1 and downregulated by insulin in conditions without FoxO1 overexpression or with expression of wildtype, but not mutant, FoxO1. Spry2, Klf6, Bmper and Ccnd1 were regulated by insulin but not by FoxO1, whereas Fbn1 and Sdpr were regulated by FoxO1 but not by insulin. Nine genes were neither regulated by insulin nor by FoxO1. Cited2, one of the genes most robustly regulated by insulin, encodes CBP/p300-interacting transactivator 2 (CITED2) which inhibits transcription of hypoxia-inducible factor-1alpha and other genes. Insulin downregulated Cited2 mRNA by 70% and this effect was abrogated by pretreatment with LY294002 and MK2206 (inhibitors of phosphoinositide 3-kinase and Akt respectively). siRNA-mediated knockdown of CITED2 increased tube formation on Matrigel and sprouting from Cytodex 3 microbeads. We conclude that insulin may promote angiogenesis through downregulation of CITED2 via Akt-dependent inhibition of FoxO1. Enhancing insulin sensitivity of this pathway or directly inhibiting CITED2 may improve neovascularization in patients with type 2 diabetes.

Wang, X., et al. (2014). "Rapid and sensitive suspension array for multiplex detection of organophosphorus pesticides and carbamate pesticides based on silica-hydrogel hybrid microbeads." Journal of Hazardous Materials **273**: 287-292.

A technique for multiplex detection of organophosphorus pesticides and carbamate pesticides has been developed using a suspension array based on silica-hydrogel hybrid microbeads (SHHMs). The main advantage of SHHMs, which consist of both silica and hydrogel materials, is that they not only could be distinguished by their characteristic reflection peak originating from the stop-band of the photonic crystal but also have low non-specific adsorption of proteins. Using fluorescent immunoassay, the LODs for fenitrothion, chlorpyrifos-methyl, fenthion, carbaryl and metolcarb were measured to be 0.02 ng/mL, 0.012 ng/mL, 0.04 ng/mL, 0.05 ng/mL and 0.1 ng/mL, respectively, all of which are much lower than the maximum residue limits, as reported in the European Union pesticides database. All the determination coefficients for these five pesticides were greater than 0.99, demonstrating excellent correlations. The suspension array was specific and had no significant cross-reactivity with other chemicals. The results for the detection of pesticide residues collected from agricultural samples using this method agree well with those from liquid chromatography-tandem mass spectrometry. Our results showed that this simple method is suitable for simultaneous detection of these five pesticides residues in fruits and vegetables.

Wang, X., et al. (2011). "Magnetic protein microbead-aided indirect fluoroimmunoassay for the determination of canine virus specific antibodies." Biosensors & Bioelectronics **26**(7): 3353-3360.

Rabies, canine distemper, and canine parvovirus are common contagious viral diseases of dogs and many other carnivores, and pose a severe threat to the population dynamics of wild carnivores, as well as endangering carnivore conservation. However, clinical diagnosis of these diseases, especially canine distemper and canine parvovirus, is difficult because of the broad spectrum of symptoms that may be confused with other respiratory and enteric diseases of dogs. The most frequently used and proven techniques for diagnosing viral diseases include the conventional enzyme-linked immunosorbent assay (ELISA), rapid fluorescent focus inhibition test (RFFIT), mouse neutralisation test (MNT), and fluorescent antibody virus neutralization (FAVN) test. However, these methods still have some inherent limitations. In this study, a magnetic protein microbead-aided indirect fluoroimmunoassay was developed to detect canine virus specific antibodies, human rabies immunoglobulin, CDV McAbs, and CPV McAbs. In this assay, an avidin-biotin system was employed to combine magnetic microbeads and virus antigens (rabies virus, canine distemper virus, and canine parvovirus). Quantification of the targeted virus antibodies was analyzed through indirect fluoroimmunoassay using the specific antigen-antibody reaction, as well as their corresponding FITC-labeled detection antibodies (mouse anti-human IgG/FITC conjugate or rabbit anti-dog IgG/FITC conjugate). The results indicated that the fluorescence intensity increased when a higher concentration of the targeted analyte was used, but the control had almost no fluorescence, much like the conventional ELISA. For human rabies immunoglobulin, CDV McAbs, and CPV McAbs, the minimum detectable concentrations were 0.2 IU/mL, 0.3 ng/mL, and 0.5 ng/mL, respectively. All of these results indicate that this assay can be employed to determine the presence of canine virus specific antibodies. In addition, the method devised here can be utilized as a general protocol in other bacterial and viral marker analysis.

Wang, X., et al. (2014). "Innovative fluorescent magnetic albumin microbead-assisted cell labeling and intracellular imaging of glioblastoma cells." Biosensors & Bioelectronics **54**: 55-63.

Superparamagnetic nanoparticle-based polymer microbeads utilized as carriers are attractive materials widely applied in the biomedical field. However, the deficiency of toxicity, biocompatibility, and biodegradability for polymer materials often limits the application of these microbeads. In the present study, magnetic albumin microbeads (MAMbs), i.e., human serum albumin-coated gamma-Fe_2O_3 nanoparticles, are synthesized to label human U251 glioblastoma multiforme cells. The effects of MAMbs on the biological behavior of U251 glioblastoma cells, including their proliferation, cell viability, cytoskeletal structure, cell cycle, and apoptosis rate, are investigated. Moreover, fluorescein isothiocyanate (FITC)-MAMbs are fabricated by reaction with fluorescent dye FITC used for intracellular imaging of U251 glioblastoma cells. MAMbs possess undetectable cytotoxicity and excellent biocompatibility with U251 glioblastoma cells, as demonstrated by the biological behavior and morphology of U251 cells exposed to MAMbs. Furthermore, the constructed fluorescent MAMbs allow effective intracellular imaging, as illustrated by fluorescence microscopic analysis. The fabricated fluorescent MAMbs have promising perspectives in biomedical research, especially in cell-targeted labeling and intracellular fluorescence magnetic dual-mode imaging in cancer-targeted diagnosis and therapy.

Wang, Y., et al. (2016). "Contamination and health risk of phthalate esters in soils from a typical waste plastic recycling area." Environmental Chemistry - Huanjing Huaxue **35**(2): 364-372.

Levels and distributions of phthalate esters(PAEs) were investigated in surface soils from a typical waste plastic recycling area in Hebei,China. The results showed that the concentrations

of total PAEs ranged from 0. 517 to 30. 1 [mu]g[middot]g super(-1) with a mean value of 6. 98 [mu]g[middot]g super(-1). Levels of PAEs in the investigated soils were similar to those soils in some e-waste recycling areas and were one to two orders of magnitude higher than those reported in other urban soils from China. Di(2-ethylhexyl)phthalate(DEHP) was the dominant congener(representing 68. 8% of the total PAEs) in the study soils,followed by diisobutyl phthalate(DIBP) and dibutyl phthalate(DBP). Source assessment indicated that the emission from waste plastic recycling was a major contributor to PAEs in the soils.The carcinogenic and non-carcinogenic risks of six congeners,i. e.,dimethyl phthalate,diethyl phthalate,dibutyl phthalate,benzyl butyl phthalate,di(2-ethylhexyl) phthalate and di-n-octylophthalate,classed as priority pollutants by US EPA and European Union, were estimatedthrough the main pathways: ingestion,inhalation and dermal contact. The non-carcinogenic risks to adults and children from exposure to soil DEHP exceeded the acceptable level. Our results show that crude plastic waste processing is a major contributor to PAEs in the soils,which should be of great concern.

Wang, Y., et al. (2003). "Microbial Degradation of the Endocrine-Disrupting Chemicals Phthalic Acid and Dimethyl Phthalate Ester Under Aerobic Conditions." Bulletin of Environmental Contamination & Toxicology **71**(4): 0810-0818.

The article presents information about microbial degradation of the endocrine-disrupting chemicals phthalic acid and dimethyl phthalate ester under aerobic conditions. Phthalates are widely used as additives in plastic manufacturing and to improve mechanical properties of the plastic resin, particularly flexibility. Microbial degradation is believed to be the principal route for complete destruction of phthalate in the environments. Considerable research has been conducted on the molecular biology and organization of degradative genes in selective bacteria over the last decade. However, few studies have been focused on the pathway description of phthalates degradation, and fewer on the degradation ability and processes of bacteria.

Wang, Y., et al. (2019). "The uptake and elimination of polystyrene microplastics by the brine shrimp, Artemia parthenogenetica, and its impact on its feeding behavior and intestinal histology." Chemosphere **234**: 123-131.

Microplastics are a ubiquitous contaminant of marine ecosystems that have received considerable global attention. The effects of microplastic ingestion on some marine biota have been evaluated, but the uptake, elimination, and histopathological impacts of microplastics remain under-investigated especially for zooplankton larvae. Here, we show that 10 micro m polystyrene microspheres can be ingested and egested by Artemia parthenogenetica larvae, which impact their health. The results indicate that A. parthenogenetica larvae have a varying capacity to consume 10 micro m polystyrene microspheres that is dependent on microplastic exposure concentrations, exposure times, and the availability of food. The lowest level of microplastics that was ingested by A. parthenogenetica was 0.15 particles/individual when exposed to 10 particles/mL and 0.05 particles/individual when exposed to 1 particle/mL over 24 h and 14 d, respectively. A. parthenogenetica larvae were able to egest feces with microplastics within 3 h of ingestion. However, ingested microplastics persisted in individuals for up to 14 days. Furthermore, microalgal feeding was significantly reduced by 27.2% in the presence of 10² particles/mL microplastics over 24 h. Histological analyses indicated that a greater abundance of lipid droplets was present among epithelia after 24 h of exposure at a concentration of 10 particles/mL. Moreover, intestinal epithelia were deformed and disorderedly arranged after 14 d of exposure. Overall, these results indicate that marine microplastic pollution could pose a threat to A. parthenogenetica health, especially that of larvae. Consequently, further research is required to evaluate the potential physiological and

histopathological effects of microplastics for other marine invertebrate species.

Wang, Y., et al. (2016). "Digital PCR using micropatterned superporous absorbent array chips." Analyst **141**(12): 3821-3831.

Digital PCR (dPCR) is an emerging technology for genetic analysis and clinical diagnostics. To facilitate the widespread application of dPCR, here we developed a new micropatterned superporous absorbent array chip (muSAAC) which consists of an array of microwells packed with highly porous agarose microbeads. The packed beads construct a hierarchically porous microgel which confers superior water adsorption capacity to enable spontaneous filling of PDMS microwells for fluid compartmentalization without the need of sophisticated microfluidic equipment and operation expertise. Using large lambda-DNA as the model template, we validated the muSAAC for stochastic partitioning and quantitative digital detection of DNA molecules. Furthermore, as a proof-of-concept, we conducted dPCR detection and single-molecule sequencing of a mutation prevalent in blood cancer, the chromosomal translocation t(14;18), demonstrating the feasibility of the muSAAC for analysis of disease-associated mutations. These experiments were carried out using the standard molecular biology techniques and instruments. Because of its low cost, ease of fabrication, and equipment-free liquid partitioning, the muSAAC is readily adaptable to general lab settings, which could significantly facilitate the widespread application of dPCR technology in basic research and clinical practice.

Wang, Y., et al. (2015). "A microfluidic digital single-cell assay for the evaluation of anticancer drugs." Analytical and bioanalytical chemistry **407**(4): 1139-1148.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis Digital single-cell assays hold high potentials for the analysis of cell apoptosis and the evaluation of chemotherapeutic reagents for cancer therapy. In this paper, a microfluidic hydrodynamic trapping system was developed for digital single-cell assays with the capability of monitoring cellular dynamics over time. The microfluidic chip was designed with arrays of bypass structures for trapping individual cells without the need for surface modification, external electric force, or robotic equipment. After optimization of the bypass structure by both numerical simulations and experiments, a single-cell trapping efficiency of 90 % was achieved. We demonstrated the method as a digital single-cell assay for the evaluation of five clinically established chemotherapeutic reagents. As a result, the half maximal inhibitory concentration (IC^sub 50^) values of these compounds could be conveniently determined. We further modeled the gradual decrease of active drugs over time which was often observed in vivo after an injection to investigate cell apoptosis against chemotherapeutic reagents. The developed method provided a valuable means for cell apoptotic analysis and evaluation of anticancer drugs. [Figure not available: see fulltext.]

Wang, Y., et al. (2016). "Contamination and risk of phthalate esters in sediments from a plastic waste recycling area." Research of Environmental Sciences **29**(4): 558-565.

The contamination features and ecotoxicological risks of phthalate esters (PAEs) in sediments from a plastic waste recycling area in Hebei Province were investigated to improve our understanding of the extent of PAEs pollution caused by plastic waste recycling operations. Samples were detected using gas chromatograph-mass spectrometer (GC-MS). The total concentrations of 16 PAEs ranged from 0.527 to 102 micro g/g. With a mean concentration of 18.9 micro g/g, di(2-ethylhexyl) phthalate (DEHP) was the most dominant congener, accounting

for 66.6% of the total PAEs in the sediments. Source assessment indicated that the PAEs in the sediments were mainly derived from the inputs from poorly controlled plastic waste recycling operations. The results showed that the concentrations of DEHP and di-n-butyl phthalate (DBP) exceeded the Environmental Risk Limits (ERLs), and the concentrations of diisobutyl phthalate (DIBP) exceeded the environmental quality standards for sediment of Washington State (0.610 micro g/g). The risk levels from exposure to DBP and DEHP in the sediment were unacceptable for fish and algae, respectively, and therefore they should be paid attention to.

Wang, Y., et al. (2019). "Effects of ingested polystyrene microplastics on brine shrimp, Artemia parthenogenetica." Environmental Pollution **244**: 715-722.

Microplastics are a contaminant of emerging concern which enter the marine environment from a variety of sources. The ingestion and toxic effects of microplastics on marine life, especially for filter feeders, are a cause of concern in view of their ubiquitous nature and their similar size as food sources. To assess the toxic effects of microspheres ingested by brine shrimp larvae, we exposed Artemia parthenogenetica to 10 micro m polystyrene microspheres at different concentrations. These concentrations were approximate to the extrapolated marine aquatic environmentally relevant concentrations. The lowest polystyrene concentrations at which ingestion was visualized in A. parthenogenetica were 12+or-0.57 particles/mL (6.7+or-0.32 micro g/L) and 1.1+or-0.16 particles/mL (0.61+or-0.088 micro g/L), respectively. There were no significant impacts on the survival, growth or development in A. parthenogenetica occurring over the 14-d exposure across a range of polystyrene nominal concentrations (1-1000 particles/mL or 0.55-550 micro g/L). However, abnormal ultrastructures of intestinal epithelial cells were observed upon exposure to polystyrene microspheres, including fewer and disordered microvilli, an increased number of mitochondrion and the appearance of autophagosome. These phenomena could affect nutrition absorption and energy metabolism. Although no major acute or chronic toxicity effects on A. parthenogenetica were observed over 24-h or 14-d exposures, this study provides evidence that the ingestion of polystyrene microplastics at extrapolated environmentally relevant concentrations can be visualized through a microscope to be causing a series of responses in intestinal epithelial cells.

Wang, Y. Q., et al. (2017). "[Prostaglandin E2 Receptor 4 Agonist Promotes Human CD34⁺ Cell Proliferation in vitro by Activating Wnt/beta-Catenin Signaling Pathway]." Zhongguo Shi Yan Xue Ye Xue Za Zhi **25**(3): 656-660.

OBJECTIVE: To investigate the potential signaling pathway that regulates the proliferation of human CD34⁺ cells stimulated by prostaglandin E2 receptor 4 agonist (EP4A) in vitro.

METHODS: Twenty samples of peripheral blood containing stem cells were collected from the G-CSF mobilized healthy donors in our department of hematology. Human CD34⁺ cells were isolated by magnetic activated cell sorting (MACS) microbeads kit. The Cell Counting Kit-8 (CCK8) assay was used to determine the optimal concentration and time of EP4A to promote human CD34⁺ cell proliferation in vitro. Under the optimal condition, quantitative real-time polymerase chain reaction (qRT-PCR) was used to detect mRNA level of beta-catenin, and Western blot was used to assay protein expression of beta-catenin and P-GSK-3beta in human CD34⁺ cells treated with EP4A.

RESULTS: Culturing with 10 micro mol/L EP4A for 72 h, it was found that EP4A promoted human CD34⁺ cell proliferation significantly, and the proliferation rate of human CD34⁺ cells was 1.36 times higher than that of the control(P=0.002). Under the optimal condition, it was also found that EP4A enhanced the beta-catenin expression at both

mRNA and protein levels, and up-regulated phosphorylation of GSK-3beta in human CD34⁺ cells, but these effects could be inhibited by the EP4A antagonist EP4AA.
CONCLUSION: EP4A can enhance human CD34⁺ cell proliferation in vitro by activating Wnt/beta-catenin signaling pathway.

Wang, Z., et al. (2018). "Sorption behaviors of phenanthrene on the microplastics identified in a mariculture farm in Xiangshan Bay, southeastern China." Science of the Total Environment **628-629**: 1617-1626.

Recently, with the accumulation of evidence that microplastic can be ingested by a variety of marine organisms, microplastic sorption behaviors towards organic contaminants (OCs) have become the subject of more studies due to the concerns about the contaminant vector effect. In this study, the priority microplastics identified in a mariculture farm in Xiangshan Bay, China, including polyethylene (PE) and nylon fibers (i.e., derived from new fishing ropes and nets), were examined for their sorption behaviors. The results indicate that both plastic fibers show linear isotherms towards phenanthrene, a common target hydrophobic organic contaminant (HOC), revealing the characteristics of a partitioning mechanism. The sorption capacity of PE fiber was found to be 1-2 orders of magnitude higher (evaluated by Freundlich parameter log K_F) than that of nylon fiber, suggesting the importance of plastic surface functional groups (i.e., with or without hydrophilic groups). By comparing carbon normalized log K_F with literature data, the organic affinity of PE fiber was found to be 1-2 orders of magnitude lower than that of vectors, such as carbonaceous geosorbents (CG), but was 1-2 orders of magnitude higher than that of marine sediments. Small size and rough surface tended to enhance the sorption of plastic fibers of phenanthrene. In addition, phenol (log K_{OW}: 1.46), a low-hydrophobicity compound, showed approximately 3 orders of magnitude lower sorption amounts onto both fibers compared to phenanthrene (log K_{OW}: 4.46), indicating the selectivity of hydrophobicity. The results of this study demonstrate that the high abundance of plastic fibers distributed in mariculture farms could lead to a higher contaminant transfer effect than marine sediments, and their effects on cultured seafood (e.g., crab and fish) need further investigation.

Wang, Z., et al. (2020). "Occurrence and removal of microplastics in an advanced drinking water treatment plant (ADWTP)." Science of the Total Environment **700**: 134520.

Microplastics (MPs) have attracted worldwide attention as the emerging persistent pollutants. Since they have been detected in raw water and the treated water of drinking water treatment plants (DWTPs), there was an urgent need to explore the properties and fates of microplastics in DWTPs. The characteristics of the effluent MPs from each treatment unit in an advanced drinking water treatment plant (ADWTP) were studied, and the relationship between the variations of MPs and the removal performances of treatment processes was also explored. Overall, both the coagulation combined with sedimentation and the granular activated carbon (GAC) filtration performed well in removing microplastics. The former had a removal efficiency of about 40.5-54.5%, mainly for fibres' removal, and the presence of GAC filtration reduced the microplastic abundance by about 56.8-60.9%, mainly for small-sized MPs. It was worthy of attention that a larger amount of polyacrylamide (PAM) was detected in the effluent of the sedimentation compared to raw water, which was caused by the usage of coagulant containing PAM. Specially, the number of 1-5mum MPs in the effluent of ozonation tank was increased by 2.8-16.0%, resulting in a negative removal efficiency in ozonation. The removals of microplastics were depended primarily on their physical properties (size and shape).

Wang, Z., et al. (2019). "Microplastic contamination in freshwater: first observation in Lake Ulansuhai, Yellow River Basin, China." Environmental Chemistry Letters **17**(4): 1821-1830.

Microplastic pollution has been widely studied in the marine environment, but is much less explored in terrestrial waters, notably in China. Therefore, we studied the degree of microplastic pollution in surface waters of Lake Ulansuhai, a major freshwater lake in the Yellow River basin of northern China. Results show microplastic concentrations ranging from 1760 ± 710 to 10,120 ± 4090 n/m3. The microplastic spatial distribution is heterogeneous, with higher levels near the drainage canal entrance of Lake Ulansuhai, and a downward trend from north to south in the lake. The main type of microplastics is colored particles, including fibers as the most abundant. More than 80% of microplastics were smaller than 2 mm. FTIR analysis results show that the main plastics were polyethylene, polystyrene and polybutylene terephthalate. There were also some metallic elements adsorbed on the surface of microplastics, such as Fe, Ca and Zn, detected by energy-dispersive spectrometry. The presence of metallic elements may worsen water pollution.

Wang, Z., et al. (2018). "Poor extraction efficiencies of polystyrene nano- and microplastics from biosolids and soil." PLoS ONE [Electronic Resource] **13**(11): e0208009.

Extraction and quantification of nano- and microplastics from sediments and soils is challenging. Although no standard method has been established so far, flotation is commonly used to separate plastic from mineral material. The objective of this study was to test the efficiency of flotation for the extraction of nano- and microplastics from biosolids and soil. We spiked biosolids and soil samples with polystyrene nano- and microbeads (0.05, 1.0, 2.6, 4.8, and 100 mum diameter). Different extraction methods (w/ and w/o H2O2 digestion) were tested, and plastic beads were separated from mineral particles by flotation in a ZnCl2 solution. Plastic particles were quantified by UV-Vis spectrometry and gravimetrically. While large beads (100 mum) could be quantitatively extracted (~100%) from both biosolids and soils, smaller beads had low extraction efficiencies (ranging from 5 to 80%, with an average of 20%). Except for the 100 mum beads, oxidation with H2O2 negatively impacted the extraction efficiencies. For the soil, extraction with water only, followed by flotation in a ZnCl2 solution, resulted in relatively high extraction efficiencies (>75%) for beads larger than 1 mum, but low efficiencies (<30%) for the 0.05 and 1.0 mum beads. Our results indicate that while flotation generally works to separate plastic nano- and microbeads in a solution, the challenge is to quantitatively extract nano- and microbeads from a biosolids or soil matrix. Samples high in organic matter content require removal of the organic matter, but the common method of H2O2 oxidation leads to poor extraction efficiencies for nano- and microbeads.

Wang, Z., et al. (2017). "SEM/EDS and optical microscopy analyses of microplastics in ocean trawl and fish guts." Science of the Total Environment **603**(604): 616-626.

Microplastic particles from Atlantic and Pacific Ocean trawls, lab-fed fish guts and ocean fish guts have been characterized using optical microscopy and SEM/EDS in terms of size, morphology, and chemistry. We assessed whether these measurements could serve as a rapid screening process for subsequent identification of the likely microplastic candidates by micro-spectroscopy. Optical microscopy enabled morphological classification of the types of particles or fibers present in the sample, as well as the quantification of particle size ranges and fiber lengths. SEM/EDS analysis was used to rule out non-plastic particles and screen the prepared samples for potential microplastic, based on their element signatures and surface characteristics. Chlorinated plastics such as polyvinyl chloride (PVC) could be easily identified with SEM/EDS due to their unique elemental signatures including chlorine, as could mineral species that are falsely identified as plastics by optical microscopy. Particle morphology determined by optical microscopy and SEM suggests the fish ingested particles contained both degradation fragments from larger plastic pieces and also manufactured microplastics. SEM images of microplastic particle surfaces revealed characteristic cracks consistent with environmental exposure, as well as pigment particles consistent with manufactured materials. Most of the microplastic surfaces in the fish guts and ocean trawls were covered with biofilms, radiolarians, and crustaceans. Many of the fish stomachs contained micro-shell pieces which visually resembled microplastics.

Wanger, T. C. and B. R. Scheffers (2011). "Plastic: matching material with usage." Frontiers in Ecology & the Environment **9**(3): 151-152.
The article discusses the study which describes the widespread plastic consumption that contributes to the global plastic pollution crisis. Researchers stress the need to substantially reduce plastic consumption to address the pollution crisis. It also emphasizes the need to support the use of biodegradable materials by developed nations for inexpensive non-plastic alternatives which can be adopted by developing countries.

Wang-Renault, S. F., et al. (2018). "Deregulation of microRNA expression in purified T and B lymphocytes from patients with primary Sjogren's syndrome." Annals of the Rheumatic Diseases **77**(1): 133-140.
OBJECTIVE: MicroRNAs (miRNAs) play an important role in the pathogenesis of autoimmune diseases such as primary Sjogren's syndrome (pSS). This study is the first to investigate miRNA expression patterns in purified T and B lymphocytes from patients with pSS using a high-throughput quantitative PCR (qPCR) approach.
METHODS: Two independent cohorts of both patients with pSS and controls, one for discovery and one for replication, were included in this study. CD4+ T cells and CD19+ B cells were isolated from peripheral blood mononuclear cells by magnetic microbeads and expression of miRNAs was profiled using the Exiqon Human miRNome panel I analysing 372 miRNAs. A selection of differentially expressed miRNAs was replicated in the second cohort using specific qPCR assays.
RESULTS: A major difference in miRNA expression patterns was observed between the lymphocyte populations from patients with pSS and controls. In CD4 T lymphocytes, hsa-let-7d-3p, hsa-miR-155-5 p, hsa-miR-222-3 p, hsa-miR-30c-5p, hsa-miR-146a-5p, hsa-miR-378a-3p and hsa-miR-28-5 p were significantly differentially expressed in both the discovery and the replication cohort. In B lymphocytes, hsa-miR-378a-3p, hsa-miR-222-3 p, hsa-miR-26a-5p, hsa-miR-30b-5p and hsa-miR-19b-3p were significantly differentially expressed. Potential target mRNAs were enriched in disease relevant pathways. Expression of B-cell activating factor (BAFF) mRNA was inversely correlated with the expression of hsa-miR-30b-5p in B lymphocytes from patients with pSS and functional experiments showed increased expression of BAFF after inhibiting hsa-miR-30b-5p.
CONCLUSIONS: This study demonstrates major miRNAs deregulation in T and B cells from patients with pSS in two independent cohorts, which might target genes known to be involved in the pathogenesis of pSS.

Wani, T. A., et al. (2016). "Analytical Application of Flow Immunosensor in Detection of Thyroxine and Triiodothyronine in Serum." Assay & Drug Development Technologies **14**(9): 535-542.
In this study, an immunosensor based on kinetic exclusion analysis (KinExA) was used for thyroxine (T4) and triiodothyronine (T3) estimation. A KinExATM 3200 instrument was used for this analysis, which is an automated flow fluorimeter designed to separate free unbound antibody binding sites in reaction mixtures of antibody, antigen, and antibody-antigen complex.

A T3-BSA- and T4-BSA-coated polymethyl methacrylate (PMMA) bead microcolumn is generated inside the flow cell of the instrument. A sample mixture containing T3 and T4 with their respective monoclonal antibodies and their complexes are drawn past the microbead column. The unbound T3 or T4 monoclonal antibody binding sites are captured by their respective T3 and T4 antigens coated on the PMMA beads as bovine serum albumin conjugates. Fluorescently labeled secondary antibodies bind to the T3 or T4 antigen-antibody complex to generate fluorescence intensity for analysis. The limit of detection for the T3 and T4 assays was found to be 0.06 and 1.9 ng mL⁻¹ with acceptable precision values. The convenience of the automated KinExA format may be valuable in medical diagnostic laboratories.

Wani, T. A., et al. (2016). "New analytical application of antibody-based biosensor in estimation of thyroid-stimulating hormone in serum." Bioanalysis **8**(7): 625-632.

Background: Conventionally, ELISA is used to measure thyroid-stimulating hormone (TSH) for diagnosis of thyroid disease. In this study, an immunosensor-based, kinetic-exclusion analysis (KinExA) was used for TSH estimation. Methodology: A PMMA microbead column coated with TSH antigen is formed inside the flow cell. Samples consisting of mouse anti-TSH monoclonal antibody and TSH antigen complex in solution are passed over the beads and the unbound anti-TSH antibody is captured by the TSH-coated beads, followed by passing fluorescent-labeled antibody over the beads to generate signals for analysis. The limit of detection for the assay was 0.4 mIU l⁻¹ and the precision was acceptable. Conclusion(s): The developed sensor was advantageous due to the automated nature and its convenience, without compromising the sensitivity for estimation of TSH. Copyright © 2016 Future Science Ltd.

Ward, J. E., et al. (2019). "Selective Ingestion and Egestion of Plastic Particles by the Blue Mussel (Mytilus edulis) and Eastern Oyster (Crassostrea virginica): Implications for Using Bivalves as Bioindicators of Microplastic Pollution." Environmental Science & Technology **53**(15): 8776.

Microplastics (MP; 1 μm to 1 mm) of various shapes and compositions are ingested by numerous marine animals. Recently, proposals have been made to adopt bivalve molluscs as bioindicators of MP pollution. To serve as indicators of MP pollution, however, the proposed organisms should ingest, without bias, the majority of plastic particles to which they are exposed. To test this premise, eastern oysters, Crassostrea virginica, and blue mussels, Mytilus edulis, were offered variously sized polystyrene microspheres (diameters 19–1000 μm) and nylon microfibers (lengths 75–1075 × diameter 30 μm), and the proportion of each rejected in pseudofeces and egested in feces was determined. For both species, the proportion of microspheres rejected increased from ca. 10–30% for the smallest spheres to 98% for the largest spheres. A higher proportion of the largest microsphere was rejected compared with the longest microfiber, but similar proportions of microfibers were ingested regardless of length. Differential egestion of MP also occurred. As a result of particle selection, the number and types of MP found in the bivalve gut will depend upon the physical characteristics of the particles. Thus, bivalves will be poor bioindicators of MP pollution in the environment, and it is advised that other marine species be explored.

Wardrop, P., et al. (2016). "Chemical Pollutants Sorbed to Ingested Microbeads from Personal Care Products Accumulate in Fish." Environmental Science & Technology **50**(7): 4037-4044.

The prevalence of microplastics (<5 mm) in natural environments has become a widely recognized global problem. Microplastics have been shown to sorb chemical pollutants from their surrounding environment, thus raising concern as to their role in the movement of these pollutants through the food chain. This experiment investigated whether organic pollutants

sorbed to microbeads (MBs) from personal care products were assimilated by fish following particle ingestion. Rainbow fish (Melanotaenia fluviatilis) were exposed to MBs with sorbed polybrominated diphenyl ethers (PBDEs; BDE-28, -47, -100, -99, -153, -154, -183, 200 ng g-1; BDE-209, 2000 ng g-1) and sampled at 0, 21, 42, and 63 days along with two control treatments (food only and food + clean MBs). Exposed fish had significantly higher ∑8PBDE concentrations than both control treatments after just 21 days, and continued exposure resulted in increased accumulation of the pollutants over the experiment (ca. 115 pg g-1 ww d-1). Lower brominated congeners showed the highest assimilation whereas higher brominated congeners did not appear to transfer, indicating they may be too strongly sorbed to the plastic or unable to be assimilated by the fish due to large molecular size or other factors. Seemingly against this trend, however, BDE-99 did not appear to bioaccumulate in the fish, which may be due to partitioning from the MBs or it being metabolized in vivo. This work provides evidence that MBs from personal care products are capable of transferring sorbed pollutants to fish that ingest them. [ABSTRACT FROM AUTHOR]
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Waring, R. H., et al. (2018). "Plastic contamination of the food chain: A threat to human health?" Maturitas **115**: 64-68.
Macro-plastic pollution is found in terrestrial and marine environments and is degraded to micro-particles (MP) and nano-particles (NP) of plastic. These can enter the human food chain either by inhalation or by ingestion, particularly of shellfish and crustaceans. Absorption across the gastrointestinal tract is relatively low, especially for MPs, which appear to have little toxicity. However, NPs are more readily absorbed and may accumulate in the brain, liver and other tissues in aquatic species and other animals. Studies using nanoparticles of other materials suggest that toxicity could potentially affect the central nervous system and the reproductive system, although this would be unlikely unless exposure levels were very high and absorption was increased by physiological factors.

Waris, M. E., et al. (2002). "Two-photon excitation fluorometric measurement of homogeneous microparticle immunoassay for C-reactive protein." Analytical Biochemistry **309**(1): 67-74.
Recent developments in infrared laser technology have enabled the design of a compact instrumentation for two-photon excitation microparticle fluorometry (TPX). The microparticles can be used in immunoassays as the antibody-coated solid phase to capture ah antigen and then detect it with a fluorescently labeled tracer antibody. Unlike most other methods, TPX technology allows low-volume, homogeneous immunoassays with real-time measurements of assay particles in the presence of a moderate excess of fluorescent tracer. In this study, the TPX assay system was used for the reagent characterization and the measurement of C-reactive protein (CRP) in diluted plasma samples, targeting the assay range useful in infectious disease diagnosis. The pentameric structure of the CRP permitted the optimization of an assay with the lowest detectable concentration of 1 mug/L (7.5 pM) by using a single monoclonal antibody both for capture and as the tracer. With a 1:200 predilution of samples, the measurement range of the assay was 1-150mg/L, but an additional 1:10 dilution was required for higher concentrations. The TPX method showed a good correlation with the reference result obtained

in a routine hospital laboratory, demonstrating the feasibility of the technology for immunodiagnostic applications. © 2002 Elsevier Science (USA). All rights reserved.

Warth, B., et al. (2015). "Deoxynivalenol-sulfates: identification and quantification of novel conjugated (masked) mycotoxins in wheat." Analytical and bioanalytical chemistry **407**(4): 1033-1039.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis We report the identification of deoxynivalenol-3-sulfate and deoxynivalenol-15-sulfate as two novel metabolites of the trichothecene mycotoxin deoxynivalenol in wheat. Wheat ears which were either artificially infected with Fusarium graminearum or directly treated with the major Fusarium toxin deoxynivalenol (DON) were sampled 96 h after treatment. Reference standards, which have been chemically synthesized and confirmed by NMR, were used to establish a liquid chromatography-electrospray ionization (LC-ESI)-MS/MS-based "dilute and shoot" method for the detection, unambiguous identification, and quantification of both sulfate conjugates in wheat extracts. Using this approach, detection limits of 0.003 mg/kg for deoxynivalenol-3-sulfate and 0.002 mg/kg for deoxynivalenol-15-sulfate were achieved. Matrix-matched calibration was used for the quantification of DON-sulfates in the investigated samples. In DON-treated samples, DON-3-sulfate was detected in the range of 0.29-1.4 mg/kg fresh weight while DON-15-sulfate concentrations were significantly lower (range 0.015-0.061 mg/kg fresh weight). In Fusarium-infected wheat samples, DON-3-sulfate was the only detected sulfate conjugate (range 0.022-0.059 mg/kg fresh weight). These results clearly demonstrate the potential of wheat to form sulfate conjugates of DON. In order to test whether sulfation is a detoxification reaction in planta, we determined the ability of the sulfated DON derivatives to inhibit in vitro protein synthesis of wheat ribosomes. The results demonstrate that both DON-sulfates can be regarded as detoxification products. DON-15-sulfate was about 44× less inhibitory than the native toxin, and no toxicity was observed for DON-3-sulfate in the tested range. [Figure not available: see fulltext.]

Waschke, J., et al. (2004). "Requirement of Rac activity for maintenance of capillary endothelial barrier properties." American Journal of Physiology **55**(1): 394-H401.

Our previous experiments indicated that GTPases, other than RhoA, are important for the maintenance of endothelial barrier integrity in both intact microvessels of rats and mice and cultured mouse myocardial endothelial (MyEnd) cell monolayers (J Physiol 539: 295-308, 2002). In the present study, we inhibited the endothelial GTPase Rac by Clostridium sordellii lethal toxin (LT) and investigated the relation between the degree of inhibition of Rac by glucosylation and increased endothelial barrier permeability. In rat venular microvessels, LT (200 ng/ml) increased hydraulic conductivity from a control value of 2.5 +/- 0.6 to 100.8 +/- 18.7 x 10-7 cm*s-1*cmH2O-1 after 80 min. In cultured MyEnd cells exposed to LT (200 ng/ml), up to 60% of cellular Rac was glucosylated after 90 min, resulting in depolymerization of F-actin and interruptions of junctional distribution of vascular endothelial cadherin (VE-cadherin) and {beta}-catenin as well as the formation of intercellular gaps. To understand the mechanism by which inhibition of Rac caused disassembly of adherens junctions, we used laser tweezers to quantify VE-cadherin-mediated adhesion. LT and cytochalasin D, an actin depolymerizing agent, both reduced adhesion of VE-cadherin-coated microbeads to the endothelial cell surface, whereas the inhibitor of Rho kinase Y-27632 did not. Stabilization of actin filaments by jasplakinolide completely blocked the effect of cytochalasin D but not of LT on bead adhesion. We conclude that Rac regulates endothelial barrier properties in vivo and in vitro by 1) modulation of actin filament polymerization and 2) acting directly on the tether between VE-cadherin and the cytoskeleton. [PUBLICATION ABSTRACT]

Waschke, J., et al. (2005). "Pemphigus foliaceus IgG causes dissociation of desmoglein 1-containing junctions without blocking desmoglein 1 transinteraction." Journal of Clinical Investigation **115**(11): 3157-3165.

Autoantibodies against the epidermal desmosomal cadherins desmoglein 1 (Dsg1) and Dsg3 have been shown to cause severe to lethal skin blistering clinically defined as pemphigus foliaceus (PF) and pemphigus vulgaris (PV). It is unknown whether antibody-induced dissociation of keratinocytes is caused by direct inhibition of Dsg1 transinteraction or by secondary cellular responses. Here we show in an in vitro system that IgGs purified from PF patient sera caused cellular dissociation of cultured human keratinocytes as well as significant release of Dsg1-coated microbeads attached to Dsg-containing sites on the keratinocyte cellular surface. However, cell dissociation and bead release induced by PF-IgGs was not caused by direct steric hindrance of Dsg1 transinteraction, as demonstrated by single molecule atomic force measurements and by laser trapping of surface-bound Dsg1-coated microbeads. Rather, our experiments strongly indicate that PF-IgG-mediated dissociation events must involve autoantibody-triggered cellular signaling pathways, resulting in destabilization of Dsg1-based adhesive sites and desmosomes.

Waste, S. (2019). "Agilyx, GE to Advance Circular Economy for Plastics." Waste360: N.PAG-N.PAG.

Agilyx Corporation announced a collaboration in artificial intelligence (AI) technology with the General Electric Company (GE) that aims to keep plastic materials from becoming waste. This announcement is the result of a year-long effort to assess GE's advanced modeling technology developed by GE Research and its applicability to the database of chemical conversions of post-use plastics that Agilyx has amassed over the last 15 years. "Together with Agilyx, we can do the same for the plastics industry by integrating Agilyx's deep industry domain knowledge with our AI, machine learning and modeling techniques to bring recycling almost entirely full circle". [Extracted from the article]

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Waste, S. (2019). "Alaska Airlines Urges Flyers to Reduce Inflight Plastic Waste." Waste360: N.PAG-N.PAG.

Alaska Airlines announced its #FillBeforeYouFly initiative to partner with guests and employees to continue reducing the use of single-use plastics inflight. In 2018, Alaska Airlines became the first airline to replace single-use plastic stir straws and citrus picks with sustainable alternatives as part of its #StrawlessSkies initiative, in partnership with Lonely Whale. [Extracted from the article]

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Waste, S. (2019). "All-female Crew Set for Plastic Pollution Sailing Mission." Waste360: N.PAG-N.PAG.
The eXXpedition Round the World voyage, which sets sail from Plymouth, U.K., on October 8 will sail through some of the most important and diverse marine environments on the planet. "The plastic pollution challenge our ocean faces is a global one, and it will take an inspired army of passionate, skilled and experienced people to tackle it", said Mission Director Penn, co-founder of eXXpedition, in a statement. The eXXpedition Round the World science program is being led by Dr. Winnie Courtene-Jones, eXXpedition science lead, University of Plymouth. [Extracted from the article]
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Waste, S. (2019). "Boxed Water Partners with Creamline NYC to Reduce Plastic Waste." Waste360: N.PAG-N.PAG.
Boxed Water Is Better, a company that provides an alternative to plastic bottles by producing pure water in 100 percent recyclable and paper-based cartons, recently announced a new contract with New York-based Creamline. In 2019, the company is asking consumers to Ditch the Plastic, a campaign intended to raise awareness of the plastic pollution problem by asking consumers to give up plastic bottles for 30 days. [Extracted from the article]
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Waste, S. (2019). "Circulate Capital Adds $15M in Funding to Combat Ocean Plastic." Waste360: N.PAG-N.PAG.
Circulate Capital, the investment management firm dedicated to incubating and financing companies and infrastructure that seek to prevent ocean plastic in South and Southeast Asia, announced that it expects to receive an additional $15 million in funding from Chevron Phillips Chemical Company LLC for Circulate Capital's strategy to combat ocean plastic. The company joins Circulate Capital's founding investors, which include several of the world's leading consumer packaged goods and chemical companies. [Extracted from the article]
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Waste, S. (2019). "Collaboration Needed to Mitigate Plastic Waste in Utah." Waste360: N.PAG-N.PAG.
In order for the state of Utah to break away from its reliance on plastic materials, it will take a

collaborative effort among consumers, companies and lawmakers. According to the report, in 2016, 2017 and 2018, Utah Sen. Jani Iwamoto attempted to pass a bill that would require companies to sell single-use plastic bags for a small fee. [Extracted from the article]

Waste, S. (2019). "Congressional Plastics Solutions Task Force Launches." Waste360: N.PAG-N.PAG.
Congresswoman Haley Stevens (MI-11) recently launched the Congressional Plastics Solutions Task Force, a coalition of lawmakers working together with state and local officials and industry representatives to facilitate investment in recycling technologies and promote education on plastics generation and recovery. "I am pleased and excited about the new Congressional Plastics Solutions Task Force that Congresswoman Haley Stevens is putting forth", said Pat Williams, Canton Township, Mich., supervisor, in a statement. Congresswoman Stevens has been paying close attention to this issue, inviting me to testify before her Research & Technology subcommittee earlier this year to speak to the challenges of overseeing a municipal recycling program. [Extracted from the article]

Waste, S. (2019). "Dallas Zoo Aims to Keep Nitrile Gloves from Landfills." Waste360: N.PAG-N.PAG.
For staffers at the Dallas Zoo, nitrile gloves from Kimberly-Clark Professional help ensure quality and safety when they care and feed for more than 2,000 animals. That's why the zoo partnered with the RightCycle Program to recycle the nitrile gloves that it uses for animal care, cleaning and food preparation. [Extracted from the article]

Waste, S. (2019). "DASANI Takes New Steps to Reduce Plastic Waste." Waste360: N.PAG-N.PAG.
Updates to DASANI's packaging lineup are designed to reduce plastic waste and increase the use of recycled and renewable materials in the United States, while ensuring that all DASANI bottles continue to be fully recyclable. While there is no single solution to the problem of plastic waste, the additional package and package-less options we are rolling out today mark an important next step in our effort to provide even more sustainable solutions at scale". [Extracted from the article]

Waste, S. (2019). "E-book Explains How the Plastics Value Chain Can Reduce Plastic Waste." Waste360: N.PAG-N.PAG.

The article informs on the newly published e-book of TOMRA Sorting Recycling, which shares ideas for reducing plastic waste in the plastics value chain. Topics discussed include explanation of adoption of a circular economy for the environment and for new business opportunities, prevention of the threat of plastic waste which poses to the oceans and marine life, and implementing effective measures in the plastics value chain to ensure health of economies, communities and the environment.

Waste, S. (2019). "FM3 Survey: Californians Favor Call to Reduce Plastic Pollution." Waste360: N.PAG-N.PAG.

A statewide survey of California voters finds a strong majority of respondents favor a proposal to reduce single-use plastics and generate funds to build more recycling and composting facilities statewide. Based solely on a brief description, seven in 10 (71 percent) voters favor the proposal to reduce the use of packaging that cannot be recycled and generate funding for maintaining and expanding recycling and composting, as well as beach cleanups (See Figure 1 below). Without funding to build recycling facilities in California, expand existing ones and increase the use of composting for organic materials, composting and recycling with be reduced even more and parts of California may give up on recycling altogether. [Extracted from the article]

Waste, S. (2019). "Global Initiative Aims to End Plastic Pollution." Waste360: N.PAG-N.PAG.

Minderoo Foundation, a global philanthropic organization, announced a $300 million commitment to a new industry-focused initiative to end worldwide plastic waste. Only a broadly adopted, international industry-led approach will keep plastics in the economy and out of the environment". [Extracted from the article]

Waste, S. (2019). "GreenPrint, Plastic Bank Partner to Offer Plastic Neutral Sustainability Solutions." Waste360: N.PAG-N.PAG.

The article informs that GreenPrint, an environmental technology firm that provides turnkey sustainability programs, is partnering with Plastic Bank. It mentions that the GreenPrint will now offer its clients and partners the opportunity to become plastic neutral by offsetting their plastic consumption with Social Plastic Collections Credits (SPCC) through the partnership with Plastic Bank. It presents views of David Katz, chief executive officer of Plastic Bank, on the partnership.

Waste, S. (2019). "Investment Fund Aims to Boost Recycling in Australia." Waste360: N.PAG-N.PAG.
Australia is looking to boost recycling through a new A$100 million ($69 million USD) investment fund. The Australian Recycling Investment Fund, to be managed by the Clean Energy Finance Corp. (CEFC), is part of a A$167 million government plan to tackle plastic waste and halve food waste by 2030, Environment Minister Sussan Ley said in a statement Sunday. [Extracted from the article]

Waste, S. (2019). "New Coalition Advocates for Consumer-focused Solution to California's Recycling Challenges." Waste360: N.PAG-N.PAG.
The article informs that Californians for Recycling and the Environment (CRE) has announced the formal launch of its coalition, whose purpose is to bring together Californians, product manufacturers and lawmakers to find an environmentally responsible, effective and consumer-focused solution to reduce the amount of plastic waste that goes into California's landfills and litters the environment. It presents views of Micah Grant, spokesperson at CRE.

Waste, S. (2019). "New Film Educates Children About Plastic Pollution." Waste360: N.PAG-N.PAG.
Plastic Oceans International, a nonprofit organization working to end global plastic pollution, recently released its new kids film "Earth's Ekko,"a 20-minute educational tool created for educators and parents to engage, inspire and teach children ages 10 and younger to be part of the solution to the global plastic pollution problem. The film features Ekko, an ocean-dwelling animated character whose species is one of Earth's oldest-living organisms. [Extracted from the article]

Waste, S. (2019). "NextGen Selects Ulterion for Advanced Solutions Program." Waste360: N.PAG-N.PAG.
Ulterion coatings from Jain Chem Ltd. of Taylors, S.C., has been selected as a participant in the NextGen Consortium's advanced solutions program to foster sustainable cup solutions for the food and beverage industry. "In our first major product rollout, over 3 million Ulterion-coated paper cups have been sold by a major fast-food chain with zero complaints", said Jain Chem Sales Manager Gil Sherman in a statement. [Extracted from the article]

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Waste, S. (2019). "NOAA Awards $2.7M in Grants for Marine Debris Removal, Research." Waste360: N.PAG-N.PAG.

The National Oceanic and Atmospheric Administration (NOAA) recently announced a total of $2.7 million in grants supporting 14 projects to address the effects of marine debris on wildlife, navigation safety, economic activity and ecosystem health. Congress authorized the NOAA Marine Debris Program in 2006 as the lead federal program for addressing marine debris. [Extracted from the article]

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Waste, S. (2019). "Nonprofit Launches Plastic Pollution Emergency Response Program." Waste360: N.PAG-N.PAG.

The Ocean Legacy Foundation, a Canadian nonprofit organization founded in 2014 with the goal to end ocean plastic waste, announced the launch of E.P.I.C. It's a plastic pollution emergency response program that incorporates a four-pillar, hands-on approach - Education, Policy, Infrastructure and Cleanup - to catalyze worldwide action around plastic pollution-free lands and oceans. The E.P.I.C. program targets ecologically sensitive locations and communities that have a plastic pollution crisis, as well as inadequate management capacity for solid waste and plastic pollution. The Policy pillar supports communities in advocating for best practice plastic management strategies to help reduce plastic waste and pollution in your community. [Extracted from the article]

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Waste, S. (2019). "SC Johnson Reports Latest Plastic Waste Reduction Results." Waste360: N.PAG-N.PAG.

SC Johnson announced it is on track to meet its 2025 commitments to help reduce plastic waste and boost recycling. "We're at a tipping point in the global plastic waste crisis", said Fisk Johnson, chairman and CEO of SC Johnson, in a statement. [Extracted from the article]

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Waste, S. (2019). "South Korea to Tighten Waste Import Inspections from Japan." Waste360: N.PAG-N.PAG.

The South Korean government recently announced that it would enhance environmental and health safety inspections for battery, tire and plastic waste imported from Japan for recycling purposes. South Korea will strengthen its environmental and health safety inspections for battery, tire and plastic waste imported from Japan, the government said Friday. [Extracted from the article]

Waste, S. (2019). "Tiny Plastics Largely Contribute to Asia's Waste Crisis." Waste360: N.PAG-N.PAG.

Tiny plastics (also referred to as sachets), such as coffee creamer packets, laundry detergent pods and candy wrappers, are large contributors to Asia's waste crisis. The palm-sized packets known as sachets have exploded in emerging economies, allowing low-income consumers to buy single servings of almost any product. [Extracted from the article]

Waste, S. (2019). "TOMRA Announces Packaging Recycling Commitment." Waste360: N.PAG-N.PAG.

At the Our Ocean conference in Oslo, Norway, TOMRA, a world leader in reverse vending machines and sensor-based sorting systems for the recycling, food and mining industries, announced its commitment to enable 40 percent of plastic packaging produced globally each year to be collected for recycling by 2030. "TOMRA is the undisputed world leader in the collection and recycling of plastic packaging, particularly bottles, and we are proud to be leading the industry by launching these ambitious targets. [Extracted from the article]

Waste, S. (2019). "Vermont Seeks Further Waste Reduction Options." Waste360: N.PAG-N.PAG.

Vermont lawmakers are looking at ways to further reduce waste from single-use products. At a Tuesday meeting in the Statehouse, lawmakers and other members of the single use products working group debated options, including the expansion of the bottle bill and a requirement that manufacturers make products with post-consumer recycled content. [Extracted from the article]

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Waste, S. (2020). "Proactive Approach Needed to Address Plastic Pollution." Waste360: N.PAG-N.PAG.
As debates around plastic pollution continue to grow, Plastics News points out that an underlying question for 2020 will be how to pay for the recycling infrastructure that industry, environmental groups and governments all say is needed. New York Gov. Andrew Cuomo, for example, proposed on Dec. 17 that his state add a polystyrene foam food packaging ban - New York already has a bag ban. [Extracted from the article]
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Watanabe, S., et al. (2014). "Microbead-based ligase detection reaction assay using a molecular beacon probe for the detection of low-abundance point mutations." Analytical Chemistry **86**(1): 900-906.
A microbead-based ligase detection reaction (LDR) assay using a molecular beacon probe was developed for the facile and rapid detection of point mutations present in low copy numbers in a mixed population of wild-type DNA. Biotin-tagged ligation products generated in the LDR were captured on the surface of streptavidin-modified magnetic beads for purification and concentration. The resulting product-tethered microbeads were combined with a molecular beacon probe solution, and the suspension was directly flowed into a capillary. The microbeads were accumulated in a confined space within the capillary using a bar magnet. The packed bead sample was then scanned by a fluorescence scanning imager to detect the presence of any mutations. With the developed methodology, we were able to successfully detect one cancer mutation in a mixture of 400 wild-type templates (t test at 95% confidence level). Furthermore, the post-LDR processing, typically the most laborious and time-consuming step in LDR-based mutation detection assays, could be carried out much more rapidly (approximately 20 min). This was enabled by the simple bead and fluid manipulations involved in the present assay.

Watari, K., et al. (2014). "N-myc downstream regulated gene 1 (NDRG1) as a novel anti-angiogenic and therapeutic target for VEGF/VEGF receptor signaling by vascular endothelial cells." European Journal of Cancer **6)**: 190.
Background: Angiogenesis is essential for the malignant progression of cancer. Therefore, development of a novel type of angiogenesis inhibitor is essential for further improvement of therapeutics against cancer patients. N-myc downstream regulated gene 1 (NDRG1) has been known to play pleiotropic roles in cell proliferation, development, differentiation, and tumorigenesis. We have previously reported that NDRG1 expression levels in cancer cells are closely correlated with tumor angiogenesis and tumor growth in both experimental models and human tumors (Hosoi et al., Cancer Res., 2009; Murakami et al., J Biol Chem., 2013). However, whether tumor angiogenesis could be affected by NDRG1 in host remains unclear. In our present study, we asked whether NDRG1 could specifically modulate tumor angiogenesis, and impaired tumor angiogenesis could be observed by NDRG1 deficiency. Material(s) and Method(s): NDRG1 deficient mice: The NDRG1 deficient mice on C57BL6 background have been

kindly donated to us by Prof. Toshiyuki Miyata (National Cerebral and Cardiovascular Center) (Okuda et al., Mol Cell Biol., 2004). Isolation of mouse endothelial cells: CD31+ endothelial cells were isolated from mouse lung by magnetic sorting using CD31 MicroBeads. Aorta ring assay: 1mm mouse aortic rings were embedded in 3-dimensional growth factor reduced Matrigel, treated with or without FGF-2 (50 ng/mL) or VEGF (25 ng/ml), and incubated at 37degreeC. Vascular length and branching point were measured at day 7. Result(s): In NDRG1 deficient mice as compared to their wild type counterparts, (1) tumor growth and angiogenesis by subcutaneous transplantation of syngeneic cancer cells were markedly suppressed; (2) tumor angiogenesis by cancer cells was suppressed in dorsal air sac assay; (3) exogenous administration of VEGF could not induce angiogenesis in corneas whereas FGF-2 could induce angiogenesis; (4) VEGF-induced angiogenesis was markedly impaired in aorta ring assay; (5) VEGF could not induce cell growth and phosphorylation of Akt and Erk in vascular endothelial cells in vitro; (6) in addition to VEGF, an inflammatory cytokine IL-1b also induced impaired angiogenesis in corneas. Conclusion(s): NDRG1 deficiency in host induced functional impairment of endothelial cells in response to VEGF, affecting impaired tumor angiogenesis, and also inflammatory angiogenesis. Based on our present study, we will discuss whether targeting NDRG1 and its downstream signaling molecules could be useful for further development of novel antiangiogenic drug.

Watermann, B. and B. Eklund (2019). "Can the input of biocides and polymeric substances from antifouling paints into the sea be reduced by the use of non-toxic hard coatings?" Marine Pollution Bulletin **144**: 146-151.

Antifouling coatings are used to protect boat hulls from fouling organisms. The paints are designed to release biocides and by this prevent fouling organisms to attach. Until now the simultaneous release of the bulk plastic material has been over-looked. In this study the amount of antifouling paints on ships and leisure boats in Scandinavian countries and Germany has been compared and a calculation of the release of micro plastics has been performed. The result shows that use of a biocide-free hard coating will completely reduce outlet of biocides and the input of polymers will dramatically be reduced from at the most 5% in comparison to traditional paints where the release rate of plastics is estimated to be 70-85%. The advantage for the boat owners will be large since the hard maintenance work will be reduced, release of micro plastics will be low and thus lead to an improved environment. Copyright © 2019 Elsevier Ltd

Wathsala, R. H. G. R., et al. (2018). "Styrene impairs normal embryo development in the Mediterranean mussel (Mytilus galloprovincialis)." Aquatic Toxicology **201**: 58-65.

This study analysed the effects of styrene, a main monomer in plastic manufacturing and acknowledged to be amongst the most common plastic leachates, on early embryo development of the Mediterranean mussel. Embryotoxicity tests showed that styrene impaired normal embryo development at concentrations (0.01 μg/L–1 mg/L) encompassing the environmental range. Occurrence of normal D-veligers was significantly reduced up to 40% of the total, and larval size was reduced of about 20%. D-veligers grown in the presence of styrene (0.1 and 10 μg/L) showed significant reduction of total Multixenobiotic resistance (MXR) efflux activity that was not apparently related to transcriptional expression of genes encoding P-glycoprotein (ABCB) and Mrp (ABCC), the two main ABC transporters of embryonal MXR system. Indeed, ABCB transcription was not affected by styrene, while ABCC was up-regulated. At these same concentrations, transcriptional profiles of 15 genes underlying key biological functions in embryo development and potential targets of adverse effects of styrene were analysed. Main transcriptional effects were observed for genes involved in shell biogenesis and

lysosomal responses (down-regulation), and in neuroendocrine signaling and immune responses (up-regulation). On the whole, results indicate that styrene may affect mussel early development through dysregulation of gene transcription and suggest the possible conservation of styrene mode of action across bivalve life cycle and between bivalves and humans, as well as through unpredicted impacts on protective systems and on shell biogenesis. [ABSTRACT FROM AUTHOR]

Watkins, L., et al. (2019). "The effect of dams on river transport of microplastic pollution." Science of the Total Environment **664**: 834-840.

Dams are known to trap pollutants such as metals and PCBs in the sediment that accumulates within their reservoirs. As more attention is paid to microplastics, an emerging contaminant in waterways worldwide, and how they move along rivers, whether microplastic particles also accumulate behind dams is an important question for informing estimates of global river inputs to oceans. In this study, we measured microplastic concentrations above, below, and within the reservoirs of six dams near Ithaca, NY USA. Samples were processed following the wet peroxide oxidation method and visual counting, followed by Raman Spectroscopy validation. We found that microplastic concentrations in sediment within reservoirs was significantly higher than in sediment above the dams ($p = 0.005$), and in water samples, concentrations within reservoirs was significantly lower ($p = 0.02$). Plastic fibers were the dominant plastic type, but in within-reservoir sediment samples, less abundant plastic types such as plastic fragments were found in higher proportions. These results show that the sediment collecting behind dams is one sink for microplastics in river systems at long timescales, indicating that accounting for dams may be important when modeling global riverine microplastic transport. Copyright © 2019

Watkins, L., et al. (2019). "A case study investigating temporal factors that influence microplastic concentration in streams under different treatment regimes." Environmental Science & Pollution Research **26**(21): 21797-21807.

Microplastics, particles less than 5 mm in size, are an emerging contaminant in waterways worldwide. Most microplastic studies focus on spatial trends in concentration, but in systems as dynamic as rivers, to draw conclusions from existing spatial studies, we must first examine how microplastic concentrations may change with time and flow conditions. In this study, we investigate how microplastic concentrations change over a 24-h period and between seasonally high and low flows. We do this in two streams, controlling for wastewater treatment strategy: one stream in a watershed where waste is treated with septic systems and the other receiving wastewater treatment plant effluent. We hypothesized that a stream with wastewater treatment plant effluent would exhibit higher and more variable microplastic concentrations than a stream in a watershed with septic systems.

Watts, A. J. R., et al. (2014). "Uptake and Retention of Microplastics by the Shore Crab Carcinus maenas." Environmental Science & Technology **48**(15): 8823-8830.

Microplastics, plastics particles <5 mm in length, are a widespread pollutant of the marine environment. Oral ingestion of microplastics has been reported for a wide range of marine

biota, but uptake into the body by other routes has received less attention. Here, we test the hypothesis that the shore crab (Carcinus maenas) can take up microplastics through inspiration across the gills as well as ingestion of pre-exposed food (common mussel Mytilus edulis). We used fluorescently labeled polystyrene microspheres (8-10 μm) to show that ingested microspheres were retained within the body tissues of the crabs for up to 14 days following ingestion and up to 21 days following inspiration across the gill, with uptake significantly higher into the posterior versus anterior gills. Multiphoton imaging suggested that most microspheres were retained in the foregut after dietary exposure due to adherence to the hairlike setae and were found on the external surface of gills following aqueous exposure. Results were used to construct a simple conceptual model of particle flow for the gills and the gut. These results identify ventilation as a route of uptake of microplastics into a common marine nonfilter feeding species. [ABSTRACT FROM AUTHOR]
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Watts, A. J. R., et al. (2015). "Ingestion of Plastic Microfibers by the Crab Carcinus maenas and Its Effect on Food Consumption and Energy Balance." Environmental Science & Technology **49**(24): 14597-14604.
Microscopic plastic fragments (<5 mm) are a worldwide conservation issue, polluting both coastal and marine environments. Fibers are the most prominent plastic type reported in the guts of marine organisms, but their effects once ingested are unknown. This study investigated the fate of polypropylene rope microfibers (1-5 mm in length) ingested by the crab Carcinus maenas and the consequences for the crab's energy budget. In chronic 4 week feeding studies, crabs that ingested food containing microfibers (0.3-1.0% plastic by weight) showed reduced food consumption (from 0.33 to 0.03 g d-1) and a significant reduction in energy available for growth (scope for growth) from 0.59 to -0.31 kJ crab d-1 in crabs fed with 1% plastic. The polypropylene microfibers were physically altered by their passage through the foregut and were excreted with a smaller overall size and length and amalgamated into distinctive balls. These results support of the emerging paradigm that a key biological impact of microplastic ingestion is a reduction in energy budgets for the affected marine biota. We also provide novel evidence of the biotransformations that can affect the plastics themselves following ingestion and excretion. [ABSTRACT FROM AUTHOR]
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Watts, A. J. R., et al. (2016). "Effect of Microplastic on the Gills of the Shore Crab Carcinus maenas." Environmental Science & Technology **50**(10): 5364-5369.
Microscopic plastic debris (microplastics, <5 mm in diameter) is ubiquitous in the marine environment. Previous work has shown that microplastics may be ingested and inhaled by the shore crab Carcinus maenas, although the biological consequences are unknown. Here, we show that acute aqueous exposure to polystyrene microspheres (8 μm) with different surface coatings

had significant but transient effects on branchial function. Microspheres inhaled into the gill chamber had a small but significant dose-dependent effect on oxygen consumption after 1 h of exposure, returning to normal levels after 16 h. Ion exchange was also affected, with a small but significant decrease in hemolymph sodium ions and an increase in calcium ions after 24 h post-exposure. Tofurther asses the effects on osmoregulation, we challenged crabs with reduced salinity after microplastic exposure. Neither microspheres nor natural sediments altered the crab's response to osmotic stress regardless of plastic concentration added. Carboxylated (COOH) and aminated (NH2) polystyrene microspheres were distributed differently across the gill surface, although neither had a significant adverse impact on gill function. These results illustrate the extent of the physiological effects of microplastics compared to the physiological resilience of shore crabs in maintaining osmoregulatory and respiratory function after acute exposure to both anthropogenic plastics and natural particles. [ABSTRACT FROM AUTHOR]

Watzl, A. (1996). "NONWOVENS FROM RECYCLED WASTE." Recycling Textile & Plastic Waste: 89-99.

The article discusses the development of the nonwoven fabric industry under the heading of optimum recyclability in Europe. Recycling defines that both production waste and used materials are returned to the production cycle. It highlights the issues including the avoidance and reduction of waste formation by the industries in the region. It is emphasized that the utilization of technologies is important in processing of the various waste groups. It is also stated that recycling nonwoven products should take a distinction between disposable and durables.

Weagel, E. G., et al. (2015). "Prostate cancer microenvironment modulates macrophage phagocytosis." Cancer Research. Conference: 106th Annual Meeting of the American Association for Cancer Research, AACR **75**(15 SUPPL. 1).

Macrophages play an important role in the body's immune system. There are two main phenotypes of macrophages, M1 and M2. M1 polarized macrophages participate in tumorcidal activity and pro-inflammatory responses. M2 macrophages perform anti-inflammatory responses and promote tissue repair, angiogenesis, and tumor growth. Macrophages within the vicinity of cancer cells may be influenced by the microenvironment and change their gene expression accordingly. Macrophages can express different cytokine profiles depending on their polarization state (M1 or M2). We investigated whether macrophages exposed to cancer cells demonstrate a M2 or M1 phenotype. We stimulated U937 cells with phorbol 12-myristate 13-acetate (PMA) for 24 hours to allow for adhesion and differentiation. We co-cultured PMA-stimulated U937 macrophages with PC3 and DU145 prostate cancer cell lines in a 1:1 ratio with a transpermeable membrane to allow for cell to cell contact and communication, and with PC3 and DU145 conditioned media for 48 hours. We isolated the RNA from the treated macrophages and performed qPCR to assess gene expression levels of the following cytokines: IL-10, a cytokine demonstrating a M2 phenotype was upregulated by 10 and 15 fold for PC3 and DU145 cells respectively and by 3 fold in both cell lines exposed to conditioned media. We also found a trend of downregulation with the cytokines IL-1, IL-12, and TNF - alpha, which also depict a M2 phenotype. We also assessed macrophage function by measuring engulfment by flow cytometry. Treated macrophages were allowed to phagocytose fluorescent microbeads for 1 hour. Flow cytometry analysis revealed that total bead engulfment decreased by up to 80% in macrophages treated with PC3 cells. Moreover, the population of macrophages that engulfed 3+ beads decreased significantly from both the cells and media treatments. Macrophages treated with DU145 cells and spent media also showed a similar trend to macrophages exposed to PC3 cells. The results show that macrophages exposed to PC3 and DU145 cancer cell lines polarized towards an M2 phenotype and could be important in the success of cancer within the microenvironment. Further research will reveal whether this process of a M2 polarization of macrophages is mediated by cytokines and cell vesicles or other factors.

Weagel, E. G., et al. (2016). "Prostate cancer exosomes and their effects on macrophage engulfment and polarization." Cancer Research. Conference: 107th Annual Meeting of the American Association for Cancer Research, AACR **76**(14 Supplement).

The purpose of this study is to explore the effects of prostate cancer-derived exosomes on macrophage engulfment and polarization. Exosomes are small vesicles secreted by virtually all cells, which contain nucleic acids, lipids, proteins, and carbohydrates. Exosomes can be abundantly found in cancer patient secretions (serum, urine, etc.) and contain a high amount of RNA molecules, some of them being miRNA, and parts of the DNA of the cell of origin. One of the functions of exosomes is to mediate cellular communication. This occurs as they are secreted from one cell and then distribute their contents into other cells. Some exosomes specifically target immune cells. The miRNA the exosomes carry can silence genes involved in the activation of these immune cells, leading to immune suppression and tumor growth. Macrophages are often found surrounding the tumor microenvironment, as they are recruited by tumor signals to promote angiogenesis and metastasis. These macrophages, which are often called tumor associated macrophages (TAMs), are exposed to various signals derived from the tumor microenvironment, including exosomes. Previous data generated in our lab suggests that the co-culture of macrophages with PC3 and DU145 cell lines results in a decrease in macrophage phagocytosis and an M2-like polarization state. For this study, we exposed U937 cells to phorbol 12-myristate 13-acetate (PMA) for 24 hours to allow for differentiation. Then, we co-cultured these macrophages with isolated exosomes from spent media from both PC3 and DU145 cell lines at 1, 2, 3, 4, 5, 6, 12, and 24 hours. We then allowed the macrophages to phagocytose fluorescent microbeads for 1 hour. Flow cytometry analysis of these macrophages revealed that the total bead phagocytosis starts decreasing at 3 hours of exosome co-culture compared to control. Interestingly, total bead phagocytosis resumes to normal at 12 and 24 hours of exosome co-culture. Gene expression analysis of these macrophages suggests an M2 phenotype from hours 2-24. These results suggest that prostate cancer-derived exosomes can target macrophages and affect their phagocytosis. Further research is required to elucidate the specific genes these exosomes target.

Weaver, J. and C. Stabler (2012). "Free-radical scavenging cerium oxide nanoparticle hydrogels for cell encapsulation." Journal of Tissue Engineering and Regenerative Medicine **1)**: 276.

Cellular encapsulation is a promising strategy for shielding foreign cells from direct immune attack; however, it fails to prevent inflammation or indirect immune activation, which exposes embedded cells to oxidative stress. Cerium oxide nanoparticles, or nanoceria, are highly unique nanoparticles with the capacity to mimic free-radical scavenging enzymes in a ubiquitous and self-renewing manner. We sought to localize these nanoparticles within a biomaterial. In this study, we incorporated nanoceria within alginate hydrogels and evaluated their catalytic activity as well as their capacity to protect co-encapsulated cells from free radical damage. Nanoceria

was synthesized and evaluated via FTIR, DLS, and superoxide reduction. Nanoceria (0.01-1 mM) retained its catalytic activity within alginate microbeads, where it was found to effectively scavenge superoxide and degrade H<inf>2</inf>O<inf>2</inf> in the surrounding milieu. No cytotoxicity was found at <1.0 mM nanoceria. Nanoceriaalginate microbeads provided statistically significant protection (50% higher viability) of co-encapsulated MIN6 cells from superoxide-mediated cell death. Live/dead imaging qualitatively verified these results. Our data illustrates a novel, self-renewing, ubiquitous free-radical scavenging biomaterial with the demonstrated capacity to protect co-encapsulated cells from free-radical damage. It is envisioned that these materials would be highly beneficial for cell-based implants, particularly pancreatic beta cells.

Webb, S., et al. (2019). "Microplastics in the New Zealand green lipped mussel Perna canaliculus." Marine Pollution Bulletin **149**: 1.

Microplastics are increasingly being recognised as a potential threat to New Zealand's coastal waters, however there is limited data on abundance of microplastics in marine organisms for New Zealand. Microplastic ingestion by the iconic green-lipped mussel Perna canaliculus was assessed. Microplastics were found in Perna canaliculus from 6 out of 9 locations sampled at abundances ranging from 0 to 1.5 particles per mussel and tissue microplastic concentrations ranged from 0 to 0.48 particles g tissue-1 (wet wt). The microplastics ranged in size from 50 to 700 µm with a median diameter of 100 µm. Polyethylene was the most frequently detected polymer with fragments the most common morphotype. These results indicate that microplastics are widespread in New Zealand's coastal waters and further assessment of microplastic contamination of New Zealand coastal environments and biota is warranted.

Weber, A., et al. (2018). "PET microplastics do not negatively affect the survival, development, metabolism and feeding activity of the freshwater invertebrate Gammarus pulex." Environmental Pollution **234**: 181-189.

Over the past decade, microscopic plastic debris, known as microplastics, emerged as a contaminant of concern in marine and freshwater ecosystems. Although regularly detected in aquatic environments, the toxicity of those synthetic particles is not well understood. To address this, we investigated whether the exposure to microplastics adversely affects the amphipod Gammarus pulex, a key freshwater invertebrate. Juvenile (6-9 mm) and adult (12-17 mm) individuals were exposed to irregular, fluorescent polyethylene terephthalate fragments (PET, 10-150 micro m; 0.8-4,000 particles mL⁻¹) for 24 h. Results show that body burden after 24 h depends on the dose and age of G. pulex with juveniles ingesting more microplastics than adults. After chronic exposure over 48 d, microplastics did not significantly affect survival, development (molting), metabolism (glycogen, lipid storage) and feeding activity of G. pulex. This demonstrates that even high concentrations of PET particles did not negatively interfere with the analyzed endpoints. These results contradict previous research on marine crustaceans. Differences may result from variations in the exposure regimes (e.g., duration, particle concentrations), plastic characteristics (e.g., type, size, shape, additives) as well as the species-specific morphological, physiological and behavioral traits. As a detritivorous shredder G. pulex is adapted to feed on non-digestible materials and might, therefore, be less sensitive towards exposure to synthetic particles. Accordingly, we argue that the autecology needs to be taken into account and that research should focus on identifying traits that render species susceptible to microplastic exposure.

Weber, I., et al. (2016). "Ex vivo expansion of T lymphocytes induces substantial alterations in cell size and actin-binding cytoskeletal proteins." Transfusion Medicine and Hemotherapy **43 (Supplement 1)**: 71.

Background: The isolation of immune cells for cellular therapies often involves culture expansion steps, e.g. in the case of selection and amplification of antigen-specific T cell clones or the generation of chimeric antigen receptor-transduced (CAR) T cells. Reports have indicated that during ex vivo expansion, T lymphocytes and other cells can undergo functional impairment, e.g. in migration or antigen recognition which may affect their therapeutic efficacy. The impact of the culture step on actin-binding proteins, which are crucial for these functionalities, is so far not known. Method(s): We analyzed the expression of seven cytoskeletal proteins at the transcriptional and the protein level, including actin modifiers cofilin and profilin, actin branching/bundling partners alpha actinin and filamin A, as well as the linkage proteins between actin and integrin signalling complexes, paxillin, vinculin and talin. Transcription was quantified using qRT-PCR. Protein levels were measured by flow cytometry of permeabilized cells using fluorescence-labelled antibodies titrated to exceed the concentration of the recognized antigens. Cell size was determined by flow cytometry using calibrated microbeads. Result(s): Analysis of cell size during anti-CD3/antiCD28-induced ex vivo expansion of freshly isolated murine CD3+ T lymphocytes in RPMI/10% FCS 30U/ml Interleukin-2 indicated a duplication of the average cell diameter from 7 to 14 mum, and a concomitant increase in cell volume from approximately 179 to 1436 mum3 over the period of 7 days. At the same time, protein levels of all seven actin binding molecules remained constant on a per cell basis, indicating a relative decrease in the intracellular concentrations of these proteins. Moreover, mRNA levels relative to the housekeeping gene GAPDH were reduced 5-7 fold in the case of profilin, cofilin, filamin A and alpha actinin, and approximately 10-50 fold for paxillin, talin and vinculin. Conclusion(s): Ex vivo expansion protocols can induce major increases in size and intracellular volume of T lymphocytes. In parallel, amounts of functionally relevant actin-binding proteins such as profilin, cofilin, alpha actinin, filamin A, paxillin, vinculin and talin did not increase in parallel. Moreover, their transcription was strongly reduced. Our findings indicate that a cell culture step can induce abnormalities in proteins with key functions in the migration and function of T lymphocytes.

Wegner, A., et al. (2012). "Effects of nanopolystyrene on the feeding behavior of the blue mussel (Mytilus edulis L.)." Environmental Toxicology & Chemistry **31**(11): 2490-2497.

As the industrial production of nanoplastic and the degradation of microplastic into smaller particles at sea increase, the potential amount of nanoplastics in the marine environment rises. It has been reported that mussels uptake 100-nm polystyrene (PS) beads; to date, however, the effects of this uptake on the organism are unknown. In the present study, the authors investigated the effects of 30-nm PS on the feeding behavior of the blue mussel (Mytilus edulis) by exposing the organism to different nano PS and different algae (Pavlova lutheri) concentrations. The state of nano PS aggregation in the exposure medium was assessed using dynamic light scattering. In all treatments that contained nano PS, M. edulis produced pseudofeces. The total weight of the feces and pseudofeces increased with increasing nano PS and increasing algae concentration. Furthermore, M. edulis reduced its filtering activity when nano PS was present but still caused a decrease in the apparent nano PS concentration in the water. The presence of nano PS around the foot of M. edulis after the bioassay confirmed that the organism removed nano PS from the water. Chronic effect studies are therefore needed to investigate the effects of nanoplastics in M. edulis and possible consequences for its predators, including humans. Environ. Toxicol. Chem. 2012; 31: 2490-2497. © 2012 SETAC [ABSTRACT FROM AUTHOR]

Wei, T.-T. and Y.-H. Lin (2015). "A WASTE CATALYST FOR A HAZARDOUS CHLORINE - CONTAINING PLASTIC WASTE." Environmental Engineering and Management Journal **14**(9): 2127-2138.

The recycling of plastic waste is important both in the conservation of resources and the environmental protection. A plastic waste (PE/PP/PS/PVC) was pyrolyzed over a series of post-use FCC catalysts using a fluidizing reaction system similar to the FCC process operating isothermally at ambient pressure. Experiments carried out with these catalysts gave good yields of valuable hydrocarbons with differing selectivity in the final products dependent on reaction conditions. A model based on kinetic considerations associated with chemical reactions and catalyst deactivation in the catalytic degradation of plastics has been developed. Greater product selectivity was observed with a hybrid catalyst of MCM-41/Cat-R1 with more than 70.5 wt% olefins products. It is demonstrated that the catalytic degradation of post-consumer chloro-commingled plastics over these recycled catalysts coped with the utility of fluidizing cracking system was shown to be a useful method for the production of potentially valuable hydrocarbons.

Wei, W., et al. (2019). "Revealing the Mechanisms of Polyethylene Microplastics Affecting Anaerobic Digestion of Waste Activated Sludge." Environmental Science & Technology **53**(16): 9604-9613.

Polyethylene (PE) microplastics retained in sewage sludge inevitably enter the anaerobic digestion system. To date, no information has been reported on the mechanisms of PE microplastics affecting anaerobic digestion of waste activated sludge (WAS). This study evaluated the mechanisms using batch and continuous tests. Short exposure to PE microplastics at lower levels (i.e., 10, 30, and 60 particles/g-TS) did not significantly affect the methane production, but higher levels of PE microplastics (i.e., 100 and 200 particles/g TS) significantly (P = 0.006 and 0.0003) decreased methane production by 12.4-27.5%, with a lower methane potential and hydrolysis coefficient. In continuous test over 130 days, feeding WAS with 200 particles PE microplastics/g TS decreased vs destruction by up to 27.3% (P = 2.18 x 10⁻¹⁸) and resulted in a 9.1% (P = 0.002) increase in the volume of digested sludge for disposal. Correspondingly, the microbial community was shifted in the direction against anaerobic digestion. A mechanisms study revealed that the negative effect of PE microplastics was likely attributed to the induction of reactive oxygen species (ROS) rather than the released acetyl tri-n-butyl citrate. The generation of ROS caused a 7.6-15.4% reduction of cell viability, thereby restraining sludge hydrolysis, acidification, and methanogenesis.

Wei, W., et al. (2019). "Polyethylene terephthalate microplastics affect hydrogen production from alkaline anaerobic fermentation of waste activated sludge through altering viability and activity of anaerobic microorganisms." Water Research **163**: 114881.

Alkaline (especially pH 10) anaerobic fermentation of waste activated sludge (WAS) has been reported to be an effective approach for hydrogen production through inhibiting the homoacetogenesis and methanogenesis. However, the potential effect of the widespread microplastics in sludge on the performance of hydrogen production has never been reported. To fill this knowledge gap, the dominant polyethylene terephthalate (PET) microplastics in WAS were selected as the model microplastics to evaluate their influences on hydrogen production during alkaline anaerobic fermentation of WAS as well as the key mechanisms involved. Experimental results demonstrated that hydrogen production from WAS decreased in the presence of PET microplastics (i.e., 10, 30 and 60 particles/g-TS) compared to the control, with the hydrogen yield at 60 particles/g-TS being only 70.7+/-0.9% of the control. Although the hydrogen consumption (i.e., homoacetogenesis and methanogenesis) was restrained under alkaline (pH 10) condition, PET microplastics inhibited hydrolysis, acidogenesis and acetogenesis in alkaline WAS anaerobic fermentation, leading to the inhibitory effect on hydrogen production. This was further confirmed by the microbial analysis, which clearly showed PET microplastics caused the shift of the microbial community toward the direction against hydrolysis-acidification. Mechanism studies revealed that PET microplastics carried on their negative influence mainly through leaching the toxic di-n-butyl phthalate (DBP). The reactive oxygen species (ROS) and live/dead staining tests indicated that the increased ROS was induced by PET microplastics, causing more cells dead, which further resulted in the decreased production of hydrogen.

Weideman, E. A., et al. (2019). "Little evidence that dams in the Orange-Vaal River system trap floating microplastics or microfibres." Marine Pollution Bulletin **149 (no pagination)**(110664).

Rivers can be major sources of plastics into coastal seas, but it is unclear whether dams retain floating plastics, thus reducing the amount reaching the sea. To test if dams trap microplastics, we collected bulk water and neuston net samples from five dams on the Orange-Vaal River system, South Africa. Most manufactured items were microfibres and densities of microplastics were modest (bulk water: 0.21 +/- 0.27 items.L⁻¹; net: 0.04 +/- 0.16 items.m⁻²). There was an interaction between dam and season: dams on the densely populated Vaal River had higher microplastic concentrations during dry than wet conditions, whereas the opposite pattern occurred on the less industrialised Orange River. Overall there was no difference in microplastic concentration at sites above vs below dam walls nor was there a strong correlation between microplastic concentration and distance to the wall. Our results therefore suggest that dams do not trap floating microplastics or microfibres. Copyright © 2019 Elsevier Ltd

Weithmann, N., et al. (2018). "Organic fertilizer as a vehicle for the entry of microplastic into the environment." Science Advances **4**(4): eaap8060.

The contamination of the environment with microplastic, defined as particles smaller than 5 mm, has emerged as a global challenge because it may pose risks to biota and public health. Current research focuses predominantly on aquatic systems, whereas comparatively little is known regarding the sources, pathways, and possible accumulation of plastic particles in terrestrial ecosystems. We investigated the potential of organic fertilizers from biowaste fermentation and composting as an entry path for microplastic particles into the environment. Particles were classified by size and identified by attenuated total reflection-Fourier transform infrared spectroscopy. All fertilizer samples from plants converting biowaste contained plastic particles, but amounts differed significantly with substrate pretreatment, plant, and waste (for example, household versus commerce) type. In contrast, digestates from agricultural energy crop digesters tested for comparison contained only isolated particles, if any. Among the most abundant synthetic polymers observed were those used for common consumer products. Our results indicate that depending on pretreatment, organic fertilizers from biowaste fermentation and composting, as applied in agriculture and gardening worldwide, are a neglected source of microplastic in the environment.

Welden, N. A., et al. (2018). "The effects of trophic transfer and environmental factors on microplastic uptake by plaice, Pleuronectes plastessa, and spider crab, Maja squinado." Environmental Pollution **239**: 351-358.

Microplastic pollution is apparent throughout the marine environment from deep ocean sediments to coastal habitats. Most of this is believed to originate on land, although marine activities, such as fishing and shipping, also contribute to the release and redistribution of microplastic. The relative importance of these maritime plastic sources, the manner by which they are distributed in the environment, and their effect on uptake by marine organisms are yet to be fully quantified. In this study, the relative impact of fishing activities on microplastic uptake by demersal fish and crustaceans was explored. Local fishing intensity, proximity to land and mean water velocity are compared to microplastic uptake in plaice, Pleuronectes platessa, and spider crab, Maja squinado, from the Celtic Sea. Observations were also made of microplastic contamination in ingested sand eels, Ammodytes tobianus, to establish a potential route of trophic transfer. This study is the first to identify microplastic contamination in spider crab and to document trophic transfer in the wild. Individuals were sampled from sites of varied fishing intensity in the Celtic Sea, and their stomach contents examined for the presence of microplastic. Contamination was observed in 50% of P. platessa, 42.4% of M. squinado, and 44.4% of A. tobianus. Locations of highest plastic abundance varied between P. platessa and M. squinado, indicating that different factors influence the uptake of microplastic in these two taxa. No significant link was observed between fishing effort and microplastic abundance; however, proximity to land was linked to increased abundance in M. squinado and Observations of whole prey demonstrate ongoing trophic transfer from A. tobianus to P. platessa. The lack of significant difference in microplastic abundance between predator and prey suggests that microplastic is not retained by P. platessa.

Welden, N. A. and P. R. Cowie (2017). "Degradation of common polymer ropes in a sublittoral marine environment." Marine Pollution Bulletin **118**(1-2): 248-253.

Contamination by microplastic particles and fibres has been observed in sediment and animals sampled from the Firth of Clyde, West Scotland. In addition to microplastics released during clothes washing, a probable source is polymer ropes in abandoned, lost and discarded fishing and recreational sailing gear. The fragmentation of polypropylene, polyethylene, and nylon exposed to benthic conditions at 10 m depth over 12 months was monitored using changes in weight and tensile properties. Water temperature and light levels were continuously monitored. The degree of biofouling was measured using chlorophyll a, the weight of attached macroalgae, and colonising fauna. Results indicate microplastic fibres and particles may be formed in benthic environments despite reduced photodegradation. Polypropylene, Nylon, and polyethylene lost an average of 0.39%, 1.02%, and 0.45% of their mass per month respectively. Microscope images of the rope surface revealed notable surface roughening believed to be caused by abrasion by substrate and the action of fouling organisms. Copyright © 2017 Elsevier Ltd

Welden, N. A. C. and P. R. Cowie (2016). "Environment and gut morphology influence microplastic retention in langoustine, Nephrops norvegicus." Environmental Pollution **214**: 859-865.

Over the past twenty years microplastic pollution has been recorded in all major marine habitats, and is now considered to be of high environmental concern. Correspondingly, the number of reports of microplastic ingestion by marine species is increasing. Despite this, there are still relatively few studies which address the uptake and retention of microplastic in wild populations. Langoustine, Nephrops norvegicus, sampled from the Clyde Sea Area, have previously been seen to contain large aggregations of microplastic fibres. The large proportion

of contaminated individuals and size of the microplastic aggregations observed suggests that Nephrops are at high risk of microplastic ingestion. In this study the levels of ingested microplastic in populations of N. norvegicus from the Clyde Sea Area, North Minch and North Sea are examined. Animals in the near-shore, Clyde Sea population showed both a higher percentage of microplastic containing individuals and much greater weights of microplastic retained in the gut. N. norvegicus revealed that only a small percentage of individuals from the North Sea and Minch contained microplastic, predominantly single strands. An expanded sample from the Clyde Sea Area was examined to identify the factors influencing microplastic retention. This revealed that males, larger individuals, and animals that had recently moulted contained lower levels of microplastic. The presence of identified food items in the gut was not seen to correlate with microplastic loads. Observations of microplastic in the shed stomach lining of recently moulted individuals and the lack of aggregations in wild-caught individuals suggests that ecdysis is the primary route of microplastic loss by N. norvegicus. Therefore the large aggregations observed in wild-caught animals are believed to build up over extended periods as a result of the complex gut structure of N. norvegicus.

Welden, N. A. C. and P. R. Cowie (2016). "Long-term microplastic retention causes reduced body condition in the langoustine, Nephrops norvegicus." Environmental Pollution **218**: 895-900.
Microplastic represents a rising proportion of marine litter and is widely distributed throughout a range of marine habitats. Correspondingly, the number of reports of species containing microplastics increases annually. Nephrops norvegicus in the Firth of Clyde have previously been shown to retain large aggregations of microplastic fibres. The potential for N. norvegicus to retain plastic over an extended time period increases the likelihood of any associated negative impacts to the individual. This study represents the longest observation of the impacts of microplastic retention in invertebrates. We exposed N. norvegicus to plastic over eight months to determine the impacts of extended exposure. Over this period we compared the feeding rate, body mass, and nutritional state of plastic-fed N. norvegicus to that of fed and starved control groups. Following the experimental period, the plastic-fed langoustine contained microplastic aggregations comparable to those of small individuals from the Clyde Sea Area. Comparisons between fed, unfed and plastic-fed individuals indicated a reduction in feeding rate, body mass, and metabolic rate as well as catabolism of stored lipids in plastic contaminated animals. We conclude that N. norvegicus exposed to high levels of environmental microplastic pollution may experience reduced nutrient availability. This can result in reduced population stability and may affect the viability of local fisheries. [ABSTRACT FROM AUTHOR]
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Welle, F. and R. Franz (2018). "Microplastic in bottled natural mineral water - literature review and considerations on exposure and risk assessment." Food Additives & Contaminants. Part A, Chemistry, Analysis, Control, Exposure & Risk Assessment **35**(12): 2482-2492.
Microplastics have been ubiquitously found and identified in aquatic and terrestrial environments for several years. Due to their occurrence in the oceans, microplastics were also found and characterised in seafood products and in other foods and beverages such as beer, honey and table salt. Very recently, microplastic particles were also determined in bottled

mineral water. The objective of this publication is to present and discuss a compilation of the currently available literature data on microplastics in bottled mineral water. The related oral exposure of the consumer from substances present in microplastics and from the plastics particles themselves is estimated and toxicological arguments for and considerations on risk assessment from the consumption of bottled mineral water containing microplastics are presented. Exposure estimations based on the reported microplastic amounts found in mineral water and the assumption of total mass transfer of small molecules like additives and oligomers present in the plastic would not raise a safety concern. Available toxicokinetic data suggests that marginal fraction of the ingested low amount of microplastics can be absorbed, if at all, the conclusion is very likely that the reported amounts present in bottled mineral water do not raise a safety concern for the consumer. Considering the use of plastic materials in our daily life, occurrence of microplastics in beverages is likely a minor exposure pathway for plastic particles. Due to recent progress in analytical methods and the public discussion on plastics marine litter, public concern about eating and drinking microplastics with food, and related safety issues was raised. However, a better data basis for exposure estimates and risk assessment would be very helpful to better accommodate consumer concerns. The intention of this paper is to deliver a contribution to this topic taking the bottled mineral water as a case example.

Wellhöner, H. H. and D. M. Neville (1987). "Tetanus toxin binds with high affinity to neuroblastoma x glioma hybrid cells NG 108-15 and impairs their stimulated acetylcholine release." The Journal of biological chemistry **262**(36): 17374-17378.

Differentiated neuroblastoma x glioma hybrid cells NG 108-15 express on their surface specific binding sites for tetanus toxin. 450 sites/cell with a KD of 2 x 10(-11) M were found under "physiological" conditions of pH and salt concentrations. A Hill coefficient of 1.1 indicated noncooperative binding. Specific binding of 125I-toxin to its sites could be prevented either by preincubation of the toxin with a neutralizing monoclonal antibody or by pretreatment of the cells with neuraminidase (Vibrio cholerae). To quantify the action of tetanus toxin on the stimulated release of 14C activity from differentiated cells preincubated with [14C]choline, a new type of perfusion device was designed which could be filled with cells growing in monolayers on Cytodex-3 microbeads. Tetanus toxin inhibited the stimulated 14C release in a time- and dose-dependent manner. A greater than 50% inhibition was found after 2 h of incubation with 10(-12) M toxin. The inhibitory action of tetanus toxin could be prevented with a monoclonal antibody to the toxin or with neuraminidase treatment of the cells. These results suggest that the neuraminidase-sensitive 2 x 10(-11) KD receptors are the productive receptors for tetanus intoxication in differentiated NG 108-15 cells. The possible chemical composition of these receptors is discussed. Differentiated NG 108-15 cells provide a useful model in which picomolar tetanus concentrations produce both measurable saturable binding and inhibition of potassium-evoked, acetylcholine release under physiological conditions of pH and salt concentrations.

Wen, B., et al. (2018). "Single and combined effects of microplastics and cadmium on the cadmium accumulation, antioxidant defence and innate immunity of the discus fish (Symphysodon aequifasciatus)." Environmental Pollution **243**(Part A): 462-471.

Microplastics (MPs) have the potential to interact with the toxicity of other common environmental contaminants, such as heavy metals. Here, we investigated the impacts of polystyrene-MPs (32-40 micro m), cadmium (Cd) and their combination on early juveniles of the discus fish (Symphysodon aequifasciatus) in relation to Cd accumulation, antioxidant defence and innate immunity. Animals were exposed to three concentrations of MPs (0, 50 or 500 micro

g L⁻¹) crossed with two levels of Cd (0 or 50 micro g L⁻¹) for 30 days. Our findings showed that MPs and Cd had no adverse effects on growth and survival. Under exposure to Cd, however, accumulation of Cd in the body of fish decreased with increasing MP concentrations as supported by a reduced metallothionein content. The activities of superoxide dismutase and glutathione peroxidase increased with MPs but decreased with Cd. MPs, Cd or the mixture increased catalase activity, despite an antagonistic interaction between the two stressors. Glutathione levels increased when exposed to high MP concentrations but decreased when co-exposed to Cd. Malondialdehyde content was only influenced by MPs and increased with elevated MPs. MPs or Cd alone did not increase protein carboxyl content but showed a synergistic effect and increased content. MPs or Cd alone showed no effect on lysozyme activity but had a synergistic effect and activated activity. Activities of both acid phosphatase and alkaline phosphatase were enhanced by MPs, Cd or their mixture, although there was an antagonistic interaction between the two stressors. In contrast, MPs, Cd or their mixture decreased complement 3 content, despite an antagonistic interaction between the two stressors. Collectively, this study suggests that exposure to Cd led to reduced Cd accumulation in the presence of MPs. Nevertheless, co-exposure could induce severe oxidative stress and stimulate innate immunity in the juvenile S. aequifasciatus.

Wen, B., et al. (2018). "Microplastics have a more profound impact than elevated temperatures on the predatory performance, digestion and energy metabolism of an Amazonian cichlid." Aquatic Toxicology **195**: 67-76.

Knowledge on the impacts of microplastics (MPs) pollution on freshwater environments and biota remains limited. Meanwhile, freshwater ecosystems have been threatened by elevated temperatures caused by climate change. To date, no information exists on how MPs - especially under elevated temperature conditions - affect predatory performance, digestive processes and metabolic pathways in freshwater organisms. Here, we examined MPs, elevated temperature and their combined effects on juveniles (0+ group) of an Amazonian cichlid, the discus fish (Symphysodon aequifasciatus). For 30 days, fish were exposed to ambient or elevated temperatures (i.e., 28 or 31 degrees C) in the absence or presence of MPs (i.e., 0 or 200 micro g/L). The following metrics were quantified: MPs accumulation; predatory performance; and biomarkers involved in neurotransmission, digestion and energy production. The results showed that survival rate and body length were not affected by MPs, elevated temperatures or their combination. Elevated temperatures resulted in an increase in MP concentrations in fish bodies. Exposure to MPs decreased the post-exposure predatory performance (PEPP) at ambient temperatures but not at elevated temperatures. Elevated temperatures, however, had no effect on the PEPP but antagonistically interacted with MPs, leading to similar predatory performances under present and future conditions. Acetylcholinesterase (AChE) activity was only affected by MPs and decreased in the presence of MPs, indicating adverse effects in nervous and neuromuscular function and, thus, potentially in predatory performance. Trypsin activity was only influenced by MPs and decreased during exposure to MPs. Elevated temperatures or MPs alone increased the amylase activity but interacted antagonistically. Lipase activity was not influenced by either of the two stressors. In contrast, alkaline phosphatase (ALP) activity was affected by MPs or elevated temperatures alone and decreased with both stressors. Such results indicate deficits in the digestive capabilities of early-stage S. aequifasciatus under elevated temperature conditions and especially during exposure to MPs. Electron transport system (ETS) activity was not influenced by either of the two stressors. Both elevated temperatures and MPs alone increased LDH activity; however, the interaction between the two stressors cancelled activity but was still higher than activity in present conditions. Citrate synthase (CS) activity

decreased with elevated temperature but increased during exposure to MPs. Cytochrome c oxidase (COX) activity was only influenced by MPs and increased in the presence of MPs. Thus, S. aequifasciatus juveniles exposed to elevated temperatures and MPs not only relied on anaerobic glycolysis for energy production but also depended on aerobic metabolism in the presence of MPs. Overall, these findings suggested that MPs showed a greater impact than elevated temperatures on the predatory performance, digestion and energy production of S. aequifasciatus. Nevertheless, juvenile survival and growth were minimally impacted, and thus, S. aequifasciatus could cope with near-future temperature increases and MP exposure.

Wen, X., et al. (2018). "Microplastic pollution in surface sediments of urban water areas in Changsha, China: Abundance, composition, surface textures." Marine Pollution Bulletin **136**: 414-423.

Microplastics pollution in the global marine environment has received much recent research attention. However, microplastics contamination of the freshwater environment has not been fully studied, especially with respect to the surface sediments of urban water areas in China. This study investigated surface sediment samples from twelve selected sites in Changsha, China. The average microplastic concentrations in the surface sediments of the urban water areas ranged from 270.17+/-48.23items.kg⁻¹ to 866.59+/-37.96items.kg⁻¹, and the highest concentration of microplastics was found in Yuejin Lake sediments. Most of the collected microplastics were transparent, and most were classified as fragments. Most microplastics (58.31%) were smaller than 1mm across all samples. Raman analysis indicated that polystyrene dominated the sediments samples. This study provided framework for future studies of microplastics pollution in the surface sediment of urban water areas in China.

Werth, A. J., et al. (2019). "Oil adsorption does not structurally or functionally alter whale baleen." Royal Society Open Science **6**(5): 182194.

Mysticete whales filter small prey from seawater using baleen, a unique keratinous oral tissue that grows from the palate, from which it hangs in hundreds of serial plates. Laboratory experiments testing effects of oils on material strength and flexibility, particle capture and tissue architecture of baleen from four mysticete species (bowhead, Balaena mysticetus; North Atlantic right, Eubalaena glacialis; fin, Balaenoptera physalus; humpback, Megaptera novaeangliae) indicate that baleen is hydrophilic and oleophobic, shedding rather than adsorbing oil. Oils of different weights and viscosities were tested, including six petroleum-based oils and two fish or plankton oils of common whale prey. No notable differences were found by oil type or whale species. Baleen did not adsorb oil; oil was readily rinsed from baleen by flowing water, especially from moving fringes. Microscopic examination shows minimal wrinkling or peeling of baleen's cortical keratin layers, probably due to oil repelling infiltrated water. Combined results cast doubt on fears of baleen fouling by oil; filter porosity is not appreciably affected, but oil ingestion risks remain. Particle capture studies suggest potentially greater danger to mysticetes from plastic pollution than oil.

Wesch, C., et al. (2016). "No microplastics in benthic eelpout (Zoarces viviparus): an urgent need for spectroscopic analyses in microplastic detection." Environmental Research **148**: 36-38.

Monitoring the ingestion of microplastics is challenging and suitable detection techniques are insufficiently used. Thus, misidentifying natural for synthetic microfibres cannot be avoided. As part of a framework to monitor the ingestion of microplastics in eelpout, this short report addresses the accurate identification of microfibres. We show that, following visual inspections, putatively synthetic microfibres are indeed of natural origin, as ascertained by spectrometric analyses. Consequently, we call for an inclusion of spectroscopic techniques in standardized microplastic monitoring schemes.

Wesch, C., et al. (2016). "Towards the suitable monitoring of ingestion of microplastics by marine biota: A review." Environmental Pollution **218**: 1200-1208.

Monitoring plastic ingestion in marine biota is a difficult task, especially regarding ubiquitous microplastics (particles of <5 mm). Due to their microscopic size, evidence for microplastic ingestion is often limited to laboratory studies. The following review provides a comparison and assessment of different microplastic ingestion monitoring procedures. Emphasis is given to the most important steps of current monitoring practice: (1) selecting suitable indicator species, (2) sampling and sample processing, (3) analytical procedures and (4) the prevention of secondary contamination of the sample. Moreover, an overview on ingestion records of microplastics by different marine feeding guilds is presented, including filter, suspension and deposit feeders as well as predators and scavengers. Lastly, monitoring processes are addressed critically in terms of their suitability for achieving the aims of an appropriate monitoring programme. Recommendations for future research priorities are presented with a focus on the necessity of standardised and comparable monitoring procedures in microplastic detection. Copyright © 2016 Elsevier Ltd

Wesch, C., et al. (2017). "Assuring quality in microplastic monitoring: About the value of clean-air devices as essentials for verified data." Scientific Reports **7**(1): 5424.

Avoiding aerial microfibre contamination of environmental samples is essential for reliable analyses when it comes to the detection of ubiquitous microplastics. Almost all laboratories have contamination problems which are largely unavoidable without investments in clean-air devices. Therefore, our study supplies an approach to assess background microfibre contamination of samples in the laboratory under particle-free air conditions. We tested aerial contamination of samples indoor, in a mobile laboratory, within a laboratory fume hood and on a clean bench with particles filtration during the examining process of a fish. The used clean bench reduced aerial microfibre contamination in our laboratory by 96.5%. This highlights the value of suitable clean-air devices for valid microplastic pollution data. Our results indicate, that pollution levels by microfibres have been overestimated and actual pollution levels may be many times lower. Accordingly, such clean-air devices are recommended for microplastic laboratory applications in future research work to significantly lower error rates.

Wessel, C. C., et al. (2016). "Abundance and characteristics of microplastics in beach sediments: Insights into microplastic accumulation in northern Gulf of Mexico estuaries." Marine Pollution Bulletin **109**(1): 178-183.

Microplastics (plastic debris smaller than 5mm) represent a growing concern worldwide due to increasing amounts of discarded trash. We investigated microplastic debris on sandy shorelines at seven locations in a northern Gulf of Mexico estuary (Mobile Bay, AL) during the summer of 2014. Microplastics were ubiquitous throughout the area studied at concentrations 66-253x larger than reported for the open ocean. The polymers polypropylene and polyethylene were most abundant, with polystyrene, polyester and aliphatic polyamide also present but in lower quantities. There was a gradient in microplastic abundance, with locations more directly exposed to marine currents and tides having higher microplastic abundance and diversity, as well as a higher contribution by denser polymers (e.g. polyester). These results indicate that microplastic accumulation on shorelines in the northern Gulf of Mexico may be a serious concern, and suggest that exposure to inputs from the Gulf is an important determinant of microplastic abundance.

Westall, G. P., et al. (2011). "Detection of class I anti-HLA antibodies by Luminex pre-transplant predicts poor outcomes following lung transplantation." Journal of Heart and Lung Transplantation **1)**: S36.

Purpose: Solid phase assays detect anti-HLA antibodies with high accuracy and sensitivity, however debate continues on how these results should be interpreted in the setting of lung transplantation. Methods and Materials: We performed a retrospective analysis of pretransplant anti-HLA antibody levels detected using a solid-phase HLA microbead assay (Luminex) in 80 patients undergoing lung transplantation at a single centre between 1/1/09 and 1/5/10. All patients underwent prospective T-and B-cell crossmatches (complement-dependent cytotoxicity assays) prior to transplantation. Outcome variables analyzed included acute cellular and antibody-mediated rejection, BOS and survival. Result(s): Pre-transplant class I and class II anti-HLA antibodies were present in 31/80 (38%) and 13/80 (10%) patients, respectively, but did not predict a positive T-or B-cell crossmatch which was weekly positive in 1/80 and 14/80 patients, respectively. HLA class I and II donor-specific antibodies (DSA) were present pre-transplant in 13 and 7 patients, respectively. The presence pre-transplant of class I DSA, irrespective of a negative prospective T-and B-cell crossmatch predicted for a poor outcome (Odds ratio for BOS/death 4.6, p = 0.03). Pre-transplant DSA was not associated with the subsequent development of either acute cellular or antibody-mediated rejection. Only two patients developed clinically significant antibody-mediated rejection. Both developed DSA following transplant having not been present pre-transplant. Conclusion(s): Identifying DSA pre-transplant predicts poor outcomes posttransplant and provides prognostic information beyond that which has been historically provided by a negative prospective crossmatch. Future studies need to focus on defining the level of pre-transplant DSA as measured using solid phase assays that predict for adverse outcomes following lung transplantation.

Westerink, J., et al. (2014). "An oral mixed fat load is followed by a modest anti-inflammatory adipocytokine response in overweight patients with metabolic syndrome." Lipids **49**(3): 247-254.

We investigated the postprandial changes in plasma levels of adipocytokines in overweight patients with metabolic syndrome after an oral fat load. After an oral fat load and during a prolonged fast, blood was drawn at 0, 2, 3, 4 and 8 h for measurement of adiponectin, adipsin, cathepsin S, chemerin, hepatic growth factor, interferon-gamma-inducible protein-10, leptin, macrophage chemoattractant protein-1, macrophage migration inhibitory factor, nerve growth factor, retinol binding protein-4, resistin, serum amyloid A1, tissue inhibitor of metalloproteinase-1 and thrombopoietin using a microbead-based Luminex assay. Area under the curves (AUC) were calculated and compared. Plasma adiponectin levels were higher after an oral fat load compared to fasting at t = 2 h (950 +/- 513 vs. -1,881 +/- 713 ng/ml) while the plasma levels for adipsin (-9 +/- 5 vs. 16 +/- 5 ng/ml), chemerin (-122 +/- 35 vs. 13 +/- 21 ng/ml), SAA-1 (-391 +/- 213 vs. 522 +/- 173 ng/ml) and TPO (-335 +/- 144 vs. 622 +/- 216 ng/ml) were lower after an oral fat load compared to fasting. The baseline corrected AUC for IP-10 was higher after fat load compared to fasting (median -116 pg h/ml; IQR -270 to 10 vs. -21 pg h/ml; IQR -136 to 418 (p = 0.047). In conclusion, in overweight male subjects with the metabolic syndrome, an oral fat load is accompanied with a modest anti-inflammatory response of adipose tissue-derived adipocytokines.

Weston, M. C., et al. (2012). "Maximizing flow velocities in redox-magnetohydrodynamic microfluidics using the transient faradaic current." Analytical Chemistry **84**(21): 9402-9409.

There is a need for a microfluidic pumping technique that is simple to fabricate, yet robust, compatible with a variety of solvents, and which has easily controlled fluid flow.

Redox-magnetohydrodynamics (MHD) offers these advantages. However, the presence of high concentrations of redox species, important for inducing sufficient convection at low magnetic fields for hand-held devices, can limit the use of redox-MHD pumping for analytical applications. A new method for redox-MHD pumping is investigated that takes advantage of the large amplitude of the transient portion of the faradaic current response that occurs upon stepping the potential sufficiently past the standard electrode potential, Edegree, of the pumping redox species at an electrode. This approach increases the velocity of the fluid for a given redox concentration. An electronic switch was implemented between the potentiostat and electrochemical cell to alternately turn on and off different electrodes along the length of the flow path to maximize this transient electronic current and, as a result, the flow speed. Velocities were determined by tracking microbeads in a solution containing electroactive potassium ferrocyanide and potassium ferricyanide, and supporting electrolyte, potassium chloride, in the presence of a magnetic field. Fluid velocities with slight pulsation were obtained with the switch that were 70% faster than the smooth velocities without the switch. This indicates that redox species concentrations can be lowered by a similar amount to achieve a given speed, thereby diminishing interference of the redox species with detection of the analyte in applications of redox-MHD microfluidics for chemical analysis.

Wey, M. Y., et al. (1998). "Operating parameters of autothermal pyrolosis of plastic waste in a fluidized bed." Waste Management and Research **16**(1): 72-82.

In this study, polyethylene was pyrolysed in the fluidized-bed pyrolysis system in a limited oxygen supply. Thus, the heat to pyrolyse the polyethylene was made available by partial incineration of the polyethylene, which can be referred to as autothermal pyrolysis. The fluidized bed was selected as the reactor owing to its high capacity, homogeneity and low tar content. Experimental parameters evaluated included the effect of: (1) the pyrolysis temperatures; (2) the air factors; and (3) the catalyst on the liquid hydrocarbon (gasoline, diesel, fuel oil, residual) formation, and B.T.X. (benzene, toluene, xylene) concentration in gasoline. Moreover, the primary composition in gasoline was analyzed. The results indicated that it is practical to recover oil from plastic waste using the autothermal pyrolysis system.

Wey, M.-Y., et al. (1996). "A study of the autothermal pyrolysis of polyethylene wastes." Journal of the Chinese Institute of Environmental Engineering **6**(4): 349-357.

In this study, plastic waste (HDPE) was pyrolyzed in the fluidized-bed pyrolysis system with a limited oxygen supply. The heat for pyrolysis of mixed wastes was offered by the incineration of partial wastes. Experimental parameters included pyrolysis temperature (For both the main and secondary combustion chambers) and air factor. The effects of pyrolysis temperature and air factor on the production of liquid hydrocarbon (Gasoline, diesel, fuel oil, residue) and gas products were discussed. The B. T. X. concentrations and the H/C ratio in gasoline from the obtained liquid hydrocarbon were also discussed. The results indicated that the operating temperature (The dense bed and the freeboard) was significantly related to the air factor. The introduction of secondary air successfully promoted the secondary reaction. Higher operating temperatures enhanced the formation of lower boiling point oils (Gasoline, diesel). However, lower temperatures had the tendency to form higher molecular-weight hydrocarbons (i.e. fuel oils or heavy oils).

Wey, M.-Y., et al. (1998). "Operating parameters of autothermal pyrolysis of plastic waste in a fluidized bed." WASTE MANAGE. RES. **16**(1): 72-82.

In this study, polyethylene was pyrolyzed in the fluidized-bed pyrolysis system in a limited oxygen supply. Thus, the heat to pyrolyze the polyethylene was made available by partial incineration of the polyethylene, which can be referred to as autothermal pyrolysis. The fluidized bed was selected as the reactor owing to its high capacity, homogeneity and low tar content. Experimental parameters evaluated included the effect of: (1) the pyrolysis temperatures; (2) the air factors; and (3) the catalyst on the liquid hydrocarbon (gasoline, diesel, fuel oil, residual) formation, and B.T.X. (benzene, toluene, xylene) concentration in gasoline. Moreover, the primary composition in gasoline was analyzed. The results indicated that it is practical to recover oil from plastic waste using the autothermal pyrolysis system.

Wezel, A. v., et al. (2016). "Release of primary microplastics from consumer products to wastewater in the Netherlands. (Special Section: Plastic debris in the aquatic environment - mechanisms and implications.)." Environmental Toxicology and Chemistry **35**(7): 1627-1631.

The authors estimate the release of primary microplastics from consumer products - cosmetics and personal care products, cleaning agents, and paint and coatings - via sewage effluent as an expected relevant route to the marine environment. Total estimated concentrations in the 3 scenarios are 0.2 micro g/L, 2.7 micro g/L, and 66 micro g/L in sewage-treatment plant (STP) effluent, respectively. All product categories relevantly contribute. Predicted concentrations are compared with reported actual concentrations in STP effluents.

Whipple, S. D. (2015). "Letter to the Editor regarding "Simultaneous determination of residues in pollen and high-fructose corn syrup from eight neonicotinoid insecticides by liquid chromatography-tandem mass spectrometry"." Analytical and bioanalytical chemistry **407**(4): 1273.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis

Whitaker, D. R. and G. A. Strasdine (1963). "A multiple-column hydraulic method for fractionation of particles for chromatographic columns." Canadian Journal of Biochemistry **41**(5): 1105-1113.

An apparatus for fractionation of particles is described. Liquid at constant temperature is freed of air bubbles and circulated at constant flow rate through a series of vertical columns of progressively increasing diameters, a settling bottle, and a filter. The particles to be fractionated are either added gradually to the first column by passage of the return flow of liquid through a particle reservoir or are added at the outset to the first column. The flow of liquid distributes the particles between the columns according to particle size and density. Illustrative data are given for fractionation of a cross-linked dextran. a diatomaceous earth, a microbead ion-exchange resin, and a micropowder ion-exchange resin.

White, E. M., et al. (2018). "Ingested Micronizing Plastic Particle Compositions and Size Distributions within Stranded Post-Hatchling Sea Turtles." Environmental Science & Technology **52**(18): 10307.

From July 2015 to November 2016, 96 post-hatchling sea turtles were collected from 118 km of the Atlantic coastline in Florida, USA, including loggerhead, green, and hawksbill sea turtle species. Forty-five of the recovered turtles were rehabilitated and released, but the remaining 52 died and were frozen. At necropsy, the gastrointestinal tracts of most the turtles contained visible plastic, and collected particles of 27 individuals were chemically characterized by Raman microscopy as polyethylene, polypropylene, polyethylene terephthalate, and polystyrene. Mesoparticle plastic fragments 1.0–8.7 mm, microparticle fragments 20–1000 µm, and nanoparticles 5–169 nm were identified in the turtles. Polyethylene and polypropylene were the most common plastics ingested from specimens representing 54.1 and 23.7% of the total observed mesoparticles and 11.7 and 21.0% of the total observed microparticles, respectively. A plastic-to-body mass ratio of 2.07 mg/g was determined for this group. The authors suggest that ingestion of micronizing plastic by post-hatchling sea turtles is likely a substantial risk to survival of these endangered and threatened species. This study also provides some of the first evidence for the formation of nanoscopic plastic particles that we theorize forms in the post-hatchling and juvenile environment and are present post-ingestion.

Whitehouse, S. (2019). "We Can No Longer Ignore Our Oceans." Sea Technology **60**(1): 11-12.
Every day now, it seems we see news headlines spelling out the end of the oceans as we know them. Whether from pollution, warming, acidification, deoxygenation or other troubling consequences of climate change and overuse, the warnings from our oceans are dire. However, their fate is not yet sealed. There is hope. There are steps we can and must take to save our seas. One of our longstanding priorities has been combating the growing marine debris crisis. Each year, nearly 8 million metric tons of plastics enter the oceans from land. Once in the ocean, this plastic breaks down under the sun and waves into tiny particles that can enter the marine food web. Recent research has found these microplastics in a wide range of food and beverages that humans ingest, from seafood to bottled water to table salt.

Whyte, C. (2019). "Banned toxins still threaten dolphins." New Scientist **241**(3213): 8-8.
The article discusses research which indicates that the industrial toxins known as polychlorinated biphenyls (PCBs), which were banned more than 30 years ago, are still threatening dolphins in the Gulf of Trieste region as of 2017, and it mentions how the use of PCBs in the Mediterranean Sea area is impacting bottlenose dolphins. Plastic pollution and PCB contamination in ringed seals are addressed, along with the relationship between water-based shipping and dolphin populations.

Whyte, M., et al. (2010). "Systemic biomarker profiling of metabolic and dysplastic skeletal diseases using multiplex serum protein analyses." Journal of Bone and Mineral Research **1)**: S137.
Understanding the etiology and pathogenesis of dysplastic and metabolic bone diseases has come from both genetic and biochemical investigation. Here, we describe our approach to systemic biomarker profiling using multiplex serum protein analyses to study age- and disease-mediated changes in healthy controls and patients as well as family members with these disorders. The Research Center at Shriners Hospital for Children, St. Louis, Missouri, serves as a national referral center for inpatient diagnosis, treatment, and investigation of pediatric dysplastic, nutritional, and metabolic bone disorders where collection of fasting blood is routine. At Amgen (Thousand Oaks, California), Luminex-based, micro-bead, multiplex kits are used for osteopontin, osteocalcin, ligand of receptor activator NF-kB (RANKL), osteoprotegerin (OPG), fibroblast growth factor 23 (FGF23), matrix metalloproteinases (MMP 1, 3, 7, 8, and 13), and cytokine quantitation. ELISA kits are used for prostaglandin E2 (PGE2), bone-specific alkaline phosphatase (BAP), tartrate-resistant acid phosphatase (TRACP 5B), and collagen formation/degradation markers. Serum levels of sclerostin (SOST) and dickkopf (DKK1) were evaluated by custom ELISAs (developed at Amgen, Inc). All sera were obtained after donors fasted at least 4 hours. To establish reference ranges, we studied 9 healthy children and 18 healthy adults (ages 6-60 yrs). MMPs (1, 3, 7, 8, and 13) correlated positively with age (R² 0.26 - 0.64, p<0.05), whereas osteocalcin, BAP, c-terminal propeptide of collagen type I (CICP), and TRACP 5B correlated negatively (R² 0.23 - 0.71, p<0.05). The patients represented 30 established and 14 unique diagnoses. Affected family members (dominant disorders) and obligate carriers (recessive disorders) were also studied, reflecting a

total of 110 individuals. Our analyses revealed that serum concentrations of FGF23 were significantly increased in x-linked hypophosphatemia (XLH), TRACP 5B in osteopetrosis, and RANKL in juvenile Paget's disease, whereas decreases in BAP were documented for hypophosphatasia, validating our array strategy. Hence, our multiplex serum protein analyses could reveal unique markers for specific bone disorders, and enhance understanding for a wide range of skeletal diseases.

Wichai-utcha, N. and O. Chavalparit (2019). "3Rs Policy and plastic waste management in Thailand." The Journal of Material Cycles and Waste Management **21**(1): 10.

Plastic has become an important and integral part of society throughout the world due to its various applications, such as packaging, agriculture, automobile parts, electronic applications and medical devices. The plastic fabrication process can be modified to form various shapes, colors and specifications according to customer needs. Consequently, the amount of plastic waste is increasing due to the increase in plastic consumption because of the increasing population. Moreover, the problem of marine plastic debris is on the rise globally, including in Thailand, which results from the irresponsibility of mankind. Generally, plastic waste in Thailand can be generated from industrial processes and households. These two waste sources have caused the rise in plastic waste, which has contributed to the problem of waste management in Thailand. Additionally, Thailand is one of the contributors to the leakage of plastic waste into the ocean, which results from inefficient waste management. To reduce the impacts of plastic waste, effective measures have to be applied, such as reducing, reusing and recycling (3Rs) or energy recovery from plastic wastes. To ensure the proper management of solid waste, Thailand has established the National 3R Strategy and the National Master Plan for Waste Management (2016–2021). Furthermore, Thailand also launched a “Plastic Debris Management Plan 2017–2021”, which comprises several approaches, such as promotion and introduction of eco-packaging design and eco-friendly plastic substitution, development of the material flow for plastic containers and packaging inventory, implementation of the 3Rs (reduce–reuse–recycle) strategy for plastic debris management, and the promotion of education for relevant stakeholders in the field of plastics and its alternative materials. In addition, the options to create more effective plastic waste management are to implement legislation or revise the laws to improve the efficiency and reduce the amount of plastic waste, such as imposing plastic bag fees, strengthening the 3Rs measures, and encouraging the implementation of a circular economy in plastic value chains.

Wieczorek, A. M., et al. (2019). "Microplastic Ingestion by Gelatinous Zooplankton May Lower Efficiency of the Biological Pump." Environmental Science and Technology **53**(9): 5387-5395.

The impacts of microplastics on some individual organisms have been well studied but what is less clear is what impacts microplastics have on wider ecosystem processes. Using salps as model organisms, we studied the effect of microplastic ingestion on the downward flux of high-density particulate organic matter in the form of salp faecal pellets. While to date most microplastic studies used virgin microplastics at unrealistic environmental concentrations here we exposed Salpa fusiformis to fractured and UV exposed polyethylene and polystyrene microplastics possessing a biofilm. It was found that when exposed to environmentally relevant concentrations, reported for the Mediterranean and the South Pacific Gyre, only few faecal pellets had microplastics incorporated within them. Under potential future scenarios, however, up to 46% of faecal pellets contained microplastics. Incorporated microplastics significantly altered the size, density and sinking rates of salp faecal pellets (p-value < 0.05 in each instance). Sinking rates decreased by 1.35-fold (95% CI = 1.18, 1.56) for faecal pellets with polyethylene microplastics and 1.47-fold (95% CI = 1.34, 1.61) for polystyrene. These results suggest that today, microplastic ingestion by salps has minimal impact on the biological pump. However, under future microplastic concentrations (or in areas such as convergent zones), microplastics may have the potential to lower the efficiency of the biological pump. Copyright © 2019 American Chemical Society.

Wierckx, N., et al. (2015). "Plastic waste as a novel substrate for industrial biotechnology." Microbial Biotechnology **8**(6): 900-903.

Wierckx, N., et al. (2015). "Plastic waste as substrate for biotechnology." Microbial Biotechnology **8**(6): 900-903.

[...]polyethylene (the most used plastic, ca. 140 million tons per year), is considered to be practically inert and its recycling (other than its downcycling into lumber) is economically unfavourable (Sivan,), thereby creating a phenomenal environmental impact, especially in marine environments (Cozar et al., 2014; 2015). [...]this genus includes some of the most efficient PU degraders known, enabling growth rates on polymeric substrates that rival the rates on many conventional substrates (Howard and Blake,). [...]given the relatively simple and defined composition of plastics compared with biomass, as well as their extreme abundance, it is surprising that this resource has thus far gone mostly unnoticed as a biotechnology feedstock. When successful, plastic-upcycling through biotechnology will increase resource efficiency through the valorization of high-volume waste streams, while also helping to reduce the burden on terrestrial resources that are needed to supply food to the world's human population. [...]through microbial biotechnology, the hereto proposed plastic waste to plastic value workflow will enable new value chains across sectors including materials, chemicals and environmental technologies within the framework of a sustainable knowledge-based bio-economy, with tangible benefits to the environment and society.

Wiewel, B. V. and M. Lamoree (2016). "Geotextile composition, application and ecotoxicology-A review." Journal of Hazardous Materials **317**: 640-655.

Geosynthetics is the umbrella term for thin, flexible material sheets applied in civil and environmental engineering, of which geotextiles form the largest group. Most geotextiles consist of a polymer from the polyolefin, polyester or polyamide family, and additives to improve their stability. The polymer may degrade into microplastic particles over time and under various conditions and can cause adverse effects, as species may ingest these particles or encounter adverse effects due to the interference of the particles with e.g. their photosynthesis system in the case of algae. Leaching of additives may occur from the intact material, as they are often not covalently bound to the polymer backbone, but is greatly enhanced when micro-sized plastic particles have been formed. A total of 42 polymer additives were identified, of which 26 had ecotoxicity information available in terms of a REACH persistence, toxicity and bioaccumulation (PBT) assessment. Of these, 15 were classified as (very) persistent and 2 as toxic. A survey to assess potential toxicity of the remaining 16 substances revealed that no ecotoxicity studies had been performed on 13 of these compounds. For 3 compounds, other toxicity data was found, as well as of several chemical groups known to be used as additives in geotextiles. The current knowledge is thus lacking in two domains: on the one hand, ecotoxicity data is scarce as many substances have not yet been the subject of ecotoxicological studies. On the other hand, in situ toxic effects might be missed by the current approach of single compound toxicity testing. Moreover, environmental occurrence data of the additives are extremely scarce. Copyright © 2016 Elsevier B.V.

Wiggin, K. J. and E. B. Holland (2019). "Validation and application of cost and time effective methods for the detection of 3-500mum sized microplastics in the urban marine and estuarine environments surrounding Long Beach, California." Marine Pollution Bulletin **143**: 152-162.

Microplastics (MP) are detected in aquatic environments worldwide, yet detection is often limited to larger sized MP. To address this data gap, the abundance of MP 3-500mum was assessed in the Los Angeles River, the San Gabriel River, and the Long Beach Harbor (CA, USA), three areas with highly urbanized surroundings. Whole surface water samples were taken, subjected to a hydrogen peroxide digestion and MP counts were compared between unstained visual examination and Nile Red staining identification techniques. The largest concentration of MP was found in the Los Angeles River, where 13,622 MP m⁻³ were found using unstained visual examination and 641,292 MP m⁻³ were found utilizing Nile Red staining. The protocol used to detect smaller sized MP is low cost, time efficient, and reproducible. This work highlights the need for more extensive sampling of smaller sized MP globally and universal testing and reporting standards for MP detection.

Wijesekara, H., et al. (2018). "Trace element dynamics of biosolids-derived microbeads." Chemosphere **199**: 331-339.

This study focused on quantifying and characterising microbeads in biosolids (i.e., treated sewage sludge), and in examining interactions of microbeads with trace elements when biosolids are added to soil. Under laboratory conditions, batch experiments were conducted to investigate the adsorption of Cu onto pure and surface modified microbeads suspended in soil. The ecotoxicity of microbead-metal complexes to soil microbial activities was also investigated by monitoring basal respiration and dehydrogenase activity. Concentrations of the microbeads were 352, 146, 324, and 174 particles kg⁻¹ biosolids for <=50, 50-100, 100-250, 250-1000mum size fractions, respectively. The Scanning Electron Microscope (SEM) images illustrated wrinkled and fractured surfaces due to degradation. The adsorption of dissolved organic matter onto microbeads was confirmed through FT-IR microscopy, while using Inductively Coupled Plasma Mass Spectrometer (ICP-MS) the presence of trace metals including Cd (2.34ngg⁻¹), Cu (180.64ngg⁻¹), Ni (12.69ngg⁻¹), Pb (1.17ngg⁻¹), Sb (14.43ngg⁻¹), and Zn (178.03ngg⁻¹) was revealed. Surface modified microbeads were capable of adsorbing Cu compared to the pure microbeads, which may be attributed to the complexation of Cu with dissolved organic matter associated with the microbeads in the matrix. It was further revealed that the biosolids derived microbead-metal complexes decreased soil respiration (up to~26%) and dehydrogenase activity (up to~39%). Hence, microbeads reaching biosolids during wastewater treatment are likely to serve as a vector for trace element contamination, transportation, and toxicity when biosolids are applied to soil.

Wilcox, C., et al. (2020). "Abundance of Floating Plastic Particles Is Increasing in the Western North Atlantic Ocean." Environmental Science & Technology **08**: 08.

Since the start of commercial plastics production in the 1940s, global production has rapidly accelerated, doubling approximately every 11 years. Despite this increase and clear evidence of plastics loss into the oceans, including a substantial standing stock, previous research has not detected a temporal trend in plastic particle concentration in the surface ocean. Using a generalized additive statistical model, we examined the longest data set on floating plastic debris available globally, collected using plankton nets in the western North Atlantic from 1986 to 2015. There was a significant increasing temporal trend in plastic particle concentration that tracked cumulative global plastics production. We estimated an increase of 506,000 tons of floating plastic in the ocean in 2010 alone or 0.2% of global production. Our results suggest that, while loss of plastic particles from the surface ocean undoubtedly occurs, the input exceeds the collective losses.

Wilcox, C., et al. (2016). "Using expert elicitation to estimate the impacts of plastic pollution on marine wildlife." Marine Policy **65**: 107-114.

Marine litter is a growing environmental concern. With the rapid increase in global plastics production and the resulting large volume of litter that enters the marine environment, determining the consequences of this debris on marine fauna and ocean health has now become a critical environmental priority, particularly for threatened and endangered species. However, there are limited data about the impacts of debris on marine species from which to draw conclusions about the population consequences of anthropogenic debris. To address this knowledge gap, information was elicited from experts on the ecological threat (both severity and specificity) of entanglement, ingestion and chemical contamination for three major marine taxa: seabirds, sea turtles and marine mammals. The threat assessment focused on the most common types of litter that are found along the world's coastlines, based on data gathered during three decades of international coastal clean-up efforts. Fishing related gear, balloons and plastic bags were estimated to pose the greatest entanglement risk to marine fauna. In contrast, experts identified a broader suite of items of concern for ingestion, with plastic bags and plastic utensils ranked as the greatest threats. Entanglement and ingestion affected a similar range of taxa, although entanglement was rated as slightly worse because it is more likely to be lethal. Contamination was scored the lowest in terms of impact, affecting a smaller portion of the taxa and being rated as having solely non-lethal impacts. This work points towards a number of opportunities both for policy-based and consumer-driven changes in plastics use that could have demonstrable affects for a range of ecologically important taxa that serve as indicators of marine ecosystem health.

Wilcox, C., et al. (2015). "Threat of plastic pollution to seabirds is global, pervasive, and increasing." Proceedings of the National Academy of Sciences of the United States of America **112**(38): 11899-11904.

Plastic pollution in the ocean is a global concern; concentrations reach 580,000 pieces per km² and production is increasing exponentially. Although a large number of empirical studies provide emerging evidence of impacts to wildlife, there has been little systematic assessment of risk. We performed a spatial risk analysis using predicted debris distributions and ranges for 186 seabird species to model debris exposure. We adjusted the model using published data on plastic ingestion by seabirds. Eighty of 135 (59%) species with studies reported in the literature between 1962 and 2012 had ingested plastic, and, within those studies, on average 29% of individuals had plastic in their gut. Standardizing the data for time and species, we estimate the ingestion rate would reach 90% of individuals if these studies were conducted today. Using these results from the literature, we tuned our risk model and were able to capture 71% of the variation in plastic ingestion based on a model including exposure, time, study method, and body size. We used this tuned model to predict risk across seabird species at the global scale. The highest area of expected impact occurs at the Southern Ocean boundary in the Tasman Sea between Australia and New Zealand, which contrasts with previous work identifying this area as having low anthropogenic pressures and concentrations of marine debris. We predict that plastics ingestion is increasing in seabirds, that it will reach 99% of all species by 2050, and that effective waste management can reduce this threat.

Wildemann, M., et al. (2013). "Fossil fuel derived particulate matter (PM10) induces maturation and aryl hydrocarbon receptor (AhR) signalling in human dendritic cells." Immunology **1)**: 33.

Background and Aims: Inhalation of fossil fuel derived air pollution particles (PM10) is linked with respiratory and systemic inflammatory diseases including asthma. Causative mechanisms are unknown but may relate to immunological effects of the complex mixture of biologically active materials, including endotoxins and aromatic hydrocarbons, associated with PM10. Respiratory dendritic cells (DCs) sample and shape responses to inhaled antigen and particulate matter is present within antigen presenting cells in the airway of individuals exposed to pollution. We therefore hypothesize that exposure of DCs to the complex signals in fossil fuel PM10 enhances their ability to induce inflammatory responses. To begin to test this concept we have examined the effects of PM10 from an urban UK environment on DC activation. Method(s): Monocytes were separated from healthy volunteer peripheral blood mononuclear cells by positive selection with anti-CD14 microbeads and differentiated into DCs in the presence of GM-CSF and IL-4. Cells were exposed for 48 h to: (i) PM10; (ii) baked carbon black (CB) as a particulate control; (iii) E. coli lipopolysaccharide (LPS) as a positive control for DC activation; (iv) FICZ, an agonist of the aryl hydrocarbon receptor (AhR); or (v) medium alone, in the presence or absence of the AhR antagonist CH223191. DC activation markers were measured by flow cytometry, gene expression by qRT-PCR and stimulatory capacity in a mixed leukocyte reaction using naive CD4 T cells. Result(s): PM10, but not CB, induced DC maturation as indicated by dose-dependent upregulation of HLA-DR, CD40, CD86 and CCR7. DC activation by PM10 at 25 mug/ml was broadly equivalent to that induced by 0.01 mug/ml LPS although there was a non-significant trend toward more induction of CCR7 by PM10. In accordance with their mature phenotype, DCs treated with PM10 were more stimulatory for naive T cells at low DC concentrations. Irrespective of stimulation, DCs expressed similar levels of AhR. However, PM10, but not LPS or CB, induced expression of the AhR-regulated gene CYP1A1 although this expression was less than that induced by the classical AhR agonist FICZ. PM10 also induced CYP1B1 and indoleamine 2,3 dioxygenase 1 (ID01) expression and induction of all these AhR regulated genes was inhibited with CH223191, confirming dependence upon AhR signalling. Conclusion(s): Fossil fuel derived PM10 particles induce a complex programme of DC activation that includes both induction of classical maturation and AhR signalling. How these pathways interact to influence DC function and immune regulation in the human airway is under investigation.

Wilflingseder, P. (1977). "[Augmentation mammoplasty (author's transl)]." Langenbecks Archiv fur Chirurgie **345**: 163-172.

Three distinct methods have proved practicable: The dermafat-transposition (DeCholnoky), the skin flap procedures, and the retromammary implants. The motivation of the patient must be carefully balanced against various complications. Frequently a constrictive fibrosis impairs the primary pleasant shape, position, and consistency of the breasts soon or many years after implantation of soft polydimethylsiloxane material, due to phagocytosis and decomposition of plastic particles. Capsulotomy, capsulectomy, or squeezing of the implants can regain approximately the original good appearance, but does not solve the problem of continuous foreign body reaction. The malignancy risks require close follow-up examinations.

Wilkens, J. L., et al. (2020). "Initial Survey of Microplastics in Bottom Sediments from United States Waterways." Bulletin of Environmental Contamination & Toxicology **104**(1): 15-20.

Given the reported extent of microplastics in the aquatic environment, environmentally relevant exposure information for sediments dredged by the US Army Corps of Engineers will lend context to the risks posed by this contaminant during dredging. We measured the occurrence, abundance, and polymer composition of microplastics in sediments collected from nine dredged waterways and two non-dredged reference areas. The number of particles in sediment samples ranged from 162 to 6110 particles/kg dry wt., with a mean of 1636 particles/kg dry wt. Fragments were the most prevalent shape observed among the 11 study sites (100% frequency of occurrence), followed by fibers (81%), spheres (75%), foams (38%) and films (34%). Based on analyses of chemical composition of the particles using Fourier transform infrared spectroscopy, polyethylene:propylene was the most common polymer type observed. Consistent with results presented by other investigators, microplastic concentrations and polymer types in bottom sediments in this study were also aligned with the most widely used plastics worldwide.

Wilkinson, J., et al. (2017). "Occurrence, fate and transformation of emerging contaminants in water: An overarching review of the field." Environmental Pollution **Part 1. 231**: 954-970.

Many of the products and drugs used commonly contain chemical components which may persist through sewage treatment works (STW) and eventually enter the aquatic environment as parent compounds, metabolites, or transformation products. Pharmaceuticals and personal care products (PPCPs) and other emerging contaminants (ECs) have been detected in waters (typically ng/L) as well as more recently bound to sediment and plastic particles (typically ng/g). Despite significant advancement of knowledge since the late 1990s, the fate of these contaminants/transformation products once introduced into the aquatic environment remains relatively unresolved. This review provides a unique focus on the fate of seven major groups of PPCPs/ECs in the aquatic environment, which is frequently not found in similar works which are often compound or topic-specific and limited in background knowledge. Key findings include: a) some replacements for regulation precluded/banned chemicals may be similarly persistent in the environment as those they replace, b) the adsorption of potentially bioactive chemicals to micro- and nanoplastics is a significant topic with risks to aquatic organisms potentially greater than previously thought, and c) micro-/nanoplastics are likely to remain of significant concern for centuries after regulatory limitations on their use become active due to the slow degradation of macro-plastics into smaller components. An interdisciplinary perspective on recent advances in the field is presented here in a unique way which highlights both the principle science and direction of research needed to elucidate the fate and transport patterns of aquatic PPCPs/ECs. Unlike similar reviews, which are often topic-specific, here we aim to present an overarching review of the field with focus on the occurrence, transformation and fate of emerging contaminants. Environmental presence of seven major classes of contaminants (analygesics, antibiotics, antineoplastics, beta-blockers, perfluorinated compounds, personal care products and plasticisers), factors affecting contaminant fate, association with plastic micro-/nanoparticles and photochemical transformation are comprehensively evaluated. Copyright © 2017 Elsevier Ltd

Willems, S. B. J., et al. (2019). "On-Flow Immobilization of Polystyrene Microspheres on beta-Cyclodextrin-Patterned Silica Surfaces through Supramolecular Host-Guest Interactions." Acs Applied Materials & Interfaces **11**(39): 36221-36231.

Species-specific isolation of microsized entities such as microplastics and resistant bacteria from waste streams is becoming a growing environmental challenge. By studying the on-flow immobilization of micron-sized polystyrene particles onto functionalized silica surfaces, we ascertain if supramolecular host-guest chemistry in aqueous solutions can provide an alternative technology for water purification. Polystyrene particles were modified with different degrees of adamantane (guest) molecules, and silica surfaces were patterned with beta-cyclodextrin (beta-CD, host) through microcontact printing (muCP). The latter was exposed to solutions of these particles flowing at different speeds, allowing us to study the effect of flow rate and multivalency on particle binding to the surface. The obtained binding profile was correlated with Comsol simulations. We also observed that particle binding is directly aligned with particle's ability to form host-guest interactions with the beta-CD-patterned surface, as particle binding to the functionalized glass surface increased with higher adamantane load on the polystyrene particle surface. Because of the noncovalent character of these interactions, immobilization is reversible and modified beta-CD surfaces can be recycled, which provides a positive outlook for their incorporation in water purification systems.

Williams, A. (2018). "Centerpiece: Region moves to rein in single-use plastic." EcoAmericas **20**(12): 6.

Early last year the United Nations came as close as a peacekeeping organization can to declaring war. The enemy: ocean plastic. It is past time that we tackle the plastic problem that blights our oceans, Erik Solheim, head of UN Environment, the UN's environmental-protection arm, said at the Feb 23, 2017 launch of the initiative, called the Clean Seas Campaign. Plastic pollution is surfing onto Indonesian beaches, settling onto the ocean floor at the North Pole and rising through the food chain onto our dinner tables. We've stood by too long as the problem has gotten worse. It must stop. As Solheim acknowledged, the campaign was late in coming. Since the early 2000s, countries, nongovernmental organizations and international environmental bodies have called for action to reduce the relentless global production, use and improper disposal-often in waterways leading to the sea-of plastic. The UN estimates that in all, some 13 million tons of plastic enter the world's oceans each year.

Williams, C. (2018). "Early glimpses of waste strategy." Materials Recycling World **208**(10): 18-18.

Williams, J. L., et al. (2008). "Lairage during transport of eighteen-kilogram pigs has an impact on innate immunity and commensal bacteria diversity in the intestines." Journal of Animal Science **86**(5): 1232-1244.

Long distance transportation may affect the health of pigs; thus, adding a rest stop (lairage) during long journeys may improve their well-being. The objective of this study was to determine whether a mid-journey lairage influenced swine innate immunity and intestinal microbial populations after a 16-h transport. Four replications were conducted, 1 in each of 4 seasons. Eighteen-kilogram pigs were housed in 16 pens (13 to 16 pigs/pen) with 8 pens/treatment. Lairage pigs were transported for 8 h, given a rest with food and water for 8 h, then transported for an additional 8 h. Continuous pigs were continuously transported for 16 h. Jugular blood samples and intestinal tissue and contents were collected from 16 pigs (8/treatment) on d 1, 3, 7, and 14 posttransport. Hematocrit and white blood cell counts were determined and neutrophil cell functions, including phagocytosis/oxidative burst and phagocytosis of latex beads and leukocyte phenotypic cell markers (CD14 and CD18), were analyzed using flow cytometry. Expression of toll-like receptors 2, 4, and 5; IL-8 (a cytokine that is a chemoattractant for neutrophils); CCL20 (a chemokine that is a chemoattractant for dendritic cells); and the antimicrobial peptide PR39 were determined from ileal and jejunal total RNA. Denaturing gradient gel electrophoresis was used to determine shifts in intestinal microbial populations. Total white blood cell and granulocyte counts in continuous pigs were greater ($P<0.01$) on d 1 than in lairage pigs. Phagocytosis of microbeads was greater in continuous ($P<0.05$) than in lairage pigs on d 7. Expression of IL-8 in jejunum was greater ($P<0.05$) for continuous than for lairage pigs on d 1. Expression of CCL20 in the ileum was greater ($P<0.05$) on d 14 for the continuous pigs. Expression of PR39 was greatest ($P<0.05$) in the jejunum of lairage pigs on d 3.

Lairage pigs had a greater ($P<0.05$) variation in microbial populations (lower similarity coefficient) in the jejunum contents on d 1 and 7, in the cecum contents and tissue on d 3, and in the jejunum contents and tissue on d 14. However, continuous pigs had greater ($P<0.05$) variation in the ileal tissues on d 14. This study indicates that adding a lairage to an extended transport alters immune functions, receptor, cytokine and chemokine expression, and gut microbiota compared with pigs transported for 16 h without lairage.

Williams, P. T. and E. Slaney (2007). "Analysis of products from the pyrolysis and liquefaction of single plastics and waste plastic mixtures." Resources, Conservation & Recycling **51**(4): 754-769.

Abstract: Waste plastics in the form of two examples of real world municipal solid waste plastics and a simulated mixture of municipal waste plastics were pyrolysed and liquefied under moderate temperature and pressure in a batch autoclave reactor. In addition, the five main polymers which constitute the majority of plastics occurring in European municipal solid waste comprising, polyethylene, polypropylene, polystyrene, polyethylene terephthalate and polyvinyl chloride were also reacted. The plastics were reacted under both a nitrogen (pyrolysis) and hydrogen pressure (liquefaction) and the yield and composition of products are reported. The hydrocarbon gases produced were mainly methane, ethane, propane and lower concentrations of alkene gases. A mainly oil product was produced with the mixed plastic waste with significant concentrations of aromatic compounds, including single ring aromatic compounds. The composition of the oils and gases suggested that there was significant interaction of the plastics when they were pyrolysed and liquefied as a mixture compared to the results expected from reactions of the single plastics. [Copyright &y& Elsevier]

Williams, S. M., et al. (2018). "Clinical-scale production of cGMP compliant CD3/CD19 cell-depleted NK cells in the evolution of NK cell immunotherapy at a single institution." Transfusion **58**(6): 1458-1467.

BACKGROUND: Allogeneic natural killer (NK) cell adoptive immunotherapy is a growing therapeutic option for patients. Clinical-scale production of NK cells using immunomagnetic selection complies with current good manufacturing practices (cGMPs) and allows for closed-system, automated purification. We report our experience with CD3/CD19 cell-depleted (CD3/CD19_{dep}) NK cell production and compare to previous methods of CD3 cell depletion and CD3 cell depletion/CD56 cell enrichment.

STUDY DESIGN AND METHODS: Nonmobilized mononuclear cells collected by apheresis were incubated with anti-CD3/anti-CD19 microbeads and depleted in an automated cell selection system (CliniMACS, Miltenyi). The NK cell-enriched products were incubated overnight in interleukin (IL)-2 or IL-15, washed, and resuspended prior to lot release testing and infusion.

RESULTS: Since 2010, 94 freshly infusible CD3/CD19_{dep} NK cell products were manufactured in support of eight clinical trials. Sixty-six products were incubated in IL-2 and 28 products in IL-15. Processing resulted in a mean NK cell recovery of 74% and viability of 95.8%; NK cells, T cells, B cells, and monocytes accounted for 47%, 0.2%, 0.08%, and 49% of the final products, respectively. Seven products required dose adjustments to meet lot release. The specification for purity changed throughout the evolution of manufacturing. IL-2 or IL-15 activation enhanced in vitro cytotoxicity compared to preactivated cells. There was no difference in final product composition or cytotoxicity between cytokine cohorts. CONCLUSION: Clinical-scale/cGMP production of NK cells using CD3/CD19 cell-depletion effectively minimized T-cell and B-cell contamination in a single manipulation without compromise to NK-cell recovery. Cytokine activation increased in vitro cytotoxicity compared to column-depleted, preactivated NK cells.

Williams, S. M., et al. (2016). "CD3/CD19-depleted natural killer cell production under good manufacturing practices." Transfusion **56 (Supplement 4)**: 49A.

Background/Case Studies: Allogeneic natural killer (NK) cell adoptive immunotherapy is a growing therapeutic option for patients with malignancy. Clinical-scale production of CD56#sup#+#/sup#CD3 NK cells using immunomagnetic microbead technology complies with good manufacturing practices (GMPs) and allows automated purification in a closed system. High level purification of NK cells using sequential CD3 depletion/CD56 selection results in significant cell loss. We present the largest report of CD3/CD19 depleted NK cells manufactured under GMP conditions for human immunotherapy trials. Study Design/Methods: Mononuclear cells (MNCs) collected by a 15L apheresis from non-mobilized peripheral blood were incubated with anti-CD3 and anti-CD19 ferromagnetic beads and depleted in an automated magnetic column. The NK cell enriched fraction was incubated overnight at 37degreeC and 5% CO#inf#2#/inf# in X-VIVO 15 with 10% human AB serum and IL-2 1000 U/mL or IL-15 10 ng/mL. The cells were washed and resuspended in 5% human serum albumin with samples sent for lot release testing prior to infusion. A chromium release assay tested cytotoxicity. Results/Findings: Since 2010, 94 CD3/CD19 depleted NK cell products were manufactured in support of 8 clinical trials. Processing data is summarized in the Table. Seven products required dose adjustments to meet lot release, including 1 for total nucleated cell (TNC) count >8x10#sup#7#/sup#/kg and 6 for CD3#sup#+#/sup# count >3x10#sup#5#/sup#/ kg. The release specification for purity changed over time from 20% to 30% (CD56#sup#+#/sup#CD3) to a > 3-fold increase in NK cells (CD3/CD19 depleted products vs apheresis MNCs). Products met lot release for viability >70% (7-aminoactinomycin D), CD20#sup#+#/sup# <3%, gram stain 'no organisms seen', and endotoxin <5 EU/kg. Cytokine activation consistently increased cytotoxicity against the K562 cell line over preactivated cells. There was no difference between IL-2 (n=66) or IL-15 (n=28) incubated cells. Conclusion(s): CD3/ CD19 depletion effectively minimizes T cell and B cell contamination in a single manipulation that does not compromise NK cell recovery. Cytokine-activation with IL-2 or IL-15 increases in vitro cytotoxicity compared to preactivated NK cells.

Williams, T. G. J. L., et al. (2010). "A case study of the open-loop recycling of mixed plastic waste for use in a sports-field drainage system." Resources, Conservation and Recycling **55**(2): 118-128.

The management of plastic wastes is important owing to the high levels of embodied fossil fuel energy they contain. Although the environmental benefits of closed-loop recycling of plastics have been established through a number of life cycle studies, the benefits of open-loop recycling of plastics have not been examined for many substituted materials. This paper compares two equivalent sports-field drainage systems, one based on conventional sand and aggregate drainage materials, the other incorporating a novel drainage material produced from mixed plastics waste. The scope is confined to an analysis of primary energy consumption and global warming potential. It was found that the novel drainage system had lower global warming potential and primary energy consumption than the conventional system. These results were robust to sensitivity analyses of electricity mix and transportation distance to installation. © 2010 Elsevier B.V. All rights reserved.

Williamson, C. E., et al. (2019). "The interactive effects of stratospheric ozone depletion, UV radiation, and climate change on aquatic ecosystems." Photochemical & photobiological sciences : Official journal of the European Photochemistry Association and the European Society for Photobiology **18**(3): 717-746.

This assessment summarises the current state of knowledge on the interactive effects of ozone depletion and climate change on aquatic ecosystems, focusing on how these affect exposures to UV radiation in both inland and oceanic waters. The ways in which stratospheric ozone depletion is directly altering climate in the southern hemisphere and the consequent extensive effects on aquatic ecosystems are also addressed. The primary objective is to synthesise novel findings over the past four years in the context of the existing understanding of ecosystem response to UV radiation and the interactive effects of climate change. If it were not for the Montreal Protocol, stratospheric ozone depletion would have led to high levels of exposure to solar UV radiation with much stronger negative effects on all trophic levels in aquatic ecosystems than currently experienced in both inland and oceanic waters. This "world avoided" scenario that has curtailed ozone depletion, means that climate change and other environmental variables will play the primary role in regulating the exposure of aquatic organisms to solar UV radiation. Reductions in the thickness and duration of snow and ice cover are increasing the levels of exposure of aquatic organisms to UV radiation. Climate change was also expected to increase exposure by causing shallow mixed layers, but new data show deepening in some regions and shoaling in others. In contrast, climate-change related increases in heavy precipitation and melting of glaciers and permafrost are increasing the concentration and colour of UV-absorbing dissolved organic matter (DOM) and particulates. This is leading to the "browning" of many inland and coastal waters, with consequent loss of the valuable ecosystem service in which solar UV radiation disinfects surface waters of parasites and pathogens. Many organisms can reduce damage due to exposure to UV radiation through behavioural avoidance, photoprotection, and photoenzymatic repair, but meta-analyses continue to confirm negative effects of UV radiation across all trophic levels. Modeling studies estimating photoinhibition of primary production in parts of the Pacific Ocean have demonstrated that the UV radiation component of sunlight leads to a 20% decrease in estimates of primary productivity. Exposure to UV radiation can also lead to positive effects on some organisms by damaging less UV-tolerant predators, competitors, and pathogens. UV radiation also contributes to the formation of microplastic pollutants and interacts with artificial sunscreens and other pollutants with adverse effects on aquatic ecosystems. Exposure to UV-B radiation can decrease the toxicity of some pollutants such as methyl mercury (due to its role in demethylation) but increase the toxicity of other pollutants such as some pesticides and polycyclic aromatic hydrocarbons. Feeding on microplastics by zooplankton can lead to bioaccumulation in fish. Microplastics are found in up to 20% of fish marketed for human consumption, potentially threatening food security. Depletion of stratospheric ozone has altered climate in the southern hemisphere in ways that have increased oceanic productivity and consequently the growth, survival and reproduction of many sea birds and mammals. In contrast, warmer sea surface temperatures related to these climate shifts are also correlated with declines in both kelp beds in Tasmania and corals in Brazil. This assessment demonstrates that knowledge of the interactive effects of ozone depletion, UV radiation, and climate change factors on aquatic ecosystems has advanced considerably over the past four years and confirms the importance of considering synergies between environmental factors.

Williamson, J. B., et al. (2019). "C-H Functionalization of Commodity Polymers." Angewandte Chemie. International Ed. in English **58**(26): 8654-8668.

Synthetic manipulation of polymer substrates is one of the oldest and most reliable methods to increase the functional diversity of soft materials. Modifying the chemical structure of polymers that are already produced on a commodity scale leverages the current high-volume and low-cost production of commodity plastics for the discovery of modern materials. A myriad of polymer C-H functionalization methods have been developed which enable the modification of material properties on both a laboratory and industrial scale. More recently, driven by advances in C-H activation, photoredox catalysis, and radical chemistry, chemoselective approaches have emerged as a means to impart precise functionality onto commodity polymer substrates. This Review discusses the historical significance of and contemporary advances in the C-H functionalization of commodity polymers. The conceptual approach outlined herein presents exciting new directions for the field, including increasing the value of otherwise pervasive materials, uncovering entirely new material properties, and a viable path to upcycle post-consumer plastic waste.

Willitzki, A., et al. (2012). "New platform technology for comprehensive serological diagnostics of autoimmune diseases." Clinical & Developmental Immunology **2012**: 284740.

Antibody assessment is an essential part in the serological diagnosis of autoimmune diseases. However, different diagnostic strategies have been proposed for the work up of sera in particular from patients with systemic autoimmune rheumatic disease (SARD). In general, screening for SARD-associated antibodies by indirect immunofluorescence (IIF) is followed by confirmatory testing covering different assay techniques. Due to lacking automation, standardization, modern data management, and human bias in IIF screening, this two-stage approach has recently been challenged by multiplex techniques particularly in laboratories with high workload. However, detection of antinuclear antibodies by IIF is still recommended to be the gold standard method for antibody screening in sera from patients with suspected SARD. To address the limitations of IIF and to meet the demand for cost-efficient autoantibody screening, automated IIF methods employing novel pattern recognition algorithms for image analysis have been introduced recently. In this respect, the AKLIDES technology has been the first commercially available platform for automated interpretation of cell-based IIF testing and provides multiplexing by addressable microbead immunoassays for confirmatory testing. This paper gives an overview of recently published studies demonstrating the advantages of this new technology for SARD serology.

Wilson, C. (2019). "Reusable Food Wraps: These eco-friendly fabric food wraps are the bees knees, and you can choose any color or print you like when you make them yourself." Mother Earth News(295): 48-50.

The article offers step-by-step instructions for recycling fabric food wraps including copal and pine resin wraps, and beeswax wraps.

Wilson, D. H., et al. (2014). "Simoa HD-1: A fully automated digital immunoassay analyzer capable of single molecule counting, sub-femtomolar sensitivity, and multiplexing." Clinical Chemistry **1)**: S134.

Objective: The aim of this work was to develop the next generation immunoassay analyzer capable of several orders of magnitude greater sensitivity than current best-in-class conventional immunoassay systems. The technology utilizes single molecule array (Simoa) technology to usher in fully automated digital immunoassay and multiplexing capability to the clinical laboratory. Simoa technology isolates individual paramagnetic beads in arrays of femtoliter-sized wells and detects single enzyme-labeled proteins on these beads using sequential fluid flows in microfabricated polymer array assemblies for ultra-sensitive signal measurements. These array assemblies have been incorporated into a low cost disk consumable. The array approach for assay signal quantification allows for rapid digital data acquisition and high throughput, enabling development of a fully automated system for low-cost measurement of clinically relevant biomarkers with high precision and unprecedented sensitivity across a broad dynamic range. Method(s): Detection of single molecules using Simoa has been reported previously. In brief, proteins are captured on antibody-coated paramagnetic microbeads (2.7-mm diameter) and labeled with single enzymes, followed by partitioning single beads into arrays of femtoliter-sized wells and sealing the arrays in the presence of a fluorogenic substrate. We developed a low cost disk consumable that enables standard fluidics handling instrumentation to load and seal assay beads into the arrays using only fluidic flow. Beads with single enzyme label molecules are isolated in single wells in the presence of a substrate, and fluorescent product is allowed to build up within the 40 femtoliter confines of the wells. The fluorescence signal quickly concentrates in such a small volume, allowing detectable signal from a single enzyme label in only 30 seconds. Depending on the analyte concentration, hundreds to many thousands of single molecule signals are counted simultaneously using a fluorescence microscope optical system and image analysis software. Next we integrated this array and imaging module together with a standard fluidics-handling platform that performs sequential cuvette processing of paramagnetic bead-based ELISA reagents. The reagents employ antibody-coated capture beads, biotinylated detector antibodies, and streptavidin-betagalactosidase as the signal enzyme. A standard bead-based immunoassay is performed, and then the beads are transferred to the Simoa module for signal development and digital quantification. Result(s): Prototype single-plex digital immunoassays were developed for PSA, Troponin, IL-6, and Abeta42. A prototype cytokine 6-plex was also developed. LoD's ranged from 0.002 to 0.05 pg/mL. The LoQ of the PSA assay was estimated as 0.037 pg/mL. These sensitivities ranged to over 1000-fold greater than conventional immunoassay. Imprecision for the prototype assays was evaluated over 10 runs across five days in a CLSI format. CVs were generally less than 10%. Spike recovery and linearity met standard criteria for acceptability. The system throughput is 68 tests/ hour, and over 4 logs of dynamic range were demonstrated. The prototype 6-plex gave equivalent precision and sensitivity performance to single-plex versions of the same assay. Conclusion(s): The data indicate we have developed a next generation fully automated immunoassay analyzer capable of orders-of-magnitude greater sensitivity than conventional state-of-the-art immunoassay systems.

Wilson, E. (2019). "Editor's note." New Scientist **244**(3252): 3-3.

An introduction is presented which discusses various reports within the issue, including the science exhibit New Scientist Live 2019, the discovery of Homo naledi fossil at a South African cave by palaeoanthropologist Lee Berger, and the ingestion of microplastics by crabs in Thames river.

Windsor, F. M., et al. (2019). "A catchment-scale perspective of plastic pollution." Global Change Biology **25**(4): 1207-1221.

Plastic pollution is distributed across the globe, but compared with marine environments, there is only rudimentary understanding of the distribution and effects of plastics in other ecosystems. Here, we review the transport and effects of plastics across terrestrial, freshwater and marine environments. We focus on hydrological catchments as well-defined landscape units that provide an integrating scale at which plastic pollution can be investigated and managed. Diverse processes are responsible for the observed ubiquity of plastic pollution, but sources, fluxes and sinks in river catchments are poorly quantified. Early indications are that rivers are hotspots of plastic pollution, supporting some of the highest recorded concentrations. River systems are also likely pivotal conduits for plastic transport among the terrestrial, floodplain, riparian, benthic and transitional ecosystems with which they connect. Although ecological effects of micro- and nanoplastics might arise through a variety of physical and chemical mechanisms, consensus and understanding of their nature, severity and scale are restricted. Furthermore, while individual-level effects are often graphically represented in public media, knowledge of the extent and severity of the impacts of plastic at population, community and ecosystem levels is limited. Given the potential social, ecological and economic consequences, we call for more comprehensive investigations of plastic pollution in ecosystems to guide effective management action and risk assessment. This is reliant on (a) expanding research to quantify sources, sinks, fluxes and fates of plastics in catchments and transitional waters both independently as a major transport routes to marine ecosystems, (b) improving environmentally relevant dose–response relationships for different organisms and effect pathways, (c) scaling up from studies on individual organisms to populations and ecosystems, where individual effects are shown to cause harm and; (d) improving biomonitoring through developing ecologically relevant metrics based on contemporary plastic research. Most research into plastic pollution has focused on marine ecosystems, but these are only the endpoint for plastics of all forms that stem from terrestrial and freshwater environments, particularly rivers. Here, we review the occurrence and transfer of plastic pollution across multiple ecosystems, and advocate the investigation of plastic sources, fluxes and fates in hydrological catchments as well-defined landscape units that provide an integrating scale for understanding and managing ecological effects. [ABSTRACT FROM AUTHOR]

Windsor, F. M., et al. (2019). "Microplastic ingestion by riverine macroinvertebrates." Science of the Total Environment **646**: 68-74.

Although microplastics are a recognised pollutant in marine environments, less attention has been directed towards freshwater ecosystems despite their greater proximity to possible plastic sources. Here, we quantify the presence of microplastic particles (MPs) in river organisms upstream and downstream of five UK Wastewater Treatment Works (WwTWs). MPs were identified in approximately 50% of macroinvertebrate samples collected (Baetidae, Heptageniidae and Hydropsychidae) at concentrations up to 0.14 MP mg tissue⁻¹ and they occurred at all sites. MP abundance was associated with macroinvertebrate biomass and taxonomic family, but MPs occurred independently of feeding guild and biological traits such as habitat affinity and ecological niche. There was no increase in plastic ingestion downstream of WwTW discharges averaged across sites, but MP abundance in macroinvertebrates marginally increased where effluent discharges contributed more to total runoff and declined with increasing river discharge. The ubiquity of microplastics within macroinvertebrates in this case study reveals a potential risk from MPs entering riverine food webs through at least two pathways, involving detritivory and filter-feeding, and we recommend closer attention to freshwater ecosystems in future research. Copyright © 2018 The Authors

Winkler, A., et al. (2019). "Does mechanical stress cause microplastic release from plastic water

bottles?" Water Research **166**: 115082.

Plastic particle ingestion has become of concern as a possible threat to human health. Previous works have already explored the presence of microplastic (MP) in bottled drinking water as a source of MP intake. Here, we consider the release of MP particles from single-use PET mineral water bottles upon exposure to mechanical stress utilizing SEM plus EDS, which allows the implementation of morphological and elemental analysis of the plastic material surface and quantification of particle concentrations in sample water. The aim of this study was to better evaluate the sources of MP intake from plastic bottles, especially considering the effect of daily use on these bottles such as the abrasion of the plastic material. For that, we analysed MP release of PET bottlenecks and HDPE caps on their surfaces after a series of bottle openings/closings (1 x, 10 x, 100 x). Furthermore, we investigated, if the inner surface of the PET bottles released MPs, counted particle increase of the water and identified MPs in the PET bottled water after exposing the bottles to mechanical stress (squeezing treatment; none, 1min, 10min). The results showed a considerable increase of MP particle occurrence on the surface of PET and HDPE material (bottlenecks and caps) after opening and closing the bottles. After 100 times the effect was impressive, especially on caps. Moreover, great differences exist in cap abrasion between brands which uncovers a discrepancy in plastic behavior of brands. Interestingly, particle concentrations in the bottled mineral water did not significantly increase after exposure to mechanical stress (squeezing treatment). The morphological analysis of the inner wall surface of the bottles supported this observation, as no stress cracks could be detected after the treatment, implying that the bottles itself are not a consistent source of MP particles after this extent of mechanical stress. However, chances of MP ingestion by humans increase with frequent use of the same single-use plastic bottle, though only from the bottleneck-cap system.

Winkler, C. M., et al. (2019). "Visualization of hemodynamics: Fabrication of artificial erythrocytes with encapsulated pivparticles via membrane emulsion technology system." International Journal of Artificia Organs **42 (8)**: 437.

Objectives: Visualization of hemodynamics often represents a simplification of blood as a monophasic fluid. In this study, blood is used as a multiphase fluid. The aim is to fabricate artificial blood to visualize hemodynamics with Particle Image Velocimetry (PIV). More specific, micro beads (ArtErys), which mimic the erythrocytes, are fabricated with a membrane-emulsion-technology system (MET). This system is developed and compared with the results (e.g. ArtEry size) of three other methods: microfluidic, electro-spraying and air flow. Method(s): The ArtErys are made of hydrogels (Agarose 0.3-0.7 wt.%) to match refractive index and biomechanics. For PIV tracking, particles (Sphericalsc, 20 mum) are encapsulated directly into the ArtErys and are not added to the plasma where they might affect the hemodynamics. For the MET system, different oils (e.g. paraffin) are used as disperse phase. The Agarose/PIV mixture is pumped (50 to 100 ml/h) into a constant oil flow (5 to 40 ml/h) through a PTFE membrane (Reichelt Chemietchnik GmbH, pore size 60 mum). The ArtErys are created during this process and transported away by the oil. The MET process is carried out in a heated water bath with a temperature of 55 degreeC. Result(s): The ArtEry size depends mainly on two parameters: the flow rate of the agarose/PIV solution and the flow rate of the oil. A flow rate of 80 ml/h Agarose/PIV solution leads to smallest bead sizes with a mean diameter of 150 mum. High rates lead to merging of the ArtErys, which is reflected in a larger diameter. Furthermore, the bead size depends on the parameter oil flow rate. Here, a rate of 30 ml/h leads to the smallest beads. Discussion(s): The MET method has been successfully implemented to fabricate ArtErys with encapsulated PIV particles. Compared to the other methods, the MET system

fabricates the biggest ArtEry sizes (MET: 150 mum, microfluidic: 15 mum, electro-spraying: 80 mum, air flow: 100 mum).

Winkler, J., et al. (2012). "GMP-grade generation of B-lymphocytes for adoptive immunotherapy in patients after allogeneic stem cell transplantation." Blood. Conference: 54th Annual Meeting of the American Society of Hematology, ASH **120**(21).

Background and objectives: We have recently shown that memory B-lymphocytes from murine CMV immune donor animals adoptively transferred into immunodeficient mice were highly effective in protecting from a viral infection indicating a therapeutic potential of virus specific memory B-cells. These preclinical data provided evidence that a cell-based strategy supporting the humoral immune response might be effective in a clinical setting of post-HSCT immunodeficiency (Klenovsek et al., 2007, Blood 110: 3472-9). As adoptive transfer of B-cells has not been used before in a clinical setting, it is necessary to establish a technology for the generation of GMP-grade B-cell products. Method(s): Starting from the leukapheresis of healthy donors, B-cells were purified by two different separation strategies using GMP-grade microbeads and the CliniMACS^{wedge}TM device. A one-step protocol was used for positive enrichment of B-lymphocytes with anti-CD19 microbeads. In a two-step enrichment protocol, first T-lymphocytes were depleted by anti-CD3 microbeads and the remaining fraction was positively selected by anti-CD19 microbeads. Result(s): The leukapheresis contained a mean of 9.0x10^{wedge}8 CD19-positive B-cells (4.5-12.4 x10^{wedge}8). After the one-step positive purification strategy a mean purity of CD20^{wedge}+ B-lymphocytes of 78.1% with a recovery of 32-41% was obtained. With the two-step T-cell depletion/B-cell enrichment protocol we achieved a mean purity of 96.4 % (93.4-97.8%) with a slightly lower recovery of 14-37%. The absolute B-cell numbers obtained in the product were 1.3 to 4.0 x10^{wedge}8 and 1.7 to 2.6 x10^{wedge}8 for the one-step positive enrichment and the two-step protocol, respectively. Importantly, the absolute number of T-cells was lower in cell products after the two-step protocol (0.1 to 0.9 x10^{wedge}6 T-cells) as compared to the one-step positive CD19-enrichment (1.6 to 3.4 x10^{wedge}6 T-cells). Assuming a patient with 70 kg body weight, the B-cell products obtained after the combined CD3-depletion and CD19-enrichment contained less then 4x10^{wedge}4 T-lymphocytes/kg bodyweight, which is a critical threshold number of T-cells in haploidentical HSCT. The B-cell products showed antibody production after in vitro stimulation in a limiting dilution assay and showed excellent viability after cryopreservation. Conclusion(s): A GMP-grade B-cell product can be obtained with high purity and very low T-cell contamination using the two-step enrichment protocol based on CliniMACS^{wedge}TM technology.

Winters, W. D. (1990). "A new perspective of microbial survival and dissemination in a prospectively contaminated air-fluidized bed model." American Journal of Infection Control **18**(5): 307-315.

A major concern of users of air-fluidized beds has been the possibility that such beds might be a source of microbial contamination. The purpose of this series of prospective, controlled experiments was to measure quantitatively the dissemination and survival of Bacillus subtilis, a species of bacterium that forms desiccation-resistant spores, as it was associated with circulating and clumped microbeads after challenge in an air-fluidized bed operating under decontamination conditions of heating at 48 degrees C and microbead agitation by an air flow of 100% at 110 cu ft/min. Microbead samples collected after B. subtilis challenge from predesignated depths and locations within the air-fluidized bed at 0.25, 1, 2, 4, 24, and 48 hours were assayed for colony-forming units (CFU) of challenge bacteria by end point dilution and streak-plate assays.

Winton, D. J., et al. (2020). "Macroplastic pollution in freshwater environments: Focusing public and policy action." Science of the Total Environment **704**: 135242.

Understanding and managing plastic pollution is an increasingly important environmental priority for policy makers, businesses and scientists. Awareness of the potential damage to the world's oceans has grown but there is less attention given to freshwater ecosystems. Yet, rivers are the dominant source of plastic pollution to the marine environment, as well as a potential sink, accumulating plastic from multiple sources. Actions to reduce the presence of macroplastics in rivers is fundamental to conserving both freshwater and marine environments, but there is limited understanding of potential pollution sources, vectors and storage. Importantly, there are only a handful of studies examining the typologies of freshwater macroplastic pollution, often using different categories and collection methods. This impedes setting priorities for scientific investigation and mitigation measures. The present study identifies the most prevalent macroplastic items in freshwater environments in Europe, with a focus on consumer plastic items, i.e. those that could potentially be reduced by targeted actions by the public, as well as industrial and government intervention. Our analysis addresses the differences between reported macroplastics in freshwater and marine environments as well as those estimated from litter rates. Our results identify a macroplastic "top ten", i.e. those dominant plastic typologies that require a more focused effort to reformulate their use and management, as well as setting a common baseline for a more consistent data gathering and reporting approach.

Wirka, J. (1989). "Plastics Recycling: Missing the Forest for the Plastic Lumber." Resource Recycling **8**(8): 25.

The emphasis to date on plastics recycling has been on eliminating plastics from the waste stream. It is important, however, that plastics recycling reduce the amount of virgin resins necessary for processing this material. The chemical process for converting natural oil and gas into resins, then plastics, has caused serious environmental problems, from toxic air pollution to hazardous waste. Plastic resin producers are among the top emitters of carcinogenic acrylonitril and carbon tetrachloride. The EPA found that five of the six top chemicals whose production results in the most hazardous waste were those used in resin manufacture. The plastics industry must see recycling as a source of alternative feedstock materials to displace use of virgin resins. New technologies must be developed to upgrade secondary resins in order to find high value uses like car parts and other large resin applications. Reducing the amount of plastics in landfills does little if the amount of hydrocarbons and other air pollutants is increased during plastics processing.

Wise, J. K., et al. (2014). "Comparison of Uncultured Marrow Mononuclear Cells and Culture-Expanded Mesenchymal Stem Cells in 3D Collagen-Chitosan Microbeads for Orthopedic Tissue Engineering." Tissue Engineering, Part A: Tissue Engineering **20**(1-2): 210-224.

Stem cell-based therapies have shown promise in enhancing repair of bone and cartilage. Marrow-derived mesenchymal stem cells (MSC) are typically expanded in vitro to increase cell number, but this process is lengthy, costly, and there is a risk of contamination and altered cellular properties. Potential advantages of using fresh uncultured bone marrow mononuclear cells (BMMC) include heterotypic cell and paracrine interactions between MSC and other marrow-derived cells including hematopoietic, endothelial, and other progenitor cells. In the present study, we compared the osteogenic and chondrogenic potential of freshly isolated

BMMC to that of cultured-expanded MSC, when encapsulated in three-dimensional (3D) collagen-chitosan microbeads. The effect of low and high oxygen tension on cell function and differentiation into orthopedic lineages was also examined. Freshly isolated rat BMMC (25106 cells/mL, containing an estimated 5104 MSC/mL) or purified and culture-expanded rat bone marrow-derived MSC (2105 cells/mL) were added to a 65-35wt% collagen-chitosan hydrogel mixture and fabricated into 3D microbeads by emulsification and thermal gelation. Microbeads were cultured in control MSC growth media in either 20% O2 (normoxia) or 5% O2 (hypoxia) for an initial 3 days, and then in control, osteogenic, or chondrogenic media for an additional 21 days. Microbead preparations were evaluated for viability, total DNA content, calcium deposition, and osteocalcin and sulfated glycosaminoglycan expression, and they were examined histologically. Hypoxia enhanced initial progenitor cell survival in fresh BMMC-microbeads, but it did not enhance osteogenic potential. Fresh uncultured BMMC-microbeads showed a similar degree of osteogenesis as culture-expanded MSC-microbeads, even though they initially contained only 1/10th the number of MSC. Chondrogenic differentiation was not strongly supported in any of the microbead formulations. This study demonstrates the microbead-based approach to culturing and delivering cells for tissue regeneration, and suggests that fresh BMMC may be an alternative to using culture-expanded MSC for bone tissue engineering.

Wisniowska, E., et al. (2018). "Efficiency of microplastics removal in selected wastewater treatment plants - preliminary studies." Desalination and Water Treatment **134**: 316-323.

Recently more and more attention is being paid to pollution of the environment by microplastics. The problem is well recognized in marine and surface water in Western Europe. There are also well-documented studies on removal of microplastics during wastewater treatment in Germany, Finland, Denmark, Canada and Norway. So far the problem has not been identified in Eastern European countries, including Poland. Because of this, it is of high importance to evaluate the scale of problem also in these countries. The paper presents the results of preliminary studies on microplastics content in influents, effluents and sewage sludge of selected wastewater treatment plants in southern Poland. It was stated that content of microplastics in influents was in the range from 19.4.10³ to 552.2.10³ particles per 1 m³, in effluents from 28 to 960 particles per 1 m³. Microlitter particles removed from raw wastewater were accumulated in sewage sludge. Total concentration of microplastic particles in the sludge was in the range from 6.7.10³ to 62.6.10³ particles per 1 kg d.m. In liquid phase, finer fractions of microplastics were dominant. In sewage sludge larger particles, especially fibers, were effectively cumulated. About 95%-99% removal efficiency of microplastics from influents was stated. No correlation has been found between the wastewater flow rate and the content of microplastics in influent, these problems require, however, more detailed analysis of microplastics chemical composition and mass.

Witte, B. d., et al. (2014). "Quality assessment of the blue mussel (Mytilus edulis): comparison between commercial and wild types." Marine Pollution Bulletin **85**(1): 146-155.

This study compared species identity, microplastics, chemical and microbial contamination between consumption mussels and wild type mussels, collected at Belgian department stores and Belgian groynes and quaysides, respectively. Species identification based on genetic analysis showed a high number of Mytilus (M.) edulis compared to M. galloprovincialis and M. edulis/galloprovincialis hybrid mussels. The number of total microplastics varied from 2.6 to 5.1 fibres/10 g of mussel. A higher prevalence of orange fibres at quaysides is related to fisheries activities. Chemical contamination of polycyclic aromatic hydrocarbons and polychlorobiphenyls could be related to industrial activities and water turbidity, with maximum concentrations at the quayside of port Zeebrugge. The inverse was noted for Escherichia coli contamination, which was relatively low at Zeebrugge quayside with a total count of 3.9x10² CFU/100 g tissue, due to limited agricultural effluents. Results of this complementary analysis stress the importance of integrated monitoring and quality assessment.

Wittig, B., et al. (1991). "Transcription is associated with Z-DNA formation in metabolically active permeabilized mammalian cell nuclei." Proceedings of the National Academy of Sciences of the United States of America **88**(6): 2259-2263.

Mammalian cells have been encapsulated in agarose microbeads, and from these cells metabolically active permeabilized nuclei were prepared. Previously, we showed that biotin-labeled monoclonal antibodies against Z-DNA can be diffused into the nuclei and, over a specific concentration range, they will bind to Z-DNA within the nucleus in a concentration-independent manner. By using radiolabeled streptavidin, we showed that the amount of Z-DNA antibody bound is related to the torsional strain of the DNA in the nucleus. Relaxation of the DNA results in a decrease of Z-DNA formation, whereas increasing torsional strain through inhibiting topoisomerase I results in increased Z-DNA formation. Here we measure the influence of RNA transcription and DNA replication. Transcription is associated with a substantial increase in the binding of anti-Z-DNA antibodies, paralleling the increased level of RNA synthesized as the level of ribonucleoside triphosphate in the medium is increased. DNA replication yields smaller increases in the binding of Z-DNA antibodies. Stopping RNA transcription with inhibitors results in a large loss of Z-DNA antibody binding, whereas only a small decrease is associated with inhibition of DNA replication.

Witting, M., et al. (2015). "DI-ICR-FT-MS-based high-throughput deep metabotyping: a case study of the Caenorhabditis elegans-Pseudomonas aeruginosa infection model." Analytical and bioanalytical chemistry **407**(4): 1059-1073.

Issue Title: A different way of looking at vibrational hyperspectral data/Micellar extraction for the analysis of Alzheimer's disease brain proteome/Quantification of polyolefin microplastics in personal-care products/Removal of Triton X-100 by microdialysis In metabolomics there is an ever-growing need for faster and more comprehensive analysis methods to cope with the increasing size of biological studies. Direct-infusion ion-cyclotron-resonance Fourier-transform spectrometry (DI-ICR-FT-MS) is used in non-targeted metabolomics to obtain high-resolution snapshots of the metabolic state of a system. We applied this technology to a Caenorhabditis elegans-Pseudomonas aeruginosa infection model and optimized times needed for cultivation and mass-spectrometric analysis. Our results reveal that DI-ICR-FT-MS is a promising tool for high-throughput in-depth non-targeted metabolomics. We performed whole-worm metabolomics and recovered markers of the induced metabolic changes in C. elegans brought about by interaction with pathogens. In this investigation, we reveal complex metabolic phenotypes enabling clustering based upon challenge. Specifically, we observed a marked decrease in amino-acid metabolism with infection by P. aeruginosa and a marked increase in sugar metabolism with infection by Salmonella enterica. We were also able to discriminate between infection with a virulent wild-type Pseudomonas and with an attenuated mutant, making it possible to use this method in larger genetic screens to identify host and pathogen effectors affecting the metabolic phenotype of infection. [Figure not available: see fulltext.]

Wojcik-Fudalewska, D., et al. (2016). "Occurrence of plastic debris in the stomach of the invasive crab

Eriocheir sinensis." Marine Pollution Bulletin **113**(1-2): 306-311.

The Chinese mitten crab is known as a pest causing damage to fishing gears and fish. On the other hand, this highly invasive species is considered a delicacy by Asian migrants and therefore commercially fished and sold in many countries. The ingestion of plastic by the Chinese mitten crab Eriocheir sinensis from the Baltic coastal waters (Poland) and the Tagus Estuary (Portugal) was studied based on stomach content analysis. As many as 13% of the 302 analysed males and females (38.07-89.07 mm carapace width) from both regions, contained microplastic in the form of strands and balls. Most of them were transparent. Ingested plastic particles were identified as fragments of fishing gears. Contamination with plastic may have a negative impact on this species as well as on higher trophic levels feeding on crabs. Copyright © 2016 Elsevier Ltd

Wolcott, A., et al. (2006). "Silica-coated CdTe quantum dots functionalized with thiols for bioconjugation to IgG proteins." Journal of Physical Chemistry. B, Condensed Matter, Materials, Surfaces, Interfaces & Biophysical **110**(11): 5779-5789.

Quantum dots (QDs) have been increasingly used in biolabeling recently as their advantages over molecular fluorophores have become clear. For bioapplications QDs must be water-soluble and buffer stable, making their synthesis challenging and time-consuming. A simple aqueous synthesis of silica-capped, highly fluorescent CdTe quantum dots has been developed. CdTe QDs are advantageous as the emission can be tuned to the near-infrared where tissue absorption is at a minimum, while the silica shell can prevent the leakage of toxic Cd(2+) and provide a surface for easy conjugation to biomolecules such as proteins. The presence of a silica shell of 2-5 nm in thickness has been confirmed by transmission electron microscopy and atomic force microscopy measurements. Photoluminescence studies show that the silica shell results in greatly increased photostability in Tris-borate-ethylenediaminetetraacetate and phosphate-buffered saline buffers. To further improve their biocompatibility, the silica-capped QDs have been functionalized with poly(ethylene glycol) and thiol-terminated biolinkers. Through the use of these linkers, antibody proteins were successfully conjugated as confirmed by agarose gel electrophoresis. Streptavidin-maleimide and biotinylated polystyrene microbeads confirmed the bioactivity and conjugation specificity of the thiolated QDs. These functionalized, silica-capped QDs are ideal labels, easily synthesized, robust, safe, and readily conjugated to biomolecules while maintaining bioactivity. They are potentially useful for a number of applications in biolabeling and imaging.

Wolff, S., et al. (2019). "Determination of the microplastics emission in the effluent of a municipal waste water treatment plant using Raman microspectroscopy." Water Research X **2 (no pagination)**(100014).

Samples from the secondary clarifier effluent of a waste water treatment plant (serving 98500 inhabitants) were analyzed to determine the microplastics (MP) emission. The samples were collected using a stainless steel centrifugal pump and filtered through a 10 mum stainless steel cartridge filter. Microplastics particles (MPPs) and microplastics fibers (MPFs) were recovered by chemical and physical sample purification. To remove natural organic matter, the samples were first subjected to oxidative treatment with H<inf>2</inf>O<inf>2</inf> and NaClO. Inorganic materials were subsequently removed by density separation in ZnCl<inf>2</inf> (rho = 1.9 g/cm³) using a centrifuge. Special centrifuge tubes were developed for this purpose. Sample analysis was performed on a Si filter by Raman micro-spectroscopy. Particles with a diameter (d<inf>p</inf>) >= 10 mum were analyzed. The results were differentiated by dry and wet weather samples. On average, 5900 MPPs m⁻³ were identified in the effluent on wet weather days compared to 3000 MPPs m⁻³ on dry weather days. Most of the MPPs detected were in the 30 mum < d<inf>p</inf> < 100 mum size range. The

MPFs ranged between 100 mum and 1000 mum in length. While most of the MPFs were of PET origin, the MPPs consisted mainly of PET, PP, PE and PS. Copyright © 2018 The Authors

Wollmann, F., et al. (2019). "Microalgae wastewater treatment: Biological and technological approaches." Engineering in Life Sciences **19**(12): 860-871.

Current global environmental issues raise unavoidable challenges for our use of natural resources. Supplying the human population with clean water is becoming a global problem. Numerous organic and inorganic impurities in municipal, industrial, and agricultural waters, ranging from microplastics to high nutrient loads and heavy metals, endanger our nutrition and health. The development of efficient wastewater treatment technologies and circular economic approaches is thus becoming increasingly important. The biomass production of microalgae using industrial wastewater offers the possibility of recycling industrial residues to create new sources of raw materials for energy and material use. This review discusses algae-based wastewater treatment technologies with a special focus on industrial wastewater sources, the potential of non-conventional extremophilic (thermophilic, acidophilic, and psychrophilic) microalgae, and industrial algae-wastewater treatment concepts that have already been put into practice. Copyright © 2019 The Authors. Engineering in Life Sciences published by WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim

Wołosiewicz-Głąb, M., et al. (2017). Plastic waste depolymerization as a source of energetic heating oils. Les Ulis, EDP Sciences. **14**.

In the past years there has been an increase in production and consumption of plastics, which are widely used in many areas of life. Waste generated from this material are a challenge for the whole of society, regardless of awareness of sustainable development and its technological progress. Still the method of disposal of plastic waste are focused mainly on their storage and incineration, not using energy contained there. In this paper technology for plastic waste depolymerization with characteristics of fuel oil resulting in the process, as an alternative to traditional energy carriers such as: coal, fine coal or coke used in households will be presented. Oil has a high calorific value and no doubt could replace traditional solutions which use conventional energy sources. Furthermore, the fuel resulting from this process is sulfur-free and chemically pure. The paper presents the installation for plastics waste depolymerization used in selected Polish Institute of Plastics Processing, along with the ability to use the main thermocatalytic transformation product.

Wolpert, V. M. (1994). "Incineration of Municipal Solid Waste Combined with Energy Production-Latest Developments." Renewable Energy **5**(5): 782.

Municipal solid-waste incineration with energy recovery is the preferred method over landfilling for the treatment of solid waste. The development and utilization of the technology depends on the concentration of the urban population and the availability of land for landfilling. The status of municipal solid-waste incineration in the US, Japan, Germany, Sweden, and the UK is described and compared. The use of the technology is growing in all of the nations profiled, especially with the advancement of enhanced air-pollution-control technologies. It is becoming paramount, however, to develop public support for incineration, as waste-to-energy incineration could account for up to 45% of all plastic waste by the year 2000.

Wolraich, M. L. and M. A. Doffing (2004). "Pharmacokinetic considerations in the treatment of attention-deficit hyperactivity disorder with methylphenidate." CNS Drugs **18**(4): 243-250.

Methylphenidate is commonly used for the treatment of attention-deficit hyperactivity disorder

(ADHD). Its efficacy in improving the core symptoms of ADHD, as well as some of the aggressive and oppositional behaviours, is well documented, based on a large volume of research. Methylphenidate has a wide margin of safety and relatively mild adverse effects, most commonly appetite suppression and insomnia. Methylphenidate is a rapidly absorbed medication that, in its d-isomer form, readily penetrates the CNS, particularly the striatum. It appears to function by blocking the reuptake of dopamine. Both the plasma concentrations and behavioural effects of methylphenidate demonstrate a time to maximum of between 1 and 3 hours, with the maximum behavioural effects occurring when the plasma concentrations are increasing. Because of the rapid onset of action, the effects of methylphenidate can be dramatic but usually last only about 4 hours with the immediate-release formulation. The behavioural responses of individuals are also highly variable, so that it is necessary to start treatment at a low dosage and increase up to a maximally effective dosage (usually starting at 10-15 mg/day with increases of 10-15mg at weekly intervals to a maximum dosage of 60 mg/day, irrespective of formulation). Because of the variability in behavioural responses, assessment of plasma concentrations is not clinically useful nor does weight help in deciding an appropriate dosage. The difficulties in administering methylphenidate multiple times a day, particularly during the school day, have been alleviated in the past few years by the development of extended-release preparations with varying behavioural effects lasting 8-12 hours. The 8-hour preparations (Metadate) CD and Ritalin) LA) utilise a microbead technology, while the 12-hour preparation (Concerta) utilises an osmotic pump system. All extended-release formulations effectively control the symptoms of ADHD. While pharmacokinetic differences appear to exist between some of these new formulations, there are currently no clinical data available to demonstrate clinical efficacy differences between them. [References: 62]

Won, J. Y. and J. Min (2010). "Highly sensitive Escherichia coli O157:H7 detection in a large volume sample using a conical polymer tube chamber consisting of micro-glass beads." Biosensors & Bioelectronics **26**(1): 112-117.

In this study, we developed a method for the highly sensitive detection of viable pathogenic bacteria in a large volume sample by performing RNA concentration, amplification, and using fluorescently tagged capture probes in a single polymer chamber without transferring RNA samples from one chamber to another. Nucleic acids were extracted from Escherichia coli O157:H7 and loaded into glass micro-beads embedded in a conical polymer tube chamber. Nucleic acids were concentrated in the micro-tube in a low pH buffer (pH 5). The mRNA, which was adsorbed to the glass micro-beads, was amplified by Nucleic Acid Sequence Based Amplification in the same chamber at a relatively high pH (pH 8.9). The products amplified were measured using the hair-loop type detection probe with FAM and DABCYL, which was pre-mixed in the NASBA mater mixture. As a result, high sensitivity (100% for rain water and 60% for river water) with less than 10 viable E. coli O157:H7 in 100ml could be achieved within 4h using the simple method proposed in this study.

Won, J. Y., et al. (2010). "Bacteria adsorption on hydrophilic surfaces for the sensitive detection of pathogenic bacteria using a single tube chamber system." Biosensors and Bioelectronics **26**(4): 1763-1767.

Here, we developed a simple and effective bacterial isolation method that can be directly used for the detection of pathogenic bacteria. This approach only requires a single plastic tube chamber that can performing serial processes such as cell gathering, cell lysis, nucleic acid amplification, and signaling without the need to transfer samples from one chamber to another. A TEOS (tetraethoxysilane) surface was selected for this application because of its superior performance in the amplification process as well as the ability of bacteria to adsorb to its surface, which is necessary for all processes to be performed in single chamber. The optimal aquatic buffer conditions for bacteria adsorption on the hydrophilic surface were determined to be 1% polyethylene glycerol (PEG) and 10mM MgCl2 in 100mM phosphate at pH 4 for the gram negative bacteria, Escherichia coli O157:H7 (E. coli O157:H7) and 10mM Na2SO4 in 100mM phosphate in 100mM phosphate at pH 4 for the gram positive bacteria, Bacillus cereus (B. cereus). When these divalent cation and anion (MgSO4) containing acidic solutions were used, 40% of both bacteria adsorbed onto the hydrophilic surface at a loading rate of 2mL/min after introduction of low concentrations of bacteria. This method was directly employed to detect E. coli O157:H7 in beef using a single plastic tube chamber that was partially filled with nickel micro beads coated with TEOS. In this system, E. coli O157:H7 were lysed by induction heating of the nickel micro beads. The extracted mRNA was readily amplified and detected by adding an isothermal amplification mixture (NASBA, nucleic acid sequence based amplification) containing a hair-loop type reporting probe with FAM and DABCYL. As a result, this highly sensitive sensing tool could detect very low concentrations of E. coli [100 CFU/1g of beef].

Wong, C. S., et al. (1974). "Quantitative tar and plastic waste distributions in the Pacific Ocean." Nature **247**(5435): 30-32.

Quantitative data on tar and plastic waste distributions in the surface waters of the Pacific Ocean are presented. It is shown that tar and plastic wastes are widespread on the surface of the oceans as a result of several factors: likely sources of marine oil transport, augmented by accidential spills, prevailing wind transport and surface circulation.

Wong, J. (2007). Bead based microreactors for sensing applications.

The dissertation research described here focuses on the fabrication and modification of the polymeric beaded sensing elements, one of the many critical components of a Microbead Array Chip-Based Multianalyte Detection System. Detection of biomolecules including proteins and oligonucleotides are based on affinity interactions between carefully selected ligands immobilized on the sensing microspheres. The current work relies on microspheres made of agarose gel shaped into micron sized beads with intrinsic porosity associated to the concentration of agarose in the gel. The beaded material described is considered of a homogeneous nature with limited transport capabilities although superior to homogeneous latex beads. The microbead array system potentially benefits from structural modifications on the sensing elements and includes improvement on the mobile phase mass transport, capture of larger particles, faster assays, and the increase in the multiplexing capabilities. Efforts are also directed to preferentially modify gels made of agarose to facilitate the transition from the existing sensing elements to the new beaded designs made of the same polysaccharide. As a result the chemistry utilized to attach affinity ligands to procure reactive sensing elements remained practically the same. Collectively, these research activities have resulted in a number of novel polymer-based reactive particles that have the potential to service a variety of new sensing applications.

Wong, M. M., et al. (2013). "Sirolimus stimulates vascular stem/progenitor cell migration and differentiation into smooth muscle cells via epidermal growth factor receptor/extracellular signal-regulated kinase/beta-catenin signaling pathway." Arteriosclerosis, Thrombosis, and Vascular Biology **33**(10): 2397-2406.

OBJECTIVE - : Sirolimus-eluting stent therapy has achieved considerable success in overcoming coronary artery restenosis. However, there remain a large number of patients presenting with

restenosis after the treatment, and the source of its persistence remains unclarified. Although recent evidence supports the contribution of vascular stem/progenitor cells in restenosis formation, their functional and molecular responses to sirolimus are largely unknown. APPROACH AND RESULTS - : Using an established technique, vascular progenitor cells were isolated from adventitial tissues of mouse vessel grafts and purified with microbeads specific for stem cell antigen-1. We provide evidence that vascular progenitor cells treated with sirolimus resulted in an induction of their migration in both transwell and wound healing models, clearly mediated by CXCR4 activation. We confirmed the sirolimus-mediated increase of migration from the adventitial into the intima side using an ex vivo decellularized vessel scaffold, where they form neointima-like lesions that expressed high levels of smooth muscle cell (SMC) markers (SM-22alpha and calponin). Subsequent in vitro studies confirmed that sirolimus can induce SMC but not endothelial cell differentiation of progenitor cells. Mechanistically, we showed that sirolimus-induced progenitor-SMC differentiation was mediated via epidermal growth factor receptor and extracellular signal-regulated kinase 1/2 activation that lead to beta-catenin nuclear translocation. The ablation of epidermal growth factor receptor, extracellular signal-regulated kinase 1/2, or beta-catenin attenuated sirolimus-induced SM-22alpha promoter activation and SMC differentiation. CONCLUSIONS - : These findings provide direct evidence of sirolimus-induced progenitor cell migration and differentiation into SMC via CXCR4 and epidermal growth factor receptor/extracellular signal-regulated kinase/beta-catenin signal pathways, thus implicating a novel mechanism of restenosis formation after sirolimus-eluting stent treatment. © 2013 American Heart Association, Inc.

Wong, O. Y. and C. Hilkens (2017). "Tolerogenic dendritic cells regulate T cells via transforming growth factor beta." Rheumatology (United Kingdom) **56 (Supplement 2)**: ii133.

Background: Rheumatoid arthritis (RA) is an autoimmune disease characterized by chronic inflammation and degradation in synovial joints, affecting approximately 1% of the adult population worldwide. Tolerogenic dendritic cells (TolDCs) are a recently developed experimental cellular immunotherapy for RA, currently under clinical trial. Dendritic cells (DCs) are potent antigen presenting cells that activate or tolerize T cells, depending on the maturation state. Mature DCs (MatDCs) activate effector T cells whereas the immature or semimature TolDCs regulate T cells and thereby induce tolerance. The aim of this study was to establish the role of TGF-beta in the mechanism by which TolDCs regulate CD4 T cells from healthy controls and RA patients. Method(s): Peripheral blood mononuclear cells (PBMCs) were isolated from blood samples from healthy donor by centrifugation. Synovial fluid mononuclear cells (SFMCs) were isolated from synovial fluid obtained from RA patients by centrifugation. CD4 T cells were isolated from isolated from PBMC or SFMCs by anti-CD4 magnetic microbeads. DCs were isolated from PBMCs by anti-CD14 magnetic microbeads and cultured into MatDCs or TolDCs. DC phenotype was checked using flow cytometry. Independent assays were conducted with DCs and T cells derived from different donors. TGF-beta inhibitor was added where indicated. Supernatants from the co-cultures were harvested and assayed for IFN-gamma by ELISA. Proliferation of T cells was assessed by thymidine incorporation assays. Allogeneic T cells were primed with DCs in the presence or absence of TGF-beta inhibitor. Primed T cells were washed and restimulated with MatDCs from the original donor. Supernatants were harvested and assessed for IFN-gamma. Proliferation of T cells was assessed. Results were expressed as median of independent events and analysed by Mann- Whitney test. Result(s): TolDCs suppressed inflammatory cytokine IFN-gamma and proliferation of T cells. When TGF-beta was inhibited, suppression of IFN-gamma was reversed. During restimulation of T cells, TolDCprimed T cells remain hyporesponsive and expressed lower levels of IFN-gamma compared to MatDC-primed T

cells. When TGF-beta was inhibited, suppression of IFN-gamma was reversed in healthy T cells but only partially reversed in RA T cells. The results demonstrated that TGF-beta plays a role in the mechanism by which TolDCs regulate T cells from RA patients. The partial reversal of IFN-gamma suppression on TGF-beta inhibition suggests there may be other mechanisms involved in the action of TolDCs. Conclusion(s): TGF-beta is an important cytokine in the tolerogenic function of TolDCs. It is potentially a quality control marker in TolDCs generation.

Wonga, S. L., et al. (2016). "Parametric study on catalytic cracking of LDPE to liquid fuel over ZSM-5 zeolite." Energy Conversion & Management **122**: 428-438.

Pyrolysis or cracking of plastic waste is considered as a potential solution to the environmental problems brought about by plastic waste, with the production of hydrocarbon fuel as a value added benefit. In order to explore the potentials of such process, parametric study have been conducted on the catalytic cracking of LDPE dissolved in benzene in a fixed bed reactor. The five factors studied were temperature (A), catalyst mass (B), feed flow rate (C), carrier gas flow rate (D), as well as concentration of LDPE solution (E), while the responses were LDPE conversion (Y sub(1)) and liquid yield (Y sub(2)). The parametric study showed that four out of five factors (A, B, C and D) have significant effects on Y sub(1) and Y sub(2). The optimum conditions that produced maximum responses for Y sub(1) and Y sub(2) simultaneously are 600 degree C (A), 0.10 g catalyst (B), 1 ml/s LDPE solution (C), 80 ml/min N sub(2) flow (D). The numerical values for Y sub(1) and Y sub(2) were 98.6% and 99.5%, respectively. Analysis on products composition indicated that catalytic cracking of LDPE in fixed bed reaction generally produced high amount of aliphatic branched-chain compounds, together with moderate amount of cyclic compounds. Aromatization of LDPE cracking products is less due to the short retention time of the compounds on the catalysts bed.

Wood, A. (1996). "KEY LESSONS FOR PLASTIC BOTTLE RECYCLING." Recycling Textile & Plastic Waste: 77-86.

The article offers information concerning plastic bottle recycling in Great Britain. It includes the key components of recycling system including legislation, bottle production, product deposit, collecting and sorting, reprocessing and market. It is emphasized that the government, manufacturer, marketer, retailer, citizen, local authority, reprocessor and industries play an important role in plastic bottle recycling. It highlights the industrial legislation for a common strategy and a plan toward recycling in the region.

Wood, C. (2006). "Zero-waste thermal process leaves the UK unmoved." Materials Recycling Week **188**(19): 7-7.

The article reports on several waste management processes developed for environmental protection in Great Britain. Thermal desorption, a waste management process that is capable to convert tyres, sewage sludge, medical waste, and plastics into highly valuable fuel. Non-oxidizing process, a waste management process capable to vaporize volatiles and semi-volatiles with different temperatures. Several companies are proposing new technologies for the environmental management of the country. Furthermore, Tox Free is currently investigating waste management processes that reduces landfill capacity.

Woodall, L. C., et al. (2015). "Using a forensic science approach to minimize environmental contamination and to identify microfibres in marine sediments." Marine Pollution Bulletin **95**(1): 40-46.

There is growing evidence of extensive pollution of the environment by microplastic, with microfibres representing a large proportion of the microplastics seen in marine sediments. Since microfibres are ubiquitous in the environment, present in the laboratory air and water, evaluating microplastic pollution is difficult. Incidental contamination is highly likely unless strict control measures are employed. Here we describe methods developed to minimize the amount of incidental post-sampling contamination when quantifying marine microfibre pollution. We show that our protocol, adapted from the field of forensic fibre examination, reduces fibre abundance by 90% and enables the quick screening of fibre populations. These methods therefore allow an accurate estimate of microplastics polluting marine sediments. In a case study from a series of samples collected on a research vessel, we use these methods to highlight the prevalence of microfibres as marine microplastics.

Woods, M. N., et al. (2018). "Microplastic fiber uptake, ingestion, and egestion rates in the blue mussel (Mytilus edulis)." Marine Pollution Bulletin **137**: 638-645.

Microplastic fibers (MPF) are a ubiquitous marine contaminant, making up to 90% of global microplastic concentrations. Imaging flow cytometry was used to measure uptake and ingestion rates of MPF by blue mussels (Mytilus edulis). Mussels were fed a diet of Rhodomonas salina and MPF concentrations up to 30 MPF mL⁻¹, or 0.374% of available seston. Filtration rates were greatly reduced in mussels exposed to MPF. Uptake of MPF followed a Holling's Type II functional response with 95% of the maximum rate (5227 MPF h⁻ ¹) occurring at 13 MPF mL⁻¹. An average of 39 MPF (SE +/- 15, n = 4) was found in feces (maximum of 70 MPF). Most MPF (71%) were quickly rejected as pseudofeces, with approximately 9% ingested and <1% excreted in feces. Mussels may act as microplastic sinks in Gulf of Maine coastal waters, where MPF concentrations are near the order of magnitude as the experimental treatments herein. Copyright © 2018 Elsevier Ltd

Woodyard, D. (1989). "Upon the slimy sea." Professional Engineering **2**(3): 26-28.

Dumping garbage from ships was being brought under control by the International Maritime Organization's Annex V to the Marpol convention. The disposal of refractory plastic waste had been banned and a minimal distance from shore had been defined for the disposal of food wastes. These regulations had stimulated the design and installation of standard marine incinerators on cargo ships.

Worm, B., et al. (2017). "Plastic as a Persistent Marine Pollutant." Annual Review of Environment & Resources **42**: 1-26.

Synthetic organic polymers-or plastics-did not enter widespread use until the 1950s. By 2015, global production had increased to 322 million metric tons (Mt) year−1, which approaches the total weight of the human population produced in plastic every year. Approximately half is used for packaging and other disposables, 40% of plastic waste is not accounted for in managed landfills or recycling facilities, and 4.8-12.7 Mt year−1 enter the ocean as macroscopic litter and microplastic particles. Here, we argue that such mismanaged plastic waste is similar to other persistent pollutants, such as dichlorodiphenyltrichloroethane (DDT) or polychlorinated biphenyls (PCBs), which once threatened a 'silent spring' on land. Such a scenario seems now possible in the ocean, where plastic cannot be easily removed, accumulates in organisms and sediments, and persists much longer than on land. New evidence indicates a complex toxicology of plastic micro- and nanoparticles on marine life, and transfer up the food chain, including to people. We detail solutions to the current crisis of accumulating plastic pollution, suggesting a Global Convention on Plastic Pollution that incentivizes collaboration between governments, producers, scientists, and citizens. [ABSTRACT FROM AUTHOR]

Wright, S. and I. Mudway (2019). "The ins and outs of microplastics." Annals of Internal Medicine **171**(7): 514-516.

Wright, S. L. and F. J. Kelly (2017). "Plastic and Human Health: A Micro Issue?" Environmental Science & Technology **51**(12): 6634-6647.

Microplastics are a pollutant of environmental concern. Their presence in food destined for human consumption and in air samples has been reported. Thus, microplastic exposure via diet or inhalation could occur, the human health effects of which are unknown. The current review article draws upon cross-disciplinary scientific literature to discuss and evaluate the potential human health impacts of microplastics and outlines urgent areas for future research. Key literature up to September 2016 relating to accumulation, particle toxicity, and chemical and microbial contaminants was critically examined. Although microplastics and human health is an emerging field, complementary existing fields indicate potential particle, chemical and microbial hazards. If inhaled or ingested, microplastics may accumulate and exert localized particle toxicity by inducing or enhancing an immune response. Chemical toxicity could occur due to the localized leaching of component monomers, endogenous additives, and adsorbed environmental pollutants. Chronic exposure is anticipated to be of greater concern due to the accumulative effect that could occur. This is expected to be dose-dependent, and a robust evidence-base of exposure levels is currently lacking. Although there is potential for microplastics to impact human health, assessing current exposure levels and burdens is key. This information will guide future research into the potential mechanisms of toxicity and hence therein possible health effects.

Wright, S. L., et al. (2019). "Raman Spectral Imaging for the Detection of Inhalable Microplastics in Ambient Particulate Matter Samples." Environmental Science & Technology **53**(15): 8947-8956.

Microplastics are ubiquitous contaminants, with preliminary evidence indicating they are a novel component of air pollution. This presents a plausible inhalation exposure pathway, should microplastics occur in the inhalable size range; however, this remains an analytical challenge. Here, we develop a filter-based sampling method compatible with both air quality monitoring and Raman spectral imaging (RSI) for the detection of inhalable-sized microplastics. Clean and particulate matter (PM) contaminated filters of a range of compositions were screened. RSI was validated using a plastic microbead suspension (poly(methyl methacrylate) (5-27 mum), polyethylene (10-27 mum), and polystyrene (4 and 10 mum)). Filters were loaded with the suspension before being analyzed. RSI analysis was conducted using a univariate analysis, fitting unique plastic bands to the spectral data sets, where high spatial intensity indicated the presence of microplastics. Inhalable microplastics were not visibly detectable against quartz or spectroscopically detectable against polytetrafluoroethylene (PTFE)- and alumina-based filters. While microplastics were detectable against cellulose, the PM-contaminated filters (4 and 24 h) burned during analysis. The greatest intensities for microplastics were observed against the silver membrane filter, and inhalable microplastics were still detectable in a 24 h PM sample. These findings will facilitate the acquisition of inhalable microplastic concentrations, which are necessary for understanding microplastic exposure and, ultimately, what their potential role in

PM-associated health effects might be.

Wright, S. L., et al. (2013). "The physical impacts of microplastics on marine organisms: a review." Environmental Pollution **178**: 483-492.

Plastic debris at the micro-, and potentially also the nano-scale, are widespread in the environment. Microplastics have accumulated in oceans and sediments worldwide in recent years, with maximum concentrations reaching 100 000 particles m³. Due to their small size, microplastics may be ingested by low trophic fauna, with uncertain consequences for the health of the organism. This review focuses on marine invertebrates and their susceptibility to the physical impacts of microplastic uptake. Some of the main points discussed are (1) an evaluation of the factors contributing to the bioavailability of microplastics including size and density; (2) an assessment of the relative susceptibility of different feeding guilds; (3) an overview of the factors most likely to influence the physical impacts of microplastics such as accumulation and translocation; and (4) the trophic transfer of microplastics. These findings are important in guiding future marine litter research and management strategies.

Wright, S. L., et al. (2019). "Atmospheric microplastic deposition in an urban environment and an evaluation of transport." Environment International: 105411.

Microplastics are a global environmental issue contaminating aquatic and terrestrial environments. They have been reported in atmospheric deposition, and indoor and outdoor air, raising concern for public health due to the potential for exposure. Moreover, the atmosphere presents a new vehicle for microplastics to enter the wider environment, yet our knowledge of the quantities, characteristics and pathways of airborne microplastics is sparse. Here we show microplastics in atmospheric deposition in a major population centre, central London. Microplastics were found in all samples, with deposition rates ranging from 575 to 1008 microplastics/m²/d. They were found in various shapes, of which fibrous microplastics accounted for the great majority (92%). Across all samples, 15 different petrochemical-based polymers were identified. Bivariate polar plots indicated dependency on wind, with different source areas for fibrous and non-fibrous airborne microplastics. This is the first evidence of airborne microplastics in London and confirms the need to include airborne pathways when consolidating microplastic impacts on the wider environment and human health.

Wroblewski, B. M. (1979). "Wear of high-density polyethylene on bone and cartilage." Journal of Bone & Joint Surgery - British Volume **61-B**(4): 498-500.

Wear of high-density polyethylene on bone and cartilage has resulted in a large volume of plastic particles being shed into the two knees and two hips studied. The giant-cell foreign-body reaction of the synovium may not be sufficient to cope with the amount of debris presented and the destruction of the endosteal bone in one hip, caused by the wear particles and movement of the prosthesis, has made revision impossible. Articulation of high-density polyethylene against bone or cartilage either by design or by the failure of alignment of the component must be avoided.

Wu, B., et al. (2019). "Size-dependent effects of polystyrene microplastics on cytotoxicity and efflux pump inhibition in human Caco-2cells." Chemosphere **221**: 333-341.

Microplastics in the environment may gain entry the human gastrointestinal tract through the food chain. However, information on different adverse effects of microplastics at nanometer or micrometer scales in human intestine cells is limited. This study compared the cytotoxicity and efflux pump inhibition ability of 0.1 mum and 5 mum polystyrene microplastics (PS-MPs) in the human colon adenocarcinoma Caco-2 cells. Both PS-MP sizes exhibited low toxicity on cell viability, oxidative stress, and membrane integrity and fluidity. However, the mitochondrial membrane potential was disrupted by both sizes of PS-MPs, and the 5 mum PS-MPs induced higher effects than 0.1 mum PS-MPs. Furthermore, 0.1 mum (>=20 mug/mL) or 5 mum (>=80 mug/mL) PS-MPs inhibited plasma membrane ATP-binding cassette (ABC) transporter activity and increased arsenic (one substrate of ABC transporter) toxicity. The 0.1 mum PS-MPs might act as substrates of ABC transporter to reduce the transport capacity of other substrates. However, high concentrations of 5 mum PS-MPs might reduce ABC transporter activity through induction of mitochondrial depolarization and potential depletion of ATP. This study provides basic information on the toxicity of 0.1 mum and 5 mum PS-MPs in human intestine cells, which are useful for assessing the risk of PS-MPs in humans. Copyright © 2019 Elsevier Ltd

Wu, D., et al. (2010). "Immunoassay on free-standing electrospun membranes." Acs Applied Materials & Interfaces **2**(1): 252-258.

For the purpose of immunoassay, electrospun membranes can be thought as the threadlike self-assembling of nano/microbeads. Nonwoven membranes of electrospun poly(epsilon-caprolactone) (PCL) fibers display excellent tenacity, flexibility and suitable surface energy. These PCL membranes exhibit easy handling in air, fast spreading, and wetting in aqueous solution, and rapid adsorption of protein molecules by hydrophobic interaction. After a fold-and-press process, the membrane porosity was reduced from approximately 75% to less than 10%, whereas the thickness increased from 5.3 to 280 microm. The resulting fluorescence signal from adsorbed protein increased>120x. With anti-HSA and HSA-FITC as an immunoassay model, a linear detection range from 500 ng/mL down to 1 ng/mL is obtained, with a detection of limit (LOD) of approximately 0.08 ng/mL. By comparison, conventional nitrocellulose and a 24.3 microm PCL fiber electrospun membrane displayed a much higher LOD of approximately 100 ng/mL. Immunoassay on free-standing electrospun membrane successfully combines the low-cost and simplicity of conventional membrane immunoassay, with the fast reaction speed and high sensitivity characteristic of magnetic nano/microbeads bioassays.

Wu, D., et al. (2019). "Molecular characterisation of cytochrome P450 enzymes in waterflea (Daphnia pulex) and their expression regulation by polystyrene nanoplastics." Aquatic Toxicology **217**: 105350.

Cytochrome P450 (CYP) enzymes are one of the largest protein families, and they metabolise a wide range of lipophilic organic endogenous and exogenous compounds. Many cytochrome P450 genes have been cloned and characterised, and they are frequently used as biomarkers in environmental toxicology studies because of their sensitivity and inducibility. In the present study, the full-length cDNAs of DpCYP370B and DpCYP4 were cloned from Daphnia pulex for the first time. The sequence of DpCYP370B consisted of an ORF of 1515 bp that encoded a 504 amino acid polypeptide, while the sequence of DpCYP4 comprised an ORF of 1527 bp that encoded a 508 amino acid polypeptide. Homologous alignments revealed the presence of a conserved cysteine haeme-iron ligand signature, FxxGxxxCxG, located in the C-terminal portion. Both the proteins contained a sequence for a transmembrane region that was deduced to be located in the endoplasmic reticulum. Subsequently, the expression levels of DpCYP370B and DpCYP4, as well as those of CYP4AN1, CYP4C33, and CYP4C34, were investigated using quantitative real-time PCR after exposure to five polystyrene nanoplastic concentrations: 0 (control), 0.1, 0.5, 1, and 2 mg/L for 21 days. Except for DpCYP4, the highest mRNA expression was observed at 0.5 mg/L nanoplastics; next, the expression of three of the enzymes (DpCYP370B, CYP4AN1, CYP4C34,) decreased to that of the control level at 1 and 2 mg/L doses

of nanoplastics. The expression of DpCYP4 did not significantly change compared with that of the control group. These results indicated that CYP genes might play an important role in protecting D. pulex against nanoplastic pollutants.

Wu, F., et al. (2020). "Variation in microplastics composition at small spatial and temporal scales in a tidal flat of the Yangtze Estuary, China." Science of the Total Environment **699 (no pagination)**(134252).

Microplastics are small, degrade slowly, and easily persist in the water column because they are close to neutrally buoyant. Understanding the distribution of microplastics is fundamental to evaluating the ecological risks that they cause and to identifying ways to control microplastics pollution. Most of the existing research on the distribution of microplastics in the coastal zone has focused on large spatial and temporal scales. To build on past work, we investigated variation in microplastics in a tidal flat of the Yangtze Estuary on small spatial (sediment depth, mudflat vs. vegetation zone) and temporal (fortnightly and semidiurnal) scales. Microplastics were more abundant in surface (0-2 cm) sediments during neap versus spring tide cycles, likely indicating increased deposition during periods with calm waters and increased suspension when water was more turbulent, but did not vary at greater depths in the sediment. Individual microplastics particles were also larger during neap versus spring tide periods. In contrast to the variation between spring and neap tide periods, we found no variation in the abundance of microplastics on the semidiurnal scale. Microplastics were also more abundant in the transect in the vegetation than at slightly lower elevations in the adjacent mudflat. Across all samples, the abundance of microplastics was negatively correlated with the strength of hydrological processes such as submergence time and flow velocity. Our results showed that sampling of microplastics in the intertidal environment needs to consider variation among spring and neap tide cycles, and also among different intertidal habitats that may differ only slightly in elevation. We encourage coupling sampling with direct measures of hydrological processes so that variation in microplastics abundance and size can be rigorously linked to hydrological processes. Copyright © 2019 Elsevier B.V.

Wu, F., et al. (2020). "Accumulation of microplastics in typical commercial aquatic species: A case study at a productive aquaculture site in China." Science of the Total Environment **708**: 135432.

The widespread occurrence of microplastics in the marine environment has drawn global attention because microplastics may impact the populations of marine organisms. As such, aquaculture industry may suffer from microplastic pollution, especially when plastic products are widely used for aquaculture. Here, we assessed the abundance and characteristics (type, size and composition) of microplastics in sediment and typical commercial species (fish, bivalves and shrimps) in an aquaculture site at Xiangshan Bay, which has been operated intensively for decades. Satellite remote sensing images revealed that aquaculture activities were associated with microplastic pollution in sediment, where the microplastics (51-88 items/kg dry weight) were mostly fibres (>94%) and between 500 and 2000 micro m. Cellulose was the predominant polymer (60-88% of microplastic composition), followed by polypropylene. Microplastics accumulated in all the commercial species (0.95-2.1 items per individual), where shrimp (Parapenaeopsis hardwickii) had lower potential for microplastic accumulation than the other species. The predominance of fibres and cellulose in the commercial species implies their limited ability to recognize the type and composition of microplastics during ingestion. Given the limited accumulation of microplastics in these typical commercial species even at a productive aquaculture site, we suggest that microplastics may not increase the health risk of consuming seafood and their impacts on commercial species may be less deleterious than previously thought.

Wu, G., et al. (2013). "Triboelectrostatic separation for granular plastic waste recycling: a review." Waste Management **33**(3): 585-597.

The world's plastic consumption has increased incredibly in recent decades, generating more and more plastic waste, which makes it a great public concern. Recycling is the best treatment for plastic waste since it cannot only reduce the waste but also reduce the consumption of oil for producing new virgin plastic. Mechanical recycling is recommended for plastic waste to avoid the loss of its virgin value. As a mechanical separation technology, triboelectrostatic separation utilizes the difference between surface properties of different materials to get them oppositely charged, deflected in the electric field and separately collected. It has advantages such as high efficiency, low cost, no concern of water disposal or secondary pollution and a relatively wide processing range of particle size especially suitable for the granular plastic waste. The process of triboelectrostatic separation for plastic waste is reviewed in this paper. Different devices have been developed and proven to be effective for separation of plastic waste. The influence factors are also discussed. It can be concluded that the triboelectrostatic separation of plastic waste is a promising technology. However, more research is required before it can be widely applied in industry.

Wu, J., et al. (2019). "Effect of salinity and humic acid on the aggregation and toxicity of polystyrene nanoplastics with different functional groups and charges." Environmental Pollution **245**: 836-843.

Studies regarding the effect of environmental factors on the environmental behaviour and potential toxicity of nanoplastics (NPs) are limited but important. In this study, four polystyrene NPs with different functional groups and charges (PS, PS-COOH, n-PSNH₂, p-PSNH₂) were selected to investigate the effect of humic acid (HA) and salinity on their aggregation behaviour and toxicity. The results showed that salinity significantly accelerated the aggregation of the four NPs, while HA mainly exerted a stabilizing effect on the three negatively charged NPs. In contrast, the positively charged p-PSNH₂ aggregated significantly at first but remained stable as HA concentration further increased. The joint effect mainly depended on their concentration ratio. The aggregation phenomena can be explained by the Derjaguin - Landau - Verwey - Overbeek (DLVO) theory. Also, the acute toxicity of NPs on Daphnia magna was affected by the surface charge of NPs, and the positively charged p-PSNH₂ showed the lowest toxicity among the selected NPs. Furthermore, the presence of HA effectively alleviated the toxicity of PS and p-PSNH₂, as the survival rates increased from 15% to 45%-95% and 100% respectively. Our results demonstrate that the surface properties of NPs significantly influence their aggregation and toxicity.

Wu, J. S., et al. (1999). "Preparation and in-vitro evaluation of a biodegradable carrier system for inducing spawning in fish." Chinese Pharmaceutical Journal **51**(2): 171-179.

Repeated injections of hormone drugs to fish reared in captivity during the spawning season is a routine procedure for local fishermen in Taiwan. To prevent stress resulting from multiple administrations, we developed a delivery system using poly(D,L-lactide-co-glycolide) (PLGA) as a carrier. Two drugs, human chorionic gonadotropin (HCG) and leutenizing hormone-releasing hormone Analog-2 (LHRH-A2), which are commonly used by fishermen, were loaded into polymeric microbeads. The microbeads released more than 20% of the loaded drug in an initial burst. However, drug readsorbed to the carrier and 100% release was not achieved in the in vitro studies. For induction of spawning, burst release accompanied by subsequent slow release is a potential single injection administration system.

Wu, M., et al. (2019). "A composite obtained from waste automotive plastics and sugarcane skin flour: Mechanical properties and thermo-chemical analysis." Powder Technology **347**: 27-34.

In this study, wood plastic composites (WPC) were made using waste automobile bumpers (WAB) and sugarcane skin flour (SSF) as matrix and fibres, respectively. A novel KH550/TCA201 composite coupling agent was applied to modify the composites. Then, the composites were analysed by FTIR, TG-MS, GC-MS and SEM-EDS after being pyrolyzed in a thermogravimetric analyser and a tubular fixed bed. The results show that the mechanical strength of the composite modified by the KH550/TCA201 composite coupling agent is higher than that of the composite modified by a single coupling agent. When KH550/TCA201 is 2% with KH550:TCA201 = 1:1, the tensile, flexural and impact strength of the WPC composites reaches a maximum. In the pyrolysis of WPC, a large amount of alkanes, olefins, aromatics and a small amount of CO<inf>2</inf> were produced from 380 degreeC to 500 degreeC. During the WPC pyrolysis process, the release of HF and HBr is higher than that of WAB, whereas the release of HCl is less than that of WAB. In the pyrolysis oil, the main fluoride production occurs at 400-600 degreeC and reaches a maximum at 500 degreeC. Meanwhile, in the fast pyrolysis oil, the content of organic fluoride is 6 times higher compared with the slow pyrolysis oil. For the solid residue, the content of F, Cl, Br and other pollutants increased with an increase in temperature. Specifically, the chlorine content was higher at slow pyrolysis than at fast pyrolysis. Therefore, from a controllable and environmental standpoint, slow pyrolysis should be adopted in order to increase the content of the contaminated halogen elements in the solid residue. Copyright © 2019

Wu, N., et al. (2019). "Co-effects of biofouling and inorganic matters increased the density of environmental microplastics in the sediments of Bohai Bay coast." Science of the Total Environment: 134431.

Size, shape and color are the basic parameters of environmental microplastic (MPs). However, the density of microplastics which is an important parameter to influence the fate of MPs in the environment has not been measured. Meanwhile, the MPs characteristics from coastal sediments of Bohai Bay remain unclear. In this study, the concentrations, distribution and composition (shapes and sizes) of MPs were investigated. The average concentration of MPs in the coastal sediments of Bohai Bay was 192.3 +/- 138.9 items/kg dw, which was at a moderate pollution level. The MPs with fiber shape (54.5%), small size (52.0%) and low density (PE and PP) were dominant. In addition, flotation experiment showed that most of PE and PP had the higher density compared with seawater. Digestion experiments suggested that the density change of MPs was caused by the co-contribution of biofouling and inorganic minerals. The density increasing rates of PE and PP were 7.4%-12.6% and 12.1%-17.5%, respectively. Finally, we also estimated that the total number of MPs in the sediments of Bohai Sea was 534 trillion, which were significantly higher than that in global ocean surface, suggesting that the coastal sediments could be the sink of MPs.

Wu, N., et al. (2019). "Occurrence and distribution of microplastics in the surface water and sediment of two typical estuaries in Bohai Bay, China." Environmental Science. Processes & Impacts **21**(7): 1143-1152.

Estuaries are considered to be seriously polluted by microplastics. As the most important water body in North China, the pollution level of microplastics in two typical estuaries (Haihe Estuary (HHE) and Yondingxinhe Estuary (YDXE)) of Bohai Bay is not well understood. The occurrence and distribution of microplastics in the surface water and sediment of HHE and YDXE were investigated. The mean concentration of microplastics in surface-water samples was 1485.7 +/-

819.9 items per m3 for HHE and 788.0 +/- 464.2 items per m3 for YDXE, respectively, whereas the concentration of microplastics in sediment was 216.1 +/- 92.1 items per kg dw for HHE and 85.0 +/- 40.1 items per kg dw for YDXE, respectively. The concentration of microplastics in surface-water and sediment-samples of HHE was higher than that of YDXE, though YDXE is a typical sewage-received river. Anthropogenic activities and the river input were the main sources of microplastic pollution in estuarine areas. Sewage rivers could be point sources of microplastic pollution on a small scale. The small size (particle diameter < 1 mm) of microplastics was a dominant feature, the most abundant shape was fiber and colored microplastics were found widely in YDXE and HHE. We provided detailed information on microplastic pollution to support their control and management in HHE and YDXE.

Wu, P., et al. (2019). "Adsorption mechanisms of five bisphenol analogues on PVC microplastics." Science of the Total Environment **Part 1. 650**: 671-678.

Polyvinyl chloride (PVC) plastics are easily embrittled and decomposed to microplastics in an aquatic environment. The plasticizers such as bisphenol A (BPA), bisphenol S (BPS) and their analogues might be released and adsorbed by the PVC microplastics causing consequential pollution to the ecosystem. Herein, a systematic study was performed to determine the adsorption mechanisms of five bisphenol analogues (BPA, BPS, BPF, BPB and BPAF) on PVC microplastics. The maximum adsorption efficiency reached 0.19 +/- 0.02 mg.g⁻¹ (BPA), 0.15 +/- 0.01 mg.g⁻¹ (BPS), 0.16 +/- 0.01 mg.g⁻¹ (BPF), 0.22 +/- 0.01 mg.g⁻¹ (BPB), and 0.24 +/- 0.02 mg.g⁻¹ (BPAF) at PVC dosage of 1.5 g.L⁻¹. The kinetics study shows that the adsorption processes can be divided into three stages including external mass transport, intraparticle diffusion and dynamic equilibrium. The isotherm modeling shows a better fit of the adsorption results to the Freundlich isotherm compared to the Langmuir model. The thermodynamic study indicates the adsorption of all bisphenols as exothermic processes. Furthermore, the adsorption mechanisms of bisphenols were explicated intensively, with respect to hydrophobic interactions, electrostatic forces, and noncovalent bonds. A positive effect of hydrophobic interactions was identified for bisphenols adsorption on PVC microplastics, but an obvious inhibition by electrostatic repulsions was revealed for BPF due to its ionization in the neutral solution. In addition, noncovalent bonds (hydrogen and halogen bonds) may promote the adsorption of bisphenols on PVC microplastics. Finally, the desorption and competitive adsorption of five bisphenol analogues on the microplastics were provided together with a perspective for future works. Copyright © 2018

Wu, P., et al. (2019). "Environmental occurrences, fate, and impacts of microplastics." Ecotoxicology and Environmental Safety **184 (no pagination)**(109612).

Microplastics (MPs) are small plastic pieces with size less than 5 mm that have entered and polluted the environment. While many investigations including several critical reviews on MPs in the environment have been conducted, most of them are focused on their occurrences in marine environment. Current understanding on the occurrences, behaviors, and impacts of MPs in the terrestrial environment is far from complete. A systematic review of the literature was thus conducted to promote the research on MPs in the environment. This work is designed to provide a comprehensive overview that summarizes current knowledge and research findings on environmental occurrences, fate and transport, and impacts of MPs. In addition to discussing the occurrences, characteristics, and sources of MPs in the ocean, freshwater, sediments, soils, and atmosphere, the review also summarizes both the experimental and modeling data of the environmental fate and transport of MPs. Research findings on the toxic effects, bioaccumulation, and bioavailability of MPs in the environment are also covered in this critical review. Future perspectives are discussed as well. Copyright © 2019 Elsevier Inc.

Wu, P., et al. (2019). "Spatial-temporal distribution of microplastics in surface water and sediments of Maozhou River within Guangdong-Hong Kong-Macao Greater Bay Area." Science of the Total Environment: 135187.

Concerns over the negative impacts of microplastics on human health have led to growing attention on the occurrence of microplastics in aquatic environment. Recent studies have extended their focus from marine to inland waters, especially on the spatial-temporal distribution of the microplastics in urban rivers. In this study, Maozhou River, the largest river in Shenzhen, a tributary of the Pearl River, was selected as a representative inland waterway of Guangdong-Hong Kong-Macao Greater Bay Area. The spatial-temporal investigation was performed on microplastics in the surface water and sediments of 17 sites along the mainstream of the Maozhou River.

Wu, S., et al. (2016). "Multiplexed detection of lung cancer biomarkers based on quantum dots and microbeads." Talanta **156-157**: 48-54.

We have developed a multiplexed fluoroimmunoassay of three lung cancer biomarkers based on multicolor quantum dots (QDs) as detection elements and micro-magnetic beads as immune carriers. QDs have the ability to simplify multiplexed analysis. In our method, the fluorescent signals derived from three cross-talk-free QD conjugated probes with emission maxima at 525, 585 and 625nm could be analyzed to determine the concentrations of the target proteins. With this system, fragments of cytokeratin 19 (CYRFA 21-1), carcinoembryonic antigen (CEA), and neuron-specific enolase (NSE), were simultaneously detected in a single sample with a low detection limit down to the 1.0ng/mL level (364pg/mL for CYRFA 21-1, 38pg/mL for CEA, 370pg/mL for NSE in a single detection). Additional advantages of the presented method include ease of operation, low cost, and a very low sample volume (20micro L).

Wu, S., et al. (2019). "Effects of polystyrene microbeads on cytotoxicity and transcriptomic profiles in human Caco-2 cells." Environmental Toxicology **03**: 03.

Microplastics (MPs) pollution is a global paradigm that raises concern in relation to environment and human health. In order to investigate the molecular toxicity mechanisms of MPs, transcriptomic analyses were performed on in vitro Caco-2 cell model. After observing that polystyrene microplastics (PS-MPs) decreased cell viability in a dose-dependent manner, the responsible genes and involved pathways that might make contribution to PS-MBs-induced toxicity to Caco-2 cells were identified with Illumina RNA seq. A total of 442 genes including, 210 up-regulated ones and 232 down-regulated ones, showed differential expression after treatment by PS-MPs with a concentration of 12.5 mg L⁻¹ or 50.0 mg L⁻¹ for 24 hours. Gene Ontology (GO) annotation enriched unigenes can be grouped into three separated clusters: cellular component (CC), biological process (BP), and molecular function (MF). The dominate pathways related to NF-kappaB, MAPK signaling, cytokine-cytokine receptor interaction, and toll-like receptor were strongly influenced by PS-MBs. These pathways are involved in modulating cell inflammatory and proliferation. The qPCR were applied to investigate the transcriptional level of five proliferation related genes (Ras, ERK, MER, CDK4, Cyclin D1) and four inflammation related genes (TRPV1, iNOS, IL-1beta, IL-8), and the results were consistent with RNA-seq data. This study has provided new insight into the understanding of the toxicity effects of PS-MBs-induced intestinal inflammatory diseases.

Wu, T. Y., et al. (2016). "A novel sensitive pathogen detection system based on Microbead Quantum Dot System." Biosensors & Bioelectronics **78**: 37-44.

A fast and accurate detection system for pathogens can provide immediate measurements for the identification of infectious agents. Therefore, the Microbead Quantum-dots Detection System (MQDS) was developed to identify and measure target DNAs of pathogenic microorganisms and eliminated the need of PCR amplifications. This nanomaterial-based technique can detect different microorganisms by flow cytometry measurements. In MQDS, pathogen specific DNA probes were designed to form a hairpin structure and conjugated on microbeads. In the presence of the complementary target DNA sequence, the probes will compete for binding with the reporter probes but will not interfere with the binding between the probe and internal control DNA. To monitor the binding process by flow cytometry, both the reporter probes and internal control probes were conjugated with Quantum dots that fluoresce at different emission wavelengths using the click reaction. When MQDS was used to detect the pathogens in environmental samples, a high correlation coefficient (R=0.994) for Legionella spp., with a detection limit of 0.1 ng of the extracted DNAs and 10 CFU/test, can be achieved. Thus, this newly developed technique can also be applied to detect other pathogens, particularly viruses and other genetic diseases.

Wu, W., et al. (2019). "AIEgens Barcodes Combined with AIEgens Nanobeads for High-sensitivity Multiplexed Detection." Theranostics **9**(24): 7210-7221.

Suspension arrays based on optical encoded microspheres have attracted great attention for multiplexed detection in gene analysis, protein profiling, early disease diagnosis, treatment monitoring and so on. However, the fluorescence stability of barcodes and detection sensitivity require further improvement to meet the increasing demands of "precision diagnosis". Methods: This work reports a novel suspension array platform based on extremely stable AIEgens (AIE33 and AIE NIR800) microbeads as barcodes and AIEgens (1,1,2,3,4,5-Hexaphenyl-1H-silole, HPS) nanobeads as fluorescent signal reporter coupled with flow cytometry for multiplexed detection. Results: Due to the excellent fluorescent signal amplification effect of the HPS nanobeads, our multiplex assay showed enhanced detection sensitivity, compared to multiplex assay using QDs nanobeads (up to 3-fold improvement) and commercial organic dye of phycoerythrin (up to 5-fold improvement) as the fluorescent signal reporters. Conclusion: Furthermore, validating experiments showed similar detection performance to the clinical gold-standard method of ImmunoCAP for allergen detection in patient serum samples, demonstrating the suspension array platform based on AIEgens microbeads with excellent fluorescence stability and AIEgens nanobeads with strong signal amplification ability is promising for high-sensitivity multiplexed bioassay applications.

Wu, W., et al. (2017). "Microplastics pollution and reduction strategies." Frontiers of Environmental Science and Engineering **11**(1).

Microplastic particles smaller than 5 mm in size are of increasing concern, especially in aquatic environments, such as the ocean. Primary source is microbeads (<1 mm) used in cosmetics and cleaning agents and fiber fragments from washing of clothes, and secondary source such as broken down plastic litter and debris. These particles are mostly made from polyethylene (PE), polypropylene (PP), polystyrene (PS), polyethylene terephthalate (PET) and polyesters. They are ingested by diverse marine fauna, including zooplanktons, mussel, oyster, shrimp, fish etc. and can enter human food chains via several pathways. Strategy for control of microplastics pollution should primarily focus on source reduction and subsequently on the development of cost-effective clean up and remediation technologies. Recent research results on biodegradation of plastics have revealed a potential for microbial biodegradation and bioremediation of plastic pollutants, such as PE, PS and PET under appropriate conditions.

Wu, X., et al. (2019). "Transport of polystyrene nanoplastics in natural soils: Effect of soil properties, ionic strength and cation type." Science of the Total Environment **707**: 136065.

Nanoplastics as emerging pollutants have caused growing concerns and posed potential threats to the environment. Nonetheless, only few studies investigated transport behaviors of nanoplastics in natural soils. In this study, column experiments were conducted to investigate the effect of soil properties, ionic strength and cation type on the transport of polystyrene nanoplastics (PSNPs) in a desert soil (DS), a black soil (BS) and a red soil (RS). The effluent recovery of PSNPs in three soils followed the order of DS (0%-96.8%) > BS (0%-87.5%) > RS (0%). The retention of PSNPs was positively correlated with Fe/Al oxides contents (DS: Fe-2.69%, Al-12.6%; BS: Fe-4.04%, Al-15.9%; RS: Fe-6.57%, Al-26.9%), whereas negatively correlated with soil pH (DS: 9.75; BS: 6.57; RS: 4.97). Soil minerals and pH were thus identified as the crucial soil properties determining transport of PSNPs, due to their coupled effects on surface charges to affect electrostatic interactions between soils and PSNPs. In addition, increasing solution ionic strength strongly inhibited the transport of PSNPs in the DS (0%-96.8%) and BS (0%-87.5%). Ca²⁺ (IS: 1-5 mM) was more pronounced in enhancing PSNP retention than Na⁺ (IS: 1-20 mM). Our findings highlight that the transport and fate of PSNPs in natural soils are highly sensitive to soil physicochemical properties, ionic strength and cation type, and reveal that nanoplastics have strong mobility ability in soils with high pH and low Fe/Al oxides contents, which may pose potential risks to the soil and groundwater environment.

Wu, X., et al. (2019). "Selective enrichment of bacterial pathogens by microplastic biofilm." Water Research **165**: 114979.

Microplastics have been found to be ubiquitous in freshwater ecosystems, providing a novel substrate for biofilm formation. Here, we incubated biofilm on microplastics and two natural substrates (rock and leaf) under a controlled environment to investigate the differences of microbial community structure, antibiotic resistance gene (ARG) profiles, and ARG microbial hosts between biofilms on three types of substrates.

Wu, X., et al. (2013). "Regulation of differentiation in trabecular bone-derived mesenchymal stem cells by T cell activation and inflammation." Oncology Reports **30**(5): 2211-2219.

Mesenchymal stem cells (MSCs) are multipotent stem cells with the ability to migrate to sites of inflammation and injury, where they participate in tissue regeneration and repair. The present study aimed to investigate the effects of T cell activation and inflammation on the differentiation of MSCs. Human trabecular bone-derived MSCs were isolated from patients undergoing total hip replacement, and T cells were isolated and purified from peripheral blood mononuclear cells (PBMCs) using CD3 MicroBeads. MSCs were co-cultured with activated T cells to mimic the inflammatory microenvironment. MTS assay was used to detect cell proliferation.qRT-PCR, western blotting, histology and immunohistochemical staining were used to detect the adipo-/osteo-specific gene expression and the relative signaling pathway. The MTS results showed that higher concentrations of T cells significantly increased the proliferation of MSCs. Expression of the inflammatory gene IL-6 was upregulated, while expression of IL-10 and INFgamma was downregulated in MSCs exposed to activated T cells. The results also showed that PHA-activated T cells significantly upregulated the expression of PPARgamma and FABP4 (adipo-specific genes) in MSCs, but no difference was noted in the expression of RUNX2,

osteocalcin and ALP (osteo-specific genes) at the protein level. T cell treatment and inflammation inhibited the protein expression of TGF-beta1 and the phosphorylation of Smad3, resulting in the weakening of the TGF-beta/Smad pathway and enhancing the adipogenic differentiation of MSCs. The results indicated that PHA-activated T cells and inflammation could promote adipogenesis without affecting the late stage of osteogenesis of MSCs, by increasing the expression of key adipogenic genes through TGF-beta/Smad3 signaling.

Wu, X., et al. (2013). "Enhancement of human regulatory gammadelta t cells in vitro induced by granulocyte colony-stimulating factor." Blood. Conference: 55th Annual Meeting of the American Society of Hematology, ASH **122**(21).

Background and Objective Graft versus host disease (GVHD) is the main complications following allogeneic hematopoietic stem cell transplantation (allo-HSCT). Regulatory gammadelta T cells (gammadelta Tregs), which express Foxp3 and primarily belong to CD27+CD25high phenotype, are a novel subset of cells with immunosuppressive function and have the potential application prospect in GVHD therapy. Peripheral blood mononuclear cells (PBMCs) could be induced to generate gammadelta Tregs in vitro by stimulating with anti-TCR gammadelta and transforming growth factor-beta (TGF-beta). Our previous studies demonstrated that granulocyte colony-stimulating factor (G-CSF) had immunomodulatory effect on T cells; G-CSF mobilization influenced the distribution and clonality of TRGV and TRDV repertoire (T cell receptors of gammadelta T cells) significant positive correlation was observed between the invariable clonality of TRDV1 gene repertoire after G-CSF mobilization and low incidence of GVHD in recipients. To further characterize the immunoregulatory functions of G-CSF, this study explored the possibility of gammadelta Tregs induced by G-CSF in vitro. Methods PBMCs of healthy donors were cultured in vitro by stimulating with anti-TCR gammadelta and different cytokines for 9-12 days. The culture system was grouped based on the difference of added cytokines, including: (1) TGF-beta (2) G-CSF (3) TGF-beta+G-CSF (4) blank group. The induced cells were used as effector cells in the carboxylfluorescein diacetate succinimidyl ester (CFSE) assays and cell immunophenotyping was analyzed by flow cytometry. Autologous CD4+T cells were purified by microbeads, labeled with CFSE, used as responder cells finally co-cultured with effector cells. After 5 days incubation, cells were harvested and analyzed for flow cytometry by gating on the CFSE-labeled cells. The expression levels of Foxp3 and CD25 genes were detected by real-time polymerase chain reaction. Results After 9 days' culture in vitro, the proportion of Foxp3+ gammadelta T cells was 7.87% in the blank group, which was significantly lower than that in the TGF-beta, G-CSF and TGF-beta + G-CSF group (62.3%, 52.9% and 63.5%) (P<0.001). The proportions of CD25+gammadelta T and CD27+gammadelta T cells were 3.9% and 3.5% in the blank group, which were also significantly lower than that in the TGF-beta, G-CSF and TGF-beta + G-CSF group (CD25+gammadelta T cells: 43.5%, 43.4% and 44.4%; CD27+gammadelta T cells: 41.5%, 41.9% and 44.0%, respectively) (P<0.001, P<0.001). The effector cells induced by anti-TCR gammadelta with TGF-beta, G-CSF and TGF-beta + G-CSF all manifested a more significant suppressive effect on responder cells than cells induced only by anti-TCR gammadelta. However, there was no significant difference in the effect of cell proliferation suppression in the TGF-beta, G-CSF and TGF-beta + G-CSF groups. The expression level of Foxp3 gene was 0.384% in the blank group, which was significantly lower than that in the TGF-beta, G-CSF and TGF-beta + G-CSF group (0.623%, 0.639% and 0.843%, respectively) (P<0.001). The expression level of Foxp3 in TGF-beta+ G-CSF group was significantly higher than that in the TGF-beta and G-CSF group (P=0.001, P=0.007). The expression level of CD25 gene was similar among the four groups (P=0.457). Conclusions The generation of gammadelta Tregs could be enhance in vitro induced by G-CSF. This may be one of the reasons that G-CSF play an immunoregulatory role on

decreased GVHD onset during allo-HSCT.

Wu, Y., et al. (2006). "Diazo coupling method for covalent attachment of proteins to solid substrates." Bioconjugate Chemistry **17**(2): 359-365.

We describe a process for covalently linking proteins to glass microscope slides and microbeads in a manner that optimizes the reactivity of the immobilized proteins and that is suitable for high-throughput microarray and flow cytometry analysis. The method involves the diazo coupling of proteins onto activated self-assembled monolayers formed from p-aminophenyl trimethoxysilane. Proteins immobilized by this method maintained bioactivity and produced enhanced levels of protein-protein interaction, low background fluorescence, and high selectivity. The binding of immobilized proteins to their specific binding partner was analyzed quantitatively and successfully correlated with solution concentrations. Diazotized surfaces bound more efficiently to proteins containing a hexahistidine tag than those without a his-tag. Moreover, significantly higher reactivity of the immobilized his-tagged proteins was observed on diazotized surfaces than on amine-terminated surfaces. Results suggest that his-tagged proteins are immobilized by reaction of the his-tag with the diazotized surface, thus offering the possibility for preferential orientation of covalently bound proteins. © 2006 American Chemical Society.

Wu, Y., et al. (2019). "Effect of microplastics exposure on the photosynthesis system of freshwater algae." Journal of Hazardous Materials **374**: 219-227.

Microplastics are widely distributed in freshwater environments. At present, most of the studies on the toxicity of microplastics are concentrated on aquatic feeding animals, but relatively few have addressed freshwater algae. This study investigated the effect of microplastics (polypropylene (PP) and polyvinyl chloride (PVC)) exposure on the photosynthetic system of freshwater algae over the logarithmic growth period. The results showed that both PVC and PP had a negative effect on chlorophyll a concentrations of Chlorella (C.) pyrenoidosa and Microcystis (M.) flos-aquae; among them, when the concentration of PVC exceeded 250 mg/L, compared with the control group, the chlorophyll a content of C. pyrenoidosa was reduced by 55.23%. For photosynthetic activity, higher concentrations of PVC and PP can induce lower values of F_v/F_m, F_v/F₀, and F_v'/F_m', suggesting a larger impact in algae. However, algae were able to adjust, with increased values of F_v/F_m, F_v/F₀, and F_v'/F_m'. This dose-negative effect phenomenon also exists in the study of the rapid light-response curves. In addition, comparing the two microplastics, we could see that PVC greatly inhibits the photosynthesis system of freshwater algae. Our study confirmed that microplastics can affect algae growth under certain concentrations, which provides evidence for understanding the risks of microplastics.

Wu, Y., et al. (2018). "Generation of Size-controlled Poly (ethylene Glycol) Diacrylate Droplets via Semi-3-Dimensional Flow Focusing Microfluidic Devices." Journal of Visualized Experiments **137**(07): 03.

Uniform and size-controllable poly (ethylene glycol) diacrylate (PEGDA) droplets could be produced via the flow focusing process in a microfluidic device. This paper proposes a semi-three-dimensional (semi-3D) flow-focusing microfluidic chip for droplet formation. The polydimethylsiloxane (PDMS) chip was fabricated using the multi-layer soft lithography method. Hexadecane containing surfactant was used as the continuous phase, and PEGDA with the ultraviolet (UV) photo-initiator was the dispersed phase. Surfactants allowed the local surface tension to drop and formed a more cusped tip which promoted breaking into tiny micro-droplets. As the pressure of dispersed phase was constant, the size of droplets became smaller with increasing continuous phase pressure before dispersed phase flow was broken off. As a result, droplets with size variation from 1 micro m to 80 micro m in diameter could be selectively achieved by changing the pressure ratio in two inlet channels, and the average coefficient of variation was estimated to be below 7%. Furthermore, droplets could turn into micro-beads by UV exposure for photo-polymerization. Conjugating biomolecules on such micro-beads surface have many potential applications in the fields of biology and chemistry.

Wu, Y., et al. (2019). "On-chip cell mechanophenotyping using phase modulated surface acoustic wave." Biomicrofluidics **13**(2): 024107.

A surface acoustic wave (SAW) microfluidic chip was designed to measure the compressibility of cells and to differentiate cell mechanophenotypes. Polystyrene microbeads and poly(methylmethacrylate) (PMMA) microbeads were first tested in order to calibrate and validate the acoustic field. We observed the prefocused microbeads being pushed into the new pressure node upon phase shift. The captured trajectory matched well with the equation describing acoustic radiation force. The compressibility of polystyrene microbeads and that of PMMA microbeads was calculated, respectively, by fitting the trajectory from the experiment and that simulated by the equation across a range of compressibility values. Following, A549 human alveolar basal epithelial cells (A549 cells), human airway smooth muscle (HASM) cells, and MCF-7 breast cancer cells were tested using the same procedure. The compressibility of each cell from the three cell types was measured also by fitting trajectories between the experiment and that from the equation; the size was measured by image analysis. A549 cells were more compressible than HASM and MCF-7 cells; HASM cells could be further distinguished from MCF-7 cells by cell size. In addition, MCF-7 cells were treated by colchicine and 2-methoxyestradiol to disrupt the cell microtubules and were found to be more compressible. Computer simulation was also carried out to investigate the effect of cell compressibility and cell size due to acoustic radiation force to examine the sensitivity of the measurement. The SAW microfluidic method is capable of differentiating cell types or cells under different conditions based on the cell compressibility and the cell size.

Wu, Y., et al. (2008). "Phenylboronic acid immunoaffinity reactor coupled with flow injection chemiluminescence for determination of alpha-fetoprotein." Analytica Chimica Acta **630**(2): 186-193.

A reusable and sensitive immunoassay based on phenylboronic acid immunoaffinity reactor in combination with flow injection chemiluminescence (CL) for determination of glycoprotein was described. The reactor was fabricated by immobilizing 3-aminophenylboronic acid (APBA) on glass microbeads with gamma-glycidoxypropyltrimethoxysilane (GPMS) as linkage. The alpha-fetoprotein (AFP) could be easily immobilized on the APBA coated beads through sugar-boronic interaction. After an off-line incubation, the mixture of the analyte AFP with horseradish peroxidase-labeled AFP antibody (HRP-anti-AFP) was injected into the reactor. This led the trapping of free HRP-anti-AFP by the surface coated AFP on glass beads. The trapped HRP-anti-AFP was detected by chemiluminescence due to its sensitizing effect on the reaction of luminol and hydrogen peroxide. Under optimal conditions, the chemiluminescent signal was proportional to AFP concentration in the range of 10-10 0 ng m L(-1). The whole assay process including regeneration of the reactor could be completed within 31 min. The proposed system showed acceptable detection and fabrication reproducibility, and the results obtained with the present method were in acceptable agreement with those from parallel single-analyte test of practical clinical sera. The described method enabled a low-cost, time saving and was potential to detect the serum AFP level in clinical diagnosis.

Wu, Y. J., et al. (2017). "Effects of immunoglobulin D on expression of IgD receptor and protein tyrosine kinase signaling in human CD4⁺ T cells." Chinese Journal of Pharmacology and Toxicology **31 (10)**: 977.

OBJECTIVE: To observe whether human CD4⁺ T cells could be activated by immunoglobulin D (IgD) via IgD receptor(lgDR)-Lck. METHOD(S): Human CD4⁺T cells were purified from peripheral blood mononuclear cells (PBMCs) with microbeads. The viability of T cells were detected by CCK-8. The binding affinity and expression of IgDR on T cells were detected by flow cytometry. The protein expression of IgDR, Lck and P-Lck were analyzed by western blot. RESULT(S): IgD could concentrationdependent bind to IgDR on CD4⁺T cells. The expression of IgDR was increased in response to treatment with IgD in a time-dependent and concentration-dependent manner. Stimulating by IgD resulted in enhanced phosphorylation of Lck compared with that in the medium control sample. The expression of Lck was not changed. As inhibitor of PTK, Herbimycin A or A770041, which combined with IgD could significantly inhibit phosphorylation of Lck(Tyr³⁹⁴). The proliferation promoting effect of IgD was blocked by Herbimycin A or A770041. IgD could stimulate CD4⁺ T cell activation and proliferation through upregulating activating tyrosine residue of Lck (Tyr³⁹⁴) phosphorylation. CONCLUSION(S): These results demonstrate that IgD exaggerates CD4⁺T cell activities, which may be through promoting Lck phosphorylation.

Wu, Y. J., et al. (2018). "CP-25 Attenuates the Activation of CD4⁺ T Cells Stimulated with Immunoglobulin D in Human." Frontiers in Pharmacology **9**: 4.

Researchers have shown that the level of immunoglobulin D (IgD) is often elevated in patients with autoimmune diseases. The possible roles of IgD on the function of human T cell activation are still unclear. Paeoniflorin-6'-O-benzene sulfonate (code: CP-25), the chemistry structural modifications of paeoniflorin, was a novel drug of anti-inflammation and immunomodulation. The aims of this study were to determine if human CD4⁺ T cells could be activated by IgD via the IgD receptor (IgDR)-Lck pathway and whether the novel compound CP-25 could affect the activation of T cells by regulating Lck. Human CD4⁺ T cells were purified from peripheral blood mononuclear cells using microbeads. T cell viability and proliferation were detected by Cell Counting Kit-8 and CFSE Cell Proliferation Kit. Cytokines secreted by T cells were assessed with the Quantibody Human Inflammation Array. The binding affinity and expression of IgDR on T cells were detected by flow cytometry, and protein expression of IgDR, Lck, and P-Lck were analyzed by western blot. IgD was shown to bind to IgDR on CD4⁺ T cells in a concentration-dependent manner and stimulate the activation and proliferation of these cells by enhancing phosphorylation of the activating tyrosine residue of Lck (Tyr³⁹⁴). CP-25 inhibited the IgD-stimulated activation and proliferation of CD4⁺ T cells, as well as the production of inflammatory cytokines; it was thus suggested that this process might be related to the downregulation of Lck (Tyr³⁹⁴) phosphorylation. These results demonstrate that IgD amplifies the activation of CD4⁺ T cells, which could be mediated by Lck phosphorylation. Further, CP-25, via its ability to modulate Lck, is a novel potential therapeutic agent for the treatment of human autoimmune diseases.

Wu, Y.-j., et al. (2017). "Effects of immunoglobulin D on expression of IgD receptor and protein tyrosine kinase signaling in human CD4+ T cells." Zhongguo Yaolixue yu Dulixue Zazhi = Chinese Journal of Pharmacology and Toxicology **31**(10): 977.

OBJECTIVE To observe whether human CD4 + T cells could be activated by immuno-globulin D (IgD) via IgD receptor(IgDR)-Lck. METHODS Human CD4+ T cells were purified from peripheral blood mononuclear cells (PBMCs) with microbeads. The viability of T cells were detected by CCK-8. The binding affinity and expression of IgDR on T cells were detected by flow cytometry. The protein expression of IgDR, Lck and P-Lck were analyzed by western blot. RESULTS IgD could concentration-dependent bind to IgDR on CD4+ T cells. The expression of IgDR was increased in response to treatment with IgD in a time- dependent and concentration- dependent manner. Stimulating by IgD resulted in enhanced phosphorylation of Lck compared with that in the medium control sample. The expression of Lck was not changed. As inhibitor of PTK, Herbimycin A or A770041, which combined with IgD could significantly inhibit phosphorylation of Lck(Tyr394). The proliferation promoting effect of IgD was blocked by Herbimycin A or A770041. IgD could stimulate CD4+ T cell activation and proliferation through upreg?ulating activating tyrosine residue of Lck (Tyr394) phosphorylation. CONCLUSION These results demon?strate that IgD exaggerates CD4+T cell activities, which may be through promoting Lck phosphorylation.

Wu, Z. and H. Nakanishi (2013). "Differential pathways for the interleukin-1beta production activated by chromogranin A and Abeta in microglia." Molecular Neurodegeneration **1)**: S29.

Background Although chromogranin A (CGA) is frequently present in Alzheimer's disease (AD) senile plaques associated with microglial activation, little is known about basic difference between CGA and fibrillar Abeta as neuroinflammatory factors. Here we have thus compared the interleukin-1beta (IL-1beta) production pathways by CGA and fibrillar Abeta in microglia. Materials and methods MG6 microglia and primary cultured microglia were used in this study. Microglia isolated from young and aged mouse brains by magnetic cell sorting using CD11b-conjugated microbeads were also used. Processings of pro-caspase-1 and pro-IL-1beta were analysed by immunoblottings. Secretion of IL-1beta was measured by ELISA.The frontal cortex of human brains from AD and no clinical evidence of dementia were used for immunohistochemical analyses. Results In cultured microglia, production of IL-1beta was induced by CGA, but not by fibrillar Abeta. CGA activated both nuclear factor-kB (NFkB) and pro-caspase-1, whereas fibrillar Abeta activated pro-caspase-1 only. For the activation of pro-caspase-1, both CGA and fibrillar Abeta needed the enzymatic activity of cathepsin B (CatB), but only fibrillar Abeta required cytosolic leakage of CatB and the NLRP3 inflammasome activation [1,2]. In contrast, fibrillar Abeta induced the IL-1beta secretion from microglia isolated from the aged mouse brain. In AD brain, highly activated microglia, which showed intense immunoreactivity for CatB and IL-1beta, surrounded CGA-positive plaques more frequently than Abeta- positive plaques. Conclusions These observations indicate differential pathways for the microglial IL-1beta production by CGA and fibrillar Abeta, which may aid in better understanding of pathological significance of neuroinflammation in AD.

Wylie, D., et al. (2012). "Novel nanotechnologies for multiple spatially and temporally resolved live single cell membrane sampling and analysis." Free Radical Biology and Medicine **1)**: S127-S128.

Studying biology at the single cell level is of profound importance as the very concept of cellular heterogeneity within supposed 'identical cell populations' is the basis for how many diseases develop, especially cancer. No cancer or disease is ever diagnosed at the first cancer or diseased cell level but having a platform that can analyse and compare components of a diseased cell's proteome relative to that of a normal cell within the same cell population would be a huge step in that direction. Using a system where optical traps are generated holographically with a spatial light modulator (SLM), we can accurately control multiple mono-disperse lipidcoated microbeads (or Smart Droplet Microtools, SDMs) within a microfluidic cell culture environment.

We are able to spatially and temporally resolve sampling of various membrane associated fluorescently tagged proteins from multiple individual adherent viable cells and cell lines in a microfluidic culture environment and can sample repeatedly, if necessary, both before and after the addition of various biological and chemical reagents. This technology has the potential for subsequent downstream processing of the SDMs and their cargo for quantitative analysis and for delivering stimuli and other reagents to the cells.

Wylot, B., et al. (2013). "Hematopoetic stem/progenitor cellderived microglia-like cells with potential to support regeneration in the central nervous system." GLIA **1)**: S204.

In response to the central nervous system (CNS) injury, hematopoetic cells migrate to the lesion where they can potentially contribute to tissue regeneration. Following CNS injury, these cells can secrete a plethora of immunomodulating cytokines and/or pro-regenerative growth factors as well as phagocyte proinflammatory tissue debris. Nevertheless, the role of primitive hematopoetic stem/progenitor cells (HSPC) - derived from bone marrow - to support CNS regeneration has not been studied in detail. Therefore, the aim of the present study was to examine characteristics of HSPC in vitro as well as to test proregenerative potential of these cells to support CNS repair in vivo. Highly pure population of primitive hematopoetic stem/progenitor cells was isolated from the bone marrow and the CNS with fluorescence activated cell sorting (FACS). The number of HSPC in the CNS lesion was significantly increased compared to intact CNS tissue. Sorted-bone marrow HSPC were co-cultured with primary astrocytes to examine their phenotype according to the presence of specific antigens and gene expression as well as to test their phagocytosis potential. In the presence of astrocytes, bone marrow-derived HSPC differentiated in vitro into microglia-like cells expressing specific myeloid/microglia markers and showing high ability to ingest fluorescent microbeads. The in vivo potential of HPSC for supporting regeneration was examined by their transplantation into the CNS lesion. Results of our study demonstrated that primitive hematopoetic stem/progenitor cells are the source of microglia-like cells which can support regeneration in the central nervous system.

Wyssusek, K. H., et al. (2019). "Operating room greening initiatives - the old, the new, and the way forward: A narrative review." Waste Management and Research **37**(1): 3-19.

Healthcare waste is a rampant issue in Australian hospitals. The operating room (OR) contributes disproportionately to total hospital waste. There has been considerable research in the literature concentrating on strategies to improve OR and hospital waste accumulation, in an attempt to provide guidance and direction on how to reduce the healthcare ecological footprint. We reviewed the literature for leading greening initiatives currently utilised in the OR in Australia and internationally. This narrative literature review focuses on the trend of OR greening initiatives over the last 25 years, comparing different innovative approaches, the successes and setbacks, and the financial implications of initiatives. A variety of measures that hospital management, surgeons, anaesthetists, nurses and other healthcare personnel can take to reduce the ecological footprint of their healthcare facility are outlined. Greening initiatives include reducing, recycling, reusing, rethinking and researching, as well as novel technology and smarter architectural design. We also evaluated the barriers to improving waste management, which include lack of leadership, misconceptions among staff, and an overall resistance to change. In conclusion, in a world where greenhouse gas emissions cause unprecedented climate change and landfill space is finite, it is incumbent upon hospitals to help reduce the environmental impact of their facility. Reducing pollution and greenhouse gas emissions would moderate the incidence of human disease, save money for the healthcare system and society as a whole, and contribute to a safer and healthier world we all would like to live in. Copyright ©

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Xanthos, D. and T. R. Walker (2017). "International policies to reduce plastic marine pollution from single-use plastics (plastic bags and microbeads): A review." Marine Pollution Bulletin **118**(1-2): 17-26.

Marine plastic pollution has been a growing concern for decades. Single-use plastics (plastic bags and microbeads) are a significant source of this pollution. Although research outlining environmental, social, and economic impacts of marine plastic pollution is growing, few studies have examined policy and legislative tools to reduce plastic pollution, particularly single-use plastics (plastic bags and microbeads). This paper reviews current international market-based strategies and policies to reduce plastic bags and microbeads. While policies to reduce microbeads began in 2014, interventions for plastic bags began much earlier in 1991. However, few studies have documented or measured the effectiveness of these reduction strategies. Recommendations to further reduce single-use plastic marine pollution include: (i) research to evaluate effectiveness of bans and levies to ensure policies are having positive impacts on marine environments; and (ii) education and outreach to reduce consumption of plastic bags and microbeads at source.

Xia, B., et al. (2019). "Polystyrene microplastics increase uptake, elimination and cytotoxicity of decabromodiphenyl ether (BDE-209) in the marine scallop Chlamys farreri." Environmental Pollution: 113657.

Microplastics are a growing problem in marine environments due to their ubiquitous occurrence and affinity for chemical pollutants. However, the influence of microplastics on the uptake, depuration and toxicity of decabromodiphenyl ether (BDE-209) in marine organisms is unclear. We exposed the marine scallop Chlamys farreri to polystyrene microplastics (PS; 125 mug/L) combined with BDE-209 (10 and 100 mug/L) to determine their toxicokinetics, cellular toxicity and histopathological effects. The results showed that PS acted as both a carrier and a scavenger for the bioaccumulation of BDE-209. Importantly, the carrier role of PS was greater than scavenger one. PS increased the negative effect of BDE-209 (100 mug/L) on hemocyte phagocytosis, and ultrastructural changes in gills and digestive gland of scallops due to their carrier role for the bioaccumulation of BDE-209. However, PS did not increase the DNA damage of BDE-209 on the hemocytes. These findings are evidence of microplastics transferring adsorbed pollutants to marine organisms, and increasing their toxicity.

Xia, H., et al. (2017). "Analysis of marker gene transcripts and 35 cytokines in adipose tissue mesenchymal stem cells spanning 15 consecutive passages." Molecular Biology of the Cell. Conference **28**(26).

Mesenchymal stem cells (MSC) are multipotent stem cells, typically isolated from bone marrow, adipose tissue, and umbilical cord. But they have also been isolated from other fetal and adult tissues. MSC can differentiate into many different cell types, among them adipocytes, chondrocytes, and osteoblasts. The therapeutic potential of MSC has been assessed for a number of conditions, including conditions characterized by inflammation. MSC have been found to promote tissue regeneration and modulate immune responses involving inflammation. Thus, the cytokine secretion profile of MSC is important in these cells' ability to modulate inflammation. However, with increasing in vitro passages, MSC progressively lose their potency. To ascertain the changes in their cytokine secretion profile during in vitro propagation, we grew adipose tissue MSC for 17 successive passages, and for each passage quantified 35 secreted cytokines by the Luminex microbeads multiplex assays. The results show that the cytokine concentrations in the culture media increased, with various cytokines peaking around passages

8-11. Then the levels decreased, in some cases precipitously. The variations in cytokine levels from passage to passage ranged from relatively small to dramatic. For example, eotaxin concentration at passage 10 was nearly 30-fold greater than that at passage 6, and it was below detection limit at passage 17. The hepatocyte growth factor (HGF) and interleukin 1 receptor antagonist (IL-1RA) exhibited a different profile; both had early passage peak levels and then gradual drop. EGF, MIG, IL-3, and IL-15 could not be detected at any passage. We also assessed the expression profile of the main MSC marker genes and several negative marker genes. The expression of the positive markers CD29, CD44, and CD73 expressions did not have appreciable changes across the span of passages, CD 90 expression generally increased with passage number, and CD166 had significantly higher levels at passages 4 and 5, but much lower at other passages. The most remarkable of the negative markers was CD34; its level at passage 15 was nearly 100-fold greater than its lowest levels at some earlier passages.

Xia, M., et al. (2018). "The adsorption of Cs⁺ from wastewater using lithium-modified montmorillonite caged in calcium alginate beads." Chemosphere **203**: 271-280.

The increasing nuclear energy consumption has posed serious environmental concerns (e.g. nuclear leakage), and the removal of radionuclides such as cesium becomes an urgent issue to be solved currently. In this research, a novel non-toxic adsorbent lithium-modified montmorillonite clay encapsulated in calcium alginate microbeads (MCA/Li) was fabricated by using ion-exchange method and then used successfully in the remediation of cesium-contaminated wastewater. Analyses of scanning electron microscopy, X-ray diffraction, Fourier transform infrared spectroscopy, and X-ray photoelectron spectroscopy were used to characterize the physicochemical properties of adsorbent MCA/Li, such as internal crystal structure, constituent elements, and functional groups. The effects of concentration ratios (sodium alginate/montmorillonite), solution pH, contacting time and initial Cs⁺ concentration on the adsorption behavior were carefully investigated via batch adsorption experiments. The adsorbent MCA/Li exhibited higher selectivity and removal efficiency towards Cs⁺ with the maximum adsorption capacity of 100.25mg/g. In the kinetics study, the pseudo-first-order fitted the cesium adsorption data of MCA/Li better than the pseudo-second-order. The adsorption mechanism studies revealed the process followed the Langmuir isotherm model, which suggested that Cs⁺ adsorption onto MCA/Li is a monolayer homogeneous adsorption process. The research findings indicated this novel adsorbent MCA/Li demonstrated great potential in radioactive wastewater treatment due to its convenience in synthesis, high adsorption capacity, and low cost.

Xiang, Q., et al. (2019). "Adsorbed Sulfamethoxazole Exacerbates the Effects of Polystyrene (∼2 μm) on Gut Microbiota and the Antibiotic Resistome of a Soil Collembolan." Environmental Science & Technology **53**(21): 12823.

Microplastics pollution in the environment is now receiving worldwide attention; however, the effects of copollution of antibiotics and microplastics on the gut microbiome of globally distributed and functionally important nontarget soil animals remain poorly understood. We studied a model collembolan (Folsomia candida) and found that the ingestion of microplastics (polystyrene, 2–2.9 μm) substantially altered the gut microbiome, antibiotic resistance gene (ARG) profile, and the isotopic fractionation in the soil collembolan tissue. Importantly, collembolans exposed to polystyrene microplastics loaded with sulfamethoxazole (MA) presented a distinctive gut microbiome, ARG profile, and isotopic fractionation compared to those exposed to polystyrene alone (MH). We observed that the abundance of ARGs and mobile genetic elements (MGEs) in the MA-treated collembolan guts was significantly higher than in the

MH and the control treatments. There were also strong interactions between the gut microbiome and ARGs in the collembolan guts. We further found that bacterial β-diversity correlated significantly with the δ13C and δ15N values in collembolan body tissues. Together, our results indicate that changes in isotopic fractionation and ARG profiles in the collembolan were induced by the changes in gut microbiota and suggest that microplastics from diverse sources may have profound influences on soil fauna and soil food webs.

Xiao, D., et al. (2019). "Development of agricultural waste/recycled plastic/waste oil bio-composite wallpaper based on two-phase dye and liquefaction filling technology." Environmental Science & Pollution Research **12**: 12.

In this paper, a complete biomass composite processing system based on agricultural waste powders, recycled plastics, and waste oil is proposed. The wood-colored wallpaper, the green wallpaper, and the blue wallpaper are produced by this processing system. These wallpapers are new products with low cost, high added value, and environmental friendliness. These wallpapers have also been systematically tested. Based on the analysis of test results, a 3D model of material formation mechanism, liquefaction filling technology, and hybrid network model construction technology are obtained. The experiment found the reasonable RLDPE and RLLDPE ratio (1:0.26), the reasonable ratio of biomass to specialty solvents (1:1.5), the reasonable dose of the solid dye (3%), and the reasonable concentration of dye solutions. Wood-colored bio-composite wallpaper products have a smooth surface, wood color (DELTAE = 36.7), natural aroma, and good comprehensive mechanical properties (tensile strength 9.255 MPa; elongation at break 20.998%; Young's modulus 2229.475 MPa). The processing system and wallpaper products in this article not only promote the plastic recycling economy and sustainable agricultural development but also provide new channels for the development of waste oil reuse and new ideas for the development of high value-added biocomposite materials.

Xiao, J., et al. (2008). "[An effective method for T-cell and B-cell simultaneous depletion in vitro from mobilized peripheral blood stem/progenitor cell graft for haploidentical transplantation]." Zhongguo Shi Yan Xue Ye Xue Za Zhi **16**(5): 1126-1129.

Depletion of T and B cells from the graft is prerequisite for haploidentical transplantation to decrease the risk of GVHD and EBV-associated lymphoproliferative disease. This study was aimed to investigate the performance of T-cell and B-cell simultaneous depletion from mobilized peripheral blood stem cells (PBSCs) for the first time in China, using anti-CD3 and anti-CD19 antibodies conjugated to magnetic microbeads by the CliniMACS device. The depletion efficiency of T-cell and B-cells was analyzed by flow cytometry; the function of the stem cells after depletion was evaluated using colony assays. The results indicated that the mononuclear cell count prior to T- and B-cell depletion was 4.88 x 10(10). After depletion, the percentage of T cells was 0.02% with a log (10) depletion of 4.4. The percentage of B cells was less than 0.01% with a log (10) depletion of at least 3.3. The product contained not only CD34(+) stem cells, but also NK cells, monocytes and granulocytes. After T- and B-cell depletion the purity of CD34(+) cells was 0.98%, the number of CD34 cells was 1.84 x 10(8) and their recovery rate was 69.7%. The number of NK cells was 2.54 x 10(9) and the recovery rate of NK cells was 71.7%. In vitro colony assays showed no negative impact on function of the hematopoietic stem cells. In conclusion, the CliniMACS system can be used to efficiently deplete T and B cells from PBSCs simultaneously, without adverse effect on biological function of hematopoietic stem cells. This study provides technical platform for haploidentical hematopoietic stem cell transplantation.

Xiao, X., et al. (2018). "Bisphenol AP is anti-estrogenic and may cause adverse effects at low doses relevant to human exposure." Environmental Pollution **242**: 1625-1632.

A recent increase in the use of bisphenol A (BPA) alternatives to manufacture plastics has led to safety concerns. Here, we evaluated the estrogenic and anti-estrogenic activities of bisphenol AP (BPAP), a poorly studied BPA alternative, using in vitro , in vivo and in silico tools. BPAP exhibited weak estrogenicity but strong anti-estrogenicity (IC 50 = 2.35 μM) in a GeneBLAzer™ β-lactamase reporter gene assay. BPAP, when administered alone or in combination with E 2 (50 μg kg−1 bw d−1) for 3 d, significantly decreased the uterine weights of post-weaning CD-1 mice at doses of 10 mg kg−1 bw d−1 and higher. When administered alone to prepubertal CD-1 mice for 10 d, BPAP significantly decreased the uterine weights at doses of 80 μg kg−1 bw d−1 and higher. Toxicogenomic analysis showed that BPAP regulated an opposite patterns of gene expression than that of E 2 in mouse uteri. In a glucose tolerance test using male mice, BPAP was found to disrupt the blood glucose homeostasis at low doses relevant to human exposure (1 and 100 μg kg−1 bw d−1). Our results suggest that BPAP should be of great concern which might affect the sexual development in immature feminine and disrupt the blood glucose homeostasis at very low doses. Graphical abstract Image Highlights • BPAP shows weak estrogenicity but strong antiestrogenicity in vitro. • BPAP shows antiuterotrophic effect in mice at doses of 80 μg kg−1 bw/day and higher. • BPAP disrupts glycemic homeostasis in mice at doses relevant to human exposure. • BPAP induces opposite patterns of gene regulation than that of E 2 in mouse uteri. BPAP exhibits strong anti-estrogenicity. It can decrease the uterine weights by regulating estrogen-response genes and disrupt the blood glucose homeostasis in mice at very low doses. [ABSTRACT FROM AUTHOR]

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Xiao, Y., et al. (2019). "Preparation of magnetic nanomaterials and application in sensor detection." Journal of Food Safety and Quality **10**(20): 6893-6901.

Driven by the external magnetic field, the magnetic nanomaterials can quickly adsorb the target materials and separate them from the substrate. Based on this, magnetic nanomaterials have been widely used in adsorption and separation, environmental management, food safety and other aspects, and will have a greater application prospect. This paper introduced the research progress in preparation, enrichment and separation of magnetic nanomaterials and sensor detection. The preparation method of magnetic nanomaterials included solid, liquid and gas combination method. The adsorption and separation of organic pollutants (such as microplastics) and inorganic metal ions (such as chromium ions, lead ions) by magnetic nanomaterials were introduced. The applications of magnetic nanomaterials in electrochemical sensors, biosensors and optical sensors also were introduced.

Xie, B., et al. (1994). "Urea and lactate determined in 1-microL whole-blood samples with a miniaturized thermal biosensor." Clinical Chemistry **40**(12): 2282-2287.

A miniaturized flow-injected thermal biosensor was developed for the determination of urea and L-lactate in undiluted blood in 1-microL samples. The sensor employed a small enzyme column constructed of stainless steel tubing and microbead thermistors. Urease and lactate oxidase/catalase were separately immobilized onto controlled-pore glass beads, which, in turn, were charged into the enzyme column. With a flow rate of 70 microL/min, linear analytical ranges from 0.2 to at least 50 mmol/L and 0.2 to 14 mmol/L were obtained for urea and lactate, respectively. The relative standard deviations (CVs) for measurements of analyte in buffer were 0.91% for urea and 1.84% for lactate. For urea in whole blood, the CV for 50 determinations was 4.1%. Contrived samples containing various concentrations of urea and L-lactate in whole blood were determined with this sensor and with a spectrophotometric method. Comparisons of the results gave correlation coefficients of 0.989 and 0.984 for 30 blood urea and 30 blood lactate assays in concentrations ranging from 4 to 20.9 mmol/L and from 1.7 to 12.7 mmol/L, respectively.

Xie, M. W., et al. (2013). "Erratum: Marrow-derived stromal cell delivery on fibrin microbeads can correct radiation-induced wound-healing deficits (Journal of Investigative Dermatology (2013) 133 (553-561) DOI: 10.1038/jid.2012.326)." Journal of Investigative Dermatology **133**(3): 859.

Xie, X., et al. (2020). "Exposure to polystyrene microplastics causes reproductive toxicity through oxidative stress and activation of the p38 MAPK signaling pathway." Ecotoxicology & Environmental Safety **190**: 110133.

Microplastics (MP) are receiving increased attention as a harmful environmental pollutant, however information on the reproduction toxicity of MP in terrestrial animals, especially mammals, is limited. In this experiment, we investigated the impact of polystyrene microplastics (micro-PS) on the reproductive system of male mice. Healthy Balb/c mice were exposed to saline or to different doses of micro-PS for 6 weeks. The results showed that micro-PS exposure resulted in a significant decrease in the number and motility of sperm, and a significant increase in sperm deformity rate. We also detected a decrease in the activity of the sperm metabolism-related enzymes, succinate dehydrogenase (SDH) and lactate dehydrogenase (LDH), and a decrease in the serum testosterone content in the micro-PS exposure group. We found that micro-PS exposure caused oxidative stress and activated JNK and p38 MAPK. In addition, we found that when N-acetylcysteine (NAC) scavenges ROS, and when the p38 MAPK-specific inhibitor SB203580 inhibits p38MAPK, the micro-PS-induced sperm damage is alleviated and testosterone secretion improves. In conclusion, our findings suggest that micro-PS induces reproductive toxicity in mice through oxidative stress and activation of the p38 MAPK signaling pathways.

Xin, X., et al. (2010). "Primary cell culture of meningothelial cells-a new model to study the arachnoid in glaucomatous optic neuropathy." Graefe's Archive for Clinical and Experimental Ophthalmology **248**(9): 1273-1278.

Background: In a previous report, we found that the occurrence and amount of meningothelial cell nests in the subarachnoid space are significantly increased in glaucomatous optic nerves compared to normals. In order to allow research into the role of meningothelial cells during diseases of the optic nerve, an in vitro model is necessary. For this purpose, we developed a culture method for porcine meningothelial cells from the arachnoid layer covering the optic nerve. Method(s): Meningothelial cells were scraped from the arachnoid layer of porcine optic nerves and cultured for 2-3 weeks until the cells formed a monolayer. To eliminate contaminating fibroblasts from the culture, cells were negatively selected using magnetic anti-fibroblast beads after the first passage. Cells were detached using 0.05% Trypsin-EDTA, incubated with anti-fibroblast beads, separated using a magnetic column and the flow-through was collected. The purified primary meningothelial cells were characterized by electron microscopy and immunocytochemistry using anti-glial fibrillary acidic protein (GFAP) and anti-keratan sulfate antibodies. Result(s): Primary cells grew out after dissection and formed a

monolayer within 2-3 weeks, which was composed of two morphologically different cell types, flattened cells with round nuclei and fibroblast-like cells with long processes. The fibroblast-like cells in the culture could be labelled and selected using anti-fibroblast microbeads. The second cell type did not bind to the anti-fibroblast beads, and upon immunocytochemistry showed a marked expression of both GFAP and keratan sulphate. In addition, examination of these cells by electron microscopy revealed morphological characteristics of meningothelial cells, including hemidesmosomes and cytoplasmatic filaments. Conclusion(s): The technique described in this paper for the primary culture of meningothelial cells from the subarachnoid space of the optic nerve and using magnetic beads for the removal of fibroblasts is effective in obtaining a highly enriched meningothelial cell culture. © 2010 Springer-Verlag.

Xiong, X., et al. (2018). "Microplastics in the intestinal tracts of East Asian finless porpoises (Neophocaena asiaeorientalis sunameri) from Yellow Sea and Bohai Sea of China." Marine Pollution Bulletin **136**: 55-60.

The direct evidences for the ingestion of microplastics by cetaceans, especially the cetaceans in Asian marine areas are limited. In this study, residue of microplastics in the intestinal tracts of East Asian finless porpoises (Neophocaena asiaeorientalis sunameri) was investigated. Microplastics were detected in all specimens, with mean abundance of 19.1+or-7.2 items/individual. With respect to microplastics properties, fibers, blue items, and polypropylene were predominant in shapes, colors, and plastic materials, respectively. Trophic transfer and unintentional ingestion might be the potential pathways for microplastics ingested by finless porpoise. The specific intestinal structure might account for the predominance of fibers and the accumulation of microplastics at the beginning portion of intestines. This study indicates that cetaceans in Chinese marine areas also suffer from microplastics pollution. Further studies on the fate and ecological effects of microplastics should be conducted to reveal their potential risks to cetaceans.

Xiong, Z., et al. (2010). "Microparticles from stored RBC units show inflammatory chemokine binding that is altered by platelets." American Journal of Respiratory and Critical Care Medicine. Conference: American Thoracic Society International Conference, ATS **181**(1 MeetingAbstracts).

Rationale: Transfusion of stored red cells is an independent predictor for the development of and mortality from acute respiratory distress syndrome (ARDS) in patients at risk for ARDS. While storage results in reduced structural integrity of red cells leading to spheroechinocyte formation and release of microparticles, the functional aspects of red cell microparticle formation, particularly as it relates to inflammation, have not been well-studied. We hypothesized that red cell microparticles released during storage express the transmembrane chemokine binding protein Duffy antigen and show inflammatory chemokine binding. Method(s): Microparticles were isolated from Adsol stored, leukoreduced red cell unit bags using ultracentrifugation technique modified from published methods. Microparticles were defined by flow cytometry by surface glycophorin A expression and size ~70-700 nm relative to fluorescent microbeads employed for relative quantification. Red cell units were assayed for Duffy antigen status using standard Blood Bank methods. Duffy expression on microparticles and red cells were confirmed by flow cytometry using murine anti-human Duffy monoclonal antibody. Microparticles were tested for 125I-CXCL1/GRO-a binding in the presence of increasing concentrations of cold CXCL1 to determine the equilibrium dissociation constant, or Kd, of chemokine for microparticle binding sites. Result(s): Glycophorin A+ microparticles from red cell units on storage day 29 (14,473 + 11,412) were significantly higher than from units obtained on storage day 13 (369 + 97) (p=0.03). Duffy surface expression on microparticles was

detectable by flow cytometry, and microparticles showed specific, saturable 125I-CXCL1 chemokine binding. CXCL1 binding affinity remained relatively constant on intact, purified red cells with storage (3.8 + 1.3 nM, 7370 + 3901 binding sites/cell surface), whereas microparticle Duffy showed wide variation in Kd (0.6-44 nM; 20,700-58,000 binding sites/cell surface). Addition of platelets into the microparticle-chemokine mixture reduced microparticle chemokine binding (2933 + 343 vs 1186 + 85 cpm, p<0.04). Conclusion(s): Red cell microparticles express Duffy antigen with functional alterations in chemokine binding activity as compared to the intact stored red cell. Furthermore, microparticle-chemokine binding is altered by the presence of platelets. We speculate that red cell microparticle formation increases with storage duration, and microparticle Duffy regulates inflammatory chemokine bioavailability in the microvasculature through altered chemokine binding and release through interaction with platelets.

Xiu, F. R., et al. (2020). "A novel safety treatment strategy of DEHP-rich flexible polyvinyl chloride waste through low-temperature critical aqueous ammonia treatment." Science of the Total Environment **708 (no pagination)**(134532).

Flexible polyvinyl chloride (f-PVC) contains high content of plasticizers and chlorine. Improper treatment of waste f-PVC can easily lead to resource wasting and bring environmental risks. In this work, a novel strategy for resource recycling and dechlorination of waste f-PVC containing high content of di-(2-ethylhexyl) phthalate (DEHP) was developed by using low-temperature critical aqueous ammonia (LCA) process. The LCA treatment of waste DEHP-rich f-PVC (WDP) was performed at the temperature range of 200-400 degreeC with the ammonia concentration of 1%-5%. The results indicated that the LCA temperature had a significant effect on the chemical composition of decomposition products. High concentration of 2-ethyl-1-hexanol (86.12%), which is an important chemical feedstock and is derived from the decomposition of DEHP, could be obtained from WDP by the LCA process at 250 degreeC, and the concentration of 2-ethyl-1-hexanol decreased markedly with increasing the temperature. Benzaldehyde and acetophenone were generated when the temperature increased to 300 degreeC, and their concentrations increased with the rise of temperature. The increase of the ammonia concentration and the temperature could enhance the dechlorination efficiency of WDP. The dechlorination could reach 98.7% at 300 degreeC. This result showed that the LCA process was a promising and high-efficiency strategy for the sustainable management of WDP. Copyright © 2019 Elsevier B.V.

Xu, B., et al. (2001). "Functional comparison of the single-layer agarose microbeads and the developed three-layer agarose microbeads as the bioartificial pancreas: an in vitro study." Cell Transplantation **10**(4-5): 403-408.

In this study, the insulin secretory characteristics of the microencapsulated hamster islets were studied during long-term culture. The hamster islets were encapsulated as single-layer agarose microbeads or three-layer agarose microbeads with agarose and agarose containing poly(styrene sulfonic acid) (PSSa), respectively. The influence of PSSa on the function of the rat islets microencapsulted in three-layer microbeads was primarily monitored. The aim of this study was to examine the influence of the PSSa on the in vitro function of the islets encapsulated in the agarose/PSSa microbeads compared with single-layer agarose microbeads during long-term culture. The microbeads were cultured for 30 days in medium of Eagle's MEM at 37 degrees C in 5% CO2 and 95% air. The basal insulin secretion into the culture medium was measured daily during the first 12 days and two times per week until 30 days. The microbeads were subjected to static incubation test on the 10th, 20th, and 30th day during culture. The

basal insulin secretion level of the agarose/PSSa microbeads was significantly higher than that of single-layer agarose microbeads. The static incubation tests revealed a similar pattern of insulin secretion from both microbeads when they were exposed to high glucose challenge. In the static incubation test, both could significantly increase insulin release to more than 6.61 times (stimulation index) in response to high glucose stimulation and could significantly decrease when glucose concentration returned from high glucose to low glucose on the 10th, 20th, and 30th day of culture. This study demonstrated that the hamster islets enclosed in agarose/PSSa hydrogel not only continuously secreted basal amounts of insulin, but also maintained their response to high glucose stimulation similar to the agarose microbeads. The above results together with those of our previous in vivo study suggest that the three-layer microbeads (agarose/PSSa) are well suitable for xenotransplantation of islets for the clinical application.

Xu, B., et al. (2018). "Microplastics play a minor role in tetracycline sorption in the presence of dissolved organic matter." Environmental Pollution **240**: 87-94.

Microplastics have a great potential to sorb organic pollutants from the adjacent environment. In this study, the sorption of tetracycline, a polar and ionizable antibiotic, on three types of microplastics (polyethylene (PE), polypropylene (PP) and polystyrene (PS)) were investigated in batch sorption experiments. The sorption isotherms were well fitted by the Langmuir model, indicating that not only hydrophobic interactions but also other interactions (e.g. electrostatic interactions) played important roles in the sorption process. PS had the maximum sorption capacity, following the order PS > PP > PE, which can be attributed to polar interactions and π-π interactions. The sorption of tetracycline on microplastics was significantly influenced by pH, with sorption capacity increasing gradually, peaking at pH 6.0 and then decreasing, likely due to the influence of tetracycline speciation with the change of pH. Fulvic acid was selected as representative dissolved organic matter (DOM) to examine the effect on sorption. The increasing concentration of fulvic acid inhibited the sorption of tetracycline on three microplastics, decreasing them by more than 90% at the fulvic acid concentration of 20 mg/L, which implied a greater affinity of tetracycline to fulvic acid than to microplastics. Increasing salinity from 0.05 to 3.5% had negligible effects on the sorption of tetracycline on the three microplastics. Our results highlight the importance of pH and DOM on the sorption of tetracycline on microplastics, and suggest the relatively minor role of microplastics in the fate and transport of tetracycline in the aquatic environment in the presence of DOM. [ABSTRACT FROM AUTHOR]

Xu, B., et al. (2018). "The sorption kinetics and isotherms of sulfamethoxazole with polyethylene microplastics." Marine Pollution Bulletin **131**(Pt A): 191-196.

Microplastics and sulfamethoxazole coexist ubiquitously in the marine environment, and microplastics tend to sorb organic pollutants from the surrounding environment. Here, the sorption kinetics and isotherms of sulfamethoxazole on polyethylene (PE) microplastics closely fitted a pseudo-second-order model (R²=0.98) and linear model (R²=0.99), respectively, indicating that the sorption process was partition-dominant interaction. The main binding mechanism was possibly the van der Waals interaction for hydrophilic sulfamethoxazole onto hydrophobic PE microplastics. The effects of pH, dissolved organic matter and salinity on sorption behavior were also studied. The sorption behavior of sulfamethoxazole on PE microplastics was not significantly influenced by pH and salinity, probably because the electrostatic repulsion played a minor role. In addition, the negligible effect of dissolved organic matter was attributed to the greater affinity of sulfamethoxazole to PE microplastics than to dissolved organic matter. Our results demonstrated that PE microplastics may serve as a carrier for sulfamethoxazole in the aquatic environment.

Xu, B., et al. (2019). "Microplastics in the soil environment: Occurrence, risks, interactions and fate-A review." Critical Reviews in Environmental Science and Technology.

The issue of microplastic pollution emerged from the marine environment, but the terrestrial environment is estimated to receive annually 4-23 times more plastic wastes. Microplastic pollution in the soil environment has thus begun to elicit great concern. This review summarizes the observed effects of microplastic pollution on soil ecosystems as well as sorption and transport behaviors of microplastics in such environments. Microplastic pollution has been detected in various soils including agricultural/farmland, greenhouse, home garden, coastal, industrial, and floodplain soils. Microplastics affect soil physical and chemical properties, microbial and enzyme activities, and plant growth, and also pose adverse ecotoxicological effects to soil fauna. These effects depend on the concentration, size, and shape of microplastics, as well as soil texture. Microplastics are known to sorb organic and inorganic pollutants, possibly affecting the distribution of these substances in soil. Existing evidence demonstrates the negligible effect of microplastics on bioaccumulation of contaminants in soil fauna. The horizontal and vertical transport of microplastics can be facilitated by soil fauna. Pollutants associated with microplastics may disperse further following the transport of microplastics in soil. This review also highlights perspectives for future research on microplastics in soil. Copyright © 2019, © 2019 Taylor & Francis Group, LLC.

Xu, H., et al. (2017). "B cell-activating factor regulates the survival of B lymphocytes infected with human cytomegalovirus." Immunology Letters **187**: 1-6.

BACKGROUND: Previous studies have suggested that B lymphocytes can be polyclonally activated by human cytomegalovirus (HCMV), and individuals infected by HCMV exhibit characteristic features of an autoimmunity disease. B cell-activating factor (BAFF) plays important roles in the survival and differentiation of B cells; however, few studies have examined the potential role of BAFF on B cells infected by HCMV.

METHODS: HCMV virus strain (HCMV AD-169) was concentrated by normal methods and used to infect microbead-purified tonsil CD19+ B cells. Cells and supernatants were collected at the 1st, 3rd, 5th, and 7th day of co-culture, respectively. Cellular phenotypes, including expression of BAFF and its cognate receptors (BAFF-R, TACI, and BCMA) were detected by flow cytometry (FCM); cells apoptosis rates were also examined by FCM; and IgG titers in supernatants was detected by ELISA. In parallel, neutralizing anti-BAFF-R antibody was applied to observe the effect of BAFF/BAFF-R signaling on apoptosis and the IgG secretion ability of B cells stimulated by HCMV.

RESULTS: LogTCID₅₀ of 3rd and 4th generation of HCMV was -3.54 and -3.28, respectively. FCM results showed that the purity of CD19⁺ B cells was >98%. BAFF-R was highly expressed and upregulated on HCMV-infected B cells (93.5%-99.3%), compared with B cells prior to HCMV infection and uninfected group; while BAFF-R expression gradually decreased with time and to the lowest level at 5th day (81%) in the control medium-only group. In contrast, expression of TACI and BCMA gradually increased during culture in both HCMV-infected and medium-only control B cells. Furthermore, the apoptosis rate of HCMV-infected and medium-only control B cells did not vary significantly during culture, but IgG secretion ability of HCMV-infected B cells significantly increased over time while no changes were observed with the medium-only control. Importantly, the apoptosis rate of B cells significantly increased when BAFF/BAFF-R signal was blocked prior to HCMV infection (P<0.05), although no significant changes of IgG levels were observed (P>0.05).

CONCLUSIONS: BAFF-R was consistently expressed on B cells infected by HCMV. Enhancement of BAFF/BAFF-R signaling decreased the apoptosis rate and extended the survival of B cells.

Xu, J., et al. (2019). "Micro-rheological and micro-heterogeneity properties of soluble glutinous rice starch (SGRS) solutions studied by diffusing wave spectroscopy (DWS)." Journal of Food Measurement and Characterization **13**(4): 2822-2827.

As a natural biopolymer, soluble glutinous rice starch (SGRS) is widely used in the food industry; and has better binding characteristics than dextrin. The micro-structural heterogeneity and micro-rheology of SGRS solutions were investigated by the novel technique diffusion wave spectroscopy (DWS). By comparing the mean-square displacement (MSD) of the microbeads imbedded in six concentrations of SGRS solutions, we found that the solutions exhibited nearly homogeneous behavior at <=0.5%, but the material displayed a clear degree of heterogeneity at >1%. Micro-rheology investigation revealed that SGRS solutions showed nearly perfect viscous behavior at <=0.5%, but the property changed into viscoelastic one at >1%. The magnitude of high-frequency viscoelastic moduli for the 3-5% SGRS solutions can be characterized by , G*, infinity omega ^{3/4}, which is the semi-flexible polymer behavior. However, the magnitude of high-frequency viscoelastic moduli (, G*,) for the 7-10% SGRS solutions is proportional to omega ^{1/2}, which is the flexible polymer behavior. All micro-structural heterogeneity and micro-rheological property shifts occurred in relatively small concentration ranges.

Xu, L., et al. (2011). "Effects of increasing dietary concentrations of corn naturally contaminated with deoxynivalenol on broiler and turkey poult performance and response to lipopolysaccharide." Poultry Science **90**(12): 2766-2774.

In this study, 2 experiments determined the effects of increasing dietary concentrations of deoxynivalenol (DON) on performance, intestinal morphology, and measures of innate immunity in broilers and turkeys. For experiment 1, the 3-wk study used 5 concentrations of DON (up to 18 or 10 mg of DON/kg of feed in broilers or turkeys, respectively) from naturally contaminated corn. The BW gains were cubically or quadratically affected by the increasing dietary concentrations of DON for broilers and turkeys, respectively; however, feed consumption was not affected. For experiment 2, the birds were subsequently injected or not injected with lipopolysaccharide (LPS) 24 h before tissue and blood sample collection. Dietary DON had no effect on intestinal crypt depth, but linearly increased the mid-ileal villus height in broilers (P=0.04). An interaction was observed between the LPS challenge and the dietary DON with regards to heterophil to lymphocyte ratio (P<0.05) in broilers, but not in turkeys. The cecal tonsil cell phagocytosis of microbeads was not affected by the dietary concentration of DON either with or without the subsequent LPS challenge for both broilers and turkeys. Conversely, the phagocytic capacity of cecal tonsil cells to engulf killed Staphylococcus aureus was significantly reduced (over 2.5-fold) when broilers were fed the highest concentration of dietary DON (non-LPS-challenged; P<0.05). However, diets containing DON showed no effects on broilers when they were challenged with LPS. Antibody-dependent phagocytosis (S. aureus) was not affected in turkeys fed DON. Overall, corn naturally contaminated with up to 18 or 10 mg/kg of DON (broiler or turkey, respectively) reduced bird BW gain at 21 d of age, reduced

antibody-dependent phagocytosis of previously killed S. aureus by cecal tonsil cells in non-LPS-challenged broilers, and greatly decreased heterophil to lymphocyte ratios in LPS-challenged broilers.

Xu, M., et al. (2019). "Internalization and toxicity: A preliminary study of effects of nanoplastic particles on human lung epithelial cell." Science of the Total Environment **694**: 133794.

As a kind of newly emerging pollutant, nanoplastics are easily to be ingested by organisms, and cause severe damage to biological functions because of their small size, high specific surface area, and strong biological penetration. Recently, there are increasing reports of numerous airborne microplastics, including polystyrene (PS), being detected in atmospheric samples, which implies a potential risk to the human respiratory system. In this work, we evaluated the effects of polystyrene nanoparticles of two different sizes (PS-NP25: 25nm diameter and PS-NP70: 70nm diameter) on the human alveolar epithelial A549 cell line including internalization, cell viability, cell cycle, apoptosis, and associated gene transcription and protein expression.

Xu, P., et al. (2019). "Sorption of polybrominated diphenyl ethers by microplastics." Marine Pollution Bulletin **145**: 260-269.

The sorption of polybrominated diphenyl ethers (PBDEs) onto polyethylene (PE), polypropylene (PP), polystyrene (PS), and polyamide (PA) microplastics was analyzed using different kinetic and isotherm models, and under various environmental conditions, including temperature, pH, salinity and dissolved organic matter (DOM). The sorption capacity was in the order of PS>PA>PP>PE, due to the different crystallinity, specific surface area, and surface structure. PS demonstrated the equilibrium sorption capacity, namely, 6.41ng/g BDE-47, 12.83ng/g BDE-99, and 14.42ng/g BDE-153. The second-order kinetic model described the sorption kinetics of PBDEs, and surface sorption was the main mechanism. The sorption of PBDEs by microplastics was a multilayer and physical process. Low temperatures reduced BDE-47 sorption on microplastics, and sorption was a spontaneous and endothermic process. The sorption of BDE-47 was not significantly influenced by pH and salinity. However, DOM exerted a negative effect on the sorption of BDE-47.

Xu, P., et al. (2018). "Microplastic risk assessment in surface waters: A case study in the Changjiang Estuary, China." Marine Pollution Bulletin **133**: 647-654.

The rapid development of plastic industry has resulted in a series of environmental problems caused by microplastics originating from larger plastics. Microplastic pollution risk in surface waters of the Changjiang Estuary was explored based on risk assessment models. The average microplastic concentration was 23.1+/-18.2 n/100L. Shape, size, color and composition types of microplastics were examined. The risk assessment models were developed using data on both the concentration and chemical hazard of microplastic polymers. Assessment results indicated that polyvinyl chloride exhibited a critical concern for microplastic risk. Areas around aquaculture farms were regarded as "hotspots" of microplastic pollution due to the accumulation of microplastics and the presence of hazardous microplastic. This risk assessment of microplastics bridged gaps in understanding between field research and policy-making for surface waters. This research provides baseline data for assessing the environmental risk of microplastics in this growing area of research.

Xu, P., et al. (2019). "Spatial-temporal distribution and pollution load of microplastics in the Changjiang Estuary." Zhongguo Huanjing Kexue = China Environmental Science **39**(5).

There has been a recent focus on microplastics(5 mm) because of their presence in different environmental media. The spatial and temporal distribution of microplastics in the surface sediments of the Changjiang Estuary were investigated in March and July 2017. Sampling was conducted at 17 stations covering the north passage and south passage of the Changjiang Estuary, East China Sea and Hangzhou bay. Among these sampling stations, the highest concentration of microplastics was(39.33±14.34)particles/kg(DW) in the Hangzhou bay in summer. There was no significant difference in spatial distribution of microplastics. The amount of precipitation was highly related with the abundance of microplastics, which showd higher concentrations in summer than in spring. The size, color, shape and composition of microplastics were classified. Attenuated total reflectance-Fourier transform infrared spectrometry showed that there were several types of microplastics existing in sediments, including polyethylene,polypropylene, polyvinyl chloride, polyamide, and polystyrene, among them, polyethylene was the main type. The method of pollution load index was used to assess the degree of microplastic pollution. Overall, the Changjiang Estuary-Hangzhou bay and its adjacent areas were less polluted by microplastics.

Xu, S., et al. (2020). "Microplastics in aquatic environments: Occurrence, accumulation, and biological effects." Science of the Total Environment **703**: 134699.

Microplastics, whether originating directly from industrial and household products or from the degradation of larger plastics, are currently of intense global concern. These particles are present in aquatic environments in high concentrations and may adversely affect aquatic organisms. An additional concern is the ability of microplastics to adsorb inorganic and organic pollutants and subsequently liberate them into marine and freshwater systems. In this review, we report on the occurrence and abundance of microplastics in the global aquatic environment. We then consider the accumulation (uptake, distribution, and elimination) of microplastics in aquatic organisms and the important factors that lead to bioaccumulation. The effects of microplastics on aquatic organisms of different trophic levels are also discussed. Several studies have shown that the size, shape, and surface physicochemical characteristics of microplastics are essential determinants of their biological effects. Finally, we examine the combined effects of microplastics and other pollutants, including persistent organic pollutants and heavy metals. Our review concludes by suggesting future lines of research based on the remaining knowledge gaps in microplastic research.

Xu, W., et al. (2018). "Isolation, identification, and degradation characteristics of a DMP-degrading strain." Journal of Agro Environment Science **37**(8): 1724-1732.

To isolate a dimethyl phthalate (DMP)-degrading strain, the soil that had been exposed to long-term plastic pollution was collected and used. The DMP-degrading strain was screened out using selective media method, and identified by morphological, physiological, and biochemical analyses, as well as 16S rDNA sequence analysis. Moreover, the degradation characteristics were studied. The results showed that the DMP-degraded strain was classified as Paracoccus sp., named as QD15-1 and belongs to Gram-negative bacterium. The substrate utilization tests showed that the QD15-1 strain could utilize phthalic acid esters (PAEs) pollutants, such as DMP, dibutyl phthalate (DBP), diethyl phthalate (DEP) and diethylhexyl phthalate (DEHP). When DMP was the only carbon source, the optimized conditions of the QD15-1 strain were as follows: pH, 8; temperature, 30 degrees C. The degradation kinetics of QD15-1 were studied in varied initial DMP concentrations under optimal conditions; the results indicated that degradation of DMP conforms to the pseudo-first order kinetic equation, and the half life of DMP was shortened as the initial concentration was increasing up. Importantly, PCR analysis showed the QD15-1 strain to contain PAE-degrading genes, such as the phthalate dioxygenase gene (PAphtAb), and 3, 4-dihydroxy-3, 4-dihydrophthalate dehydrogenase (PAphtB). Liquid mass spectrometry showed that the intermediate metabolites in the minimal medium included o-benzene dicarboxylic acid monoester and phthalic acid. The DMP degradation pathway in the gram-negative strain Paracoccus sp. QD15-1 was speculated to operate as follows: DMP was degraded into o-benzene dicarboxylic acid monoester, decomposed into phthalic acid, and was then further degraded by the above-mentioned genes. These results indicate that QD15-1 is a high-efficiency DMP-degrading strain, and it is expected that the strain QD15-1 could be used to clear DMP pollution in future.

Xu, X., et al. (2018). "Research progress on the transference and pollution characteristics of microplastics in wastewater treatment plants." China Environmental Science **38**(11): 4393-4400.

Due to the widespread use and persistent contamination of synthetic polymers, microplastic (<5 mm) has been got more and more attention in recent years as a new type of pollutants. The discharge of sewage was one of the main sources of microplastic in freshwater and marine environment, so the sewage treatment plants also became an important path for microplastic to enter into fresh water and marine environment. The source of microplastic was investigated systematically, the research progress in the transport and pollution characteristics of microplastic in wastewater treatment plants was reviewed, and the differences of microplastic pollution in wastewater treatment plants at home and abroad in recent years were compared. It would provide reference for the research and supervision of microplastic pollution in domestic sewage treatment plants and look forward to the future development and improvement direction of wastewater treatment process.

Xu, X., et al. (2019). "Microplastics in the wastewater treatment plants (WWTPs): Occurrence and removal." Chemosphere **235**: 1089-1096.

WWTPs may be one of the important ways for MPs to enter surface water. In the present study, the influent and effluent from eleven WWTPs in Changzhou were collected and analyzed. At the same time, the abundance, size, color, and shape of MPs in influent and effluent were investigated. The average abundance of MPs in the influent and effluent were 196.00 +/- 11.89 n/L and 9.04 +/- 1.12 n/L respectively, and the MPs removal efficiency of eleven WWTPs was almost over 90% in which it could be up to 97.15%. MPs were divided into four particle size based on abundance changes, and the size of MPs with the highest abundant was mainly concentrated at 0.1-0.5 mm. Among these MPs, fibers were the main shape in wastewater, followed by fragments, flakes, spheres and films. The colors of MPs in wastewater were various and 14 types of plastics were detected from wastewater using attenuated total reflection Fourier transform infrared spectroscopy (ATR-FTIR). Moreover, Rayon and PET were the dominant polymer types in eleven WWTPs. The research results provided basic data for the research and supervision of MPs pollution in WWTPs. Copyright © 2019 Elsevier Ltd

Xu, X., et al. (2020). "Detection of Treponema denticola in Chronic Periodontitis by Quantitative Real-Time Polymerase Chain Reaction." Journal of Nanoscience & Nanotechnology **20**(3): 1463-1469.

Chronic periodontitis constitutes a significant public health issue, particularly in China. Treponema denticola is one of the bacterial species critically involved in the development of this disease. Therefore, an effort was made in this study to design a technique for isolation of DNA from gingival fluid and detection of T. denticola genes by PCR methodology. For this purpose, samples were collected from 30 patients with severe periodontitis and 20 patients with mild periodontitis. A group of 50 healthy individuals served as a control. Following the isolation of

DNA from the gingival fluid by magnetic microbeads, the material was analyzed for the presence of 16S rRNA by conventional and quantitative real-time PCR protocols. This newly developed methodology identified the presence of T. denticola in all samples from periodontitis patients. Quantitative analysis of copy numbers demonstrated that the bacterial count was highest in the severe periodontitis group and intermediate in the mild periodontitis group. The smallest number of bacteria were present in healthy controls. Besides being rapid, accurate and specific, the proposed method eliminates the need for anaerobic bacterial cultures, making it applicable in a typical clinical setting.

Xu, X., et al. (2019). "Marine microplastic-associated bacterial community succession in response to geography, exposure time, and plastic type in China's coastal seawaters." Marine Pollution Bulletin **145**: 278-286.

Microplastics have emerged as new pollutants in oceans. Nevertheless, information of the long-term variations in the composition of plastic-associated microbial communities in coastal waters remains limited. This study applied high-throughput sequencing to investigate the successional stages of microbial communities attached to polypropylene and polyvinyl chloride microplastics exposed for one year in the coastal seawater of China. The composition of plastisphere microbial communities varied remarkably across geographical locations and exposure times. The dominant bacteria in the plastisphere were affiliated with the Alphaproteobacteria class, particularly Rhodobacteraceae, followed by the Gammaproteobacteria class. Scanning electron microscopy analysis revealed that the microplastics showed signs of degradation. Microbial communities showed adaptations to plastisphere including more diverse microbial community and greater "xenobiotics biodegradation and metabolism" in metabolic pathway analysis. The findings elucidate the long-term changes in the community composition of microorganisms that colonize microplastics and expand the understanding of plastisphere microbial communities present in the marine environment.

Xu, X. Y., et al. (2017). "Microplastic ingestion reduces energy intake in the clam Atactodea striata." Marine Pollution Bulletin **124**(2): 798-802.

The effects of microplastic concentrations (10 items l⁻¹ and 1000 items l⁻¹) on the physiological responses of Atactodea striata (clearance rate, absorption efficiency, respiration rate) were investigated. The fates of ingested microplastics and the efficiency of depuration in removing ingested microplastics were also studied. A. striata ingested microplastics and the clearance rate was reduced at high concentration of microplastics. Since the respiration rate and absorption efficiency remained unchanged in exposed A. striata, reduction in the clearance rate would reduce the energy intake. Ingestion and retention of microplastics in the body were further limited by the production of pseudofaeces and faeces, and depuration in clean water, resulting in a very small amount of microplastics stored in the body of the clam.

Xu, Y., et al. (2019). "Are Micro- or Nanoplastics Leached from Drinking Water Distribution Systems?" Environmental Science & Technology **53**(16): 9339-9340.

Xue, J. and K. Kannan (2019). "Mass flows and removal of eight bisphenol analogs, bisphenol A diglycidyl ether and its derivatives in two wastewater treatment plants in New York State, USA." Science of the Total Environment **648**: 442-449.

Despite high production and usage of bisphenols including bisphenol A (BPA) as well as bisphenol A diglycidyl ether and its derivatives (BADGEs), little is known about the occurrence and fate of these substances in wastewater treatment plants (WWTPs) in the U.S. In this study, we investigated the occurrence, removal, mass flows, and fate of eight bisphenol analogues and six BADGEs based on the concentrations measured in influent, primary effluent, final effluent, and sludge from two WWTPs (WWTP<inf>A</inf> and WWTP<inf>B</inf>) in the Albany area of New York State, USA. BPA, bisphenol F, bisphenol S, and BADGE.2H<inf>2</inf>O were the predominant compounds found in influents of both WWTPs, at respective geometric mean (GM) concentrations of 90.0, 90.2, 31.2, and 6.48 ng/L in WWTP<inf>A</inf>, and 53.3, <MLOQ, 27.6, 2.25 ng/L in WWTP<inf>B</inf>. Incomplete removal of these compounds was observed in both WWTPs with the highest removal rate (52%) was found for BPA after the secondary treatment in WWTP<inf>A</inf>. The fraction of BPA sorbed to suspended particulate matter (SPM) was 6.83%. Mean daily mass loadings of total bisphenols and BADGEs ranged from 9.2 [(BADGEs) in WWTP<inf>B</inf>] to 226 mg/d/1000 inhabitants [(BPs) in WWTP<inf>A</inf>]. The environmental emission rates of total bisphenols and BADGEs through effluent discharges from WWTPs ranged from 13.7 [(BADGEs) in WWTP<inf>B</inf>] to 246 mg/d/1000 inhabitants [(BPs) in WWTP<inf>A</inf>]. Overall, bisphenols and BADGEs were not removed completely by activated sludge treatment. Furthermore, formation of bisphenols from the degradation of microplastics or other precursors such as alkylated bisphenols, in WWTPs is suggested. Copyright © 2018 Elsevier B.V.

Xue, Y., et al. (2010). Physics-based multistage fatigue model for fatigue in notched structures. TMS 2010 - 139th Annual Meeting and Exhibition, February 14, 2010 - February 18, 2010, Seattle, WA, United states, Minerals, Metals and Materials Society.

A physically motivated mechanistic MultiStage Fatigue (MSF) model was developed for variable loading and multiaxial loading cases for notched structures. The MSF model depicts the effects of microstructural features on fatigue damage evolution stages, i.e., incubation, small crack growth, and long crack growth, allowing the assessment of variations in fatigue behaviors associated with the random microstructural features and stochastic interference between fatigue damage and those microstructural features. Therefore, the MSF model is an example of a necessary fatigue model for a structural health prognosis system. In this paper, special functions/effects in notched structures related to prognosis-specific requirements for airframe structures were evaluated and added into the MSF model. The notch-root behavior was presented as a function of not only the local plasticity accumulation but also the damage at the microscale associated with cyclic loads. Meanwhile, overload effects to the microplasticity in the vicinity of intermetallic particles were incorporated into the incubation model. Thus, the variable loads associated with generic flight spectrum were reorganized based on the transient material behavior at notch root. Finally, the MSF model was validated to predict damage and fatigue life of a wrought aerospace-graded Al alloy in experiments under various spectrums and notch root stress concentrations.

Yabanli, M., et al. (2019). "Microplastic pollution at the intersection of the Aegean and Mediterranean Seas: A study of the Datca Peninsula (Turkey)." Marine Pollution Bulletin **145**: 47-55.

This study aims to reveal microplastic pollution. It is the first to be conducted in the South Aegean Region and one of the limited numbers of such studies in Turkey. To this aim, in September 2018 microplastic particles (MP's) pollution was evaluated on the sandy beaches along the coastline of the Datca Peninsula (Southern Aegean coast of Turkey) located at the intersection of the Aegean and Mediterranean Seas. MP's were analyzed using standard operating procedure along with some experimental techniques. Prior to the identification process, microplastics ranging from 1 to 5mm were exposed to an experimental pre-treatment and efficient polymer scanning. The results showed that fragments (72%) were the dominant category from all the beaches exposed to dominant winds and surface currents and that MP contamination in the Datca Peninsula was higher than that reported in the literature from similar locations around the world (1154.4+/-700.3 particles kg⁻¹ dw). More specifically the highest contamination was found in Aktur Beach (2073.3+/-648.6 particles kg⁻¹ dw) which could be considered as a hotspot for the whole region in terms of MP pollution. As a result of the study, as sampling stations are remote from major cities and industrial zones, maritime activities increase during summer season and tar has been observed on particles during analyses, it can be asserted that the pollution may be caused by marine resources.

Yabanlı, M., et al. (2019). "Microplastic pollution at the intersection of the Aegean and Mediterranean Seas: A study of the Datça Peninsula (Turkey)." Marine Pollution Bulletin **145**: 47.

This study aims to reveal microplastic pollution. It is the first to be conducted in the South Aegean Region and one of the limited numbers of such studies in Turkey. To this aim, in September 2018 microplastic particles (MP's) pollution was evaluated on the sandy beaches along the coastline of the Datça Peninsula (Southern Aegean coast of Turkey) located at the intersection of the Aegean and Mediterranean Seas. MP's were analyzed using standard operating procedure along with some experimental techniques. Prior to the identification process, microplastics ranging from 1 to 5 mm were exposed to an experimental pre-treatment and efficient polymer scanning. The results showed that fragments (72%) were the dominant category from all the beaches exposed to dominant winds and surface currents and that MP contamination in the Datça Peninsula was higher than that reported in the literature from similar locations around the world (1154.4 ± 700.3 particles kg−1 dw). More specifically the highest contamination was found in Aktur Beach (2073.3 ± 648.6 particles kg−1 dw) which could be considered as a hotspot for the whole region in terms of MP pollution. As a result of the study, as sampling stations are remote from major cities and industrial zones, maritime activities increase during summer season and tar has been observed on particles during analyses, it can be asserted that the pollution may be caused by marine resources.

Yada, D., et al. "Plastic waste as an effective stormwater best management practice. (Geotechnical Special Publication No.211)." Geo-frontiers 2011 **Dallas**: Texas, March 13-16, 2011; 2011.

This study focused on the manufacture, hydraulic and mechanical properties of a porous plastic-based cementitious (P-PBC) material. P-PBC, produced from plastic waste, soil and aggregates, will offer an effective technique for reducing stormwater runoff, improving water quality and providing a structural pavement suitable for pedestrian and vehicular loadings. It will also help divert a large amount of plastic from landfills and incinerators thus playing a crucial role in the recycling efforts currently underway. P-PBC specimens with different plastic to soil/aggregate ratios were prepared and then tested for hydraulic conductivity (k) and indirect tensile strength (ITS). Results showed that k and ITS values of specimens were within the expected values found in the literature for porous pavements. It was also found that the k values decreased with the increase of percentage of plastic waste. ITS, on the other hand, increased with the amount of plastic waste. The study findings indicated that P-PBC could be an effective Stormwater Best Management Practice with significant positive economic and ecological implications.

Yamada, K., et al. (1999). "Constituents of Organic Pollutants in Leachates from Different Types of

Landfill Sites and Their Fate in the Treatment Processes." Mizu Kankyo Gakkaishi/Journal of Japan Society on Water Environment **22**(1): 40-45.

Constituents of oraganic pollutants in leachates from different types of landfill sites were measured by gas chromatograph - mass spectrometry (GC/MS). The leachates contained various volatile and semi-volatile compounds, some of which were regarded as endocrine disrupting chemicals. The leachate from a site filled with more plastic waste contained more micropollutants such as plastic additives than the leachte from a site filled mainly with incinerator ash waste. These micropollutants were decreased in their concentrations along the treatment processes of the leachates. Leachates from least controlled sites where only non hazardous industrial wastes can be dumped legally also contained micropollutants. The changes in the concentration along with the age of the sites were explained by water - octanol partitioning coefficient.

Yamaguchi, T., et al. (2014). "Correlation between human tear cytokine levels and cellular corneal changes in patients with bacterial keratitis by in vivo confocal microscopy." Investigative Ophthalmology & Visual Science **55**(11): 7457-7466.

PURPOSE: We investigated bilateral tear cytokine levels in patients with unilateral bacterial keratitis (BK) as associated with in vivo confocal microscopic (IVCM) alterations in corneal nerves and dendritiform immune cells (DCs).

METHODS: A total of 54 (13 BK, 13 contralateral, 28 healthy controls) tear samples was collected prospectively and analyzed by multiplex microbeads assay. The IVCM of the central cornea was performed on the same day, and assessed for corneal nerve and DC alterations.

RESULTS: Interleukin-1beta, IL-6, and IL-8 were significantly elevated only in affected eyes (66.6 +/- 26.8, 7174 +/- 2430, and 810 +/- 315 rhog/mL, respectively; P = 0.04, P < 0.001, and P < 0.001, respectively), compared to healthy controls (13.0 +/- 4.0, 171.8 +/- 32.1, and 56.5 +/- 33.8 rhog/mL). Levels of chemokine ligand 2 (CCL-2), IL-10, and IL-17a were elevated only in contralateral eyes (813 +/- 478, 86.7 +/- 38.3, and 3350 +/- 881 rhog/mL, respectively; P = 0.02, P = 0.01, and P = 0.04, respectively), compared to controls (73.7 +/- 25.3, 17.5 +/- 4.9, and 1350 +/- 337 rhog/mL). Triggering receptor expressed on myeloid cells (TREM)-1 was significantly elevated in affected (551 +/- 231 rhog/mL, P = 0.02) and contralateral unaffected (545 +/- 298 rhog/mL, P = 0.03) eyes compared to controls (31.3 +/- 12.4 rhog/mL). The density of DCs was significantly increased in affected (226.9 +/- 37.3 cells/mm(2), P < 0.001) and unaffected (122.3 +/- 23.7 cells/mm(2), P < 0.001) eyes compared to controls (22.7 +/- 5.9 cells/mm(2)). Sub-basal nerve density significantly decreased in affected (3337 +/- 1615 mum/mm(2), P < 0.001) and contralateral (13,230 +/- 1635 mum/mm(2), P < 0.001) eyes compared to controls (21,200 +/- 545 mum/mm(2)). Levels of IL-1beta, IL-6, and IL-8 were significantly correlated with DC density (R = 0.40, R = 0.55, and R = 0.31, all P < 0.02) and nerve density (R = -0.30, R = -0.53, and R = -0.39, all P < 0.01).

CONCLUSIONS: Proinflammatory tear cytokines are elevated bilaterally in patients with unilateral BK, and are correlated strongly with alterations in DCs and nerve density as detected by IVCM.

Yamamoto, N., et al. (2011). "Cytotoxicity evaluation of reactive metabolites using rat liver homogenate microsome-encapsulated alginate gel microbeads." Journal of Bioscience and Bioengineering **111**(4): 454-458.

We present an improved cytotoxicity test for reactive metabolites, in which the S9 microsomal fraction of rat liver homogenate is encapsulated in alginate gel microbeads to avoid cytotoxic effects of S9-self-generated toxicants, microsomal lipid peroxides. The S9-encapsulated gel microbeads were prepared by a coaxial two-fluid nozzle and surfaces of the microbeads were

coated with poly-L-lysine (PLL). Although the initial metabolic rate of the S9-encapsulated gel microbeads was about 20% slower than that of bare S9, the microbeads prevented the leakage of microsomal lipid peroxides thanks to the dense alginate and PLL polymer networks. In fact, the half maximal effective concentration of the indirect mutagen cyclophosphamide on NIH3T3 cells in the presence of the S9-encapsulated gel microbeads was about 5 times higher than that in the presence of bare S9. Use of the S9-encapsulated gel microbeads enabled the more accurate evaluation of the cytotoxicity of the reactive metabolites without the S9-based cytotoxicity.

Yamamoto, T., et al. (2005). High efficiency heat and material recovery of plastic waste including polyvinyl chloride by using sumitomo metals' waste gasification and smelting system, World Scientific Publishing Co., Inc., 27 Warren Street Suite 401-402 Hackensack NJ 07601 USA, [URL:http://www.worldscinet.com/index.html].

Ordinary waste treatment systems have problems caused by low heat and material recovery, such as the emission of dioxin and heavy metals. To promote heat and material recovery, a new type of waste gasification and smelting system, using iron-making and steel-making technologies based on high-temperature metallurgy, has been developed for much kind of wastes. This system can steadily gasify and smelt municipal waste and industrial waste such as plastic waste including polyvinyl chloride, automobile shredder residue, soil and so on. As a result of steady operation in the high temperature reduction atmosphere, dioxin-free high calorie purified gas and heavy metal-free high quality slag were produced. Three commercial plants which have capacities of 132tons/day (2 units of 66tons/day) based on municipal waste in Tosu, Japan and 100tons/day (1 units of 100tons/day) based on industrial waste in Yamaguchi and industrial waste in Yamaguchi and Kashima, Japan have been operating at full capacity.

Yamamoto, T. and A. Yasuhara (1999). "Quantities of bisphenol a leached from plastic waste samples." Chemosphere **38**(11): 2569-2576.

To quantify the leaching of bisphenol A into water, various samples of plastic waste were cut into small pieces, soaked in water for two weeks at room temperature in the dark, and the concentration of bisphenol A in the water determined by gas chromatography/mass spectrometry (GC/MS). The amount of bisphenol A leached from the plastic wastes ranged from undetectable to 139 micrograms/g. The detection limit was 2 ng/g when 100 g of plastic waste was used. Polyvinyl chloride products yielded the highest concentrations because bisphenol A is used in its manufacture as a stabilizer.

Yamana, H., et al. (2014). "Down-regulated expression of monocyte/macrophage major histocompatibility complex receptors in human and mouse monocytes by expression of their ligands." Clinical & Experimental Immunology **178**(1): 118-128.

Mouse monocyte/macrophage major histocompatibility complex (MHC) receptor 1 (MMR1; or MMR2) specific for H-2D(d) (or H-2K(d)) molecules is expressed on monocytes from non-H-2D(d) (or non-H-2K(d)), but not those from H-2D(d) (or H-2K(d)), inbred mice. The MMR1 and/or MMR2 is essential for the rejection of H-2D(d) - and/or H-2K(d) -transgenic mouse skin onto C57BL/6 (H-2D(b) K(b)) mice. Recently, we found that human leucocyte antigen (HLA)-B44 was the sole ligand of human MMR1 using microbeads that had been conjugated with 80 types of HLA class I molecules covering 94.2% (or 99.4%) and 92.4% (or 96.2%) of HLA-A and B molecules of Native Americans (or Japanese), respectively. In the present study, we also explored the ligand specificity of human MMR2 using microbeads. Microbeads coated with HLA-A32, HLA-B13 or HLA-B62 antigens bound specifically to human embryonic kidney (HEK)293T or EL-4 cells expressing human MMR2 and to the solubilized MMR2-green fluorescent protein (GFP) fusion protein; and MMR2(+) monocytes from a volunteer bound HLA-B62 molecules with a Kd of 8.7 x 10(-9) M, implying a three times down-regulation of MMR2 expression by the ligand expression. H-2K(d) (or H-2D(d)) transgene into C57BL/6 mice down-regulated not only MMR2 (or MMR1) but also MMR1 (or MMR2) expression, leading to further down-regulation of MMR expression. In fact, monocytes from two (i.e. MMR1(+) /MMR2(+) and MMR1(-) /MMR2(-)) volunteers bound seven to nine types of microbeads among 80, indicating <= 10 types of MMR expression on monocytes. The physiological role of constitutive MMRs on monocytes possibly towards allogeneic (e.g. fetal) cells in the blood appears to be distinct from that of inducible MMRs on macrophages toward allografts in tissue.

Yamaoka, K., et al. (2009). "Inhibition of Jak3-Stat6 pathway leading to an anti-inflammatory process in rheumatoid arthritis." Arthritis and Rheumatism **10)**: 147.

Purpose: Janus kinase 3 (Jak3) is a tyrosine kinase necessary for lymphocyte differentiation and proliferation, causing severe combined immunodeficiency. Because of its necessity for lymphocyte function, it is also known to be expressed at the inflammation site such as synovium from rheumatoid arthritis (RA) patients. Recently, a transcription factor Stat6, which is activated by Jak3 was reported to be specifically expressed on dendritic cells in the synovium from RA patient. Recent clinical trials of a Jak inhibitor CP-690,550 for RA has been conducted showing dramatic effects. Herein we have analyzed the function of dendritic cells (DCs) from Jak3 and Stat6 deficient mice to elucidate the involvement of Jak3-Stat6 in inflammatory process. Objective(s): To elucidate the role of Jak3-Stat6 in dendritic cell function and inflammatory process. Method(s): Jak3 and Stat6 deficient mouse was used to obtain splenic DCs or bone marrow derived DCs. Mouse bone marrow and purified human monocyte was cultured with GM-CSF and IL-4 or GM-CSF only to derive DC in vitro. Human monocyte and bone marrow derived DCs was positively purified with CD14 or CD11c microbeads respectively. Jak3 and Stat6 expression was analyzed by western blotting and cytokine concentration was measured by enzyme-linked immunosorbent assay (ELISA) or cytokine beads array. Result(s): Jak3 and Stat6 deficient mice showed normal DC development in vivo and in vitro. Further evaluation with DC cell surface marker and antigen uptake was comparable with wild-type mice. Surprisingly, both Jak3 and Stat6 deficient DCs showed increased IL-10 production in response to toll-like receptor ligand stimulation while other inflammatory cytokine (TNF-a, IL-6) was at comparable level with wild type DCs. We further evaluated the cytokine profile with different genetic background and found that overproduction of IL-10 by Stat6-/- DCs was a consistent phenomenon. Conclusion(s): We have evaluated DCs from Jak3 deficient and Stat6 deficient mice and found normal development with high production of IL-10 which was not affected by genetic background of the mice. Recently, a Jak inhibitor possessing high potency to Jak3 has been shown to have anti-rheumatic activity. It has shown potent anti-inflammatory effect with minimum side effect on haematopoietic cells leading to a question on its mechanism of action. Our results suggests that Jak3-Stat6 not only plays an important role in lymphocyte function but also has essential roles in regulating DC function and its inhibition leads to suppression of RA by enhancing IL-10 production by DC.

Yamashita, S., et al. (2019). Water flow measurement for swimmers using artificial food-grade roe as tracer particles. ACM International Conference Proceeding Series.

Water flow is strongly related to swimming speed; thus, technologies for measuring the three-dimensional movement of water are highly desired in the water sports industry. However, existing fluid measurement methods are not suitable for use with humans because they

introduce tiny plastic particles (known as tracer particles) that contain fluorescent ink, which is used to visualize water flow. A laser then irradiates the environment to make the particles brighter than the surroundings to track their movement with cameras. This method has potential adverse effects to humans, such as accidental swallowing of the particles and laser burns to the skin and eyes. In this research, we propose a human-friendly water flow measuring technology using tracer particles made of food-grade materials and a harmless light source. To visualize tracer particles, we give the particles an optical property, which makes them sufficiently brighter than the surroundings when placed between circularly polarized plates. We tested the proposed setup for water flow measurement in an actual swimming environment with swimmers. We observed that tracer particles moved in accordance with the water flow caused by a swimming stroke. © 2019 Association for Computing Machinery.

Yan, B., et al. (2017). "Development of a novel flow cytometric immunobead array to quantify VWF: Ag and VWF: GPIbR and its application in acute myocardial infarction." European Journal of Haematology **99**(3): 207-215.

OBJECTIVES: Both von Willebrand disease (VWD) and acute myocardial infarction (AMI) involve quantitative and qualitative changes in von Willebrand factor (VWF). Our objective was to develop a rapid and precise flow cytometric immunobead array (FCIA) to quantify VWF antigen (VWF:Ag) and ristocetin-triggered platelet glycoprotein Ib binding (VWF:GPIbR) and apply it in a clinical setting.

METHODS: Microbeads, coated with monoclonal antibodies for SZ29 or SZ151 IgG, were incubated with diluted plasma. VWF-binding microbeads were detected with FITC-conjugated sheep-anti-human VWF IgG by flow cytometry. Plasma VWF:Ag and VWF:GPIbR levels in normal controls (CTL; n=105), patients with VWD (n=21), and patients with AMI (n=146) were tested by FCIA and ELISA in parallel. ADAMTS13 activity and VWF multimer analyses were also implemented.

RESULTS: Our novel FCIA showed a strong correlation with the ELISA results (VWF:Ag, r=.855; VWF:GPIbR, r=.813). The intra-assay coefficient variations (CVs) of VWF:Ag-FCIA and VWF:GPIbR-FCIA were 9.2% and 7.7%, respectively, and the interassay CVs were 12.6% and 13.5%, respectively. Plasma VWF:Ag and VWF:GPIbR levels were significantly higher in patients with AMI than in CTL (P<.0001), whereas the ratios of ADAMTS13/VWF:Ag and ADAMTS13/VWF:GPIbR were significantly lower (P<.0001). Levels of plasma ultra-large VWF (UL-VWF) were dramatically increased in patients with AMI.

CONCLUSIONS: The novel VWF:Ag and VWF:GPIbR-FCIA assays were found to be simpler, more specific, and more accurate than the classical ELISA method. In addition, elevated VWF:GPIbR and UL-VWF may contribute to the pathogenesis of AMI.

Yan, M., et al. (2019). "Microplastic abundance, distribution and composition in the Pearl River along Guangzhou city and Pearl River estuary, China." Chemosphere **217**: 879-886.

Like many urban rivers, the Pearl River in China is contaminated with microplastics. Compared with marine environments, microplastic pollution in freshwater is less understood, especially in urban rivers. In the present study, the abundance and distribution of microplastics in water from the Pearl River was investigated, including the estuary and the urban section along Guangzhou. The average abundance of microplastics was 19,860 items/m³ and 8902 items/m³ in the urban section and estuary, respectively. Wastewater effluents from cities might be a main source of microplastics in the Pearl River, and the urban tributaries might act as retention systems for microplastics. Among these microplastics, over 80% of them were less than 0.5mm. The main shapes of microplastics were film, fragment, and fiber, mostly blue or transparent. Moreover, the most common polymer types of these microplastics were polyamide (26.2%) and cellophane (23.1%). This study reveals the contamination and characteristics of microplastics in the Pearl River, and provides important data for further research on microplastics in freshwater ecosystems.

Yan, Y., et al. (2018). "Determination of 8 benzotriazole ultraviolet absorbers in food contact grade plastic resin by ultra high performance liquid chromatography." Journal of Food Safety and Quality **9**(2): 434-440.

Objective: To establish a method to determine 8 kinds of ultraviolet absorbers (UV-0, UV-9, UV-71, UV-329, UV-326, UV-327, UV-234, UV-360) in food plastic packaging resin using reflow extraction followed by ultra high performance liquid chromatography (UPLC).

Yan, Z., et al. (2020). "An efficient method for extracting microplastics from feces of different species." Journal of Hazardous Materials **384**: 121489.

Concerns have been raised regarding the ingestion of microplastics (MPs) by numerous organisms including humans. However, no efficient and standardized methods are available for extracting MPs from feces. In this study, we introduce a novel approach with high digestion efficiency that involves using Fenton's reagent and nitric acid to remove feces solids. Firstly, Fenton's reagent was used to degrade small solids and decompose large solids into small pieces. Secondly, nitric acid was used to digest the remaining solids and filters. Furthermore, absolute ethyl alcohol was used to remove the mineral residues wrapped on the plastic surfaces and disperse MPs. By using this method, 97.78 % MPs can be recovered from human and chicken feces, and no significant changes were observed in the physical and Raman spectral properties of different polymer types of MPs. This method has also been verified by extracting MPs from field feces. Overall, the proposed method can efficiently digest feces solids and extract MPs with higher recovery rate, less intermediate steps and less damage, which can serve as an economical and feasible method for the detection of MPs in the feces of different species.

Yang, C., et al. (2019). "Anomalous dispersion of bioinspired flower-like microparticles for oil/water separation." Nanotechnology **31**(9): 095712.

Hydrophobic particles have been suffering from aggregation in aqueous media, which limits their applications in oil/water separation. Surfactants have been used to increase the dispersity of the hydrophobic particles in water, but this approach compromises particles' hydrophobicity and oil absorption capabilities. Recently, hierarchical microparticles decorated with nanospikes were found to exhibit long-term anomalous dispersion in liquid medium without adding any surfactants. However, whether this anomalous dispersion phenomenon was applicable to 2D nano-petals decorated microparticles still remains unknown. Here, we developed a ZnO-based flower-like microparticles (FLMPs) whose surfaces were attached with 2D nano-petals, and we examined their anomalous dispersity. Our results showed that both hydrophilic and hydrophobic FLMPs could achieve anomalous dispersity either in water or organic solvents, likely due to reduced interparticle collision by the 2D nano-petals. In addition, the functional hydrophobic FLMPs also possessed a large surface area and superhydrophobic surfaces to efficiently absorb oil spills on water and oil emulsion suspended in water. In contrast, the hydrophobic microbeads (MBs) without nano-petals structure seriously aggregated in water and exhibited reduced oil absorption abilities. Our work demonstrated the new finding of 2D nano-pedal structure-mediated anomalous dispersity, and provided a new method for effective oil/water separation using superhydrophobic particles without surfactants.

Yang, C. J., et al. (2008). "High-Throughput Single Copy DNA Amplification and Cell Analysis in Engineered Nanoliter Droplets." Analytical Chemistry (Washington) **80**(10): 3522-3529.

A high-throughput single copy genetic amplification (SCGA) process is developed that utilizes a microfabricated droplet generator (mu DG) to rapidly encapsulate individual DNA molecules or cells together with primer functionalized microbeads in uniform PCR mix droplets. The nanoliter volume droplets uniquely enable quantitative high-yield amplification of DNA targets suitable for long-range sequencing and genetic analysis. A hybrid glass- polydimethylsiloxane (PDMS) microdevice assembly is used to integrate a micropump into the mu DG that provides uniform droplet size, controlled generation frequency, and effective bead incorporation. After bulk PCR amplification, the droplets are lysed and the beads are recovered and rapidly analyzed via flow cytometry. DNA targets ranging in size from 380 to 1139 bp at single molecule concentrations are quantitatively amplified using SCGA. Long-range sequencing results from beads each carrying similar to 100 amol of a 624 bp product demonstrate that these amplicons are competent for achieving attomole-scale Sanger sequencing from a single bead and for advancing pyrosequencing read-lengths. Successful single cell analysis of the glyceraldehyde 3 phosphate dehydrogenase (GAPDH) gene in human lymphocyte cells and of the gyr B gene in bacterial Escherichia coli K12 cells establishes that SCGA will also be valuable for performing high-throughput genetic analysis on single cells.

Yang, D., et al. (2015). "Microplastic Pollution in Table Salts from China." Environmental Science & Technology **49**(22): 13622-13627.

Microplastics have been found in seas all over the world. We hypothesize that sea salts might contain microplastics, because they are directly supplied by seawater. To test our hypothesis, we collected 15 brands of sea salts, lake salts, and rock/well salts from supermarkets throughout China. The microplastics content was 550-681 particles/kg in sea salts, 43-364 particles/kg in lake salts, and 7-204 particles/kg in rock/well salts. In sea salts, fragments and fibers were the prevalent types of particles compared with pellets and sheets. Microplastics measuring less than 200 mum represented the majority of the particles, accounting for 55% of the total microplastics, and the most common microplastics were polyethylene terephthalate, followed by polyethylene and cellophane in sea salts. The abundance of microplastics in sea salts was significantly higher than that in lake salts and rock/well salts. This result indicates that sea products, such as sea salts, are contaminated by microplastics. To the best of our knowledge, this is the first report on microplastic pollution in abiotic sea products.

Yang, D. K., et al. (2014). "Selection of aptamers for fluorescent detection of alpha-methylacyl-CoA racemase by single-bead SELEX." Biosensors & Bioelectronics **62**: 106-112.

This paper first reports DNA aptamers and a fluorescent enzyme-linked aptamer assay (ELAA) targeting alpha-methylacyl-CoA racemase (AMACR), an emerging prostate cancer biomarker. The aptamers were in vitro selected using a new single-bead SELEX approach, which was rapid and consumed only ca. 45 ng AMACR. Before SELEX, silane chemistry was used to prepare epoxide-functionalized glass microbeads (EGBs, 500 mum in size and manipulated by tweezers) for AMACR coating. Recombinant AMACR was also prepared. During SELEX, the ligand evolution was assured by a differential real-time quantitative PCR assay. After SELEX, the aptamers were identified by the alignment analysis and 2nd structure prediction from the selected, cloned sequences. The circular dichroism (CD) analysis revealed that the aptamers formed stable B-form, stem-loop conformations. The fluorescent ELAA method confirmed the nM-level affinity and high specificity of the aptamers against AMACR. Finally, an aptamer-based fluorescent AMACR assay was demonstrated. The assay featured a wide dynamic range (from 10(-1) to 10(3)

nM of AMACR), a low detection limit of 0.44 nM (19.5 ng/mL), and high AMACR specificity and is promising for clinical AMACR diagnostics.

Yang, H., et al. (2014). "Magnetic prussian blue/graphene oxide nanocomposites caged in calcium alginate microbeads for elimination of cesium ions from water and soil." Chemical Engineering Journal **246**: 10-19.

To remove cesium ions in water and soil, magnetic prussian blue/graphene oxide (PB/Fe₃O₄/GO) nanocomposites encapsulated in calcium alginate microbeads (PFGM) were designed and fabricated. The protocol was processed with environment-friendly and low-cost precursors at ambient temperature and pressure. The adsorbents presented high selectivity to Cs⁺ and could extract it even in trace amounts. Sorption of 80% Cs⁺ to the new adsorbent were fulfilled in less than 2 h, and maximum adsorption capacities were 43.52 mg/g. Cesium ions were absorbed primarily by both of chemisorption (K⁺/H⁺-exchange) and physisorption (ion trapping). The saturation adsorption and adsorption kinetics fitted well with the Langmuir isotherm and the pseudo-second-order kinetic model. Both the temperature and pH value would affect the sorption performance, meanwhile, the microbeads were stable in natural water, seawater, and pH value of solutions ranging from 4 to 10 without collapse of microbeads and leaching of prussian blue. Most importantly, these microbeads could be separated effectively from aqueous solution (or soil suspensions) by an external magnetic field, which was convenient for large-scale treatment of cesium-contaminated water (or soil).

Yang, H., et al. (2020). "Toxicity comparison of nano-sized and micron-sized microplastics to Goldfish Carassius auratus Larvae." Journal of Hazardous Materials **388**: 122058.

Plastic pollution is one of the most serious environmental issues worldwide. The negative influence of plastics on aquatic organisms has increasingly concerned, especially the influence of microplastic (MPs). In the present study, the toxicology of nano-sized MPs (nMPs) and micron-sized MPs (mMPs) were comparatively studied. Goldfish larvae were exposed to 10, 100 and 1000 mug/L nMPs and mMPs for 1, 3 and 7 days. The enrichment of MPs, body length, heart rate, motor ability, microscopic and ultrastructure of intestine, liver, gill and muscle tissue, as well as the oxidative stress were analyzed.

Yang, H. J., et al. (2016). "Antifungal activity of nano and micro charcoal particle polymers against Paecilomyces variotii, Trichoderma virens and Chaetomium globosum." New Biotechnology **33**(1): 55-60.

This study investigates the antifungal activity of a polymer integrated with nano-porous charcoal particles against Paecilomyces variotii, Chaetomium globosum, Trichoderma virens, which are all filamentous fungi. The charcoal polymers were prepared by combining charcoal powders with plastic resin under a vacuum to form charcoal particle protrusions on the polymer surface. The mycelial growth of P. variotii and T. virens exhibited a reduction of 10 and 30%, respectively, after the conidia were pre-treated with charcoal polymers, and in particular, no mycelial growth was found in C. globosum during 5 days of culture. The adsorption of Ca²⁺ into charcoal was suggested to inhibit growth due to the reduction in the flux of calcium ions (Ca²⁺) into the hyphae. In 5h, about 15mM of Ca²⁺ were removed from CaCl<inf>2</inf> solution with 0.2g/mL of polymers, and the nano-sized pores of the charcoals on the polymer were responsible for the Ca²⁺ adsorption. Copyright © 2015 Elsevier B.V.

Yang, J., et al. (2019). "Effects of different soil environmental factors on tetracycline adsorption of microplastics." Nong Ye Huan Jing Ke Xue Xue Bao = Journal of Agro-Environment Science(11): 2503.

To investigate the effect of different soil environmental factors on the adsorption of antibiotics on microplastics, this study used three microplastics, i.e., polyethylene（PE）, polystyrene（PS）, and polyamide（PA）, with tetracycline（TC）as the target antibiotic, in a batch equilibrium experiment to study the mechanism of TC adsorption on microplastics and the influence of different soil environmental factors on its adsorption behavior. The results showed that the TC adsorption capacities of the microplastics were in the order PE>PS>PA,and these microplastics were suitable for fitting using Langmuir's equation. The maximum adsorption capacities were 0.154, 0.086, and0.075 mg·g–1, respectively. The TC adsorption capacity for PE reached the maximum value under neutral pH conditions; for PS, it was the largest under acidic conditions, and it decreased with an increase in pH; and for PA, pH had little effect on TC adsorption capacity. Different concentrations of Ca2+ and Mg2+ hinder the absorption of TC by microplastics, and the cation concentration was inversely proportional to the adsorption capacity. The presence of fulvic acid inhibited the adsorption of TC on PE; however, the presence of low concentration fulvic acid(<1 mg·L–1)promoted the adsorption of TC on PA and PS. In conclusion, the experiments showed that the adsorption of TC on different microplastics was significantly different; furthermore, different soil environmental factors considerably affected the adsorption behavior of TC on microplastics, which lays the foundation for further investigation of the adsorption behavior of microplastics in soil.

Yang, J., et al. (2019). "Effects of soil environmental factors and UV aging on Cu²⁺ adsorption on microplastics." Environmental Science & Pollution Research **26**(22): 23027-23036.

Microplastics (MPs) in natural environments have attracted lots of attention. Although the quantity of MPs present in terrene is much higher than that in aquatic environment, few studies have investigated the chemical behavior of MPs in terrestrial environment. This study investigate the Cu²⁺ (as a model heavy metal) adsorption capacity of six kinds of MPs (polyamide-6 (PA), polyethylene (PE), polystyrene (PS), polyethylene terephthalate (PET), polyvinyl chloride (PVC), polymethyl methacrylate (PMMA)) in batch adsorption experiments and the effects of different soil environmental factors, including pH and the presence of cations and low-molecular-weight organic acids (LMWOAs), as well as ultraviolet (UV) aging. The Cu²⁺ adsorption capacities of PA and PMMA were higher than those of other MPs and their maximum equilibrium adsorption capacities (estimated by the Langmuir adsorption equation) were 323.6 mug/g +/- 38.2 and 41.03 +/- 1.78 mug/g, respectively. The Cu²⁺ adsorption on MPs was affected by pH, and the greatest amount of Cu²⁺ adsorbed on PA and PMMA was observed at pH = 6 and pH = 7, respectively. The presence of Ca²⁺ or Mg²⁺ inhibited Cu²⁺ adsorption by MPs, due to competition for the adsorption sites. Moreover, Cu²⁺ adsorption by MPs was affected by various types of LMWOAs. The Cu²⁺ adsorption on PA was significantly reduced by citric acid, followed by oxalic acid, and oxalic acid was particularly evident for Cu²⁺ adsorption on PMMA. UV aging (200 h) had different effect on Cu²⁺ adsorption on MPs and it depends on the change of carbonyl index.

Yang, J., et al. (2016). "Integrated microfluidic aptasensor for mass spectrometric detection of vasopressin in human plasma ultrafiltrate." Analytical Methods **8**(26): 5190-5196.

We present a microfluidic aptamer-based biosensor for detection of low-molecular-weight biomarkers in patient samples. Using a microfluidic device that integrates aptamer-based specific analyte extraction, isocratic elution, and detection by matrix-assisted laser desorption/ionization time-of-flight (MALDI-TOF) mass spectrometry, we demonstrate rapid, sensitive and label-free detection of arginine vasopressin (AVP) in human plasma ultrafiltrate. AVP molecules in complex matrices are specifically captured by an aptamer that is immobilized on microbeads via affinity binding in a microchamber. After the removal of unbound, contaminating molecules through washing, aptamer-AVP complexes are thermally disrupted via on-chip temperature control. Released AVP molecules are eluted with purified water and transferred to a separate microchamber, and deposited onto a single spot on a MALDI plate via repeated, piezoelectrically actuated ejection, which enriches AVP molecules over the spot area. This integrated on-chip sample processing enables the quantitative detection of low-abundance AVP by MALDI-TOF mass spectrometry in a rapid and label-free manner. Our experimental results show the detection of AVP in human plasma ultrafiltrate as low as physiologically relevant picomolar concentrations via aptamer-based selective preconcentration, demonstrating the potential of our approach as a rapid (~1 h), sensitive clinical AVP assay. © The Royal Society of Chemistry 2016.

Yang, L., et al. (2019). "Removal of microplastics in municipal sewage from China's largest water reclamation plant." Water Research **155**: 175-181.

Municipal sewage treatment plants (STPs) are an important point source of microplastics in domestic waterways. In the present study, effluents from the largest water reclamation plant in China were sampled throughout the treatment process and microplastics were extracted and identified to evaluate their removal. As expected, microplastics were detected in the influent (12.03 +/- 1.29 items/L). Following treatment, concentrations of microplastics were reduced by greater than 95% and 0.59 +/- 0.22 items/L of microplastics were detected in reclaimed waters. Among detected microplastics, 18 types of polymers of ten colors were identified. Polyethylene terephthalate (PET), polystyrene (PS) and polypropylene (PP) accounted for greater than 70% of detected microplastics. Furthermore, microfibers were the dominant shape detected with an average size of 1110.72 +/- 862.95 mum. However, microparticles accounted for only 14.08% of total microplastics with an average size of 681.46 +/- 528.73 mum. Results of the present study suggest that current treatment technologies employed at the chosen STP are efficient to remove the majority of microplastics, however consideration of STPs as a point source of microplastics is important due to the large volumes of effluents being released into the aquatic environment on a consistent basis. Copyright © 2019 Elsevier Ltd

Yang, L., et al. (2019). "Microfiber release from different fabrics during washing." Environmental Pollution **249**: 136-143.

Microfiber is a subgroup of microplastics and accounts for a large proportion of microplastics in aquatic environment, especially in municipal effluents. The purpose of the present study was to quantify microfiber shedding from three most populate synthetic textile fabrics: polyester, polyamide, and acetate fabrics. The results showed that more microfibers were released after washing with a pulsator laundry machine than a platen laundry machine. The greatest number of microfibers was released from acetate fabric, which was up to 74,816 ± 10,656 microfibers/m2 per wash, although microfibers were shed from all materials. Moreover, an increasing trend was found in the number of microfibers shedding from synthetic fabrics with the washing temperature increasing, and greater microfiber release occurred when washing fabrics with detergent rather than with water alone. The lint filter bag equipped with the pulsator laundry machine retained the longer microfibers (>1000 μm), but not the shorter microfibers (<500 μm) instead of releasing into the drainage system. Our data suggested that microfibers released during washing of synthetic fabrics may be an important source of microfibers in aquatic environment due to the increasing production and use of synthetic fabrics

globally. Thus, more efficient filtering bags or other technologies in household washing machines should be developed to prevent and reduce the release of microfibers from domestic washing. Image 1 • The releasing of microfibers from three kinds of synthetic fabrics were evaluated. • More microfibers were released after washing with pulsator laundry machine. • The greatest number of microfibers were released from the acetate fabric. • The temperature and detergent promoted the releasing of microfibers. • The lint filter bag retained parts of microfibers with long size (>1000 μm). [ABSTRACT FROM AUTHOR]

Yang, L. H., et al. (2015). "A "turn-on" fluorescent microbead sensor for detecting nitric oxide." International Journal of Nanomedicine **10**: 115-123.

Nitric oxide (NO) is a messenger molecule involved in numerous physical and pathological processes in biological systems. Therefore, the development of a highly sensitive material able to detect NO in vivo is a key step in treating cardiovascular and a number of types of cancer-related diseases, as well as neurological dysfunction. Here we describe the development of a fluorescent probe using microbeads to enhance the fluorescence signal. Microbeads are infused with the fluorophore, dansyl-piperazine (Ds-pip), and quenched when the fluorophore is coordinated with a rhodium (Rh)-complex, ie, Rh2(AcO(-))4(Ds-pip). In contrast, they are able to fluoresce when the transition-metal complex is replaced by NO. To confirm the "on/off" mechanism for detecting NO, we investigated the structural molecular properties using the Fritz Haber Institute ab initio molecular simulations (FHI-AIMS) package. According to the binding energy calculation, NO molecules bind more strongly and rapidly with the Rh-core of the Rh-complex than with Ds-pip. This suggests that NO can bond strongly with the Rh-core and replace Ds-pip, even though Ds-pip is already near the Rh-core. However, the recovery process takes longer than the quenching process because the recovery process needs to overcome the energy barrier for formation of the transition state complex, ie, NO-(AcO(-))4-(Ds-pip). Further, we confirm that the Rh-complex with the Ds-pip structure has too small an energy gap to give off visible light from the highest unoccupied molecular orbital/lowest unoccupied molecular orbital energy level.

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Yang, S., et al. (2011). "Novel double labeled mixed lymphocyte in vitro assay to predict the dominant graft in 2 unit UCB transplantation." Blood. Conference: 53rd Annual Meeting of the American Society of Hematology, ASH **118**(21).

Introduction: Umbilical cord blood cells (UCB) from allogeneic donors have been established as an alternative source for HSC transplantation in patients who lack suitably HLA matched bone marrow or peripheral blood stem cells from adult donors. Transplantation using 2 unit UCB has been shown to compensate the low engraftment and slow hematopoietic recovery resulting from 1 unit UCB transplantation in full stature adult patients. At present, there are no unit specific factors that reliably predicts for the "winning unit" in 2 unit UCB transplantation, e.g. cell viability, number of infused total nucleated cells, CD34+ or CD3+ cells, sex mismatch, ABO blood group, and degree of HLA mismatch. In vivo mouse models suggest that CD34 negative subsets play an important role. Among CD34 negative subsets, CD8 T subset accounts for approximately 34.0+/-23.3% of T lymphocytes from UCB. In bone marrow transplantation CD8 T cells have been found to facilitate donor hematopoietic cell engraftment. Moreover, it has been reported that 1 dominant unit coincides with a specific CD8 T cell response against the non-engrafted unit which was not observed from CD4 or NK cells. Method(s): In this study, we used volunteer donated UCB research units (kindly provided by P. Rubinstein, MD, New York Blood Center). Mononuclear cells (MNC) were purified by Ficoll gradient centrifugation, and CD3 T cells were isolated with CD3 MicroBeads (Miltenyi Biotec; autoMACS). The purified CD3 (confirmed by FACS >95% purity) cells were labeled with CFSE and DDAO-SE. After labeling, the cells from two different donors were mixed in 96-well U-bottom plates for continued culture in 37 degreeC 5% CO<inf>2</inf>. The expansion from each labeled donor cells was evaluated using flow cytometry; the dead cells were gated out using propidium iodide, and the data was analyzed using FlowJo software. For proper T cells activation, we also compared different activation conditions using i.) anti-CD3/CD28 Beads, ii.) anti-CD3 antibody plus anti-CD28 antibody, and iii.) cytokine IL-2. The schematic illustration of methods is shown in Figure 1. [Image Presented] Results and discussion: We noted that T cells from UCB are primarily at naive stage as determined by CD45RA (93.8 +/-7.11%) and CCR7 (84.9 +/-12.0%) expression. We also determined the optimal activation condition using a modified mixed lymphocyte reaction from 2 UCB units. Four days after incubation, the proliferation from 2 units labeled with CFSE and DDAO-SE could be reproducibly distinguished using FL1 channel for CFSE and FL4 channel for DDAO-SE (Figure 1). The optimal concentration for labeling using CFSE (1 mM) and DDAO (1 muM or 3 mM) was determined by titration. To avoid cell toxicity resulting from CFSE and DDAO-SE labeling, as well as self-crossing from each donor using two dyes, we examined additional mixed lymphocyte analyses in which each donor was labeled with CFSE or DDAO-SE respectively and vice versa. As shown in Figure 1, we found consistently that the predicated dominant unit accounted for the majority of culture (73.2% stained with DDAO; 63.5% stained with CFSE) after 4 days co-culture. The dominance was not correlated with cell proliferation indicated by the proliferation index (1.12 for dominant and 1.48 for another unit). After confirmation of this in vitro assay, further studies were conducted to evaluate the IFN-gamma

release of 2 UCB units in this optimized mixed lymphocyte assay in the condition using cytokine IL-2. Interestingly, we could only detect IFN-gamma by intracellular staining in one unit when co-culture was set-up using CD3 T cells from each unit; the expression of IFN-gamma was not detected when we used CD3 T cells from 1 unit. The correlation between dominance and the expression of IFN-gamma is currently under investigation. Conclusion(s): UCB Transplantation is an important alternative for patients lacking bone marrow or peripheral blood stem cell donors. With the establishment of this novel modified mixed lymphocyte in vitro assay for prediction of the "winning" immune dominant unit, routine analyses can be performed to guide unit selection. Further interventions can be exploited to preferentially treat the expected dominant unit with glycosylation, cytokines, prostaglandins, or C3a compliments to further enhance hematopoietic stem cells trafficking and engraftment to the marrow.

Yang, S., et al. (2016). "Environmental fate and health risks of phthalate acid esters in soils: a review." Zhongguo Shengtai Nongye Xuebao / Chinese Journal of Eco Agriculture **24**(6): 695-703.

Phthalic acid esters (PAEs) are classified as environmental hormone organic compounds, commonly contained in plastic, resin and rubber, accounting for 20%-60%, as plasticizers with potentially hazardous impacts on the environment and human health. In soils, the main anthropogenic sources of PAEs are agricultural chemicals, sewage water irrigation and atmospheric precipitation. PAEs can abundantly accumulate in the soil and be transported to different environmental systems via a series of environmental, geochemical processes such as volatilization, leaching, adsorption, biodegradation, plant uptake and food chain. This article combined the results of domestic and international studies to summarize the state of soil PAEs pollution in China. Anthropogenic activities and land use changes were the main factors responsible for seasonal and spatial distributions of PAEs. The contents of PAEs in soils in most regions of China reached dozens milligram per kilogram, which obviously exceeded the standards for the US and the European countries. Di-n-butyl phthalate (DnBP) and di (2-ethylhexyl) phthalate (DEHP) were the dominant PAEs in soils, similar to those observed in other countries. Also the environmental behavior of PAEs in soil-gas interface (volatilization and atmospheric precipitation), soil-plant system (phytoremediation and plant uptake) and soil-water interface (sediment adsorption and desorption) were analyzed to determine the causes of soil PAEs transfer between air, water, sediments and plants. There were significant differences in the characteristics of PAEs absorption, accumulation, distribution and transformation among the different interfaces. Because of the widespread application of PAEs and its occurrence in most common daily chemicals, humans are exposed to PAEs through foods contaminated during crop growth in soil or during packaging. Humans are also at risk through exposure to air (for breathing or absorption by skin), causing severely ecological and health risks in many regions of China. It was recommended that future soil PAEs research should focus on regional soil pollution and environmental behavior, PAEs transmission and evolution regularity in space and time, medium migration mechanisms, risk reduction and remediation measure research. There was need to use knowledge about the environmental fate and health risks of PAEs in soils to improve the regulation of organic pollution transformation in soils. This knowledge was also necessary for providing theoretical basis for the protection of ecological environments and soil health.

Yang, S., et al. (2018). "Alpha 1-antitrypsin inhibits microglia activation and facilitates the survival of iPSC grafts in hypertension mouse model." Cellular Immunology **328**: 49-57.

This study was conducted to investigate the use of Alpha 1-antitrypsin (AAT) to inhibit microglia activation in chronic hypertension model and provide a permissive environment for stem cell transplantation. Chronic ocular hypertension of C57BL/6 mice using magnetic microbead injection was induced 3weeks prior to iPSCs transplantation. The ocular hypertension model was assessed histologically and intraocular pressure was measured. Survival of grafted cells and microglia activation were examined by flow cytometry and immunofluorescence in AAT and PBS treated hosts. Retinal cytokines expression was also detected by real-time PCR. Chronic ocular hypertension resulted in persistent microglia activation and stem cell grafts loss. AAT treatment significantly inhibited microglia activation and facilitated the survival of transplant iPSCs 4w post transplantation compared to PBS treatment. AAT holds tremendous potential for the clinical application to control neuroinflammation factor in glaucoma and improve the stem cell replacement therapy of retinal neurodegenerative disease.

Yang, X., et al. (2018). "Influence of microplastic addition on glyphosate decay and soil microbial activities in Chinese loess soil." Environmental Pollution **242**(Pt A): 338-347.

The intensive use of pesticide and plastic mulches has considerably enhanced crop growth and yield. Pesticide residues and plastic debris, however, have caused serious environmental problems. This study investigated the effects of the commonly used herbicide glyphosate and micrometre-sized plastic debris, referred as microplastics, on glyphosate decay and soil microbial activities in Chinese loess soil by a microcosm experiment over 30 days incubation.

Yang, X., et al. (2019). "Biogenic transport of glyphosate in the presence of LDPE microplastics: a mesocosm experiment." Environmental Pollution **245**: 829-835.

The accumulation of plastic debris and herbicide residues has become a huge challenge and poses many potential risks to environmental health and soil quality. In the present study, we investigated the transport of glyphosate and its main metabolite, aminomethylphosphonic acid (AMPA) via earthworms in the presence of different concentrations of light density polyethylene microplastics in the litter layer during a 14-day mesocosm experiment. The results showed earthworm gallery weight was negatively affected by the combination of glyphosate and microplastics. Glyphosate and AMPA concentrated in the first centimetre of the top soil layer and the downward transport of glyphosate and AMPA was only detected in the earthworm burrows, ranging from 0.04 to 4.25 micro g g⁻¹ for glyphosate and from 0.01 (less than limit of detection) to 0.76 micro g g⁻¹ for AMPA. The transport rate of glyphosate (including AMPA) from the litter layer into earthworm burrows ranged from 6.6+or-4.6% to 18.3+or-2.4%, depending on synergetic effects of microplastics and glyphosate application. The findings imply that earthworm activities strongly influence pollutant movement into the soil, which potentially affects soil ecosystems. Further studies focused on the fate of pollutants in the microenvironment of earthworm burrows are needed.

Yang, X., et al. (2009). "[Analysis of Differentially Expressed Proteins in Self-Paired Sera of Advanced Non-small Cell Lung Cancer Patients Responsive to Gefinitib.]." Chinese Journal of Lung Cancer **12**(7): 765-769.

BACKGROUND: All the advanced NSCLC patients that received EGFR-TKI therapy will eventually relapse after a period of efficacy. The aim of this study is to investigate the serum biomarkers as potential predictive factors for the efficacy of epidermal growth factor receptor (EGFR) tyrosine kinase inhibitor (TKI) targeted therapy in advanced non-small cell lung cancer.

METHODS: Twenty self-paired serum samples were collected from 9 advanced NSCLC patients that evaluated as disease control (SD or PR) after gefinitib therapy, at the time points of before and after gefinitib treatment but 2 weeks before being evaluated as disease progress. All samples were pre-separated by WCX microbeads, and then detected on the MALDI-TOF-MS platform of

Bruker Autoflex. ClinProTools (Version: 2.1) was used to analyze the differentially expressed proteins.

RESULTS: There were 7 protein peaks (m/z), 3 242.09, 8 690.36, 2 952.64, 3 224.04, 1 450.51, 1 887.8 and 3 935.73 found statistically differentially expressed between the self-paired samples. Three proteins (3 242.09, 2 952.64 and 3 224.04) were down-regulated and four proteins (8 690.36, 1 450.51, 1 887.8 and 3 935.73) up-regulated in gefinitib treated sera.

CONCLUSIONS: The data here suggest that several specific protein peaks might indicate gefinitib resistance, yet the identities of these proteins and the mechanisms underlying the responsiveness to gefinitib treatment need further investigation.

Yang, Y., et al. (2020). "Lipid metabolic response to polystyrene particles in nematode Caenorhabditis elegans." Environmental Pollution **256**: 113439.

Nanoplastics can be used in various fields, such as personal care products. Nevertheless, the effect of nanoplastic exposure on metabolism and its association with stress response remain largely unclear. Using Caenorhabditis elegans as an animal model, we determined the effect of nanopolystyrene exposure on lipid metabolism and its association with the response to nanopolystyrene. Exposure (from L1-larave to adult day-3) to 100nm nanopolystyrene (>=1mug/L) induced severe lipid accumulation and increase in expressions of mdt-15 and sbp-1 encoding two lipid metabolic sensors. Meanwhile, we found that SBP-1 acted downstream of intestinal MDT-15 during the control of response to nanopolystyrene. Intestinal transcriptional factor SBP-1 activated two downstream targets, fatty acyl CoA desaturase FAT-6 and heat-shock protein HSP-4 (a marker of endoplasmic reticulum unfolded protein response (ER UPR)) to regulate nanopolystyrene toxicity. Both MDT-15 and SBP-1 were involved in the activation of ER-UPR in nanopolystyrene exposed nematodes. Moreover, SBP-1 regulated the innate immune response by activating FAT-6 in nanopolystyrene exposed nematodes. In the intestine, function of MDT-15 and SBP-1 in regulating nanopolystyrene toxicity was under the control of upstream signaling cascade (PMK-1-SKN-1) in p38 MAPK signaling pathway. Therefore, our data raised an important molecular basis for potential protective function of lipid metabolic response in nanopolystyrene exposed nematodes.

Yang, Y., et al. (2020). "Biodegradation and mineralization of polystyrene by plastic-eating superworms Zophobas atratus." Science of the Total Environment **708**: 135233.

Polystyrene (PS) is one of the major plastic debris accumulated in environment. Previously, we reported that mealworm (Tenebrio molitor) was capable of degrading and mineralizing Styrofoam (PS foam). This finding arouses our curiosity to explore whether more other insect species have the same capability as mealworms. Here, an insect larva, superworm (Zophobas atratus), was newly proven to be capable of eating, degrading and mineralizing PS. Superworms could live with Styrofoam as sole diet as well as those fed with a normal diet (bran) over a 28-day period. The average consumption rate of Styrofoam for each superworm was estimated at 0.58 mg/d that was 4 times more than that of mealworm. Analyses of frass, using gel permeation chromatography (GPC), solid-state ¹³C cross-polarization/magic angle spinning nuclear magnetic resonance (CP/MAS NMR) spectroscopy, and thermogravimetric interfaced with Fourier transform infrared (TG-FTIR) spectroscopy, demonstrated that the depolymerization of long-chain PS molecules and the formation of low molecular-weight products occurred in the larval gut. A respirometry test showed that up to 36.7% of the ingested Styrofoam carbon was converted into CO₂ during a 16-day test period. The PS-degrading capability of superworm was inhibited by the antibiotic suppression of gut microbiota, indicating that gut microbiota contributed to PS degradation. This new finding

extends the PS-degrading insects beyond the species within the Tenebrio genus and indicates that the gut microbiota of superworm would be a novel bioresource for pursuit of plastic-degrading enzymes.

Yang, Y. C., et al. (2011). "Selective and absolute quantification of endogenous hypochlorous acid with quantum-dot conjugated microbeads." Analytical Chemistry **83**(21): 8267-8272.

Endogenous hypochlorous acid (HOCl) secreted by leukocytes plays a critical role in both the immune defense of mammalians and the pathogenesis of various diseases intimately related to inflammation. We report the first selective and absolute quantification of endogenous HOCl produced by leukocytes in vitro and in vivo with a novel quantum dot-based sensor. An activated human neutrophil secreted 6.5 +/- 0.9 x 10(8) HOCl molecules into its phagosome, and kinetic measurement for the secretions showed that the extracellular generation of HOCl was temporally retarded, but the quantity eventually attained a level comparable with its intraphagosomal counterpart with a delay of about 1.5 h. The quantity of HOCl secreted from the hepatic leukocytes of rats with or without stimulation of lipopolysaccharide was also determined. These results indicate a possibility to extend our approach to not only clinical settings for quantitative assessment of the bactericidal capability of isolated leukocytes of patients but also fundamental biomedical research that requires critical evaluation of the inflammatory response of animals.

Yang, Y. F., et al. (2019). "Toxicity-based toxicokinetic/toxicodynamic assessment for bioaccumulation of polystyrene microplastics in mice." Journal of Hazardous Materials **366**: 703-713.

While a large body of literature has shown that microplastics (MPs) are highly likely to be accumulated in marine organisms and terrestrial animals, information about toxicity of MPs in mammal from a mechanistic point of view is more limited. Our paper fills this knowledge gap by assessing polystyrene (PS)-MPs-mice system based on toxicity-based toxicokinetic/toxicodynamic (TBTK/TD) modeling to quantify organ-bioaccumulation and biomarker responses appraised with published dataset. The key TBTK-parameters for mice liver, kidney, and gut posed by 5 or 20 mum PS-MPs could be obtained. We found that gut had the highest bioaccumulation factor (BCF) of ~8 exposed to 5 mum PS-MPs with a mean residence time of ~17 days. We showed that threshold concentrations of 5 and 20 mum PS-MPs among the most sensitive biomarkers were 8 +/- 5 (mean +/- SE) and 0.71 +/- 0.14 mug g⁻¹ bw, respectively, implicating that particle size was likely to affect TK/TD behavior in mice. The mice-based TK parameters and threshold criteria greatly assist in designing robust researches to evaluate MP consumption by humans. We establish a TBTK/TD framework for mechanistically assessing potential from mice size-specific MPs exposure that would offer a tool-kit for extrapolating to humans from health risk assessment perspective.

Yang, Z., et al. (2014). "Photonic crystal-encoded suspension array and its application in screening malignant tumors. [Chinese]." Chinese Journal of Clinical Oncology **41**(1): 42-45.

Multiple tumor makers are needed to improve the diagnostic rate of the simultaneously detection of malignant tumors through screening. Therefore, multiplex detection technology is urgently required to improve the screening efficiency. Suspension arrays are multiplex detection method based on gene microarrays. It consists of encoded microbeads, probes, targets, and report molecules are applied to analyze targets quantitatively. The microbead encoding strategy is a hotspot in suspension array research. The photonic crystal encoding mentioned in this review is a type of optical encoding that is very stable and easily decoded. Photonic suspension arrays have broad prospects in the screening and diagnosis of malignant tumors through long-term studies. This review summarizes the basic principle, classification, and characteristics of photonic suspension arrays and their application in the screening of malignant tumors.

Yang, Z. X., et al. (2013). "Handy, rapid and multiplex detection of tumor markers based on encoded silica-hydrogel hybrid beads array chip." Biosensors & Bioelectronics **48**: 153-157.

Malignant tumor has become the leading cause of death worldwide; however, multiplex detection technology could provide great assistance in large-scale population screening of diseases which could effectively reduce the mortality of malignant tumors. Here a microbeads array chip, which could be a perfect alternative method for the early screening, was developed. Silica-hydrogel hybrid bead (SHHB) with photonic encoding, which consists of both silica and hydrogel materials, was manufactured as the carrier of microbeads array for the first time. The SHHB has the advantages of the beads made of silica or hydrogel, but does not have their limitations. Reaction conditions of SHHBs array were optimized and then the fluorescent concentration curves of two widely-used tumor markers, human alpha fetoprotein and carcinoembryonic antigen, were constructed. The accuracy of SHHBs array has been proven according to the comparison between the results obtained by detecting 50 clinical samples with SHHBs array and chemiluminescence immunoassay. A cassette like chip device has also been developed to standardize operational processes and benefit automization in the next work. Hence it is concluded that SHHBs array chip is a handy, rapid and multiplex immunoassay technology, which could imply its practical application in clinical immunoassay in the near future.

Yao, L., et al. (2019). "Freshwater microplastics pollution: Detecting and visualizing emerging trends based on Citespace II." Chemosphere **245**: 125627.

Microplastic particles with less than 5 mm in diameter has been detected in human feces and freshwater systems. Microplastics could cause serious physical and chemical harm to humans and organisms. Some previous studies on microplastics mainly concentrate on the marine environment, but few have focused on freshwater microplastics. Therefore, Citespace II is used to systematically analyze the related literature in order to comprehensively understand the research state of freshwater microplastics. The results show that there is still a large gap between research on freshwater and marine microplastics. Studies on freshwater microplastics have mainly been undertaken in developed countries such as the United States and Germany, while fewer studies have been conducted in the developing countries which face the most serious plastic pollution. Most studies focus on the rivers and lakes, but other freshwater sources with microplastic pollution, such as groundwater and reservoirs, have received less attention. This study also explored the possible opportunities and challenges that may be faced in freshwater research in order to introduce specific policies and measures to mitigate this emerging pollutant.

Yao, L. S., et al. (2007). "Culture of neural stem cells in alginate microbeads. [Chinese]." Chinese Journal of Biomedical Engineering **26**(1): 126-133.

Neural Stem Cells (NSCs) with the capacity of self-renewal and differentiation into neurons and glial cells have obtained more and more worldwide attention. The finding, research and application of NSCs will play an important role in the nerve disease treatment and nerve injury repair. The shortage of the source and the amount of NSCs, however, is the main obstacle for its clinic application. Large-scale three-dimensional culture of NSCs in vitro provides a feasible answer for this problem. But the shear stress in bioreactors would cause serious cell damage especially for the shear sensitive cells like NSCs. To avoid the shear stress, encapsulation of NSCs

and then cultivation in bioreactors is thus worth of investigating. Therefore, we explored the method of culturing NSCs in Calcium-Alginate Microbeads (Ca-Alg MBs). To provide the optimum growth conditions for NSCs in Ca-Alg MBs, the gelation parameters, such as diameter, reactant concentration, and gelation time were determined firstly to form the proper bead structure for cell growth. The diffusion experiment was performed to get the diffusion data for different Ca-Alg MBs and a diffusive mathematical model was set up to find the diffusion coefficient (D) of glucose in Ca-Alg MBs by fitting the experimental data. Base on the orthogonal test, the optimum gelation conditions for preparing microbeads with a proper diffusivity were determined. And the gelation parameters were 2mm in bead diameter, 1.5% sodium alginate, 3.5%CaCl<inf>2</inf>, and the gelation time of 10 min. The culture of encapsulated NSCs with different cell density was then conducted. The results showed that the culture effect with the encapsulation density of 0.08 x 10⁶ cells . mL⁻¹ was the best among the testing samples. The recovered NSCs were stained by immunofluorescence and the majority of the expanded NSCs in Ca-Alg MBs were nestin-positive. The experimental results demonstrated that mouse hippocampus-derived NSCs could survive and be expanded in Calcium-alginate Microbeads.

Yao, M., et al. (2017). "Microencapsulation of Lactobacillus salivarious Li01 for enhanced storage viability and targeted microbiome delivery." FASEB Journal. Conference: Experimental Biology **31**(1 Supplement 1).

Probiotics, used in food products, dietary supplements and pharmaceutical products have been considered to provide health-promoting effects in humans. In order to be efficacious, probiotics need to be viable at sufficient abundance in the intestine. However, many functional foods containing probiotics suffer from a large loss of bacterial viability during shelf storage and gastrointestinal transit after ingestion. In this study, probiotic Lactobacillus salivarious Li01 was incorporated into alginate or alginate-gelatin microbeads. Their morphology was characterized by SEM. Probiotic viability was determined under aerobic conditions, heat treatment and simulated gastrointestinal conditions. The results showed that microbeads were roughly round and almost all the bacterial cells were encapsulated in the microbeads. Encapsulation significantly enhanced the viability of the probiotic during aerobic storage. Moreover, the microbeads maintained their structures during simulated gastric digestion before they dissolved during simulated digestion in the small intestine. Most importantly, the alginate-gelatin microbeads protected encapsulated bacteria during simulated gastrointestinal digestion and effectively enhanced their survival rate in comparison with alginate microbeads and non-encapsulated bacteria. In conclusion, the alginate-gelatin microbeads showed a great potential to facilitate the delivery of probiotics such as lactobacillus salivarious Li01 in various products.

Yasmin, M., et al. (2014). "Multi-drug resistant Mycobacterium tuberculosis complex genetic diversity and clues on recent transmission in Punjab, Pakistan." Infection, Genetics & Evolution **27**: 6-14.

Multi-Drug Resistant Tuberculosis (MDR-TB), i.e. bacilli resistant to rifampicin (RIF) and isoniazid (INH), is a major Public Health concern in Pakistan according to WHO estimates (3.5% and 32% of new and retreated cases, respectively). Previous Pakistanis reports identified a correlation between being MDR and belonging to Beijing or EAI lineages in one study, and belonging to "H4"-Ural Euro-American sublineage in another study. In addition, MDR-TB transmission was suspected in Karachi. We tested MDR characteristics on a Punjab sample of 278 clinical isolates (without selection for Multi-Drug Resistance) including new and retreated cases collected from 2008 to 2012. All samples were characterized by a new, microbead-based method named

"TB-SPRINT" (molecular diagnostic including spoligotype identification, and genetic resistance determinants to first-line anti-TB drugs RIF and INH). Isolates from 2011 to 2012 (n=100) were further analyzed using 24-loci MIRU-VNTR. We detected 8.7% MDR isolates (CI95%=[5.0; 12.5]), mainly among CAS lineage that predominates in this central-East region of Pakistan. Out of 20 MDR-TB cases, 12 different TB-SPRINT profiles were identified, limiting the suspicion of MDR-TB transmission. 24 MIRU-VNTR confirmed the unrelatedness of isolates with different TB-SPRINT profiles and discriminated 3 isolates with identical TB-SPRINT profiles. In conclusion, our study did not confirm any of the correlations between Multi-Drug Resistance and lineage or sublineage in Punjab, Pakistan. MDR-TB isolates were diverse indicating that transmission is not pervasive. TB-SPRINT proved useful as a first step for detecting MDR-TB likely transmission events, before more extensive genotyping such as 15 or 24 MIRU-VNTR and thorough epidemiological investigation.

Yasuda, K., et al. (1989). "Basic research on the emission of polycyclic aromatic hydrocarbons caused by waste incineration." Journal of the Air and Waste Management Association **39**(12): 1557-1561.

The emission of polycyclic aromatic hydrocarbons (PAH) caused by municipal waste incineration varies according to waste composition and operating parameters such as furnace temperature and excess air. However, to obtain a sample sufficient to measure the emission of PAH at trace levels, it is necessary to operate the incinerator for many hours. Since during these lengthy periods it has not always been possible to maintain stable conditions, it is very difficult to determine the relationship between the emission and waste composition. In our basic research, therefore, we used municipal waste with an artificially regulated composition for our combustion experiments, and by using an experimental incinerator we examined the emission behavior of PAH with respect to changes in waste composition and combustion conditions. The following facts were revealed by the results: · The PAH found in the flue gas were predominantly the more volatile compounds. · When municipal waste was incinerated at over 850°C, the concentration of PAH in the flue gas increased rapidly as the proportion of plastics in the waste increased from 0 to 24 percent. · The elimination of plastics from municipal waste by separate collection and the improvement of combustion conditions can effectively diminish the emission of PAH. The emission of polycyclic aromatic hydrocarbons (PAH) caused by municipal waste incineration varies according to waste composition and operating parameters such as furnace temperature and excess air. In our basic research, therefore, we used municipal waste with an artificially regulated composition for our combustion experiments, and by using an experimental incinerator we examined the emission behavior of PAH with respect to changes in waste composition and combustion conditions. The PAH found in the flue gas were predominantly the more volatile compounds. When municipal waste was incinerated at over 850°C, the concentration of PAH in the flue gas increased rapidly as the proportion of plastics in the waste increased from 0 to 24 percent. The elimination of plastics from municipal waste by separate collection and the improvement of combustion conditions can effectively diminish the emission of PAH.

Yasuda, S., et al. (2017). "Twisting microfluidics in a planetary centrifuge." Soft Matter **13**(11): 2141-2147.

This paper reports a twisting microfluidic method utilising a centrifuge-based fluid extruding system in a planetary centrifuge which simultaneously generates an orbital rotation and an axial spin. In this method, fluid extrusion from a micro-scale capillary to an 'open-space' solution or air enables release of the fluid from the capillary-based microchannel, which physically means that there is a release of fluids from a confined low-Reynolds-number environment to an open

non-low-Reynolds-number environment. As a result, the extruded fluids are separated from the axial spin of the capillary, and the difference in the angular rates of the axial spin between the capillary and the extruded fluids produces the 'twisting' of the fluid. In this study, we achieve control of the twist of highly viscous fluids, and we construct a simple physical model for the fluid twist. In addition, we demonstrate the formation of twisted hydrogel microstructures (stripe-patterned microbeads and multi-helical microfibres) with control over the stripe pattern and the helical pitch length. We believe that this method will enable the generation of more sophisticated microstructures which cannot easily be formed by usual channel-based microfluidic devices. This method can also provide advanced control of microfluids, as in the case of rapid mixing of highly viscous fluids. This method can contribute to a wide range of applications in materials science, biophysics, biomedical science, and microengineering in the future.

Yazdani Foshtomi, M., et al. (2019). "Composition and abundance of microplastics in surface sediments and their interaction with sedimentary heavy metals, PAHs and TPH (total petroleum hydrocarbons)." Marine Pollution Bulletin **149 (no pagination)**(110655).

The composition and abundance of microplastics (MPs) and concentrations of heavy metals, PAHs and TPH in surface sediments as well as their relationship with the number of MPs in three contrasting sediment types were investigated in Bandar Abbas, Iran. Total number of MPs ranged from 3542 to 33561 items per m² in different stations. The collected MPs displayed a variety of shapes and colors. White filaments were the most dominant MP item in the Khor-e-Yekshabeh and Suru stations while blue fragments were dominant items in the Gorsozan. Concentrations of heavy metals, PAHs and TPH also varied among stations. There were significant correlations between the total number of MPs, sediment grain size and ten measured heavy metals ($P < 0.05$). In contrast, no significant correlations were detected with PAHs (except for Benzo (a) ant) and TPH concentrations ($P > 0.05$). MPs in sediment as vectors for heavy metals and some PAHs can ingest by benthic animals, resulting in their bioaccumulation in marine food web. Copyright © 2019 Elsevier Ltd

Ye, L.-j. and N.-x. Wu (2019). "Progress on detection of microplastics and their effects on ecosystem." Huan Jing Yu Zhi Ye Yi Xue = Journal of Environmental & Occupational Medicine **36**(12): 1161.

Microplastics are a sort of plastic pieces with a size less than 5 mm and large specific surface area, and can absorb pollutants in the environment. A large number of studies have shown that microplastics are widely distributed in the environment and may have a variety of adverse health effects on organisms. The evidence for human health effects, however, is insufficient yet. Thus, this review introduced the distribution of microplastics in the environment and human diet, the extraction and detection methods of microplastics, and various ways of affecting organisms, aiming to provide a theoretical basis for developing relevant standards and studying the toxicity of microplastics.

Ye, S. and A. L. Andrady (1991). "Fouling of Floating Plastic Debris under Biscayne Bay Exposure Conditions." Marine Pollution Bulletin MPNBAZ, Vol. 22, No. 12, p 608-613, December 1991. 6 fig, 2 tab, 22 ref.

Incidence of plastic waste in the marine environment is a relatively recent phenomenon directly attributable to the industry-wide use of plastic fishing gear in commercial fishing and the continuing popularity of plastic packaging material. Six plastic/rubber materials commonly encountered in marine debris and beach litter were studied under Biscayne Bay (Florida) exposure conditions to determine the effect of fouling on buoyancy. Fouling of plastic materials

was generally preceded by the formation of a transparent slimy biofilm on the surface. Within weeks of exposure to seawater under restricted floating conditions, nearly all sample surfaces developed algal fouling communities. The foulant colonies were predominantly green algae and biofilm for the first 7 weeks of exposure, hydroid colonies during 9-11 weeks of exposure, and encrusting bryozoa and tunicates during 13-19 weeks of exposure. In spite of the variability in specific surface area, most samples were fouled sufficiently to sink in seawater by about the seventh week of exposure. Rapid defouling of the submerged fouled samples was observed. The results suggest that free-floating plastics at sea may, under certain conditions, undergo fouling-induced sinking followed by resurfacing as floating debris. (MacKeen-PTT) 35 045968000

Yee, M. S. L., et al. (2014). "Potent antifouling silver-polymer nanocomposite microspheres using ion-exchange resin as templating matrix." Colloids and Surfaces A: Physicochemical and Engineering Aspects **457**(1): 382-391.

Biofouling of marine surfaces is a significant and complex problem especially in the shipping industry. This study seeks to develop a silver-polymer nanocomposite (Ag-PNC) system by synthesizing highly dispersed silver nanoparticles with narrow size distributions using Dowex protonated copolymer ion exchange resins as a templating matrix. Ag ions were introduced into the copolymer microbeads through an ion exchange process with silver nitrate, followed by chemical reduction using sodium borohydride to form metallic Ag on the surface of the microbead structure. Scanning electron microscopy (SEM) imaging revealed the uniform distribution of Ag nanoparticles with diameters between 20 and 60. nm on the surface of the microbeads, while UV-visible (UV-VIS) analysis showed the characteristic surface plasmon resonance for Ag nanoparticles ranging from 406 to 422. nm. Thermal stability of the nanocomposites was enhanced with the incorporation of Ag nanoparticles, with significant degradation occurring at 460. degreeC compared to 300. degreeC for the copolymer microbead, while the glass transition temperature of the Ag-PNCs increased from 130. degreeC to 323. degreeC. Significant inhibition of biofilm formation by Halomonas pacifica, a common marine bacteria responsible for initial marine fouling process, was observed, following treatment with Ag-PNC. Biocompatibility testing with human lung fibroblast and human keratinocytes show no significant toxicity to human cells. Toxicity testing of the Ag-PNC material with non-target marine microalgae Dunaliela tertiolecta and Isochrysis sp. also displayed no significant morphological changes, with cytostatic growth inhibition. These results strongly suggest that Ag-Dowex nanocomposites possess great potential to be an alternative to other antifouling agents due to their affordable, accessible and high yield production method. © 2014 Elsevier B.V.

Yellanki, S. K. and N. K. Nerella (2010). "Stomach-specific drug delivery of riboflavin using floating alginate beads." International Journal of Pharmacy and Pharmaceutical Sciences **2**(SUPPL. 2): 160-163.

A multiple-unit-type oral floating dosage form (FDF) of Riboflavin was developed to prolong gastric residence time, and increase drug bioavailability. The floating bead formulations were prepared by dispersing Riboflavin together with calcium carbonate into a mixture of sodium alginate and hydroxypropyl methylcellulose solution and then dripping the dispersion into an acidified solution of 1% (w/v) calcium chloride. The formulations were optimized for different weight ratios of gas-forming agent and sodium alginate. Prepared microbeads were evaluated for Particle size, Scanning electron microscopy, In-Vitro buoyancy study, Drug entrapment efficiency and In-Vitro drug release. The beads containing higher amounts of calcium carbonate demonstrated instantaneous, complete, and excellent floating ability. All the formulations remained buoyant and controlled release for up to 10 hrs. The mechanism of drug release was found to follow Higuchi matrix order release. Results indicate that FDF performed significantly better than the simple tablet dosage form.

Yeo, B. G., et al. (2017). "Polycyclic Aromatic Hydrocarbons (PAHs) and Hopanes in Plastic Resin Pellets as Markers of Oil Pollution via International Pellet Watch Monitoring." Archives of Environmental Contamination and Toxicology **73**(2): 196-206.

Oil pollution in the marine environment is an unavoidable problem due to chronic input from local sources, particularly in urban areas and oil spills. Oil pollution not only causes immediate physical damages to surrounding wildlife but also some components, including higher molecular weight PAHs, can persist in the environment for many years and pose insidious threats to the ecosystem. Long-term and nontargeted monitoring of oil pollution is important. This paper examines the ability of International Pellet Watch (IPW) for initial identification and monitoring of oil pollution by analysing PAHs and hopanes in plastic pellet samples collected globally by volunteers. PAH concentrations with the sum of 28 parent and methyl PAHs vary geographically, ranging from 0.035 to 24.4 micro g/g-pellet, in line with the presence or absence of local oil pollution sources, such as oil refineries or oil spill sites. This suggests that PAHs can be used to monitor petroleum pollution in IPW. A colour-coded categorization for PAH concentrations within IPW monitoring also is established to facilitate data presentation and understanding. PAH concentrations are generally higher in Western Europe, especially around the North Sea shorelines, moderate in East Asia and North America, and lower in South East Asia, Oceania, South America, and Africa. Hopane concentrations, with a smaller spatial variation (1.7-101 micro g/g-pellet), showed no spatial pattern. This result and the poor correlation between hopanes and PAHs suggest that hopane concentrations alone are unsuited to identify petroleum pollution. However, hopane compositions can be used for fingerprinting sources of oil pollution. Thus, both PAHs and hopanes in IPW allow for low cost, remote monitoring of global oil pollution. Copyright © 2017, Springer Science+Business Media, LLC.

Yeo, B. G., et al. (2015). "POPs monitoring in Australia and New Zealand using plastic resin pellets, and International Pellet Watch as a tool for education and raising public awareness on plastic debris and POPs." Marine Pollution Bulletin **101**(1): 137-145.

Persistent organic pollutants (i.e. PCBs, DDTs, and HCHs) were analyzed along Australia and New Zealand North Island coastlines. PCB concentrations were high in urban areas (107-294 ng/g-pellet), with Sydney Harbour the most polluted. Hepta-chlorinated PCB was abundant, with ~. 30% in urban areas suggesting legacy pollution. DDT concentrations showed similar pattern except in rural agricultural sites, Taupo Bay and Ahipara, New Zealand (23 and 47 ng/g-pellet). p,p'-DDE predominance at these 2 sites suggested historical input; they also had high HCH concentrations (17 and 29 ng/g-pellet). The role of International Pellet Watch (IPW) in science communication was studied through feedbacks from IPW volunteers, case studies and examples. IPW data were categorized into understandable terms and tailored reports based on volunteers' backgrounds complemented with pollution maps. The effectiveness of IPW science communication has led to its use in awareness and education activities focusing on both POPs and plastic debris issues. Copyright © 2015 Elsevier Ltd.

Yeo, B. G., et al. (2019). "PCBs and PBDEs in microplastic particles and zooplankton in open water in the Pacific Ocean and around the coast of Japan." Marine Pollution Bulletin **(no pagination)**(110806).

PCBs and PBDEs in microplastics and zooplankton collected in surface water at 27 locations in the Pacific Ocean and around the coast of Japan were investigated. Both PCBs and PBDEs were observed in buoyant microplastics, even in smaller particles of 0.315-1 mm. Concentrations of

SIGMA13 PCBs were 0.04-124 ng/g, and were higher in urban bay areas such as Tokyo Bay. Sporadic moderate to high concentrations of PBDEs were observed in both urban-offshore and rural-offshore locations, consisting mostly of higher-brominated congeners. From the latter, BDE 209 ranged from not detected to 2158 ng/g. The microplastic-to-zooplankton abundance ratio threshold was 0.6 for PCBs and 0.08 for PBDEs, above which exposure would be greater from microplastics than from zooplankton. Copyright © 2019 Elsevier Ltd

Yi, X., et al. (2019). "Combined effect of polystyrene plastics and triphenyltin chloride on the green algae Chlorella pyrenoidosa." Environmental Science & Pollution Research **26**(15): 15011-15018.

The combined effect of polystyrene (PS) particles and triphenyltin chloride (TPTCl) to the green algae Chlorella pyrenoidosa was studied. The 96 h IC₅₀ of TPTCl to the green algae C. pyrenoidosa was 30.64 mug/L. The toxicity of PS particles to C. pyrenoidosa was size-dependent, with the 96 h IC₅₀ at 9.10 mg/L for 0.55 mum PS but no toxicity observed for 5.0 mum PS. The exposure to 0.55 mum PS led to damage on structure of algal cells, which could in turn cause inhibition on photosynthesis and population growth of the green algae. TPTCl concentrations in test medium were lowered by 15-19% at presence of 0.55 mum PS particles, indicating a reduced bioavailability of TPTCl. In spite of this reduced bioavailability, the presence of PS increased the toxicity of TPTCl, which might be attributed to facilitated uptake of TPTCl by the green algae after the damage of cell structure. The overall results of the present study provided important information on the effect of PS on the bioavailability and toxicity of TPTCl to phytoplankton species.

Yi, X., et al. (2019). "The effect of polystyrene plastics on the toxicity of triphenyltin to the marine diatom <i>Skeletonema costatum</i>—influence of plastic particle size." Environmental science and pollution research international **26**(25): 25445-25451.

The effect of polystyrene (PS) particles on the toxicity of triphenyltin (TPT) to the marine diatom Skeletonema costatum was investigated. The 0.1-μm PS particles attached to the cell walls of S. costatum but did not cause adverse effects on the growth of the diatom. The adsorption of TPT to PS particles was negligible in seawater systems, but the presence of 0.1-μm PS significantly reduced the bioavailable concentrations of TPT in f/2-Si medium, indicating a potential three-way interaction between TPT, PS particles, and components of f/2-Si medium. The adsorption of TPT to PS of smaller size (i.e., 0.1 μm) was stronger than that of PS of larger size (i.e., 5 μm), which was probably attributed to larger surface areas of smaller PS particles. The presence of PS could reduce the toxicity of TPT. IC50 values of TPT increased from 0.56 to 0.85 and 0.71 μg/L at the presence of 20 mg/L 0.1-μm PS and 5-μm PS, respectively. The overall results of this study profiled the combined toxic effects of PS and TPT on marine phytoplankton species and highlighted the difference in adsorption of organic pollutants by microplastics in different ambient mediums.

Yifeng, L., et al. (2016). "Uptake and Accumulation of Polystyrene Microplastics in Zebrafish (Danio rerio) and Toxic Effects in Liver." Environmental Science & Technology **50**(7): 4054-4060.

Microplastics have become emerging contaminants, causing widespread concern about their potential toxic effects. In this study, the uptake and tissue accumulation of polystyrene microplastics (PS-MPs) in zebrafish were detected, and the toxic effects in liver were investigated. The results showed that after 7 days of exposure, 5 μm diameter MPs accumulated in fish gills, liver, and gut, while 20 μm diameter MPs accumulated only in fish gills and gut. Histopathological analysis showed that both 5 μm and 70 nm PS-MPs caused inflammation and lipid accumulation in fish liver. PS-MPs also induced significantly increased activities of

superoxide dismutase and catalase, indicating that oxidative stress was induced after treatment with MPs. In addition, metabolomic analysis suggested that exposure to MPs induced alterations of metabolic profiles in fish liver and disturbed the lipid and energy metabolism. These findings provide new insights into the toxic effects of MPs on fish. [ABSTRACT FROM AUTHOR]

Yilmaz, F., et al. (2013). "Bioinspired surface modification of poly(2-hydroxyethyl methacrylate) based microbeads via oxidative polymerization of dopamine." Colloids & Surfaces B: Biointerfaces **109**: 176-182.

Surface modification of support materials is crucial for improving their selectivities and biocompatibilities in bioaffinity applications. However, conventional modification techniques including chemical or physical conjugations mostly suffer from limitations of their multistep and complicated procedures, surface denaturations, batch-to-batch inconsistencies, and insufficient surface conjugations. In this study, we demonstrate a simple yet effective bioinspired approach for the surface modification of poly(2-hydroxyethyl methacrylate) [PHEMA] based bioaffinity adsorbents through oxidative polymerization of dopamine. The magnetic (mPHEMA) and non-magnetic (PHEMA) polymeric microbeads were fabricated by suspension polymerization technique. Surface modification of obtained microbeads was then carried out by using dopamine molecules under alkaline conditions. The polydopamine (PDOPA) coated microbeads were further employed as a bioaffinity absorbent targeted for immunoglobulin G (IgG) molecules. The effects of pH, temperature, protein concentration and ionic strength on the IgG adsorption process have been investigated. We found that PDOPA coated microbeads display dramatically higher IgG adsorption capacities when compared with their un-modified forms. Adsorption capacities also increased with increasing temperature. Monolayer Langmuir adsorption model can be thought more applicable for these adsorbent systems.

Yilmaz, V., et al. (2012). "Cytokine levels in peripheral cell culture without B cell in myasthenia gravis patients." Journal of Neuroimmunology **253 (1-2)**: 167.

Objective: In acquired myasthenia gravis (MG), the differential antibody production in disease subgroups is regulated by T cells and by related cytokine activity. In this study, T cell activity mediated by cy-tokine secretion is compared in patients with autoantibodies (Abs) to acetylcholine receptor (AP), to muscle-specific kinase (MP) and without detectable antibodies (SN) in an in vitro cell culture with specific and non-specific T cell stimulation. Method(s): The study group of 59 MG patients (18 AP, 19 MP and 22 SN) with generalized disease (W/M: 42/17) were included. Fifty-six % of the patients were on immunosuppressives. In addition, 10 healthy controls (HC) (W/M: 6/4) were evaluated. Peripheral blood mononuclear cells without B cells were stimulated with t-AChR, recombinant-MuSK or anti-CD3 antibody. IFN-gamma, IL-10, IL-2, IL-13, IL-17A and IL-21 were measured in supernatants using a microbead array system (Milliplex). Results were compared with non-parametric tests. Result(s): Spontaneous IFN-gamma, IL-13 and IL-2 secretion was lower in the MG group than HC (p=0.004, 0.004 and 0.028). However, when the patients with or without treatment were compared, a suppression of only IFN-gamma was shown in steroid-treated patients (p=0.02) whereas lower IL-13 and IL-2 were not related to ongoing treatment. Spontaneous IL-10 production was not depressed in the

MG group. In all groups, in vitro antigen specific stimulation with AChR or MuSK did not alter the cytokines compared to non-stimulated cells, whereas anti-CD3 stimulation induced effective secretion of all measured cy-tokines except IL-2. When all cytokines were compared, anti-CD3 stimulated lower levels of IL-10, IL-13, IL-17A, IL-2, IL-21 in MG compared to HC (p=0.019, 0.022, 0.021, 0.002, 0.027), also in patients not-on-treatment (p=0.02, 0.05, 0.03 and 0.04). CD3 stimulation was also less effective for IFN-gamma in MG patients without treatment compared to HC (p=0.01). The differences were also evident in all subgroup comparisons. Conclusion(s): In MG, even in patients not on treatment, disease specific (AChR and MuSK) stimulations induced no cytokine secretion and non-specific (CD3) T cell stimulation induced only lower levels of cy-tokines in vitro. The decrease of cytokine induction in immunosup-pressive naive patients emphasizes the disease related changes in the immune response of MG patients on T cell cytokine activity.

Yin, L., et al. (2018). "Polystyrene microplastics alter the behavior, energy reserve and nutritional composition of marine jacopever (Sebastes schlegelii)." Journal of Hazardous Materials **360**: 97-105.

Uptake and toxicity of microplastics on marine organisms have been reported elsewhere. However, there is limited knowledge regarding the ecological effects of microplastics on marine organisms. In this study, we investigated the effects of polystyrene microplastics (1 × 106 microspheres per L) on the behavior, energy reserve and nutritional composition of juvenile jacopever (Sebastes schlegelii). Compared to the controls, fish treated by microplastics showed lower sensitivity toward the added food in the tank, and increased foraging time, indicating that microplastics significantly weakened feeding activity of the fish. Interestingly, the microplastics treated-fish obviously reduced swimming speed and range of movement, demonstrating that polystyrene microplastics could have negative effect on hunting behavior. Furthermore, polystyrene microplastics accumulated in the gills and intestine, causing significant histopathological changes in the gallbladder and liver. Moreover, the energy reserve and nutritional quality of fish were influenced by microplastics as evidenced by lower growth, protein and lipid contents. Our results highlighted the potential negative effects of microplastics on marine ecological function and food safety.

Yin, L., et al. (2019). "Microplastic Pollution in Surface Water of Urban Lakes in Changsha, China." International Journal of Environmental Research & Public Health [Electronic Resource] **16**(9): 12.

As emerging pollutants, microplastics have attracted the attention of scholars from all over the world. However, there is a lack of research on freshwater areas, even in densely populated urban areas. This study investigated eight urban lakes in Changsha, China. It was found that microplastic concentrations ranged from 2425 +/- 247.5 items/m³ to 7050 +/- 1060.66 items/m³ in the surface water of research areas and the maximum concentration was found in Yuejin Lake, a tourist spot in the center of the city. Anthropogenic factors are an important reason for microplastic abundance in urban lakes. The major shape of microplastics was linear and most of the microplastics were transparent. More than 89.5% of the microplastics had a size of less than 2 mm. Polypropylene was the dominant type in the studied waters. This study can provide a valuable reference for a better understanding of microplastic pollution in urban areas of China.

Yin, L., et al. (2019). "Impacts of polystyrene microplastics on the behavior and metabolism in a marine demersal teleost, black rockfish (Sebastes schlegelii)." Journal of Hazardous Materials **380**: 120861.

After nano- (0.5 mum) or micro- (15 mum) polystyrene (PS) microplastics exposure, the behavior, metabolism and energy reserve in marine demersal fish (Sebastes schlegelii) were

evaluated. The behavior of fish was accurately recorded by video behavior tracking technology.

Ying, D., et al. (2018). "Development and evaluation of a rapid point-of-care test for detecting the hepatitis E virus antigen." Clinical Biochemistry **55**: 89-92.

BACKGROUND: Hepatitis E virus (HEV)-caused acute viral hepatitis is a major threat to public health worldwide. Recently, an enzyme linked immunosorbent assay (ELISA) kit detecting the HEV antigen was reported to have good concordance with the HEV RNA load and showed good clinical performance. But the ELISA kits can barely satisfy the needs of community clinics. In this study, a fluorescent microbead-based immunoassay (FMIA) for detecting the HEV antigen was developed and evaluated.

METHODS: A mouse anti-HEV monoclonal antibody (mAb) conjugated with fluorescent microbeads was used as capturing antibody and another mouse mAb was used as detection antibody. Overall, 150 serum samples were collected from HEV-infected patients (n=50) and non-HEV cases (n=100) to evaluate the performance of the FMIA.

RESULTS: The FMIA results showed a strong linear correlation with the viral RNA load. The diagnostic sensitivity and specificity of the HEV antigen FMIA were 92.0% (46/50) and 100.0% (100/100), respectively, and the test was consistent (kappa=0.937, p=0.627) with the commercial HEV antigen ELISA. The FMIA also showed good consistency with the PCR results (kappa=0.939, p=0.134).

CONCLUSIONS: As a rapid point-of-care (POC) test, a FMIA that is developed with acceptable performance is suitable for acute hepatitis E diagnosis, especially in developing countries and regions, because of its reduced time and simplified operation.

Yodkaew, R., et al. (2007). "Sound absorption of an interior ceiling material from chaff." Proceedings of the 44th Kasetsart University Annual Conference, Kasetsart.

Chaff is an abundant agricultural waste. Unique to chaff is its low moisture content, porous texture in nanoscale and light weight. These characteristics are suitable for local and national material industry. The objectives of this research were to develop chaff intergrated panels for sound absorption. Several chaff panels were made into 50 cm x 50 cm boards with 1 cm thick. The panels were made by mixing chaffs with plastic resin glue, latex glue and natural rubber. The panels were then tested for sound absorption. A comparison with ceiling boards and sound absorption materials in the market, i.e, gymsum board, acoustic board and fibreglass insulator board, was made. Results show that the ceiling board made from chaff with the mixing ratio of 5:1 (chaff:plastic resin glue) is able to absorb sound better than gymsum board and is able to absorb sound nearly as effectively as the fibreglass insulator board.

Yonkos, L. T., et al. (2014). "Microplastics in four estuarine rivers in the Chesapeake Bay, U.S.A." Environmental Science & Technology **48**(24): 14195-14202.

Once believed to degrade into simple compounds, increasing evidence suggests plastics entering the environment are mechanically, photochemically, and/or biologically degraded to the extent that they become imperceptible to the naked eye yet are not significantly reduced in total mass. Thus, more and smaller plastics particles, termed microplastics, reside in the environment and are now a contaminant category of concern. The current study tested the hypotheses that microplastics concentration would be higher in proximity to urban sources, and vary temporally in response to weather phenomena such as storm events. Triplicate surface water samples were collected approximately monthly between July and December 2011 from four estuarine tributaries within the Chesapeake Bay, U.S.A. using a manta net to capture appropriately sized microplastics (operationally defined as 0.3-5.0 mm). Selected sites have watersheds with broadly divergent land use characteristics (e.g., proportion urban/suburban, agricultural and/or forested) and wide ranging population densities. Microplastics were found in all but one of 60 samples, with concentrations ranging over 3 orders of magnitude (<1.0 to >560 g/km(2)). Concentrations demonstrated statistically significant positive correlations with population density and proportion of urban/suburban development within watersheds. The greatest microplastics concentrations also occurred at three of four sites shortly after major rain events.

Yoo, H. J., et al. (2018). "Short-Length DNA Adsorption on Graphene Oxide-Coated Microbeads for DNA Target Separation from Clinical Samples." Journal of Nanoscience & Nanotechnology **18**(9): 6364-6368.
Nucleic acid preparation (concentration and purification of various nucleic acid targets) from biological samples is essential for personalized and precision medicine. The adsorption of short-length DNA on graphene oxide (GO) layers was investigated and compared with that on silica surfaces. GO was efficiently coated on glass beads to be used more easily and spatially. Surface of the GO bead was confirmed by field-emission scanning electron microscopy. GO-coated beads were packed and the adsorption conditions of short-length DNA were optimized under various pH and flow rate conditions. The amount of adsorbed DNA was confirmed by real-time polymerase chain reaction and visualized using fluorescence microscopy.

Yoo, J. H., et al. (2014). "Microfluidic based biosensing for Escherichia coli detection by embedding antimicrobial peptide-labeled beads." Sensors and Actuators B: Chemical **191**: 211-218.
Due to their ability of effective binding to multiple target microbes, the antimicrobial peptides (AMPs) have recently received lots of attention as an alternative to antibodies for detecting bacteria. We developed a new biosensing method to detect Escherichia coli (E. coli) by implementing a microfluidic chip designed with a weir inside the channel, in which AMP-labeled microbeads were embedded. We characterized the detection rate of the stained E. coli within a certain period of time to examine the detection effectiveness of our device. As the flow rate of the bacterial suspension increases, the detection time to reach the saturation level decreases to less than 30min, suggesting rapid detection, while the detection efficiency is maintained at a similar level. Except with very low concentrations of E. coli (<103 cells/mL), both the detection time and the efficiency do not depend on the E. coli concentration. Our method has the potential to be developed as a novel biosensing platform for rapid and accurate detection of pathogens.

Yoo, J. H., et al. (2012). "The detection of p53 gene via fluorescence quenching of quantum dot in microfluidic chip." Journal of Nanoscience & Nanotechnology **12**(5): 4109-4114.
Recently, quantum dot (QD) has been used widely in the field of bio assay including cell imaging, biomarker, and fluorescence resonance energy transfer (FRET) sensor. The DNA assay without labeling process has several advantages including low cost, short time, and simplicity. Microbeads of agarose, glass, and polystyrene have been used as a solid support in microfluidic devices to trace molecules. The main advantages of microfluidics include high throughput, short analysis time, small sample volume, and high sensitivity. PDMS based microfluidic chips were prepared for the detection of p53 gene by using QD-DNA conjugate. The microfluidic chip has a weir in the channel to trap microbeads to which QD-DNA probes bind. Carboxylated CdSe/ZnS QDs (wavelength of emission: 605 nm) could bind to microbeads of polystyrene/divinyl benzene via EDC/NHS crosslinking reaction. The target gene and DNA intercalating dye (TOTO-3) were loaded into the micro-channel. Fluorescence quenching from QDs by intercalating dye was observed after hybridization of DNA at the weir in the channel of microfluidic chip. The fluorescence quenching from QDs by TOTO-3 was dependent on the concentration of target

gene. This experiment shows the possibility of rapid detection of DNA via bead-QD complex on microfluidic chip.

Yoo, J. J., et al. (2014). "Electrochemical detection of insulating beads at subattomolar concentration via magnetic enrichment in a microfluidic device." Analytical Chemistry **86**(9): 4302-4307.

We report electrochemical detection of collisions between individual magnetic microbeads, present at subattomolar concentrations, and electrode surfaces. This limit of detection is 4 orders of magnitude lower than has been reported previously, and it is enabled by using a magnetic field to preconcentrate the microbeads prior to detection in a microfluidic electrochemical cell. Importantly, the frequency of collisions between the microbeads and the electrode is not compromised by the low concentration of microbeads. These findings represent an unusual case of detecting individual electrochemical events at very low analyte concentration. In addition to experiments supporting these claims, finite-element simulations provide additional insights into the nature of the interactions between flowing microbeads and their influence on electrochemical processes.

Yoon, J., et al. (2016). "Fabrication of type I collagen microcarrier using a microfluidic 3D T-junction device and its application for the quantitative analysis of cell-ECM interactions." Biofabrication **8**(3): 035014.

We presented a new quantitative analysis for cell and extracellular matrix (ECM) interactions, using cell-coated ECM hydrogel microbeads (hydrobeads) made of type I collagen. The hydrobeads can carry cells as three-dimensional spheroidal forms with an ECM inside, facilitating a direct interaction between the cells and ECM. The cells on hydrobeads do not have a hypoxic core, which opens the possibility for using as a cell microcarrier for bottom-up tissue reconstitution. This technique can utilize various types of cells, even MDA-MB-231 cells, which have weak cell-cell interactions and do not form spheroids in conventional spheroid culture methods. Morphological indices of the cell-coated hydrobead visually present cell-ECM interactions in a quantitative manner.

Yordanova, D., et al. (2013). "Plastic waste: definition, types, properties and alternatives for utilisation and disposal." Journal of Balkan Ecology **16**(4): 341-346.

The growing consumption of plastic goods inevitably leads to an increase of the amounts of generated plastic waste. The only possible solution for dealing with this problem is utilisation of plastic waste for material or energy recovery, which is in compliance with the main principles of sustainable development. This paper deals with the diverse properties of various types of plastic (polyethylene terephthalate (PET), high density polyethylene (HDPE), low density polyethylene (LDPE), polyvinylchloride (PVC), polypropylene (PP), polystyrene (PS), polyurethane (PUR), expanded polyurethane, epoxy resins, phenolates), the use of hazardous substances in the production of plastics (new persistent organic pollutants (POPs), such as tetrabromodiphenyl ether, pentabromodiphenyl ether, hexabromodiphenyl ether and heptabromodiphenyl ether) and difficulties related to the organization of separate collection of waste from all sectors which complicate the selection of a process for plastic waste recovery.

Yoshida, K. (2017). "Development of Functional Thin Polymer Films Using a Layer-by-Layer Deposition Technique." Yakugaku Zasshi - Journal of the Pharmaceutical Society of Japan **137**(10): 1215-1221.

Functional thin films containing insulin were prepared using layer-by-layer (LbL) deposition of insulin and negatively- or positively-charged polymers on the surface of solid substrates. LbL films composed of insulin and negatively-charged polymers such as poly(acrylic acid) (PAA),

poly(vinylsulfate) (PVS), and dextran sulfate (DS) were prepared through electrostatic affinity between the materials. The insulin/PAA, insulin/PVS, and insulin/DS films were stable in acidic solutions, whereas they decomposed under physiological conditions as a result of a change in the net electric charge of insulin from positive to negative. Interestingly, the insulin-containing LbL films were stable even in the presence of a digestive-enzyme (pepcin) at pH 1.4 (stomach pH). In contrast, LbL films consisting of insulin and positively-charged polymers such as poly(allylamine hydrochloride) (PAH) decomposed in acidic solutions due to the positive charges of insulin generated in acidic media. The insulin-containing LbL films can be prepared not only on the surface of flat substrates, such as quartz slides, but also on the surface of microparticles, such as poly(lactic acid) (PLA) microbeads. Thus, insulin-containing LbL film-coated PLA microbeads can be handled as a powder. In addition, insulin-containing microcapsules were prepared by coating LbL films on the surface of insulin-doped calcium carbonate (CaCO₃) microparticles, followed by dissolution of the CaCO₃ core. The release of insulin from the microcapsules was accelerated at pH 7.4, whereas it was suppressed in acidic solutions. These results suggest the potential use of insulin-containing microcapsules in the development of oral formulations of insulin.

Yoshimoto, K., et al. (2018). "Possible involvement of BAFF and matrixmetalloproteinase-9 in the activation of monocytes of patients with primary sjogren's syndrome." Annals of the Rheumatic Diseases **77 (Supplement 2)**: 882.

Background: B cell activating factor belonging to TNF family (BAFF) is well known as a factor which regulates proliferation, differentiation and survival of B cells, and plays a pivotal role in the pathogenesis of primary Sjogren's syndrome (pSS). In our previous study, we found that BAFF significantly enhanced IL-6 production by pSS monocytes and the amount of IL-6 produced by BAFF-stimulated monocytes was positively and significantly correlated with the expression level of a BAFF receptor (BR3). These data collectively suggest that the BAFF signalling through BR3 is involved in activation of monocytes to promote production of inflammatory cytokines, such as IL-6. Matrix metalloproteinase-9 (MMP-9) is well known as one of the enzymes involved in degradation of extracellular matrix (ECM) and mainly produced by activated T cells and monocytes. It has been reported that the concentration of MMP-9 in saliva was significantly higher in pSS patients as compared to healthy controls (HC). Therefore, it is conceivable that MMP-9 is involved in the pathogenesis of pSS through degradation of ECM of salivary glands, which consequently results in decrease in saliva, one of the clinical manifestations of pSS. Objective(s): To explored the relationship between BAFF and MMP-9 in the pathogenesis of pSS. Method(s): Peripheral monocytes from pSS patients (n=37) and HC (n=19) were prepared by using CD14 +microbeads and cultured in vitro in the presence or absence of recombinant human soluble BAFF (rhsBAFF) for 96 hours. The amounts of IL-6 and MMP-9 in the culture supernatants were measured by ELISA. Signal transduction pathways were investigated by exposing rhsBAFF-stimulated pSS monocytes to several inhibitors against NF-kappaB (BAY11-7082 and BAY11- 7085) and PI3 kinase (LY294002). FACS analysis of whole blood samples was performed to investigate the expression levels of BR3 and MMP-9 in monocytes. The expression level of MMP-9 was also analysed by quantitative RT-PCR (qPCR). Serum levels of BAFF and MMP-9 were measured by an electrochemiluminescence assay. Result(s): Serum levels of BAFF and MMP-9 in pSS patients were significantly higher than those of HC, and the levels showed positive and significant correlation. FACS analysis of whole blood samples demonstrated that MMP-9 was mainly expressed in monocytes and that the expression level was significantly higher in pSS than in HC. ELISA and qPCR revealed that stimulation of pSS moncytes with rhsBAFF drastically enhanced the expression of MMP-9 as compared to normal monocytes.

Remarkably, the amount of MMP-9 produced by the cells was positively and significantly correlated with the expression level of BR3 in pSS monocytes, suggesting that BAFF-signalling is involved in the production of MMP- 9 by the cells. Moreover, the elevated production of MMP-9 was significantly suppressed by specific inhibitors against NF-kappaB and PI3 kinase in a dose dependent manner. Conclusion(s): The present study suggests that BAFF stimulates monocytes through BR3 to promote MMP9 production and may contribute to ECM degradation. Our study also suggests that NF-kappaB and PI3 kinase are involved in the pathway.

Yoshizawa, A., et al. (2010). "The impact of donor specific antibody on liver allograft survival after living donor liver transplantation." Transplantation **1)**: 376.

Introduction: The relevance of a positive crossmatch test against the donor to the outcome of liver transplantation remains unclear. We have reported that survival rate of the crossmatch-positive recipients was significantly lower than that of crossmatch-negative recipients after living donor liver transplantation (LDLT); 1 year survival rates of crossmatch positive and negative recipients were 56.0% and 82.1%, respectively (p=0.014).(Ashihara et al. Transplantation 2007;83:506-9, Kaido et al. Liver Transplantation 2009;15:1420-5) Recently, donor specific antibody (DSA) can be determined and quantified by single antigen beads method. In this study, we retrospectively analyzed the relationship between pre-transplant quantity of DSA and clinical outcomes in crossmatch-positive LDLT. Method(s): 870 recipients underwent LDLT between Jan 2000 and March 2008. A lymphocyte crossmatch test was preoperatively performed, using direct complement-dependent cytotoxicity. To characterize DSA, the preserved sera from recipients with positive crossmatch at transplantation were examined using micro-beads coated with single Class I HLA antigen and a Liminex analyzer. To study of contribution of antibody-mediated rejection (AMR), C4d was detected by immunohistochemical staining in paraffin-bedded specimens obtained by liver biopsy. Biopsies in which only vascular endothelium was stained were evaluated as endothelial-positive and biopsies in which both vascular endothelium and stroma were stained were evaluated as stromal-positive. Biopsies showing any stromal or endothelial staining of C4d were recorded as positive. Any C4d staining on elastic fibers within arteries and stroma was regarded as a nonspecific finding without clinical significance. (Sakashita, et al. Modern Pathology 2007; 20: 676-84) Result: The crossmatch test was positive in 25 of 870 recipients. Twenty-five crossmatch-positive recipients were 3 males and 22 females. Median age of them was 33.5 years old (range 0 - 68). Original diseases of them were as follows: 8 biliary atresia, 6 primary biliary cirrhosis, 3 viral liver cirrhosis, and other diseases. Five donors were unrelated spouses, and 20 donors were related; 8 mothers, 3 fathers, 2 sisters, 4 daughters, and 3 sons. Nine crossmatch-positive recipients died during perioperative period. The fluorescence intensity (FI) of Luminex single was divided to high FI (FI of greater than 10,000), low FI (FI of lower than 10,000), and negative. The numbers of the recipients with high FI, low FI, and negative were 11, 3, and 8, respectively, and 3 patients were not tested because of preserved blood sample shortage. Eight of 11 patients with high IF periooperatively died; 5 patients died because of sepsis after repeated steroid pulse therapy, and 3 patients also perioperatively died due to uncontrolled infection. C4d was positive in liver biopsy specimen from 5 high-IF recipients. All of 3 patients with low IF survived, but showed chronic cholangitis or steatohepatitis accompanied by positive C4d within 3 months after transplantation. On the other hand, 7 of 8 crossmatch-positive recipients with negative DSA survived. Conclusion(s): HLA Class I DSA with FI greater than 10,000 had great negative impacts on patient survival secondary to AMR in crossmatch-possitive patients. Detection of DSA added on crossmatch test is a more prominent predictor for AMR after liver transplantation.

You, Y., et al. (2013). "Neurotrophic factors impart functional protection to the retina against ocular hypertension." Clinical and Experimental Ophthalmology **1)**: 127.

Purpose: TrkB signalling plays a critical role in the maintenance of retinal integrity. TrkB dimerization and autophosphorylation lead to activation of prosurvival cell signalling pathways that can afford neuroprotection to retinal ganglion cells (RGCs). We investigated functional changes in the retinas of mice with impaired TrkB downstream signalling in response to exposure to increased intraocular pressure, and determined whether augmenting the TrkB signalling using a specific agonist 7,8- dihydroxyflavone (7,8-DHF), can prevent this functional loss in experimental glaucoma. Method(s): A unilateral chronic ocular hypertensive model was established by weekly microbead injections into the anterior chamber of adult B6.129S4-Bdnftm1Jae/J heterozygous mice with wildtype as control. 7,8-DHF was administered weekly to another set of mice with unilaterally increased IOP for 8 weeks. Electroretinogram (ERG) and scotopic threshold response (STR) measurements were performed to assess retinal function. Result(s): Exposure to increased intraocular pressure leads to a decline in the inner retinal function (STR amplitudes) in both wildtype ($p < 0.04$) and heterozygous ($p < 0.004$) mice. Heterozygous mice were however more susceptible to the decline in the inner retinal function compared to their wildtype counterparts ($p < 0.04$). Administration of 7,8-DHF prevented the loss of STR amplitudes to a greater extent in heterozygous mice ($p < 0.001$). Scotopic ERG recordings were not significantly altered in any of the cases. Conclusion(s): This study demonstrates that the TrkB signalling plays an important role in protecting retinal ganglion cell function in glaucoma and that the detrimental effects of TrkB downstream deficiency can be compensated by exogenous administration of 7,8-DHF - a TrkB agonist.

Young, B. R., et al. (1978). "The motility and chemotactic response of Phytophthora cinnamomi zoospores in 'ideal' soils." Phytophthora Newsletter **6**: 59-60.

Passage of zoospores at 2.5 cm/min through 21-cm columns of microbeads caused little loss of motility even with beads providing pore neck sizes slightly less than the overall zoospore dimension, or when passed at 50 cm/min (70 times autonomous swimming speed) through a range of bead sizes. Where pore neck size allowed unimpeded movement along helical pathways, chemotaxis to 5 mM ethanol in Pfeffer tubes was considerably greater at low flow speeds than at flow speeds of zero.

Young, L. (2019). "Highlights from the Resource Recycling Conference." Waste360: N.PAG-N.PAG.

Shailesh Gothal of the brokerage firm Gemini Corporation noted the importance of the Indian export market in the wake of National Sword, and he believes it will remain a strong growth market for recovered paper export, in part due to the difficulties in increasing domestic collection in India. Domestic mills are demanding 1 to 2 percent contamination rates, and the export markets are all trending to 0.5 percent. That said, the blended price per ton at his MRF has gone from $140 in 2010 to $30 now, while paper quality standards have risen by four times, and the facilities are experiencing higher processing costs, in part from labor challenges. [Extracted from the article]

Young, M. and N. J. Adams (2010). "Plastic debris and seabird presence in the Hauraki Gulf, New Zealand." New Zealand Journal of Marine and Freshwater Research **44**(3): 167-175.

The potential threat of plastic pollution to seabirds within the Hauraki Gulf was assessed by determining its abundance and distribution at two different spatial scales and assessing the community of resident seabirds during July to September 2008. Samples of floating plastics within the gulf were taken during 66 trawls from the surface of the water in three regions within the inner gulf and Waitamata harbour. Within each of these regions, samples were taken in and outside of visually identified natural slick lines that are surface manifestations of small-scale convergence zones. During each trawl, the identity and abundance of seabirds were assessed. Plastic debris was recorded in all three regions sampled with the greatest abundance being recorded in the harbour. Plastics and debris were also significantly more concentrated within natural slick lines. Both user and industrial plastics were identified and consisted of colours and lengths likely to be mistaken as food items for small to medium seabirds. Surface or near-surface feeding seabirds in the gulf most likely mistakenly to consume plastics were fluttering shearwaters, Cape pigeons and Buller's shearwaters. However, these birds were most abundant in the area of the gulf where abundance of plastic pollution was lowest. The Hauraki Gulf is considered significantly less polluted by plastic debris than other severely polluted areas cited in literature.

Yu, C., et al. (2009). "Dynamics of CD4⁺CD25⁺ regulatory T cells of mice infected with Schistosoma japonicum and reversal of function." Zhongguo Bingyuan Shengwuxue Zazhi / Journal of Pathogen Biology **4**(10): 754-757.

Objective: To investigate the dynamics of CD4⁺CD25⁺ regulatory T cells of mice infected with Schistosoma japonicum and ascertain factors that could reverse the inhibition of CD4⁺ CD25⁺ regulatory T cells.

Yu, F., et al. (2019). "Adsorption behavior of organic pollutants and metals on micro/nanoplastics in the aquatic environment." Science of the Total Environment **694**: 133643.

Plastic debris becomes currently a ubiquitous environmental pollutant and is susceptible to contamination by many other pollutants, including aqueous metals and organic matter. This review summarizes the effects of environmental factors on the properties and sorption behavior of microplastics, presents a further discussion on the fate of microplastics adsorption on contaminants, and critically discusses the mechanism of sorption behaviors between micro/nanoplastics and normal contaminants. Previous references indicated that the hydrophobicity and particle sizes of microplastics were the dominant influence factors for virgin plastic debris adsorption, whereas for aged microplastics, hydrogen bonding, hydrophilicity and increasing specific surface ratio affected the adsorption behavior. The effects of pH and salinity always influence the sorption conditions by changing the charge state of microplastics and contaminants and causing competing adsorption. In addition, the existence of microplastics affects biotoxicity, increases the dissolved organic matter in the environment, and influences carbon cycling. The knowledge is fundamental to the assessment of potential risks posed by microplastics to organisms from human beings to the entire environment.

Yu, G., et al. (2018). "An agricultural waste based composite to replace or reduce the use of plastics." International Journal of Environmental Science and Development **9**(7): 167-172.

BioPlastics such as PLA has a few drawbacks among them incompatible with existing recycling stream and hence classified as "unrecyclable" in many countries; not truly biodegradable in natural conditions since it requires high temperature to decompose (>58 degrees C); high impact to the environment for it's high carbon footage production process; and competing to our food production for taking the corps as it's feedstock. FPC^{TM} presented in this paper resolves all the above difficulties by using agricultural waste which contains fiber as it's main ingredient, mixed with proprietary Compatiblizer^{TM} which is converted starch without adding any man-made chemicals, so FPC^{TM} is inherently biodegradable and compostable, yet FPC^{TM} can be mixed with almost any plastics in any percentage, making it exhibits no harm to the existing recycling system, such characteristics also make FPC^{TM} to be an excellent binder to create new material from various recycled plastics including ocean plastic waste and textile waste. Products using 100% FPC^{TM} are not only biodegradable & compostable, but also a truly circular bioeconomy fashion without competing with our food source, while significantly reduce air pollution because the agricultural waste would otherwise be burned off; and in the meantime create high value since the processing of biomass is not targeted to obtained low-value calories through burning, but the replacement of petro-chemical products without causing long-term burden to our land and ocean.

Yu, H. W., et al. (2012). "Multiplex competitive microbead-based flow cytometric immunoassay using quantum dot fluorescent labels." Analytica Chimica Acta **750**: 191-198.

In answer to the ever-increasing need to perform the simultaneous analysis of environmental hazards, microcarrier-based multiplex technologies show great promise. Further integration with biofunctionalized quantum dots (QDs) creates new opportunities to extend the capabilities of multicolor flow cytometry with their unique fluorescence properties. Here, we have developed a competitive microbead-based flow cytometric immunoassay using QDs fluorescent labels for simultaneous detection of two analytes, bringing the benefits of sensitive, rapid and easy-of-manipulation analytical tool for environmental contaminants. As model target compounds, the cyanobacterial toxin microcystin-LR and the polycyclic aromatic hydrocarbon compound benzo[a]pyrene were selected. The assay was carried out in two steps: the competitive immunological reaction of multiple targets using their exclusive sensing elements of QD/antibody detection probes and antigen-coated microsphere, and the subsequent flow cytometric analysis. The fluorescence of the QD-encoded microsphere was thus found to be inversely proportional to target analyte concentration. Under optimized conditions, the proposed assay performed well within 30 min for the identification and quantitative analysis of the two environmental contaminants. For microcystin-LR and benzo[a]pyrene, dose-response curves with IC(50) values of 5 mug L(-1) and 1.1 mug L(-1) and dynamic ranges of 0.52-30 mug L(-1) and 0.13-10 mug L(-1) were obtained, respectively. Recovery was 92.6-106.5% for 5 types of water samples like bottled water, tap water, surface water and seawater using only filtration as sample pretreatment.

Yu, J. Production of green bioplastics from agri-food chain residues and co-products. (Woodhead Publishing in Food Science, Technology and Nutrition). Cambridge, Woodhead Publishing Ltd.

The environmental benefits are elucidated of polyhydroxyalkanoates (PHAs), natural thermoplastics synthesised by microbial species on renewable carbon sources, which may substantially reduce plastic pollution, greenhouse gas emissions and fossil energy consumption by replacing their petrochemical counterparts. Agri-food chain co-products are potential feedstocks for PHA bioplastics with technology innovations in pretreatment, microbial fermentation, and polymer recovery and purification. Pre-treatment is to convert special co-products into fermentative substrates and precursors for microbial biosynthesis of polyesters with desired molecular size, chemical composition and material properties. High volumetric productivity is a technical and economical indicator of PHA fermentation technology and can be achieved by using high cell density culture on highly concentrated feedstocks. Technical limitations may result in low to moderate productivities in large bioreactors with feedstocks of low carbon content. PHA recovery and purification is an essential and costly step in the process, which has moderated progress in technical innovation compared with PHA biosynthesis and material science. Problems are analyzed for potential breakthrough in polymer recovery and purification. In the near future, microbial production of PHA bioplastics could be integrated into advanced biorefineries to make fuels, chemicals and materials from renewable biomass including agri-food chain co-products in a cost-effective way.

Yu, J., et al. (2010). "The use of human mesenchymal stem cells encapsulated in RGD modified alginate microspheres in the repair of myocardial infarction in the rat." Biomaterials **31**(27): 7012-7020.

The combination of scaffold material and cell transplantation therapy has been extensively investigated in cardiac tissue engineering. However, many polymers are difficult to administer or lack the structural integrity to restore LV function. Additionally, polymers need to be biological friendly, favorably influence the microenvironment and increase stem cell retention and survival. This study determined whether human mesenchymal stem cells (hMSCs) encapsulated in RGD modified alginate microspheres are capable of facilitating myocardial repair. The in vitro study of hMSCs demonstrated that the RGD modified alginate can improve cell attachment, growth and increase angiogenic growth factor expression. Alginate microbeads and hMSCs encapsulated in microbeads successfully maintained LV shape and prevented negative LV remodeling after an MI. Cell survival was significantly increased in the encapsulated hMSC group compared with PBS control or cells alone. Microspheres, hMSCs, and hMSCs in microspheres groups reduced infarct area and enhanced arteriole formation. In summary, surface modification and microencapsulation techniques can be combined with cell transplantation leading to the maintenance of LV geometry, preservation of LV function, increase of angiogenesis and improvement of cell survival.

Yu, J., et al. (2019). "Characterization of microplastics in environment by thermal gravimetric analysis coupled with Fourier transform infrared spectroscopy." Marine Pollution Bulletin **145**: 153-160.

As a global pollutant, microplastics have attracted attention from the public and researchers. However, the lack of standard and time-saving methods for analysis has become one of the bottlenecks in microplastics research. Here, we demonstrate TGA coupled to FTIR to identify and quantify certain microplastics in environment. Samples were pyrolyzed in TGA and the pyrolysis gases were analyzed by FTIR. Combining TGA and FTIR data adds discriminatory power as temperature profiles and absorption spectra differ among several common plastics. To quantify on a mass basis, we calibrated on characteristic IR peaks at temperatures of maximum weight loss for individual polymers. The method can distinguish PVC, PS and was validated by spiking samples with known quantities of microplastics. The result of field sample experiments showed that TGA-FTIR can be used to identify and quantify PVC and PS in bivalves, seawater and soil. And the method may be applicable to environmental samples.

Yu, K. (2014). Copper ion adsorption by chitosan gel nanoparticles and calcium-alginate gel beads for water purification applications.

Water purification is emerging as a critical need as resources become increasingly limited. Chitosan and alginate are both low-cost natural carbohydrate materials used for the removal of heavy metal ions from aqueous solutions. The objective of this research is to enhance

understanding of the process and mechanisms of copper ion adsorption by these biopolymer gel particles at multiple size scales, with the aim of guiding the next generation of biosorbent design for water purification applications. First, the equilibrium adsorption capability of copper ions from copper sulfate solution onto chitosan gel nanoparticles, calcium-alginate gel microbeads, chitosan/alginate combination particles and large alginate gel beads at fixed pH was studied. Results show that the adsorption behavior of chitosan and alginate in the low concentration region follows the Langmuir isotherm. Chitosan gel nanoparticles exhibit a minor increase in adsorption capacity compared to other forms of chitosan. Alginate has significantly higher capacity than chitosan, which can be attributed to a comparatively higher density of adsorption sites. Combination particles consisting of alginate microbeads coated with chitosan nanoparticles possess an intermediate maximum adsorption capacity, corresponding to the weight ratio of the alginate and chitosan. Also, adsorption kinetics of copper ions onto calcium-alginate gel microbeads, chitosan/alginate combination particles and large alginate gel beads were investigated. It was observed that the adsorption kinetics of large alginate gel beads was much faster than that of alginate microbeads and combination particles. The adsorption of copper ions on to combination particles was slightly faster than on to plain alginate microbeads. A pseudo-second order kinetic model successfully predicted the adsorption behavior over the whole range of studies, indicating that chemisorption is the rate controlling step and the chemisorption reaction is second order. Moreover, the adsorption behavior of fixed-bed columns packed with large alginate gel beads was studied by varying the column size and volumetric flow rate. The column had shorter active life at a higher flow rate, or at a smaller size. The Thomas model, Adams-Bohart model and Yoon-Nelson model successfully fit experimental data, allowing prediction of the breakthrough time.

Yu, K., et al. (2013). "Copper ion adsorption by chitosan nanoparticles and alginate microparticles for water purification applications." Colloids and Surfaces A: Physicochemical and Engineering Aspects **425**: 31-41.

Chitosan and alginate are natural carbohydrate materials used to remove heavy metal ions from aqueous solutions. In this research, chitosan gel nanoparticles were formed by ionic cross-linking with sodium tripolyphosphate and characterized by zetasizing and TEM. The equilibrium adsorption capability of chitosan nanoparticles and calcium-alginate gel microbeads for Cu²⁺ from copper sulfate solutions at fixed pH has been explored. Results show that the adsorption behavior of chitosan and alginate in the low concentration region follows the Langmuir isotherm. Approximately linearly increasing adsorption behavior was observed at higher solution concentrations. Chitosan gel nanoparticles exhibit a minor increase in adsorption capacity compared to other forms of chitosan. Alginate has significantly higher capacity than chitosan, which can be attributed to a comparatively higher density of adsorption sites. Combination particles consisting of alginate microbeads coated with chitosan nanoparticles possess an intermediate maximum adsorption capacity, corresponding to the weight ratio of the alginate and chitosan. © 2013 Elsevier B.V..

Yu, M., et al. (2019). "Leaching of microplastics by preferential flow in earthworm (Lumbricus terrestris) burrows." Environmental chemistry (Online) **16**(1): 31-40.

Abstract. In the current study, we examine how the activities of earthworms (Lumbricus terrestris) affect microplastic (MP) distribution and concentration in soil, with a focus on low density polyethylene (LDPE). We also want to determine if MPs can be flushed out with water. We used a laboratory sandy soil column (polyvinyl chloride tube) experimental set-up and tested five different treatments: (1) treatment with just soil (control) to check if the saturated

conductivity (Ksat) could be impacted by MP, (2) treatment with MP, (3) treatment with MP and litter, (4) treatment with earthworms and litter as a second control for treatment 5 and (5) treatment with MPs, earthworms and litter. Each treatment consisted of eight replicates. For the treatments with MP, the concentration of MP added at the start of the experiment was 7 % by weight (3.97 g, polyethylene, 50 % 1 mm–250 µm, 30 % 250 µm–150 µm and 20 % <150 µm) based on 52.78 g of dry litter from Populus nigra. In the treatments using earthworms, two adult earthworms, with an initial average weight of (7.14 ± 0.26) g, were placed in each column. Results showed that LDPE particles could be introduced into the soil by the earthworms. MP particles were detected in each soil sample and within different soil layers for the earthworm treatments. Earthworms showed a tendency to transport the smaller MP particles and that the amount of MPs in size class <250 µm increased in soil samples with increasing soil depth in comparison to the other size classes. After leaching, MPs were only detected in the leachate from the treatments with the earthworms, and the MP had similar size distributions as the soil samples in the 40–50 cm layer of the treatment with MP, earthworms and litter. The results of this study clearly show that biogenic activities can mobilise MP transport from the surface into the soil and even be leached into drainage. It is highly likely that biogenic activities constitute a potential pathway for MPs to be transported into soil and groundwater.

Yu, P., et al. (2018). "Accumulation of polystyrene microplastics in juvenile Eriocheir sinensis and oxidative stress effects in the liver." Aquatic Toxicology **200**: 28-36.

As a widespread and ubiquitous pollutant of marine ecosystems, microplastic has the potential to become an emerging global threat for aquatic organisms. The present study aims to elucidate the effects of microplastics on the growth, accumulation and oxidative stress response in the liver of Eriocheir sinensis. Fluorescent microplastic particles (diameter=0.5 micro m) accumulated in the gill, liver and gut tissues of E. sinensis were investigated when crabs were exposed to a concentration of 40000 micro g/L for 7 days. A 21 day toxicity test suggested that the rate of weight gain, specific growth rate, and hepatosomatic index of E. sinensis decreased with increasing microplastic concentration (0 micro g/L, 40 micro g/L, 400 micro g/L, 4000 micro g/L and 40000 micro g/L). The activities of AChE and GPT in crabs exposed to microplastics were lower than those in control group. GOT activity increased significantly after exposure to a low concentration of microplastics and then decreased continuously with increasing microplastic concentrations. The activities of superoxide dismutase (SOD), aspartate transaminase (GOT), glutathione (GSH), and glutathione peroxidase (GPx) increased in specimens exposed to low concentrations of microplastics (40 and 400 micro g/L) compared to the control and decreased in organisms exposed to high concentrations (4000 and 40000 micro g/L). In contrast, the activities of acetylcholinesterase, catalase (CAT), and alanine aminotransferase were significantly lower in the organisms exposed to microplastics compared to control animals. Upon exposure to increasing microplastic concentrations, the expression of genes encoding the antioxidants SOD, CAT, GPx and glutathione S-transferase in the liver decreased after first increasing. Exposure to microplastics increased the expression of the gene encoding p38 in the MAPK signaling pathway and significantly decreased the expressions of genes encoding ERK, AKT, and MEK. The results of this study demonstrate that microplastics can accumulate in the tissues of E. sinensis and negatively affect growth. In addition, exposure to microplastics causes damage and induces oxidative stress in the hepatopancreas of E. sinensis. The findings provide basic biological data for environmental and human risk assessments of microplastics of high concern.

Yu, P. H., et al. (1998). "Conversion of food industrial wastes into bioplastics." Applied Biochemistry and

Biotechnology **70-72**(1): 603-614.

The usage of plastics in packaging and disposable products, and the generation of plastic waste, have been increasing drastically. Broader usage of biodegradable plastics in packaging and disposable products as a solution to environmental problems would heavily depend on further reduction of costs and the discovery of novel biodegradable plastics with improved properties. In the authors' laboratories, various carbohydrates in the growth media, including sucrose, lactic acid, butyric acid, valeric acid, and various combinations of butyric and valeric acids, were utilized as the carbon (c) sources for the production of bioplastics byAlcaligenes eutrophus. As the first step in pursuit of eventual usage of industrial food wastewater as nutrients for microorganisms to synthesize bioplastics, the authors investigated the usage of malt wastes from a beer brewery plant as the C sources for the production of bioplastics by microorganisms. Specific polymer production yield by A. Latus DSM 1124 increased to 70% polymer/cell (g/g) and 32g/L cell dry wt, using malt wastes as the C source. The results of these experiments indicated that, with the use of different types of food wastes as the C source, different polyhydroxyal-kanoate copolymers could be produced with distinct polymer properties.[PUBLICATION ABSTRACT]

Yu, S., et al. (2019). "Aggregation kinetics of different surface-modified polystyrene nanoparticles in monovalent and divalent electrolytes." Environmental Pollution **255**(Pt 2): 113302.

The intentional production and degradation of plastic debris may result in the formation of nanoplastics. Currently, the scarce information on the environmental behaviors of nanoplastics hinders accurate assessment of their potential risks. Herein, the aggregation kinetics of different surface-modified polystyrene nanoparticles in monovalent and divalent electrolytes was investigated to shed some light on the fate of nanoplastics in the aquatic environment. Three monodisperse nanoparticles including unmodified nanoparticles (PS-Bare), carboxylated nanoparticles (PS-COOH) and amino modified nanoparticles (PS-NH₂), as well as one polydisperse nanoparticles that formed by laser ablation of polystyrene films (PS-Laser) were used as models to understand the effects of surface groups and morphology.

Yu, X., et al. (2016). "Occurrence of microplastics in the beach sand of the Chinese inner sea: The Bohai Sea." Environmental Pollution **214**: 722-730.

The occurrence of microplastics in the beach sand of the Bohai Sea was investigated for the first time. The Bohai Sea is the largest Chinese inner sea and its coastal region is one of the most densely urbanized and industrialized zones of China. Samples from three costal sites (i.e., Bijianshan, Xingcheng and Dongdaihe) were collected, quantified and identified for microplastic analysis. Effects of sample depth and tourism activity were investigated. Surface samples (2 cm) contained higher microplastic concentrations than deep samples (20 cm). Samples from the bathing beach exhibited higher microplastic concentrations than the non-bathing beach, suggesting the direct contribution of microplastics from tourism activity. Of eight types of microplastics that were found, PEVA (polyethylene vinyl acetate), LDPE (light density polyethylene) and PS (polystyrene) were the largest in abundances. Moreover, the non-plastic items from samples were analyzed and results revealed that the majority abundance of the observed non-plastics were viscose cellulose fibers. Further studies are required to evaluate the environmental hazards of microplastics, especially as they may "act as a contaminant transporter" to the Bohai Sea ecosystem. Copyright © 2016 Elsevier Ltd.

Yu, Y., et al. (2015). "Biodegradation and Mineralization of Polystyrene by Plastic-Eating Mealworms: Part 1. Chemical and Physical Characterization and Isotopic Tests." Environmental Science & Technology

49(20): 12080-12086.

Polystyrene (PS) is generally considered to be durable and resistant to biodegradation. Mealworms (the larvae of Tenebrio molitor Linnaeus) from different sources chew and eat Styrofoam, a common PS product. The Styrofoam was efficiently degraded in the larval gut within a retention time of less than 24 h. Fed with Styrofoam as the sole diet, the larvae lived as well as those fed with a normal diet (bran) over a period of 1 month. The analysis of fecula egested from Styrofoam-feeding larvae, using gel permeation chromatography (GPC), solid-state 13C cross-polarization/magic angle spinning nuclear magnetic resonance (CP/MAS NMR) spectroscopy, and thermogravimetric Fourier transform infrared (TG-FTIR) spectroscopy, substantiated that cleavage/depolymerization of long-chain PS molecules and the formation of depolymerized metabolites occurred in the larval gut. Within a 16 day test period, 47.7% of the ingested Styrofoam carbon was converted into CO_2 and the residue (ca. 49.2%) was egested as fecula with a limited fraction incorporated into biomass (ca. 0.5%). Tests with α 13C- or β 13C-labeled PS confirmed that the 13C-labeled PS was mineralized to $^{13}CO_2$ and incorporated into lipids. The discovery of the rapid biodegradation of PS in the larval gut reveals a new fate for plastic waste in the environment. [ABSTRACT FROM AUTHOR]

Yu, Y., et al. (2018). "Advancement and Challenges of Microplastic Pollution in the Aquatic Environment: a Review." Water, Air & Soil Pollution **229**(5): 1-1.

As a new persistent environmental pollutant, microplastic pollution has attracted great interest recently. Microplastic particles are distributed widely throughout the world’s freshwaters, oceans, and seas, including the water column and sediments reaching as far as the deep sea. However, the practical considerations and protocols for microplastic pollution have, to the best of our knowledge, not been reviewed properly with regard to assessing their distribution, biotoxicity, sampling, and identification in the aquatic environment. In this review, the implications of microplastic pollution, including its wide distribution, biotoxicity threats, sampling, and identification challenges in the <ext-link>aquatic environment</ext-link>, were discussed and evaluated. The challenges and perspective of the related research are also presented to identify knowledge gaps and to prioritize future research needs.In this review, the implications of microplastic pollution, including its wide distribution, biotoxicity threats, sampling, and identification challenges in the aquatic environment, were discussed and evaluated. The challenges and perspective of the related research are also presented to identify knowledge gaps and to prioritize future research needs.<graphic></graphic> [ABSTRACT FROM AUTHOR]

Yu, Y. L., et al. (2012). "Development of a miniature analytical system in a lab-on-valve for determination of trace copper by bead injection spectroscopy." Talanta **88**: 352-357.

A miniature analytical system based on a lab-on-valve platform is developed for trace metal analysis by bead injection spectroscopy. A multipurpose flow cell integrated into a lab-on-valve is furnished with two pieces of fiber optics to communicate with light source and charge coupled device (CCD) spectrometer, respectively, in order to monitor real-time absorbance of the samples. Micro-beads loaded with chromogenic reagent are packed into the multipurpose flow cell to form a renewable microcolumn for solid phase extraction by bead injection. When the sample solution flows through the microcolumn, the target analyte will be captured on the surface of beads and detected directly by the CCD spectrometer without elution. The beads are automatically discarded from the multipurpose flow cell after each analytical cycle. This analytical system was employed to determine trace copper by loading of a chromogenic reagent 2-carboxy-2'-hydroxy-5'-sulfoformazylbenzene (zincon) on the beads of an anion exchanger (Sephadex QAE A-25). With a sample volume of 2.5mL, a detection limit of 3mugL(-1) and a linear range of 10-100mugL(-1) were obtained for copper, along with a RSD value of 2.5% (at the 50mugL(-1) level). The accuracy and practical applicability of the proposed system were validated by analysing certified reference materials, i.e., GBW10010, GBW09101, GBW08608, and further demonstrated by spiking recovery of copper in a water sample.

Yu, Z., et al. (2019). "Development and Validation of an Efficient Method for Processing Microplastics in Biota Samples." Environmental Toxicology & Chemistry **38**(7): 1400-1408.

The impacts of microplastics on aquatic ecosystems and biota are gaining attention globally. Although microplastics have been widely detected in biota, there currently are few standardized detection and identification methods. The present study developed a novel one-step digestion method which was evaluated with mussel and fish samples. This method employed nitric acid and hydrogen peroxide (HNO₃ :H₂ O₂ = 4:1 by volume) as digestion reagents, which completely digested biota samples <5 g weight within 30 min at 50 degreeC. A density separation step was subsequently used to remove organic residues as necessary. The efficiency and suitability of this method were tested by spiking microplastics of 7 different types and of various sizes (1000, 900, 675, 300, 250, and 150 mum) into mussel and gastrointestinal tracts of fish. The recoveries of microplastics ranged from 90 to 100%. No significant changes in weight, surface area, and particle size (t test, $p > 0.05$) were observed for all tested polymers. Fourier transform infrared spectral analyses demonstrated that the method did not degrade any of the polymers except for polyethylene terephthalate. The method was demonstrated with mussel and fish samples collected from the Pearl River delta, south China, and was able to recover microplastics effectively. Overall, the present method is time-saving and easy to operate, with low procedural cross-contamination. The properties of microplastics recovered by the present method remained largely intact, greatly benefiting subsequent qualitative and quantitative analyses. Environ Toxicol Chem 2019;38:1400-1408. © 2019 SETAC.

Yuan, C., et al. (2018). "Synthesis of Monodisperse Plasmonic Magnetic Microbeads and Their Application in Ultrasensitive Detection of Biomolecules." Analytical Chemistry **90**(13): 8178-8187.

Plasmon-enhanced fluorescence (PEF)-based analytical technology has recently demonstrated its ability in detecting biomarkers with ultrahigh sensitivity. However, the scope of the PEF-based technology has been hindered by its reliance on flat substrates with relatively low binding kinetics and the limited multiplex detection ability. Herein, we reported a simple yet robust method for the fabrication of plasmonic magnetic microbeads (PMMBs)-based suspension array technology (SAT) with fluorescence enhancement of about 60-fold, improving the detection limit of biomarkers by 2-orders of magnitude toward 100 fM. We also

demonstrated the performance of this method for the detection of anti-acidic ribosomal phosphoprotein 0 (anti-P0) autoantibody in sera from systemic lupus erythematosus (SLE) patients. Owing to the high sensitivity and efficient magnet-based sample collection, our method can be employed for detection of ultrasmall volumes of samples (e.g., 2 muL), promising for point-of-care detection. Furthermore, a size-encoded PMMBs-based multiplexed suspension array for simultaneous detection of multiple biomarkers is realized, illustrating the great potential of this technology in high-throughput disease diagnosis applications.

Yuan, W., et al. (2019). "New Perspective on the Nanoplastics Disrupting the Reproduction of an Endangered Fern in Artificial Freshwater." Environmental Science & Technology **53**(21): 12715-12724.

The potential risks of micro/nanoplastics on the ecological environment, particularly aquatic fauna, have been realized in recent years. However, information about its potential effects on aquatic plants is scarce. In this study, a four-week exposure experiment was conducted to investigate the effects of varying polystyrene nanoplastics concentration (PS-NPs, 0-100 mug/mL) on the early development of an endangered aquatic plant, Ceratopteris pteridoides. Fluorescent observations demonstrated that PS-NPs were adsorbed and accumulated on the spore surface of C. pteridoides rapidly and massively with increasing exposure concentration and time. The adsorption and accumulation of PS-NPs on the spore surface posed a negative effect on spore imbibition, causing 2.3-22.4% reduction in final spore size. Spore germination and gametophyte sex differentiation were both negatively affected by PS-NP exposure, resulting in 10.4-88.0% inhibition in germination ratio and 2.9-53.4% reduction in hermaphroditic gametophyte ratio. Additionally, PS-NPs were observed to penetrate into the roots of gametophytes. Higher concentration of PS-NPs (100 mug/mL) can even induce pathological changes on gametophytes, although with a low incidence (4.9%). The results above indicated that exposure to PS-NPs caused a series of disruptions from the spore imbibition to germination and gametophyte stages, and are likely to pose an eco-physiological risk on the reproductive success of endangered ferns.

Yuen, L. H., et al. (2014). "Pattern-based detection of toxic metals in surface water with DNA polyfluorophores." Angewandte Chemie. International Ed. in English **53**(21): 5361-5365.

Heavy metal contamination of water can be toxic to humans and wildlife; thus the development of methods to detect this contamination is of high importance. Here we describe the design and application of DNA-based fluorescent chemosensors on microbeads to differentiate eight toxic metal ions in water. We developed and synthesized four fluorescent 2'-deoxyribosides of metal-binding ligands. A tetramer-length oligodeoxy-fluoroside (ODF) library of 6561 members was constructed and screened for sequences responsive to metal ions, of which seven sequences were selected. Statistical analysis of the response patterns showed successful differentiation of the analytes at concentrations as low as 100 nM. Sensors were able to classify water samples from 13 varied sites and quantify metal contamination in unknown specimens. The results demonstrate the practical potential of bead-based ODF chemosensors to analyze heavy metal contamination in water samples by a simple and inexpensive optical method.

Yukioka, S., et al. (2018). "ADSORPTION CHARACTERISTICS OF MICROPOLLUTANTS ON MICROPLASTICS BY FOCUSING ON THEIR DIAMETERS IN WATER ENVIRONMENT." Doboku Gakkai Ronbunshu. G, Kankyo = Journal of Japan Society of Civil Engineers. Ser. G, Environmental Research **74**(7).

Recently, a new exposure pathway of micropollutants via Microplastics (MPs) to aquatic organisms have been a great concern. Main objective of this study was to understand adsorption characteristics of perfluoroalkyl acids (PFAAs), polycyclic aromatic hydrocarbons

(PAHs) and their halogenated compounds (X-PAHs) in water environment by focusing on the diameters of MPs. Adsorption bach experiments with standard substances of MPs were conducted. Field surveys were conducted in Lake Biwa and Osaka bay from Oct. to Nov. 2017 in order to analyze 15 PFAAs, 16 PAHs, 11 X-PAHs on adsorbed MPs in surface water. It was shown that MPs in water environment with smaller diameter tended to adsorb more PFAAs, PAHs, X-PAHs. It was assumed that micropollutants were adsorbed more to MPs than to suspended solids when their diameters were in the range of several tens of µm. In addition, it was suspected that more PFAAs and PAHs were adsorbed to MPs when surface areas of MPs were increased by the effect of physical and/or chemical reactions in the water environment.

Yukioka, S., et al. (2020). "Occurrence and characteristics of microplastics in surface road dust in Kusatsu (Japan), Da Nang (Vietnam), and Kathmandu (Nepal)." Environmental Pollution **256**: 113447.

Microplastics (MPs, plastics<5mm) are a growing concern in ecosystems, being found in the soil and water environment. One of the primary sources of MPs has been suspected to be road dust in urban areas as it can flow into waters with runoff. To understand the occurrence of MPs (100mum-5mm) in surface road dust of three cities (Kusatsu, Shiga, Japan; Da Nang, Vietnam; and Kathmandu, Nepal), we collected surface road dust samples. The samples were pretreated (organic matter decomposition and gravity separation), and all MP candidates were individually observed by microscope for color, shape, and size; and analyzed their polymer types using fourier transform infrared spectrometry. The abundances of MPs 100mum to 5mm in size were 2.0+/-1.6 pieces/m² (13 polymer types) in Kusatsu, 19.7+/-13.7 pieces/m² in Da Nang (14 types), and 12.5+/-10.1 pieces/m² in Kathmandu (15 types). We classified the MPs into two groups; containers/packaging-MPs and rubber-MPs. Among all MPs, the containers/packaging-MPs accounted for 55+/-5% of the polymer types composition. In contrast, the rubber-MPs accounted for 16+/-6% of all MPs which were higher than those previously published for environmental water and sediment samples. The containers/packaging-MPs were fragments of various colors while most of the rubber-MPs were fragments or granules in black. The number-size distributions of MPs showed that the mode of formation explains the differences between their polymer types (tearing for containers/packaging-MPs and abrasion for rubber-MPs). In Da Nang and Kathmandu, the abundance of containers/packaging-MPs and rubber-MPs were correlated so that those MPs might be micronized from the originated materials in the sources with the similar composition (e.g. dump points). It was indicated that the characteristics of MPs pollution in surface road dust might be different depending on waste management practices.

Yuksel, A. (2016). "The evaluation and assessment of the kind and amount of solid waste produced in a hospital kitchen." Revista Espanola de Nutricion Humana y Dietetica **20 (Supplement 1)**: 547.

Introduction: The environment is the most important source in meeting the nutritional needs of people's basic needs. Solid waste is one of the most important causes of environmental pollution. Today, incerasing of the population and the development of technology leads to increase the production of not only types of package materials but also the waste per capita. Method(s): In the hospital, the waste that may ocur at the end of the food and meal production was calculated according to records of the menu items. On those days produced waste was collected and seperated according to their types (glass, paper-cardboard, composites, metals, organic, plastic, porcelain, wood). Then all the seperated waste groups were weighted and recorded. Result(s): The total weight of all types of solid waste were obtained according and 7238.5kg total solid waste produced was found. 1106.2kg of this waste (15.3%) were plastics, 272.0kg (3.8%) were metal, 1132.8kg (15.6%) were paper and board, and 3013.8kg (41.6%) were

organic waste. The amount of plastic waste collected from produced solid waste were 323.8kg (7.3%), the amount of metal waste were 205.4kg (4.6%) and 318.5kg of waste were paper and cardboard (7.2%), respectively. During the study period in the kitchen 3317.3kg, of recycle package waste were produced and 967.7kg (29.2%) were found to be collected. 21.0% of the collected organic waste were found to be used in composting. It is evaluated that, the 148.9kg of total waste were organic which is able to eat, can be reduced by appropriate revisions in the recipts. Conclusions, discussion and/or practical application: It is important to plan how to reduce the amount of waste before production and collect the waste effectively will be beneficial to solve the waste problem. COMPETING INTERESTS: The authors of this document can confirm there is no conflict of interests.

Yun, K. S., et al. (2009). "Chapter 5: Microfluidic Chips Designed for Measuring Biomolecules Through a Microbead-Based Quantum Dot Fluorescence Assay." Methods in Molecular Biology **544**: 53-67.

This chapter introduces the demonstration of specific antibody detection by using a microbead-based assay with quantum dot (QD) fluorescence on a polydimethylsiloxane (PDMS) microfluidic chip. The microfluidic chip is designed to isolate a single microbead where the binding reaction of antibodies occurs on the surface. The microfluidic chip is fabricated on a glass substrate using a transparent sili-cone elastomer, PDMS, for easy access of monitoring and flexible gate operations to capture the single microbead. For antibody detection, a sequence of functionalized assays has been performed in the fabricated chip, including the capturing of microbeads, antibody injection into a microchamber, quantum dot injection, and fluorescence detection. Various concentrations of human IgG antibodies have been introduced to bind to a single microbead captured and isolated inside a designated microchamber in a small volume of 75 pL. Fluorescence detection is monitored using a CCD camera after the second binding with the QDs conjugated with anti-human IgG. In this experiment, a human IgG antibody concentration below 0.1 kg/mL has been successfully detected.

Yun, K. S., et al. (2009). "Microfluidic chips designed for measuring biomolecules through a microbead-based quantum dot fluorescence assay." Methods in Molecular Biology **544**: 53-67.

This chapter introduces the demonstration of specific antibody detection by using a microbead-based assay with quantum dot (QD) fluorescence on a polydimethylsiloxane (PDMS) microfluidic chip. The microfluidic chip is designed to isolate a single microbead where the binding reaction of antibodies occurs on the surface. The microfluidic chip is fabricated on a glass substrate using a transparent silicone elastomer, PDMS, for easy access of monitoring and flexible gate operations to capture the single microbead. For antibody detection, a sequence of functionalized assays has been performed in the fabricated chip, including the capturing of microbeads, antibody injection into a microchamber, quantum dot injection, and fluorescence detection. Various concentrations of human IgG antibodies have been introduced to bind to a single microbead captured and isolated inside a designated microchamber in a small volume of 75 pL. Fluorescence detection is monitored using a CCD camera after the second binding with the QDs conjugated with anti-human IgG. In this experiment, a human IgG antibody concentration below 0.1 microg/mL has been successfully detected.

Yung, C. W., et al. (2009). "Micromagnetic-microfluidic blood cleansing device." Lab on a Chip **9**(9): 1171-1177.

Sepsis is a lethal disease caused by a systemic microbial infection that spreads via the bloodstream to overwhelm the body's defenses. Current therapeutic approaches are often suboptimal, in part, because they do not fully eliminate the pathogen, and hence the source of deadly toxins. Here we describe an extracorporeal blood cleansing device to selectively remove pathogens from contaminated blood and thereby enhance the patient's response to antibiotic therapy. Immunomagnetic microbeads were modified to create magnetic opsonins that were used to cleanse flowing human whole blood of Candida albicans fungi, a leading cause of sepsis-related deaths. The micromagnetic-microfluidic blood cleansing device generates magnetic field gradients across vertically stacked channels to enable continuous and high throughput separation of fungi from flowing whole blood. A multiplexed version of the device containing four parallel channels achieved over 80% clearance of fungi from contaminated blood at a flow rate of 20 mL/h in a single pass, a rate 1000 times faster than a previously described prototype micromagnetic-microfluidic cell separation system. These results provide the first proof-of-principle that a multiplexed micromagnetic-microfluidic separation system can be used to cleanse pathogens from flowing human blood at a rate and separation efficiency that is relevant for clinical applications.

Yura, H., et al. (2008). "Selection of hematopoietic stem cells with a combination of galactose-bound vinyl polymer and soybean agglutinin, a galactose-specific lectin." Transfusion **48**(3): 561-566.

BACKGROUND: Selection of hematopoietic stem cells can be used to prevent graft-versus-host disease (GVHD) after allograft transplantation. The purpose of the study was to examine a novel cell separation system comprising a galactose-bound vinyl polymer (Gal-VP) and soybean agglutinin (SBA), a galactose-specific lectin.

STUDY DESIGN AND METHODS: A vinyl polymer (VP) containing alpha-1,6- and beta-1,4-linked galactose terminals was used to facilitate cell separation. A VP containing an alpha-1,4-linked glucose terminal (alpha-1,4-Glu-VP) was also synthesized as a control for alpha-1,6- and beta-1,4-Gal-VP. Peripheral blood samples were collected from healthy volunteers and umbilical cord blood cells were collected after normal labor.

RESULTS: The sugar-VP was adsorbed on the surface of various materials. In the presence of SBA, T lymphocytes bound to beta-1,4-Gal-VP-coated microbeads, but not to alpha-1,4-Glu-VP-coated microbeads. When peripheral or cord blood cells were cultured on alpha-1,6-Gal-VP-coated plates, most red blood cells, lymphocytes, granulocytes, and monocytes adhered to the plate in the presence of 300 mg per mL SBA, whereas few CD34+ cells attached, even with 800 mg per mL SBA.

CONCLUSION: SBA binds selectively to blood cells by recognizing cell-surface sugars, which are dependent on the extent of cellular differentiation. Therefore, the combination of alpha-1,6-Gal-VP and SBA might be useful for separation of blood cells according to their stage of differentiation and lineage.

Yurtsever, M. (2019). "Glitters as a Source of Primary Microplastics: An Approach to Environmental Responsibility and Ethics." Journal of Agricultural and Environmental Ethics **32**(3): 459-478.

This paper is about “glitters”, one of the sources of primary microplastics, which, in turn, are deemed an emerging source of pollutants affecting the environment. Today, most glitters available on the market are essentially microplastics, as they are made of polyesters and are of a size smaller than 5 mm. The tiny, shiny, decorative and colorful glitters are used in a wide range of products including but not limited to make-up or craft materials, clothing, shoes, bags, ornaments, and various objects. The marketing of micron-sized plastic materials, the environmental risks of which are no longer disputable, as disposable products clearly merits attention. People without substantial knowledge or awareness about microplastics pollution and sources thereof have been consuming these glitter products without giving it a second thought. Given their tasteless, odourless, invisible, durable, and last but certainly not least, ubiquitous characteristics, small microplastics nowadays came to pose a substantial threat for the environment and the biota, as a sneaky and persistent contaminant. Microplastic pollution is a completely anthropogenic one. In this context, the consumers should assume a careful and sensible attitude, and question all their consumption habits. On the other hand, the responsibilities of the manufacturers and regulators are also substantial. For, in the lack of any regulation or sanctions in the context of laws and legislation concerning a global problem, and in a context of scarce awareness on part of the society, the people would continue to buy and consume plastic products like glitters without really thinking about them, for as long as they are supplied to the market.

Yurtsever, M. and U. Yurtsever (2019). "Use of a convolutional neural network for the classification of microbeads in urban wastewater." Chemosphere **216**: 271-280.

Scientists are on the lookout for a practical model that can serve as a standard for sorting out, identifying, and characterizing microplastics which are common occurrences in water sources and wastewaters. The microbeads (MBs) used in cosmetics and discharged into the sewer systems after use cause substantial microplastics pollution in the receiving waters. Today, the use of plastic microbeads in cosmetics is banned. The existing use cases are to be discontinued within a few years. Yet, there are no restrictions regarding the use of microbeads in a number of industries, cleaning products, pharmaceuticals and medical practices. In this context, the determination and classification of MBs which had so far been discharged to water sources and which continue to be discharged, represent crucial problems. In this work, we examined a new approach for the classification of MBs based on microscopic images. For classification purposes, Convolutional Neural Network (CNN) -a Deep Learning algorithm- was employed, whereas GoogLeNet architecture served as the model. The network is built from scratch, and trained then after tested on a total of 42928 images containing MBs in 5 distinct cleansers. The study performed with the CNN which achieved a classification performance of 89% for MBs in wastewater.

Yusof Shuaib, I., et al. (2017). "Isolation and characterisation of microplastic abundance in Lates calcarifer from Setiu Wetlands, Malaysia." Malaysian Journal of Analytical Sciences **21**(5): 1054-1064.

The presence of microplastics (<1 mm) in wild and cage-cultured Asian sea bass (Lates calcarifer) was successfully studied. Fish samples were collected from Setiu Wetlands in October 2016. Microplastics were isolated from fish samples using the alkaline solution method (10 M of NaOH solution). Microplastics were sorted visually according to their shapes and colours after being observed under dissecting microscope. A total of 4,498 pieces of microplastics were identified and threadlike shape was the most abundant microplastic particles found during this study. The identification of functional groups in the composition of microplastics was achieved using Fourier transform infrared (FTIR) spectroscopy. Microplastics, with the presence of strong peaks at upsilon =3342 cm⁻¹ (N-H str), 1510 cm⁻¹ (N-H bend) and upsilon =1706 cm⁻¹ (C=O str) are associated with the materials consist of polyamide. Additionally, peaks related to the polyvinyl alcohol groups are recorded at upsilon =3321-4323 cm⁻¹ (O-H str), 1706 cm⁻¹ (C=O str), 1219 cm⁻¹ (O-H wag) and upsilon =1028-1128 cm⁻¹ (C-O str). The abundance levels of microplastics ingested by wild and cage-cultured fishes are statistically significantly different, p<0.05.

Zada, L., et al. (2018). "Fast microplastics identification with stimulated Raman scattering microscopy." Journal of Raman Spectroscopy **49**(7): 1136-1144.

The abundance of plastic products in modern society has resulted in a proliferation of small plastic particles called “microplastics” in the global environment. Currently, spectroscopic techniques such as Fourier-transform infrared and spontaneous (i.e., conventional) Raman spectroscopy are widely employed for the identification of the plastic microparticles, but these are rather time consuming. Stimulated Raman scattering (SRS) microscopy, based on the coherent interaction of 2 different laser beams with vibrational levels in the molecules of the sample, would enable much faster detection and identification of microplastics. Here, we present for the first time an SRS-based method for identifying 5 different high production-volume polymer types in microplastics extracted from environmental or consumer product samples. The particles from the extracts were collected on a flat alumina filter, and 6 SRS images were acquired at specifically chosen wavenumbers. Next, we decomposed these spectral data into specific images for the 5 polymers selected for calibration. We tested the approach on an artificial mixture of plastic particles and determined the signal-to-noise and level of cross talk for the 5 polymer types. As a proof of principle, we identified polyethylene terephthalate particles extracted from a commercial personal care product, demonstrating also the thousand-fold higher speed of mapping with SRS compared with conventional Raman. Furthermore, after density separation of a Rhine estuary sediment sample, we scanned 1 cm2 of the filter surface in less than 5 hr and detected and identified 88 microplastics, which corresponds to 12,000 particles per kilogram dry weight. We conclude that SRS can be an efficient method for monitoring microplastics in the environment and potentially many other matrices of interest.

Zafar, U., et al. (2013). "Fungal communities associated with the biodegradation of polyester polyurethane buried under compost at different temperatures." Applied & Environmental Microbiology **79**(23): 7313-7324.

Plastics play an essential role in the modern world due to their low cost and durability. However, accumulation of plastic waste in the environment causes wide-scale pollution with long-lasting effects, making plastic waste management expensive and problematic. Polyurethanes (PUs) are heteropolymers that made up ca. 7% of the total plastic production in Europe in 2011. Polyester PUs in particular have been extensively reported as susceptible to microbial biodegradation in the environment, particularly by fungi. In this study, we investigated the impact of composting on PUs, as composting is a microbially rich process that is increasingly being used for the processing of green waste and food waste as an economically viable alternative to landfill disposal. PU coupons were incubated for 12 weeks in fresh compost at 25degreeC, 45degreeC, and 50degreeC to emulate the thermophilic and maturation stages of the composting process. Incubation at all temperatures caused significant physical deterioration of the polyester PU coupons and was associated with extensive fungal colonization. Terminal restriction fragment length polymorphism (TRFLP) analysis and pyrosequencing of the fungal communities on the PU surface and in the surrounding compost revealed that the population on the surface of PU was different from the surrounding compost community, suggesting enrichment and selection. The most dominant fungi identified from the surfaces of PU coupons by pyrosequencing was Fusarium solani at 25degreeC, while at both 45degreeC and 50degreeC, Candida ethanolica was the dominant species. The results of this preliminary study suggest that the composting process has the potential to biodegrade PU waste if optimized further in the future.

Zakharian, A. R., et al. (2006). "Single-beam trapping of micro-beads in polarized light: Numerical simulations." Optics Express **14**(8): 3660-3676.

Using numerical solutions of Maxwell's equations in conjunction with the Lorentz law of force, we compute the electromagnetic force distribution in and around a dielectric micro-sphere trapped by a focused laser beam. Dependence of the optical trap's stiffness on the polarization state of the incident beam is analyzed for particles suspended in air or immersed in water, under conditions similar to those realized in practical optical tweezers. A comparison of the simulation results with available experimental data reveals the merit of one physical model relative to two competing models; the three models arise from different interpretations of the same physical picture.

Zam, W., et al. (2013). "Formulation and In-vitro release of pomegranate peels' polyphenols microbeads." International Journal of Pharmaceutical Sciences and Research **4**(9): 3536-3540.

Sodium alginate and combinations of sodium alginate-pectin were used to study the effect on the loading efficiency and the radical scavenging activity of the polyphenols extracted from pomegranate peels (Punica granatum). The results indicate that the polyphenol content was less when the microbeads were prepared with a single type of polymer in comparison of the microbeads prepared with two types of polymers. Also there was an optimum ratio of these two polymers (2:1), which was responsible for the maximum polyphenol content. The microencapsulated particles provided to polyphenols an effective protection against the degradation phenomenon, whereas antioxidant activity remained identical. In-vitro release studies indicated that 64.87% and 48.81% of polyphenols was released in simulated gastric fluid from sodium alginate and sodium alginate-pectin microbeads respectively. 88.37% and 70.48% of polyphenols was released in simulated intestinal fluid from sodium alginate and sodium alginate-pectin microbeads respectively. The microcapsules described in this study represent an interesting food additive for incorporation into functional foods. © 2013 are reserved by International Journal of Pharmaceutical Sciences and Research.

Zambello, R., et al. (2015). "Immunophenotypic heterogeneity of T-LGLL: Clinical and biological implications." Hematological Oncology **1)**: 222.

Introduction: T-large granular lymphocytes leukaemia is a rare disease characterized by an abnormal expansion of large granular lymphocytes (LGLs). T-LGLs typically exhibit a terminally differentiated cytotoxic T-cell phenotype (CD3+/CD8+/ CD4-/abTCR+). Together with the most common CD8+ T-LGLL, rare forms of CD4+/CD8-/+dim LGL proliferation (CD4+ T-LGLL) have been described. In addition, LGLs variably express CD57, CD16, CD56 and NK receptors (NKR), originating different immunophenotype combinations. The disease generally follows an indolent clinical course with neutropenia representing the major feature along the natural history of the disease (40% of patients presenting with severe neutropenia). Recently, hotspot STAT3 and STAT5b mutations have been described in T-LGLL patients supporting the idea that mutations could lead to a cytokine-independent STAT activation. STAT3 mutations were described in 30-40% of T-LGLL patients, while STAT5b were found only in very few cases, these latters being more frequently detectable in patients with aggressive clinical course. The aim of this study was to correlate immunophenotypes with relevant biological and clinical features, namely STAT mutations and severe neutropenia in a series of 101 patients with T-LGLL. Method(s): The immunophenotypic characterization of patients with T-LGLL was obtained by flow cytometer analysis. T-LGLs were purified from PBMCs by FACSAria cell sorter or by microbeads system. For the screening of STAT mutations, all the exons covering the activation gene region, where all of the mutations are located, were analysed. Sanger sequencing was performed on DNA of LGLs and of remaining autologous PBMCs. The presence of D661Y and Y640F STAT3 mutations undetectable by direct sequencing was further analysed by a DNA amplification refractory mutation system (ARMS-PCR). Data are expressed as mean +/- median standard error (SEM), and statistical analysis and correlations were performed by Student t-test and chi²

test, respectively. Result(s): Our results show that CD8+ T-LGLL patients with CD16+/CD56-/CD57+/- immunophenotype (n = 54) were characterized by a high frequency of expression of NK receptors (KIRs and NKG2) and a significant association with STAT3 mutations (p < 0.001) and neutropenia (p < 0.001). Furthermore, the rare CD8+/CD56+/ CD16-/CD57- immunophenotype (n = 1 patient) was associated with aggressive clinical behaviour and STAT5b mutations. Interestingly, in this patient, different subclones characterized by different phenotypes and STAT5b mutations could be identified. Expression of CD4+ by LGL was typically associated with a very indolent clinical course. Conclusion(s): In conclusion, we provided further evidence of the heterogeneous pattern of immunophenotypes accounting for LGL leukaemia, suggesting that discrete LGL phenotypes might be predictive of different biological and clinical features of disease.

Zambello, R., et al. (2011). "Intrinsic and estrinsic mechanism contributes to maintain the JAK/STAT pathway aberrantly activated in T-type large granular lymphocyte leukemia." Blood. Conference: 53rd Annual Meeting of the American Society of Hematology, ASH **118**(21).

T-cell large granular lymphocyte (T-LGL) leukemia is a heterogeneous disorder characterized by the chronic expansion of a terminally differentiated cytotoxic T lymphocytes (CTLs) with a CD3+/CD8+/CD57+ phenotype. Although the pathogenesis of T-LGL leukemia is still unknown, the hallmark of the disease is the abnormal clonal expansion of antigen-primed mature CTLs that successfully escape activation-induced cell death (AICD) and remain long-term competent. Similar to normal activated CTLs, leukemic T-LGLs exhibit activation of multiple survival signaling pathways. Among the intracellular signaling pathways altered in T-LGL leukemia, JAK/STAT (Janus Kinase/signal transducer and transcription factor) signaling has been associated with LGL transformation. In particular, it has been demonstrated that the STAT3, a pivotal element of this pathway, is over-expressed and constitutively activated in leukemic LGLs as compared to normal peripheral blood mononuclear cells (PBMCs). STAT3 is a transcription factor inducing a number of genes promoting cell survival and the involvement of an aberrant STAT3 expression has been suggested to play a role in the pathogenesis of this disease. In order to investigate the mechanism through which STAT3 is maintained in a state of activation in T-LGL leukemia, in patients in 27 patients we studied the expression of "suppressor of cytokine signaling 3 protein" (SOCS3) which is the specific negative regulator of STAT3 signaling, and the interleukin 6 (IL-6), which strongly induces STAT3 activation. Expression analysis was performed by Real Time-PCR and Western Blot assay in highly purified LGLs from PBMCs of patients by magnetic microbeads system. By Real Time-PCR, the expression level of IL-6 was shown to be increased in patients' PBMCs (56.84 +/- 17.01) as compared to normal PBMCs (0.53 +/- 0.14, p<0.05). However, we found that SOCS3 was down-expressed, both at mRNA and protein level, in neoplastic LGLs as compared to control LGL (mRNA: 0.26 +/- 0.04 vs 0.63 +/- 0.17, p<0.01; protein: 0.59 +/- 0.05 vs 0.85 +/- 0.10, p<0.01). We also observed that in vitro SOCS3 was unresponsive to IL-6 in patients' LGL, whereas in LGLs of healthy individuals this cytokine was definitely able to increase SOCS3 expression level. To better understand the mechanism responsible for SOCS3 low expression and unresponsiveness to IL-6 and since we found that this epigenetic mechanism is implicated in the NK type of this disease (Haematologica 2010. 95:1722), we evaluated whether an aberrant methylation of SOCS3 promoter takes place in T-LGL patients. Neoplastic LGLs were treated with the demethylating agent 5-aza-2'-deoxycytidine (DAC) and we observed that DAC re-established SOCS3 expression after IL-6 stimulation. Interestingly, as consequence of IL-6-induced SOCS3 expression we observed the inhibition of STAT3 phosphorylation and a reduction of Mcl1 protein level. These results support that in LGLs, SOCS3 tightly controls STAT3 and is able to modulate STAT3-induced gene Mcl1, that could be involved in LGL survival.

Studies are now in progress to confirm the hypothesis that SOCS3 silencing is caused by the SOCS3 promoter methylation. In conclusion, our results suggest that the downregulation of SOCS3, likely related to aberrant methylation, cooperates with IL-6 in the activation of JAK/STAT pathway, leading to the constitutive phosphorylation of STAT3, and thus ultimately resulting into increased survival of leukemic LGLs.

Zaninovic, L., et al. (2018). "The frequency of ANA/ENA in patients with neuromyelitis optica positive for AQP4 autoantibodies." Biochemia Medica **28 (Supplement 1)**: S59.

Introduction: Neuromyelitis optica (NMO) is an autoimmune disease characterized with the presence of antibodies to aquaporin-4 (AQP4) that are sensitive and highly specific serum markers. Antinuclear antibodies (ANA) and antibodies to extractable nuclear antigens (ENA) are characteristic for systemic autoimmune rheumatic diseases (SARD). The aim of this study was to investigate the incidence of ANA/ENA autoantibodies in patients with NMO in order to investigate possible overlap of SARD with NMO. Material(s) and Method(s): The study was conducted in a group of 24 patients positive for AQP4 autoantibodies, which were simultaneously analyzed for ANA and ENA autoantibodies. Antibodies to AQP4 were determined by ELISA method (Iason, Austria). Antinuclear antibodies were determined on HEp-2 cells with indirect immunofluorescence (IIF) method (Euroimmun, Germany). Autoantibodies to: ds-DNA, histone, SS-A, SS-B, Sm, RNP, DNA topo I, Jo-1 and CENP B were determined by the AtheNA ANA-II Plus Multiplex Luminex microbead immunoassay (Zeus Scientific Inc., USA). Result(s): Out of 24 patients positive for AQP4 antibodies, 17(71%) were women. Positive ANA IIF were found in 12 (50%) positive AQP4 patients. All 12 patients were women. Seven of ANA positive samples (58%) were anti-SS-A positive and 3 (25%) were anti-SS-B positive while 3 (25%) were positive for dsDNA antibody and histone. Other tested antibodies were negative. Conclusion(s): Positive ANA/ENA antibodies were found in half of the patients with positive results of antibodies to AQP4, exclusively in women. Positive ANA antibodies were mostly related to SS-A and SS-B antibodies which are characteristic for Sjogren's syndrome. The obtained results indicate the possible high frequency of overlap between NMO and Sjogren's syndrome. Future studies on a larger number of patients could contribute to a better understanding of the association between these autoimmune diseases.

Zaragoza Arnaez, C., et al. (2015). "Diosmetin and diosmin: Changes in platelet structure and activity." Basic and Clinical Pharmacology and Toxicology **2)**: 46.

Cardiovascular diseases are major causes of death in the developed world. Platelets play a key role in hemostasis and in the initiation and propagation of thrombus formation. Anti-platelet therapies are used widely, but current are associated with side effects including problem bleeding. Drugs from medical plants with vascular protection properties such as flavonoids could exert an important role in the platelet function regulation. Blood was extracted from 10 free-drug normal volunteers. Drugs (flavonoids: diosmetin and diosmin) were dissolved in dimethyl sulfoxide and added to the samples blood with or without calcium ionophore. Flow cytometry and fluorescence microscopy were employed to detect, using microbeads, the characterization of platelet-derived microparticles, platelets, and aggregates generated by in vitro activation of platelets using calcium ionophore. Both flavonoids showed certain antiplatelet activity, compared to the control, reducing the potent effect of the pro-aggregant agent. A percentage antiplatelet activity index (ACI) of 29.48 +/- 3.21% was recorded for diosmin 2 mM, and 13.51 +/- 2.36% for diosmetin 2 mM achieved descended the 10% of the PDMPs generated by the calcium ionophore, therefore this product proved a moderate antiplatelet capacity index. These drugs could have a potentially use in the prevention of cardiovascular

events, taking to account the differences in the chemical structures of the heteroside and the aglycon here studied might explain their different ACIs.

Zarfl, C. and M. Matthies (2010). "Are marine plastic particles transport vectors for organic pollutants to the Arctic?" Marine Pollution Bulletin **60**(10): 1810-1814.

Plastic litter accounts for 50-80% of waste items stranded on beaches, floating on the ocean surface and lodged in the seabed. Organic pollutants can be absorbed onto plastic particles from sea water, attached to their surfaces or included in the plastic matrix as additives. Such chemicals may be transported to remote regions by buoyant plastics and ocean currents. We have estimated mass fluxes of polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and perfluorooctanoic acid (PFOA) to the Arctic via the main ocean currents and compared them to those in the dissolved state and in air. Substance fluxes with atmospheric or sea water currents account for several tons per year, whereas those mediated by plastics are four to six orders of magnitude smaller. However, the significance of various pollutant transport routes does not depend only on absolute mass fluxes but also on bioaccumulation in marine food chains.

Zbyszewski, M. and P. Corcoran (2009). Plastics Distribution and Degradation on Lake Huron Beaches, American Geophysical Union, 2000 Florida Ave., N.W. Washington DC 20009 USA, [URL:http://www.agu.org].

The resistivity of plastic debris to chemical and mechanical weathering processes poses a serious threat to the environment. Numerous marine beaches are littered with plastic fragments that entangle and become ingested by organisms including birds, turtles and plankton. Although many studies have been conducted to determine the amount and effects of plastics pollution on marine organisms, relatively little is known about the distribution and quantity of polymer types along lacustrine beaches. Plastic particles sampled from selected beaches on Lake Huron were analyzed using Fourier Transform Infrared Spectroscopy (FTIR) to determine polymer composition. The majority of the plastic fragments are industrial pellets composed of polypropylene and polyethylene. Varying degrees of oxidation are indicated by multiple irregular peaks in the lower wavenumber region on the FTIR spectra. The oxidized pellets also represent the plastic particles with the most pronounced surface textures, as identified using Scanning Electron Microscopy (SEM). Crazes and flakey, fibrous, or granular textures are consistent with chemical weathering processes, whereas gauges and pits occur through abrasion during mechanical weathering. Further textural and compositional analysis will indicate which polymer types are more resistant to weathering processes. Additional investigation of the distribution of plastic debris along the beaches of Lake Huron will indicate the amount and primary transport directions of resistant plastic debris polluting one of Ontario's Great Lakes.

Zbyszewski, M. and P. L. Corcoran (2011). "Distribution and degradation of fresh water plastic particles along the beaches of Lake Huron, Canada." Water, Air, and Soil Pollution **220**(1-4): 365-372.

Resistivity of plastic litter to chemical weathering, mechanical erosion, and biological degradation poses a critical environmental threat. Plastic debris has increased in abundance over the past several decades along shorelines and at sea, where organisms mistake small particles including plastic pellets as a potential food supply. These pellets have been shown to adsorb persistent organic pollutants such as PCBs, which may endanger the organism and become ingested higher in the food chain. Although several studies have been conducted to determine the amount and effects of plastics pollution in marine environments, relatively little is known concerning fresh water plastics pollution. This study represents the first detailed examination of the distribution, types, and physical and chemical degradation processes of plastic particles in a fresh water setting. In conducting field surveys along the shoreline of Lake Huron, Canada, we were able to ascertain that the total number of pellets over multiple sampling localities comprise 94% of plastic debris. The majority of the pellets were found proximal to an industrial sector along the southeastern margin of the lake and their abundance steadily decreased northward, following the dominant lake current patterns. Laboratory analyses using Fourier transform infrared spectroscopy (FTIR) and scanning electron microscopy indicate predominant mechanical abrasion textures, including grooves, gauges, pits, and flakes, and less common chemical weathering features such as linear and crescentic fractures that developed from shrinkage during subaerial exposure. The predominant type of plastic, polyethylene, appears to be much more resistant to chemical weathering than polypropylene, as indicated by oxidation peaks on FTIR spectra suggesting that polypropylene degrades more readily under natural conditions on freshwater beaches. © 2011 Springer Science+Business Media B.V.

Zecheru, T., et al. (2010). "Poly(2-hydroxyethyl methacrylate-co-dodecyl methacrylate-co-acrylic acid): synthesis, physico-chemical characterisation and nafcillin carrier." Journal of Materials Science-Materials in Medicine **21**(10): 2793-2804.

In the present study polymeric microbeads of poly(2-hydroxyethyl methacrylate-co-dodecyl methacrylate-co-acrylic acid) or p(HEMA-co-dDMA-co-AA) were synthesised and characterized through FT-IR and scanning electron microscopy (SEM); their swelling behavior against saline solution was explored and their in vitro cytotoxicity was evaluated. Further, in order to elucidate kinetic aspects regarding the ternary system p(HEMA-co-dDMA-co-AA), a mathematical model of the reactivity ratios of the comonomers in the terpolymer has been conceived and analyzed. An intensified tendency of AA units accumulation in the copolymer has been noticed, in spite of HEMA units, while dDMA conserves in the copolymer the fraction from the feed. Three compositions have been selected for nafcillin-loading and their in vitro release capacity was evaluated. The compositions of 80:10:10 and 75:10:15 M ratios appear suitable for further in vivo testing, in order to be used as drug delivery systems in the treatment of different osseous diseases.

Zekusic, M. and K. Fumic (2015). "Tissue and cell biobank of patients with inborn errors of metabolism in Croatia." Regenerative Medicine **1)**: 111.

Objectives Rare diseases are a clinically heterogeneous group of disorders with prevalence less than 5/10000. Only 6-8% of the world's population is likely to be affected by some form of rare disease. Since these diseases affect multiple organ systems and do not have characteristic symptoms, interdisciplinary cooperation is essential to establish diagnosis and include appropriate treatment. Life expectancy in these patients is often reduced; however, if detected in time, many of these diseases can be successfully treated. Inherited metabolic diseases form a small group of rare diseases diagnosed not only using conventional biological material (blood, urine, cerebrospinal fluid) but also tissue biopsy specimens are often included in the diagnostic process. In the Clinical Unit for Hereditary Metabolic Diseases of the University Hospital Centre Zagreb, different types of progenitor cells (dermal fibroblasts and skeletal myoblasts) and various human biopsy specimens (muscle, liver) of patients with rare hereditary metabolic diseases have been collected, processed, stored and handled for many years. Until now, Croatia had no organized biobank that would meet common European standards and is currently in process of establishing the first non-profit tissue and cell biobank of patients with inborn errors of metabolism. The main goal is to optimize the establishment of cell cultures and ultimately implement and harmonize Standard Operating Procedures in accordance with the European Network of Biobanks (EuroBioBanks, EBB) and ISO 15189 standards. Materials and Methods Progenitor cells were isolated from skin and skeletal muscle biopsy specimens of patients with inborn errors of metabolism. After the establishment of primary and secondary cultures, the cells were frozen in liquid nitrogen. Dulbecco's modification of Eagle's medium supplemented with 20% of fetal bovine serum (FBS), 1% of L-glutamine and 1% of antibiotics was used in the cultivation of fibroblasts. Myoblasts, with a small number of fibroblasts, were cultured in a Skeletal Muscle Growth Medium, SGM (Promo Cell, Germany) supplemented with 5% of growth factors (epidermal growth factor, fibroblast growth factor and insulin). Into the medium 10% of FBS, 1.5% of glutamine and antibiotics were added. Purification of myoblasts from fibroblasts was performed using Magnetic-Activated Cell Sorting Technology (Miltenyi Biotec, Germany). IgG-microbeads coated in specific primary antibody NCAM/CD56 were used to label myoblasts and separate them from unlabelled cells. Purity of myoblasts obtained by immunomagnetic sorting was assessed using flow cytometer before the storage in liquid nitrogen. Results The number of established cell cultures (1002 human fibroblast cultures and 48 skeletal myoblast cultures) together with the number of human biopsy specimens (337) isolated from patients with rare hereditary diseases was entered in the first Croatian biobank database. The purity of myoblast cell cultures was nearly 90%. The entire process of collecting, processing, storage and handling of samples was performed in concordance with valid European standards. Conclusion The first step in establishment of Croatian tissue and cell biobank has been taken. Requirements for data networking and harmonization of Croatian biobank according to the EBB and ISO 15189 standards have been accomplished. Cell culture of human myoblasts opens up new possibilities in the field of research of adult stem cells.

Zeng, E. (2018). "Microplastics contamination in aquatic environments: an emerging matter of environmental urgency." Microplastics contamination in aquatic environments: an emerging matter of environmental urgency **424**.

This book comprehensively illustrates the traditional and advanced technologies on sampling, identification and quantification of microplastic from different environmental media. Contributors summarize and discuss recent research on microplastic and examine studies on nano-sized plastic particles. Chapters cover a full range of microplastic research, including global distribution, detection, environmental fate, biological effects and political legislation. Users will find the book to be a comprehensive overview of microplastic research that is ideal for research and understanding on the occurrence of microplastic in aquatic environments.

Zeng, H., et al. (2012). "Controllable construction of ordered three-dimensional microbeads structure and its application in enzyme-linked immunosorbent microarray." Sensors and Actuators B: Chemical **168**: 446-452.

In this paper, three-dimensional ordered microbeads structure (3 DOS) was controllably constructed, and was firstly adopted in the enzyme-linked immunosorbent assay (ELISA) for the detection of IgA. The 3 DOS analytical matrix greatly increased the reaction surface and improved the sensitivity of ELISA microassay. Briefly, the 3 DOS dot microarray for bio-analysis was dispensed by the ink-jet micro-device, and assembled in a close box with controlled relative humility (RH). The influence of supporting substrate material, concentration of microbeads suspension, and RH on the conformation of 3 DOS was also discussed in detail. Then the optimum conditions for the uniform and stable 3 DOS for microassay were achieved, and the uniform and stable 3 DOS microarray for the enzyme-linked immunosorbent assay (ELISA) was built up. Finally, the ELISA microassay on the 3 DOS microarray was done to detect IgA and

compared with the classic 96-well plate and blank PDMS surface. The results have shown that 15 times reaction time was shortened due to the decreasing of the mass transferring distance; Almost 10 times sensitivity was obtained owing to the increased reaction surface; the large dynamic range was achieved in the 3 DOS ELISA microarray.

Zeng, K., et al. (2019). "Allogeneic cord blood regulatory T cells can prevent graft Vs. Host disease and preserve graft vs leukemia effect: Update on phase I/II clinical trial." Blood. Conference: 61st Annual Meeting of the American Society of Hematology, ASH **134**(Supplement 1).

Previously, we presented the results of a phase I trial of using cord blood (CB) derived regulatory T cells (Tregs) at a dose of 1x10⁶ cells/kg in the prevention of graft vs. host disease (GVHD) in five patients undergoing allogeneic stem cell transplant (SCT). We now present an update of those patients and also the outcome of a single patient treated with CB Tregs at higher dose of 1x10⁷ cells/kg. At the last follow up of 3.5 years, 5 of 6 patients are alive, in complete remission, without GVHD and off immune-suppression (table 1). One patient died of head injury at day 45 posttransplant without GVHD. None of the patients relapsed in spite of having high risk disease including Flt3+ acute myeloid leukemia (AML) (pt#1); refractory mycosis fungoides/ sezary syndrome (pt#2); relapsed refractory multiple myeloma including two autologous SCT (pt#3); myeloid sarcoma (pt#4); AML with complex cytogenetics (pt#5). Specifically, the sixth patient (treated at CB Tregs cell dose of 1x10⁷ cells/kg) had a diagnosis of lymphoid blast crisis of chronic myelogenous leukemia (CML) and underwent allogeneic peripheral blood (PB) matched unrelated donor (MUD) SCT in second chronic phase with the conditioning regimen of fludarabine (40 mg/m2/d on day -5 to -2) and melphalan (140mg/m2 on day -2) and received CB Tregs at a dose of 1x10⁷ cells/kg on day -1. The CB Tregs were manufactured at the MD Anderson GMP facility. Tregs were isolated from 4 out of 6 HLA matched CB unit with a post-thaw total nucleated cell (TNC) count of 1295 x 10⁶ cells with 90% recovery. Enrichment of CD25+ Treg cells was accomplished with directly conjugated anti-CD25 magnetic microbeads and the LS column (Miltenyl) based selection. After selection, the total no. of isolated CB Tregs was 17.6 x 10⁶ cells. These cells were ex-vivo expanded in culture for a total of 14 days in the continued presence of CD3/28 microbeads and interleukin-2. On the day of harvest, a total of 1359 x 10⁶ Treg cells were generated with 96% viability. Based on patient's weight of 67 kg, a total of 67x10⁷ CB Treg cells were infused. The expanded CB Tregs were also evaluated for functionality by using an in vitro suppression assay, where the stimulated CD4+ Tcon cells stained with CellTrace Violet and Tregs were added into a 96-well plate at a 1:1 and 1:2 ratio and incubated for three days at 37oC. As shown in figure 1A, the clinically manufactured CB Tregs were functional and exerted 98% suppression of the proliferating Tcon cells. Subsequently, the patient received PB MUD graft on day 0. The graft had a TNC count of 1900 x10⁶ cells where the CD3+ T cells were at a dose of 400 x10⁶ cells/kg resulting in a Treg: Tcon ratio of 1:40, a significantly lower number of Tregs compared to other published clinical trials using Treg prophylaxis for GVHD. There was no infusion reaction related to the CB Treg infusion, the patient engrafted on day+12 with 100% donor chimerism on day +30. The patient did not develop any grade II-IV GVHD and was off immune suppression by +6 months. At the time of last follow up of 2 years and 4 months, the patient remains alive, in complete remission and without GVHD. We compared the inflammatory cytokine profile as well as GVHD biomarkers for pt #6 to the rest of the five patients who received the lower dose of CB Tregs at 1x10⁶ cells/kg (with up to 400 times Tcon cells in the graft), where 4 patients had developed acute GVHD. The inflammatory biomarkers of IL-6 (fig 1B) and IL-8 (fig 1C) for pt#6 were low to undetectable compared to the other patients. Similarly, the GVHD biomarkers of ST2 (fig 1D); MIG/ CXCL9 (fig 1E) and follistatin (fig 1F) were also low to undetectable in pt#6 compared to the rest. At the time of last follow up, all patients had resolved acute GVHD and were off-immune suppression and in complete remission. Based on these data, we conclude that CB Treg dose of 1x10⁷ cells/kg may be able to prevent GVHD without alleviati g the graft vs leukemia effect.

Zeng, M., et al. (2017). "Development of a fluorescent microbead-based immunoassay for the detection of porcine reproductive and respiratory syndrome virus IgG." Chinese Veterinary Science / Zhongguo Shouyi Kexue **47**(12): 1497-1502.

In order to establish a high-throughput, reproducible and highly specific method to detect swine reproductive and respiratory syndrome virus (PRRSV) antibodies, the purified non-structural protein 7 (Nsp7) recombinant protein was used as an antigen to establish a fluorescent microsphere-based immunoassay (FMIA). SDS-PAGE and Western-blot analysis showed that PRRSV Nsp7 recombinant was soluble and had good antigenicity. The intra-assay and inter-assay coefficient of variation of MFIA was 3.2% and 4.2%, respectively, and there were no cross-reactions with the positive sera of other swine diseases. When the concentration of mAb was as low as 1 ng/mL, the method still had high sensitivity. These results indicate that the FMIA is rapid, sensitive and specific for detecting antibodies against swine PRRSV.

Zennegg, M., et al. (2014). "Formation of PBDD/F from PBDE in electronic waste in recycling processes and under simulated extruding conditions." Chemosphere **116**: 34-39.

The increasing volumes of waste electrical and electronic equipment (WEEE) in Europe and developing economies demand for efficient disposal solutions. However, WEEE also contains toxic compounds and, therefore, there is a need for recycling technologies for WEEE that creates revenue without causing environmental harm. Among other fast developing economies, South Africa is tempting to make use of recycled plastic. Brominated flame retardants (BFRs) are additives used to protect plastic materials in electrical and electronic equipment (EEE) against ignition. Some BFRs are known persistent organic pollutants (POPs) and some BFRs can be transformed into highly toxic compounds such as polybrominated dibenzofurans and dioxins (PBDD/Fs). In this study, the contents of critical BFRs, i.e. polybrominated diphenyl ethers, and highly toxic PBDD/Fs were measured in WEEE material from Switzerland and South Africa. The formation of PBDD/Fs has been observed in two South African recycling processes and under controlled laboratory conditions. Total PBDE-contents in the South African and Swiss plastic waste varied between 1x10(3) and 7x10(6) mug kg(-1). A few WEEE plastic fractions exceeded the RoHS limit of 1x10(6) mug kg(-1) for PBDEs and thus they could not be used for recycling products without special treatment. The total content of PBDFs was around 1x10(3) mug kg(-1). Such contents in materials do not pose a risk for consumer under normal conditions. Workers at recycling plants might be at risk. The measured formation rates of PBDFs were between 2x10(-5) and 2x10(-4)PBDE(-1) min(-1).

Zerbato, J. and N. Sluis-Cremer (2013). "Development of a primary cell model of HIV-1 latency in naive CD4⁺ T-cells." Antiviral Therapy **1)**: A25.

BACKGROUND: HIV-1 DNA can be readily detected in naive CD4⁺ T-cells from ART-naive and -experienced HIV-infected individuals. In contrast, HIV-1 DNA was rarely detected in naive CD4⁺ T-cells from post-treatment controllers in the ANRS Visconti Study. Taken together, these studies suggest that naive CD4⁺ T-cells constitute a persistent reservoir of HIV-1 infection, and that reduction/elimination of this reservoir may be important to achieve a functional cure. In this regard, the goals of this study were: (i) to develop

a primary cell model of HIV-1 latency in naive CD4⁺ T-cells; and (ii) to compare the kinetics of virus reactivation in naive and central memory (T<inf>CM</inf>) CD4⁺ T-cells. METHOD(S): Total resting, naive and T<inf>CM</inf> CD4⁺ T-cells were isolated from uninfected donors. These cells were then treated with 100 nM CCL19 and infected with HIV-1<inf>LAI</inf>, as described previously. Infection was assessed by qPCR of total HIV-1 DNA and 2LTRs. T-cell activation was assessed by low analysis of CD69, CD25 and HLA-DR expression. Virus production was measured by quantification of viral RNA in the supernatant before and after exposure to 10 nM PMA+10 mg/ml PHA or anti-CD3/CD28 microbeads. RESULT(S): We found that CCL19-treated naive and T<inf>CM</inf> CD4⁺ T-cells were equally susceptible to HIV-1 infection. Neither CCL19 nor HIV-1 infection promoted T-cell activation. Following HIV-1 infection of the CCL19-treated cells we observed essentially no virus production. However, virus production could be stimulated by PMA/PHA or anti-CD3/CD28. Interestingly, robust virus production was observed as early as 3 days post-stimulation in the HIV-infected T<inf>CM</inf> CD4⁺ T-cells. In comparison, much less virus was produced from the HIV-infected naive CD4⁺ T-cells, and the kinetics of virus production was also much slower. Collectively, these data suggest that the two resting CD4⁺ T-cell subsets analysed here reactivate differently. CONCLUSION(S): We have developed a primary cell model of HIV-1 latency in naive CD4⁺ T-cells. This model can be used to determine whether the mechanisms responsible for the establishment and reversal of latency differ in naive versus memory CD4⁺ T-cells.

Zeri, C., et al. (2018). "Floating plastics in Adriatic waters (Mediterranean Sea): From the macro- to the micro-scale." Marine Pollution Bulletin **136**: 341.

Macro- and microplastics abundances were determined in the Adriatic Sea following the MSFD TG10 protocol. The studied areas included populated gulfs, river outlets and offshore waters in five Adriatic countries. The use of small ships enabled us to detect small sized plastics (2.5–5 cm) and record average macroplastics densities of 251 ± 601 items km−2, one order of magnitude higher than previously considered. Results from manta net tows for microplastics revealed an average abundance of 315,009 ± 568,578 items km−2 (217 ± 575 g km−2). We found significantly higher microplastics abundances in nearshore (≤4 km) than in offshore waters (>4 km) and this trend seems to affect also the small sized macro plastic fragments (2.5–5 cm). The dominant polymers were polyethylene and polypropylene while the presence of some rare polymers and waxes used in food and dentistry indicated waste water treatment plants as potential sources of microplastics.

Zerlaut, G. A. and A. M. Stake (1974). "Chemical aspects of plastic waste management, RECYCLING AND DISPOSAL OF SOLID WASTES: INDUSTRIAL, AGRICULTURAL, DOMESTIC (Yen, ed.)." Ann Arbor Sci.Publ.Inc: 175-184.

The role of polymers and plastics in the total municipal and industrial solid waste management picture is becoming increasingly important. Demands for broader ecological responsiveness are placing greater emphasis on the technical problems of plastic waste management. Recycling of plastics offers the possibility of new materials and useful products. The chemistry of plastic waste degradation is not unlike the polymerization chemistry of polymeric materials. In this paper, some of the chemical aspects of particular value to waste management are examined. The authors discuss classical degradation mechanisms, mixed waste plastics, and photodegradation. It is shown that the overall aspect of plastic waste management that is most promising is the fact that some aspects of the technology as well as most of the chemistry of plastic degradation and recycling are the same as the chemistry of plastic synthesis and fabrication. In order to make it readily available and useful, researchers will be required to adapt this chemical technology to specific aspects of plastic waste reuse, recycling, and disposal. The potential applications of this common technology are outlined. Utilization of the recycling technology should be justifiable if useful products and byproducts can be manufactured. In order to establish the specific procedures for economically sound recycling, it will be necessary to perform process development studies and market analyses.

Zevi, Y., et al. (2006). "Quantifying colloid retention in partially saturated porous media. (Special section: Colloid transport in subsurface environments.)." Water Resources Research **42**(12).
The transport of colloid-contaminant complexes and colloid-sized pathogens through soil to groundwater is of concern. Visualization and quantification of pore-scale colloid behaviour will enable better description and simulation of retention mechanisms at individual surfaces, in contrast to breakthrough curves which only provide an integrated signal. We tested two procedures for quantifying colloid movement and retention as observed in pore-scale image sequences. After initial testing with static images, three series of images of synthetic microbead suspensions passing through unsaturated sand were examined. The region procedure (implemented in ImageJ) and the Boolean procedure (implemented in KS400) yielded nearly identical results for initial test images and for total colloid-covered areas in three image series. Because of electronic noise resulting in pixel-level brightness fluctuations the Boolean procedure tended to underestimate attached colloid counts and conversely overestimate mobile colloid counts. The region procedure had a smaller overestimation error of attached colloids. Reliable quantification of colloid retention at pore scale can be used to improve current understanding on the transport mechanisms of colloids in unsaturated porous media. For example, attachment counts at individual air/water meniscus/solid interface were well described by Langmuir isotherms.

Zhai, J. P., et al. (2019). "[Establishment of Flow Cytometric Immunobead Array Assay for Quantitation of Platelet-Specific Antibodies and Its Application]." Zhongguo Shi Yan Xue Ye Xue Za Zhi **27**(6): 1955-1961.
OBJECTIVE: To establish a flow cytometric immunobead array assay (FCIA) to quantify platelet antibodies and to explore its application in the diagnosis and treatment of ITP.
METHODS: The guantitative standard curve was established by binding the human IgG of known concentration on antibody-coated microbeads; at the same time, the platelet-specific antigen and antibody complex was captured and levels of platelet antibodies were detected using the microbeads coated by 5 kinds of antibodies against platelets suca as GPIX (SZ1), GPIb (SZ2), GpIIIa (SZ21), GPIIb (SZ22) and p-selection (SZ51). The fluorescence signal detected by flow cytometry were transformed into the conentration of platelet antibodies in samples through the quantitative standard curve, thereby establishing the method for quantititive detection of platelet-specific antibodies in plasm samples (FCIA), moreover the property, efficiency and clinical application of establishod FCIA method were evaluated.
RESULTS: The FCIA could detect 5 kinds of antibodies against GPIX, GPIb, GpIIIa, GPIIb and beta-selection within a broad range of 33.29-1280 ng/ml, 45.17-1280 ng/ml, 42.07-1280 ng/ml, 46.40-1280 ng/ml, 42.48-1280 ng/ml and 42.48-1280 ng/ml respectively, and their recovery rates were 115.23%, 112.58%, 117.47%, 107.64% and 112.67% respectively. The intra-assay coefficient of variation (CV) for anti- GPIX, -GPIb, -GpIIIa, -GPIIb and p-selection antibodies was 3.54%, 3.63%, 4.66%, 6.43% and 6.67% respectively, and the inter-assay CV for above mentioned antibodies were 10.89%, 7.57%, 10.34%, 6.95% and 10.72% respectively. The detection showed that the levels of 5 kinds of platelet-specific antibodies in ITP group all were higher than those in non-ITP and healthy control groups ($P<0.01$). The sensitivity, specificity and accuracy of quantitatively

detecting 5 kinds of antibodies for diagnosis of ITP by FCIA were 68.29%, 84.98% and 78.95% respectively, while the sensitivity, specificity and accuracy of detecting 5 kinds of antibodies by modified indirect MAIPA were 41.46%, 90.41% and 72.81% respectively.

CONCLUSION: The established quantitative FCIA for detection of antibodies provides a powerful tool for diaghosis and evaluation of therapeutic efficacy and prognosis of ITP patients.

Zhan, H., et al. (2013). "First-in-man use of T cells engineered to express a HSVTKCD34 sort-suicide gene." Human Gene Therapy **24 (5)**: A10.

Introduction: Suicide gene modified donor T cells can treat leukaemic relapse and improve immune reconstitution after allogeneic haematopoietic stem cell transplantation (SCT), and can be safely eliminated in the event of graft versus host disease (GVHD). Here we report generation and first-in-man use of mismatched donor T cells modified with a MPSV gamma-retroviral vector engineered to express a splice site corrected herpes simplex thymidine kinase (HSVTK):truncated CD34 (tCD34) suicide gene/ selection marker in three children. Method(s): A stable PG13 packaging cell line was generated to produce Gibbon Ape Leukaemia Virus pseudotyped retroviral vector stocks. Both master cell bank and vector supernatant were characterised in detail. Donor peripheral blood lymphocytes were activated with anti-CD3/CD28 microbeads and interleukin-2, transduced and enriched to a high purity (92-97%) by anti-CD34 CliniMacs selection, and cryopreserved. Cells were administered in two escalating doses (5 x 10⁴/kg and 5 x 10⁵/kg) to three paediatric patients receiving T-depleted, CD34 stem cell enriched, mismatched allogeneic grafts. Result(s): All infusions were completed without acute toxicity or the development of acute GVHD. Circulating gene modified T cells were detectable by flow cytometry in all three subjects. There was resolution of Varicella zoster reactivation, Adenoviraemia and pandemic H1N1 influenza virus infections, concordant with donor derived antigen specific interferon-g T cell responses. In the longest surviving subject, gene modified cells persisted for over 12 months, albeit at low levels in peripheral blood. Conclusion(s): These findings demonstrate the feasibility of producing and administrating HSVTK-tCD34 suicide gene modified donor T cells under GMP compliant conditions.

Zhan, Y., et al. (2019). "Carbogen gas-challenge BOLD fMRI in assessment of liver hypoxia after portal microcapsules implantation." PLoS ONE [Electronic Resource] **14**(11): e0225665.

BACKGROUND: Hypoxia is one of the key factors affecting the survival of islet cells transplanted via the portal vein. Blood oxygen level dependent functional magnetic resonance imaging (BOLD-fMRI) is the only imaging technique that can detect the level of blood oxygen level in vivo. However, so far no study has indicated that BOLD-fMRI can be applied to monitor the liver oxygen level after islet transplantation.

OBJECTIVE: To evaluate the value of Carbogen-challenge BOLD MRI in assessing the level of hypoxia in liver tissue after portal microcapsules implanted.

METHODS: Fifty-one New Zealand rabbits were randomly divided into three experimental groups (15 in each group) were transplanted microencapsulated 1000 microbeads/kg (PV1 group), 3000 microbeads/kg (PV2 group), 5000 microbeads/kg (PV3 group), and 6 rabbits were injected with the same amount of saline as the control group, BOLD-fMRI was performed following carbogen breathing in each group after transplantation on 1d, 2d, 3d and 7d, T2* weighted image, R2* value and DELTAR2* value parameters for the liver tissue. Pathological examinations including liver gross pathology, H&E staining and pimonidazole immunohistochemistry were performed after BOLD-fMRI. The differences of pathological results among each group were compared. The DELTAR2* values and transplanted doses were analyzed.

RESULTS AND CONCLUSIONS: DELTAR2* values at the 1-3d and 7d after transplantation were significantly different in each groups (P<0.05). DELTAR2* values decreased gradually with the increase of transplanted dose, and was negatively correlated with transplant dose at 3d after transplantation (r = -0.929, P <0.001). Liver histopathological examination showed that the degree of hypoxia of liver tissue increased with the increase of transplanted doses, Carbogen-challenge BOLD-fMRI can assess the degree of liver hypoxia after portal microcapsules implanted, which provided a monitoring method for early intervention.

Zhan, Z., et al. (2016). "Sorption of 3,3',4,4'-tetrachlorobiphenyl by microplastics: A case study of polypropylene." Marine Pollution Bulletin **110**(1): 559-563.

Though plastics show good chemical inertness, they could sorb polychlorinated biphenyls (PCBs) and other toxic pollutants from the surrounding environment. Thus, ingestion of microplastics by marine organisms potentially enhances the transport and bioavailability of toxic chemicals. However, there is lack of studies on the sorption capacity, mechanism and factors affecting the sorption behavior. Here, sorption of PCBs by microplastics in the simulated seawater was studied using the batch oscillation equilibration technique, in which polypropylene (PP) and 3,3',4,4'-tetrachlorobiphenyl (PCB77) acted as model plastic and PCB, respectively. Factors including particle size, temperature and solution environment were investigated.

Zhang, B., et al. (2017). "Effects of crude antigen and excretory-secretory products of Clonorchis sinensis on T cells." Chinese Journal of Zoonoses **33**(6): 491-494.

We investigated the roles of the crude antigen (CA) of Clonorchis sinensis and excretory-secretory products (ESPs) in the polarization of Th1 and Th2 cells. Bone marrow-derived cells were generated from BALB/c mice and isolated into immature DCs; immature DCs were then treated with either CA (CA stimulated group), ESPs (ESPs stimulated group), LPS (positive control group) or PBS (negative control group) for 24 hours. Then the CD4⁺T cells were isolated from mouse spleen by using anti-mouse-CD4 Microbeads, and further cocultured with stimulated DCs for another 72 hours. The purities of DCs and CD4⁺ T cells were evaluated by flow cytometry and the expressing levels of T-bet mRNA and GATA-3 mRNA were detected by real-time PCR. ELISA was used to detect the levels of IFN- gamma and IL-4 cytokines in the supernatant. mRNA levels of T-bet and GATA-3 in the ESPs group were higher than those in PBS-stimulated group (P<0.05). The concentrations of IFN- gamma and IL-4 cytokines in the culture were increased in the ESPs group, compared with PBS stimulated group (P<0.05). IFN- gamma but not IL-4 was increased in CA group (P<0.05). The results implied that CA might play a role in Th1 type immune response, and ESPs likely play roles in both Th1 and Th2 immune responses.

Zhang, C., et al. (2017). "Toxic effects of microplastic on marine microalgae Skeletonema costatum: Interactions between microplastic and algae." Environmental Pollution **220**(Pt B): 1282-1288.

To investigate toxic effects of microplastic on marine microalgae Skeletonema costatum, both algal growth inhibition test and non-contact shading test were carried out, and algal photosynthesis parameters were also determined. The SEM images were used to observe interactions between microplastic and algae. It was found that microplastic (mPVC, average diameter 1 mum) had obvious inhibition on growth of microalgae and the maximum growth inhibition ratio (IR) reached up to 39.7% after 96 h exposure. However, plastic debris (bPVC, average diameter 1 mm) had no effects on growth of microalgae. High concentration (50 mg/L) mPVC also had negative effects on algal photosynthesis since both chlorophyll content and photosynthetic efficiency (PHIPSII) decreased under mPVC treatments. Shading effect was not one reason for toxicity of microplastic on algae in this study. Compared with non-contact shading effect, interactions between microplastic and microalage such as adsorption and aggregation were more reasonable explanations for toxic effects of microplastic on marine microalgae. The SEM images provided a more direct and reasonable method to observe the behaviors of microplastic.

Zhang, C., et al. (2019). "Transgenerational Proteome Plasticity in Resilience of a Marine Copepod in Response to Environmentally Relevant Concentrations of Microplastics." Environmental Science & Technology **53**(14): 8426.

Here, we examined the multigenerational effect of microplastics (6-µm polystyrene beads; with different environmentally relevant concentrations of 0.023 and 0.23 mg/L in seawater) on the marine copepod Tigriopus japonicus under two-generation exposure (F0–F1) followed by one-generation recovery (F2) in clean seawater. Also, the seven life-history traits (survival, sex ratio, developmental time of nauplius phase, developmental time to maturation, number of clutches, number of nauplii/clutch, and fecundity) were measured for each generation. Furthermore, to investigate within-generation proteomic response and transgenerational proteome plasticity, proteome profiling was conducted for the F1 and F2 copepods under the control and 0.23 mg/L microplastics treatment. The results showed successful ingestion of microplastics in F0–F1 under both exposure concentrations, while higher concentration (0.23 mg/L) of microplastics resulted in the significant reduction in survival rate, number of nauplii/clutch, and fecundity. However, the affected traits were totally restored in the recovery generation (F2). Proteomic analysis demonstrated that microplastics exposure increased several cellular biosynthesis processes and, in turn, reduced energy storage due to the trade-off, hence compromising survival and reproduction of the treated copepods in F1. Interestingly, the two-generational effect of microplastics in copepods had significant transgenerational proteome plasticity as demonstrated by increased energy metabolism and stress-related defense pathway, which accounts for regaining of the compromised phenotypic traits during recovery (i.e., F2). Overall, this study provides a molecular understanding on the effect of microplastics at a translational level under long-term multigenerational exposure in marine copepods, and also the transgenerational proteome plasticity is likely rendering the robustness of copepods in response to microplastics pollution.

Zhang, C., et al. (2011). "Terminal field specificity of forebrain efferent axons to the pontine parabrachial nucleus and medullary reticular formation." Brain Research **1368**: 108-118.

The pontine parabrachial nucleus (PBN) and medullary reticular formation (RF) are hindbrain regions that, respectively, process sensory input and coordinate motor output related to ingestive behavior. Neural processing in each hindbrain site is subject to modulation originating from several forebrain structures including the insular gustatory cortex (IC), bed nucleus of the stria terminalis (BNST), central nucleus of the amygdala (CeA), and lateral hypothalamus (LH). The present study combined electrophysiology and retrograde tracing techniques to determine the extent of overlap between neurons within the IC, BNST, CeA and LH that target both the PBN and RF. One fluorescent retrograde tracer, red (RFB) or green (GFB) latex microbeads, was injected into the gustatory PBN under electrophysiological guidance and a different retrograde tracer, GFB or fluorogold (FG), into the ipsilateral RF using the location of gustatory NST as a point of reference. Brain tissue containing each forebrain region was sectioned, scanned using a confocal microscope, and scored for the number of single and double labeled neurons. Neurons innervating the RF only, the PBN only, or both the medullary RF and PBN were observed, largely intermingled, in each forebrain region. The CeA contained the largest number of cells retrogradely labeled after tracer injection into either hindbrain region. For each forebrain area

except the IC, the origin of descending input to the RF and PBN was almost entirely ipsilateral. Axons from a small percentage of hindbrain projecting forebrain neurons targeted both the PBN and RF. Target specific and non-specific inputs from a variety of forebrain nuclei to the hindbrain likely reflect functional specialization in the control of ingestive behaviors. © 2010 Elsevier B.V. All rights reserved.

Zhang, C., et al. (2019). "Microplastics in offshore sediment in the Yellow Sea and East China Sea, China." Environmental Pollution **244**: 827-833.

Microplastic particles are a global concern due to their widespread and growing threat to marine and coastal environments. To improve knowledge of microplastic pollution in China, we investigated 25 sediment samples collected with a box corer in the Southern Yellow Sea and East China Sea off the coast of China. The microplastics were extracted from sediments via density separation, after which they were observed under a microscope and characterized according to shape, color, and size, while polymer type identification was performed using micro-Fourier transform infrared spectroscopy. The abundance of microplastics in the offshore region of the Southern Yellow Sea and East China Sea was mapped. The mean concentration of microplastics at the 25 sites was 13.4+/-0.6 particles 100g⁻¹ dry weight (range: 6.0-24.0 particles 100g⁻¹ dry weight). Based on the categorization according to shape, color, and size, fiber (77%) was the most abundant shape, while blue (35%) and transparent (29%) were the most prevalent colors. In addition, the dominant size of microplastics was smaller than 1000mum which accounted for 89%. Finally, polyethylene, polyethylene terephthalate, acrylic, polyester, cellulose, and cellophane were the most abundant types of microplastics identified. Our result highlighted the presence of microplastics in offshore sediments from the Yellow Sea and East China Sea, and provided useful information for evaluating the environmental risks posed by microplastics in China.

Zhang, C. Y. and L. W. Johnson (2008). "Simple and accurate quantification of quantum dots via single-particle counting." Journal of the American Chemical Society **130**(12): 3750-3751.

Quantification of quantum dots (QDs) is essential to the quality control of QD synthesis, development of QD-based LEDs and lasers, functionalizing of QDs with biomolecules, and engineering of QDs for biological applications. However, simple and accurate quantification of QD concentration in a variety of buffer solutions and in complex mixtures still remains a critical technological challenge. Here, we introduce a new methodology for quantification of QDs via single-particle counting, which is conceptually different from established UV-vis absorption and fluorescence spectrum techniques where large amounts of purified QDs are needed and specific absorption coefficient or quantum yield values are necessary for measurements. We demonstrate that single-particle counting allows us to nondiscriminately quantify different kinds of QDs by their distinct fluorescence burst counts in a variety of buffer solutions regardless of their composition, structure, and surface modifications, and without the necessity of absorption coefficient and quantum yield values. This single-particle counting can also unambiguously quantify individual QDs in a complex mixture, which is practically impossible for both UV-vis absorption and fluorescence spectrum measurements. Importantly, the application of this single-particle counting is not just limited to QDs but also can be extended to fluorescent microspheres, quantum dot-based microbeads, and fluorescent nano rods, some of which currently lack efficient quantification methods.

Zhang, D., et al. (2020). "Microplastic pollution in water, sediment, and fish from artificial reefs around the Ma'an Archipelago, Shengsi, China." Science of the Total Environment **703**: 134768.

In this study, the occurrence and distribution of microplastics in artificial reefs around the Ma'an Archipelago, a national marine ranching area in China, were investigated. The abundance of microplastics ranged from 0.2+/-0.1 to 0.6+/-0.2itemsL⁻¹ in surface water, 30.0+/-0.0 to 80.0+/-14.1itemskg⁻¹ dry weight in the sediment, and 2.3+/-1.5 to 7.3+/-3.5 items individual⁻¹ in fish. Most of the detected microplastics were fiber-shaped, blue or transparent, and smaller than 1mm. Polyethylene, polypropylene, and poly(ethylene:propylene:diene) copolymer were the most abundant polymer types in the surface water samples, whereas cellophane was dominant in the sediment and fish. The appearance of microplastic pollution around the artificial reefs could be attributed mainly to the activities of the fisheries in the area, whereas the microplastic ingestion by fish was affected by the extent of microplastic contamination of the sediment. The results highlight the widespread presence of microplastics in the water, sediment, and biota of the artificial reefs around the Ma'an Archipelago, thereby improving understanding of the environmental risks posed by microplastics to marine artificial reef ecosystems and fisheries in general.

Zhang, F., et al. (2019). "Direct and indirect effects of microplastics on bivalves, with a focus on edible species: A mini-review." Critical Reviews in Environmental Science and Technology.

Bivalves play important roles in the ecosystem. However, bivalve populations have suffered a global decline in recent decades. This decline has caused public concern, because bivalves provide ecosystem services and are important sources of protein and ornaments (such as pearls) that support the fishing industry in coastal zones worldwide. Microplastics are an emerging global threat for bivalves and have been commonly detected in commercial edible bivalves, including mussels, oysters and clams. To comprehensively understand impacts of microplastics on bivalves, the potential exposure pathways by which microplastics affect bivalves are reviewed. The existing scientific evidence indicates that microplastics not only directly affect the physiology of bivalves, but also indirectly affect them by changing the structure of their sedimentary habitats, impairing their food resources and delivering persistent organic pollutants. In addition, the consumption of contaminated bivalves is a main pathway of exposure to microplastics by humans, which raises potential human health concerns. An evaluation of the hazards associated with the consumption of bivalves that contain microplastics and associated toxic chemicals is urgently needed. More studies related to the effects of microplastic fibers on bivalves should be conducted, because microplastic fibers comprise the largest proportion of microplastics in the environment and bivalves. (Figure presented.). Copyright © 2019, © 2019 Taylor & Francis Group, LLC.

Zhang, F., et al. (2019). "Food-web transfer of microplastics between wild caught fish and crustaceans in East China Sea." Marine Pollution Bulletin **146**: 173.

Plastic pollution, including microplastics (MPs), poses a global threat to environmental and human health. Studies on the transference of MPs along marine food webs are limited. In the present study, we investigated MP pollution in 11 wild fish species (193 individuals) and 8 wild crustacean species (136 individuals) captured from the Zhoushan fishing ground, off the East China Sea. The average abundance of MPs found in two main tissues, the gill and gastrointestinal (GI) tract, were 0.77 ± 1.25 and 0.52 ± 0.90 items/individual, respectively. The MPs we found were predominantly fiber-shaped, blue, and composed of polyester polymers. Our results suggest that MP pollution is ubiquitous in the East China Sea. We suggest that MPs are likely aggregated in the higher trophic level fish species throughout the marine food web. Furthermore, we suggest that marine organisms which occupy higher trophic levels might be suitable MP indicator species.

Zhang, F., et al. (2019). "Aquatic toxicity of iron-oxide-doped microplastics to Chlorella pyrenoidosa and Daphnia magna." Environmental Pollution: 113451.

Novel metal-oxide-doped microplastic particles (MMPs) have become emerging particulate plastics. The toxicity of MMPs in the aquatic environment remains unknown yet. In this study, toxicological effects of a representative MMP (iron-oxide core) with the nominal diameter of 1mum and two different surface functional groups, amine-modified (MPS (Fe)-NH₂) and carboxyl-modified (MPS (Fe)-COOH) polystyrene, were investigated by toxicity testing using Chlorella pyrenoidosa and Daphnia magna. The aquatic toxicity of two microplastic particles (MPS-NH₂ and MPS-COOH) with the same particle size and surface modification in the absence of iron-oxide core was also observed and compared.

Zhang, G. S. and Y. F. Liu (2018). "The distribution of microplastics in soil aggregate fractions in southwestern China." Science of the Total Environment **642**: 12-20.

Plastic particle accumulation in arable soils is a growing contaminant of concern with unknown consequences for soil productivity and quality. This study aimed to investigate abundance and distribution of plastic particles among soil aggregate fractions in four cropped areas and an established riparian forest buffer zone at Dian Lake, southwestern China. Plastic particles (10-0.05mm) from fifty soil samples were extracted and then sorted by size, counted, and categorized. Plastic particles were found in all soil samples. The concentration of plastic particles ranges from 7100 to 42,960 particles kg⁻¹ (mean 18,760 particles kg⁻¹). 95% of the sampled plastic particles are in the microplastic size (1-0.05mm) range. The predominant form is plastic fibers, making up on average 92% of each sample followed by fragments and films that contributed with to 8%.

Zhang, G. S. and F. X. Zhang (2019). "Variations in aggregate-associated organic carbon and polyester microfibers resulting from polyester microfibers addition in a clayey soil." Environmental Pollution: 113716.

Organic carbon is an essential element for sustainable soil management. While the effects of microplastics on soil physical and biological properties are presenting, it remains unclear whether the organic carbon dynamics of soil are altered by increased microplastic accumulation. The objectives of this study were to evaluate the influences of different polyester microfiber (PMF 0, 0.1% and 0.3% of soil dry weight) and organic material (OM 0, 1%, 2% and 3% of soil dry weight) addition levels on soil organic carbon and to determine the PMF distribution in aggregates from a pot experiment. After 75 days of incubation under 6 wet-dry cycles, the concentrations of soil total organic carbon did not differ significantly between the PMF (9.7 +/- 6.6 g kg⁻¹) and control (9.7 +/- 6.9 g kg⁻¹) treatments. However, PMF addition significantly reduced the organic carbon concentration in the large (>2 mm) macro-aggregates compared to the control treatment (10.6 +/- 4.8 g kg⁻¹ vs. 11.7 +/- 4.4 g kg⁻¹), but the results were opposite in the small (2-0.25 mm)macro-aggregates (10.2 +/- 4.9 g kg⁻¹ vs. 8.4 +/- 3.8 g kg⁻¹). In this study, less than 30% of added PMFs were incorporated into soil aggregates. In addition, the abundance and average length of aggregate-associated PMF in the large (2210 +/- 180 particles per g aggregate and 2.08 +/- 0.17 mm) and small (1820 +/- 150 particles per g aggregate and 1.68 +/- 0.11 mm) macro-aggregates were significantly greater than those in the micro-aggregates (1010 +/- 70 particles per g aggregate and 0.72 +/- 0.05 mm). Our results demonstrate that the distribution of organic carbon in soil macro-aggregates is affected by PMFs addition. Thus, we propose that the behavior of microplastics inside soil aggregates should be further explored to clarify their effects on the physical protection of soil organic carbon.

Zhang, G. S., et al. (2019). "Effects of polyester microfibers on soil physical properties: Perception from a field and a pot experiment." Science of the Total Environment **670**: 1-7.

Understanding soil physical properties is essential for soil quality management and sustainable land use. With the growing accumulation of microplastics in soils, a better understanding of the impact of microplastics on soil physical properties is crucial to conserve and manage soil quality. This study explored the effects of polyester microfiber (PMF) concentrations (0, 0.1% and 0.3%) on bulk density, porosity, aggregation and hydraulic conductivity of a clayey soil from a field experiment (1year) and a pot experiment (6 wet-dry cycles). Polyester microfibers significantly increased the volume of >30mum pores and reduced the volume of <30mum pores compared to the control treatment. However, there were no detectable changes in the soil bulk density and saturated hydraulic conductivity between the PMF treatments and the control treatment. Interestingly, we observed that polyester microfibers significantly increased the contents of water stable large macroaggregates (>2mm) in the 0.3% PMF (44%) and 0.1% PMF (39%) treatments compared to the control treatment (31%) in the pot experiment, but this was not true in the field experiment. The efficient interaction between polyester microfibers and fine soil particles and the frequent wet-dry cycles enhanced the formation and stability of macro-aggregates induced by polyester microfibers in the pot experiment. Overall, our results provide valuable evidence for microplastic influences on soil physical properties. Because microplastics are long-term anthropogenic contaminants, it is necessary to further study the impacts of microplastics on soil quality for terrestrial ecosystem sustainability.

Zhang, H., et al. (2013). "Microfluidic bead-based multienzyme-nanoparticle amplification for detection of circulating tumor cells in the blood using quantum dots labels." Analytica Chimica Acta **779**: 64-71.

This study reports the development of a microfluidic bead-based nucleic acid sensor for sensitive detection of circulating tumor cells in blood samples using multienzyme-nanoparticle amplification and quantum dot labels. In this method, the microbeads functionalized with the capture probes and modified electron rich proteins were arrayed within a microfluidic channel as sensing elements, and the gold nanoparticles (AuNPs) functionalized with the horseradish peroxidases (HRP) and DNA probes were used as labels. Hence, two signal amplification approaches are integrated for enhancing the detection sensitivity of circulating tumor cells. First, the large surface area of Au nanoparticle carrier allows several binding events of HRP on each nanosphere. Second, enhanced mass transport capability inherent from microfluidics leads to higher capture efficiency of targets because continuous flow within micro-channel delivers fresh analyte solution to the reaction site which maintains a high concentration gradient differential to enhance mass transport. Based on the dual signal amplification strategy, the developed microfluidic bead-based nucleic acid sensor could discriminate as low as 5 fM (signal-to-noise (S/N)3) of synthesized carcinoembryonic antigen (CEA) gene fragments and showed a 1000-fold increase in detection limit compared to the off-chip test. In addition, using spiked colorectal cancer cell lines (HT29) in the blood as a model system, the detection limit of this chip-based approach was found to be as low as 1 HT29 in 1 mL blood sample. This microfluidic bead-based nucleic acid sensor is a promising platform for disease-related nucleic acid molecules at the lowest level at their earliest incidence.

Zhang, H., et al. (2012). "Microfluidic bead-based enzymatic primer extension for single-nucleotide discrimination using quantum dots as labels." Analytical Biochemistry **426**(1): 30-39.

This study reports the development of an on-chip enzyme-mediated primer extension process based on a microfluidic device with microbeads array for single-nucleotide discrimination using quantum dots as labels. The functionalized microbeads were independently introduced into the arrayed chambers using the loading chip slab. A single channel was used to generate weir structures to confine the microbeads and make the beads array accessible by microfluidics. The applied allele-specific primer extension method employed a nucleotide-degrading enzyme (apyrase) to achieve specific single-nucleotide detection. Based on the apyrase-mediated allele-specific primer extension with quantum dots as labels, on-chip single-nucleotide discrimination was demonstrated with high discrimination specificity and sensitivity (0.5 pM, signal/noise > 3) using synthesized target DNA. The chip-based signal enhancement for single-nucleotide discrimination resulted in 200 times higher sensitivity than that of an off-chip test. This microfluidic device successfully achieved simultaneous detection of two disease-associated single-nucleotide polymorphism sites using polymerase chain reaction products as target. This apyrase-mediated microfluidic primer extension approach combines the rapid binding kinetics of homogeneous assays of suspended microbeads array, the liquid handling capability of microfluidics, and the fluorescence detection sensitivity of quantum dots to provide a platform for single-base analysis with small reagent consumption, short assay time, and parallel detection.

Zhang, H., et al. (2013). "Microfluidic beads-based immunosensor for sensitive detection of cancer biomarker proteins using multienzyme-nanoparticle amplification and quantum dots labels." Biosensors & Bioelectronics **42**: 23-30.

This study reports the development of a microfluidic beads-based immunosensor for sensitive detection of cancer biomarker alpha-fetoprotein (AFP) that uses multienzyme-nanoparticle amplification and quantum dots labels. This method utilizes microbeads functionalized with the capture antibodies (Ab1) and modified electron rich proteins as sensing platform that was fabricated within a microfluidic channel, and uses gold nanoparticles (AuNPs) functionalized with the horseradish peroxidase (HRP) and the detection antibodies (Ab2) as label. Greatly enhanced sensitivity for the cancer biomarker is based on a dual signal amplification strategy: first, the large surface area of Au nanoparticle carrier allows several binding events of HRP on each nanosphere. Enhanced sensitivity was achieved by introducing the multi-HRP-antibody functionalized AuNPs onto the surface of microbeads through "sandwich" immunoreactions and subsequently multiple biotin moieties could be deposited onto the surface of beads resulted from the oxidation of biotin-tyramine by hydrogen peroxide. Streptavidin-labeled quantum dots were then allowed to bind to the deposited biotin moieties and displayed the signal. Secondly, enhanced mass transport capability inherent from microfluidics leads to higher capture efficiency of targets because continuous flow within micro-channel delivers fresh analyte solution to the reaction site which maintains a high concentration gradient differential to enhance mass transport. Based on the dual signal amplification strategy, the developed microfluidic bead-based immunosensor could discriminate as low as 0.2 pg mL-1 AFP in 10 muL of undiluted calf serum (0.2 fg/chip), and showed a 500-fold increase in detection limit compared to the off-chip test and 50-fold increase in detection limit compared to microfluidic beads-based immunoassay using single label HRP-Ab2. The immunosensor showed acceptable repeatability and reproducibility. This microfluidic beads-based immunosensor is a promising platform for disease-related biomolecules at the lowest level at their earliest incidence.

Zhang, H., et al. (2011). "Multienzyme-nanoparticles amplification for sensitive virus genotyping in microfluidic microbeads array using Au nanoparticle probes and quantum dots as labels." Biosensors & Bioelectronics **29**(1): 89-96.

A novel microfluidic device with microbeads array was developed and sensitive genotyping of human papillomavirus was demonstrated using a multiple-enzyme labeled oligonucleotide-Au nanoparticle bioconjugate as the detection tool. This method utilizes microbeads as sensing platform that was functionalized with the capture probes and modified electron rich proteins, and uses the horseradish peroxidase (HRP)-functionalized gold nanoparticles as label with a secondary DNA probe. The functionalized microbeads were independently introduced into the arrayed chambers using the loading chip slab. A single channel was used to generate weir structures to confine the microbeads and make the beads array accessible by microfluidics. Through "sandwich" hybridization, the enzyme-functionalized Au nanoparticles labels were brought close to the surface of microbeads. The oxidation of biotin-tyramine by hydrogen peroxide resulted in the deposition of multiple biotin moieties onto the surface of beads. This deposition is markedly increased in the presence of immobilized electron rich proteins. Streptavidin-labeled quantum dots were then allowed to bind to the deposited biotin moieties and displayed the signal. Enhanced detection sensitivity was achieved where the large surface area of Au nanoparticle carriers increased the amount HRP bound per sandwiched hybridization. The on-chip genotyping method could discriminate as low as 1fmol/L (10zmol/chip, SNR>3) synthesized HPV oligonucleotides DNA. The chip-based signal enhancement of the amplified assay resulted in 1000 times higher sensitivity than that of off-chip test. In addition, this on-chip format could discriminate and genotype 10copies/muL HPV genomic DNA using the PCR products. These results demonstrated that this on-chip approach can achieve highly sensitive detection and genotyping of target DNA and can be further developed for detection of disease-related biomolecules at the lowest level at their earliest incidence.

Zhang, H., et al. (2019). "A review of the potential utilisation of plastic waste as adsorbent for removal of hazardous priority contaminants from aqueous environments." Environmental Pollution: 113698.
There is growing global awareness of the presence and negative impacts of waste plastic in the marine environment. Risks to wildlife include ingestion and entanglement for macro-plastic (larger than 5 mm in length), alongside food chain transfer for micro-plastics (less than 5 mm in length). Plastics in the marine environment have also been shown to adsorb and accumulate contaminants from seawater, e.g., heavy metals and hydrophobic organic compounds. This means that plastics can additionally act as vectors for transport of contaminants, permitting ecotoxicological risks to be spatially extended. However, the ability of waste plastic to adsorb pollutants also offers potential opportunity, if they can be used for the decontamination of wastewater. Here, we provide an overview of marine plastic types and distribution, and then systematically assess their potential to be repurposed as novel adsorbents. Data published in recent years are interrogated to gain an overview of the interaction mechanisms between marine plastics and both organic and inorganic contaminants. In addition, factors that may be exploited to enhance their performance in removal of contaminants are also reviewed and prioritised, e.g., surface modification and activation. This paper highlights the novel potential of repurposing plastic waste for wastewater treatment applications and seeks to identify key knowledge gaps and future research priorities for scientists and engineers.

Zhang, H., et al. (2018). "Enhanced adsorption of oxytetracycline to weathered microplastic polystyrene: Kinetics, isotherms and influencing factors." Environmental Pollution **243**(Pt B): 1550-1557.
Microplastic polystyrene foam has been found widely in the environment and is readily transported by wind or water. Beached and virgin foams of size 0.45-1mm were prepared as sorbents to study oxytetracycline sorption. Enhanced adsorption were found in the beached foams compared to the virgin foams, corresponding to the higher specific surface area,

micropore area and the degree of oxidation of the former. The Freundlich K_f value was 894+/-84 ((mg kg⁻¹) (mg L⁻¹)^{1/n}) for oxytetracycline adsorption on the beached foams, approximately twice as high as on the virgin foams. Effects of solution pH on adsorption to the beached foams were more pronounced to the virgin foams. Maximum adsorption occurred at pH 5at which electrostatic repulsion between the microplastic surface and the oxytetracycline zwitterion was minimal, indicating that electrostatic interaction may have regulated adsorption. Moreover, H-bonding and multivalent cationic bridging mechanisms may also have affected the adsorption of oxytetracycline to the beached foams as reflected by the ionic effects. Adsorption was promoted more in the presence of humic acid than of fulvic acid, perhaps owing to pi-pi conjugation between the humic acid and the microplastic surface which led to enhanced electrostatic attraction for oxytetracycline. This study suggests that weathered polystyrene foams may act as carriers of antibiotics in the environment and their potential risks to ecosystem and human health merit further investigation.

Zhang, H., et al. (2010). "A microfluidic device with microbead array for sensitive virus detection and genotyping using quantum dots as fluorescence labels." Biosensors & Bioelectronics **25**(11): 2402-2407.
In this study, a novel microfluidic device with microbead array was developed and sensitive genotyping of HBV was demonstrated using quantum dot as labels. This device was assembled by using two PDMS slabs featured with different microstructures and channel depths for the construction of a functional region comprising a chamber array and a single sampling microchannel. Since the chamber array and its sampling channel are of different channel depths and are bonded face-to-face, weir structures are generated to confine the microbeads which could be addressed using the microfluidic channel. Highly sensitive virus DNA detection was achieved by the enhanced mass transport in the microfluidics and the rapid reaction dynamics of suspension microbead array. The device could detect 1000 copies/mL of HBV virus in clinical serum samples using in vitro transcribed RNA as the target molecules. Based on DNA hybridization with quantum dots labels, on-chip virus genotyping was also demonstrated with high discrimination specificity and sensitivity (4 pM, S/N >3) using synthesized HBV DNA probes. This microfluidic device combines the rapid binding kinetics of homogeneous assays of microbead array, the liquid handling capability of microfluidics, and the fluorescence detection sensitivity of quantum dots to provide a platform for high sensitivity virus DNA analysis with small reagent consumption, short assay time and parallel detection.

Zhang, H., et al. (2018). "Occurrences of organophosphorus esters and phthalates in the microplastics from the coastal beaches in north China." Science of the Total Environment **616-617**: 1505-1512.
Chemical pollution in the microplastics has been concerned worldwide as pollutants might potentially transfer from the environment to living organisms via plastics. Here, we investigate organophosphorus esters (OPEs) and phthalic acid esters (PAEs) in the beached microplastics collected from 28 coastal beaches of the Bohai and Yellow Sea in north China. The analyzed microplastics included polyethylene (PE) pellets and fragments, polypropylene (PP) flakes and fragments and polystyrene (PS) foams. The tris-(2-chloroethyl)-phosphate (TCEP), tris (1-chloro-2-propyl) phosphate (TCPP) and di-(2-ethylhexyl) phthalate (DEHP) were the three predominant compounds found overall. The maximum SIGMA4 OPEs concentration was 84,595.9ngg⁻¹, almost three orders of magnitude higher than the maximum SIGMA9 PAEs concentration. The PP flakes and PS foams contained the highest concentrations of the additives in contrast to the PE pellets which contained the lowest. The high concentration level of carcinogenic chlorinated OPEs and DEHP with endocrine disrupting effects implied the

suggested potential hazards to coastal organisms. Spatial differences and compositional variation of the additives among the different microplastics suggests different origins and residence times in the coastal environment. This indicates that the characteristics of chemical additives might be a useful approach when tracing sources of microplastics in the environment.

Zhang, J., et al. (2018). "Selection and evaluation of microorganisms for biodegradation of agricultural plastic film." 3 Biotech **8**(7): 308.

Three Bacillus amyloliquefaciens isolates (HK1, GSDM02, and GSDM15) were tested for effectiveness in biodegradation of plastic films. Isolates were screened by plate on carbon-free medium and by using the clear-zone formation test. Their biodegradation ability was analyzed based on: film weight reduction, pH change of the fluid medium, a soil microbial biomass carbon test, scanning electron microscopy (SEM), and Fourier transform infrared spectrometry (FTIR). Polyvinyl alcohol (PVA) clear-zone and film weight reduction results revealed that the strain with a bigger clear-zone had a better biodegradation effect, that PVA can be evenly distributed in the medium, and that PVA can be a substitution for polyethylene in screening the biodegradation of strains. SEM and FTIR revealed that HK1 can tear the film apart and make surface chemical changes within 30 days. HK1 exhibited a better biodegradation effect in all tests, indicating its potential for helping solve the plastic pollution problems.

Zhang, J., et al. (2017). "A generic label-free microfluidic microobject sorter using a magnetic elastic diverter." Biomedical Microdevices **19**(2): 43.

Cell sorters play important roles in biological and medical applications, such as cellular behavior study and disease diagnosis and therapy. This work presents a label-free microfluidic sorter that has a downstream-pointing magnetic elastic diverter. Different with most existing magnetic sorters, the proposed device does not require the target microobjects to be intrinsically magnetic or coated with magnetic particles, giving users more flexibility in sorting criteria. The diverter is wirelessly deformed by an applied magnetic field, and its deformation induces a fluid vortex that sorts incoming microobjects, e.g., cells, to the collection outlet. The diverter does not touch samples in this process, reducing the sample contamination and damage risks. This sorter uses a magnetic field generated by off-chip electromagnetic coils that are centimeters away from the device. With simple structure and no on-chip circuits or coils, this device can be integrated with other lab-on-a-chip instruments in a sealed chip, ameliorating the safety concerns in handling hazardous samples. The parallel and independent control of two such diverters on a single chip were demonstrated, showing the potential of doubling the overall throughput or forming a two-stage cascaded sorter. The sorter was modeled based on the Euler-Bernoulli beam theory and its reliability was demonstrated by achieving a raw success rate of 96.68% in sorting 1506 registered microbeads. With a simple structure, the sorter is easy and cheap to fabricate. The advantages of the proposed sorter make it a promising multi-purpose sorting tool in both academic and industrial applications.

Zhang, J., et al. (2018). "Identification and quantification of microplastics in table sea salts using micro-NIR imaging methods." Analytical Methods **10**(24): 2881-2887.

Microplastics have been one of the most serious environmental pollutants of concern over recent decades. These pollutants have been detected not only in the marine biota, but also in abiotic sea products such as sea salts, which might pose a threat to food safety. Although efficient methods for the analysis of microplastics in different matrices have been published, in many cases, part of the quantification protocol relies on counting by eye, which is inefficient and time consuming. In this study, a new method for the analysis of polyethylene terephthalate

(PET) microplastics in table sea salts was developed. After hydrogen peroxide (H₂O₂) pretreatment and filtration, the PET particles in vacuum-filtered retentates of table sea salts were imaged by micro-FT-NIR imaging and identified using spectral similarity methods including correlation coefficient mapping (CCM), spectral angle mapping (SAM) and Euclidean distance mapping (EDM) methods. The number of particles was acquired by a computer based automatic counting method. The results showed that, in most cases, the number of microplastics obtained by the automatic counting method was equal to that obtained by the counting by eye method, which proved that micro-NIR chemical imaging combined with chemometric methods can be an alternative way to identify and count the microplastics simultaneously. This method for detecting and quantifying PET microplastics in table sea salts could also be applied to other types of polymers in other environmental sample detection.

Zhang, J., et al. (2019). "Polyethylene Terephthalate and Polycarbonate Microplastics in Pet Food and Feces from the United States." Environmental Science & Technology **53**(20): 12035-12042.

Human exposure to microplastics has been a topic of interest, but measurements of exposure are limited. Pet animals are sentinels of human exposure, as they share a common living environment with humans. In this study, 58 pet (cat and dog) foods and 78 pet feces samples were collected from Albany, NY, USA, for the analysis of polyethylene terephthalate (PET) and polycarbonate (PC) by alkali-assisted thermal depolymerization and liquid chromatography-tandem mass spectrometry (HPLC-MS/MS) methods. PET was detected at concentrations in the range of <1,500 ng/g to 12,000 ng/g (median: <1,500 ng/g) and <1,500 to 4,600 ng/g (median: <1,500 ng/g) in cat and dog foods, respectively. The concentrations of PET in cat (<2,300-340,000 ng/g, median: 61,000 ng/g) and dog (7700-190,000 ng/g, median: 30,000 ng/g) feces were 1-2 orders of magnitude higher than those in pet food samples. A significant positive correlation was found between the concentrations of the monomers (i.e., TPA and BPA) and the corresponding MPs in cat feces. The calculated mean estimated daily intake of PET and PC (calculated from pet food) was lower than that of the mean cumulative daily intake (calculated from pet feces), which suggested that diet is a minor source of exposure to PET and PC in pets.

Zhang, J., et al. (2020). "Microplastics in house dust from 12 countries and associated human exposure." Environment International **134**: 105314.

Global marine pollution by microplastics (MPs) has received considerable attention in recent years. Nevertheless, little is known about the occurrence of MPs in indoor environments. A novel analytical method was used to quantitatively determine polyethylene terephthalate (PET)- and polycarbonate (PC)- based MPs in 286 indoor dust samples collected from 12 countries. PET-based MPs were detected in all dust samples at concentrations of 38-120,000micro g/g (median: 5900micro g/g), whereas PC-based MPs were measured at <0.11-1700micro g/g (median: 8.8micro g/g). Significant positive correlations were found between the concentrations of terephthalic acid (a PET monomer) and PET as well as between bisphenol A (a PC monomer) and PC. Based on the concentrations of MPs measured in indoor dust, the median daily intake of PET-based MPs calculated for infants was in the range of 4000-150,000ng/kg-bw/day.

Zhang, J.-x., et al. (2019). "Study on the legislation of the marine plastic and microplastic management." Haiyang Huanjing Kexue = Marine Environmental Science(2): 167.

Marine microplastic pollution is becoming a global concern in recent years. To prevent and reduce marine microplastic pollution,it is very necessary to control the sources including the

primary and secondary source i. e. plastic debris. To improve the legislation on plastic and microplastic management in China,the present legislation status in China and abroad was investigated. Totally most of the articles are on the plastic garbage management,however the detailed regulations are insufficient. The legislation on the microplastic management is lack,and it is mostly to limit the usage of the micro-beads in the cosmetics,pharmaceuticals and personal care products. Based on the international experience,it is necessary to enact the regulations of prohibiting the usage of micro-beads in the pharmaceuticals and personal care products,add the plastic garbage tax in the environmental taxes,improve the garbage reclamation system,promote the marine microplastic monitoring and assessment system,enhance the public participation institution and so on.

Zhang, K., et al. (2019). "The hydro-fluctuation belt of the Three Gorges Reservoir: Source or sink of microplastics in the water?" Environmental Pollution **248**: 279-285.

Reservoirs can be an important environmental compartment for microplastic pollution. Previous investigations have found that surface waters and sediments in the Three Gorges Reservoir (TGR) have had high microplastic abundance, and the Xiangxi River, which is one of the largest primary tributaries of the TGR, has had much higher microplastic abundance than several marine and freshwater systems in China. A strip of land on the bank of the reservoir area, which is called the hydro-fluctuation belt (HFB), is periodically exposed due to the special hydrodynamic conditions in the TGR. The HFB may be an important source and/or sink of microplastics in TGR. In this study, microplastic occurrence in sediments from the Xiangxi River HFB was investigated to reflect the local microplastic pollution status and to evaluate its potential to serve as a source/sink of microplastics in the TGR. Seven sampling sites were selected, and sediments within the HFB and above the belt were collected in summer when the water level was low. The results showed that the microplastic abundance ranged from 0.55+/-0.12x10³ to 14.58+/-5.67x10³ particles m⁻², which was one to two orders of magnitude higher than that in sediments from the Xiangxi River in our previous study (80-846 particles m⁻²). Statistical analysis revealed that the microplastic abundance within the HFB was significantly higher than that of the area above the HFB. The results indicate that the HFB can be an important microplastic sink when the water level is low, and the belt can turn into a potential source when the water level is high. Cluster analysis was applied to reveal the characteristics of the microplastics collected at different sites, and the results suggest that the cluster analysis may be a useful tool in elucidating the source and fate of microplastics.

Zhang, K., et al. (2015). "Accumulation of floating microplastics behind the Three Gorges Dam." Environmental Pollution **204**: 117-123.

We investigated the occurrence and distribution of microplastics in surface water from the Three Gorges Reservoir. Nine samples were collected via trawl sampling with a 112 mum mesh net. The abundances of microplastics were from 3407.7 x 10³ to 13,617.5 x 10³ items per square kilometer in the main stream of the Yangtze River and from 192.5 x 10³ to 11,889.7 x 10³ items per square kilometer in the estuarine areas of four tributaries. The abundance of microplastics in the main stream of the Yangtze River generally increased as moving closer to the Three Gorges Dam. The microplastics are made exclusively of polyethylene (PE), polypropylene (PP), and polystyrene (PS). Together with microplastics, high abundance of coal/fly ash was also observed in the surface water samples. Comparing with previously reported data, microplastics in the TGR were approximately one to three orders of magnitudes greater, suggesting reservoirs as potential hot spot for

microplastic pollution. Copyright © 2015 Elsevier Ltd. All rights reserved.

Zhang, K., et al. (2020). "Efficient particle and droplet manipulation utilizing the combined thermal buoyancy convection and temperature-enhanced rotating induced-charge electroosmotic flow." Analytica Chimica Acta **1096**: 108-119.

Efficient granular sample manipulation is crucial for various microfluidic-based applications such as material synthesis and drug delivery. Herein we present a novel method to efficiently manipulate microbeads and droplets using the combined thermal buoyancy convection and temperature-enhanced rotating induced-charge electroosmotic flow. Within the granular fluid, a pair of counter-rotating microvortices is formed above the floating electrode, leading to the formation of a flow stagnation region at the bottom center. Granular samples then can be effectively transported to this region by the Stokes drag, and the concentration performance can be flexibly manipulated by adjusting the energization strategies of the chip. The contributions of fluid convection, dielectrophoresis, thermophoresis, and gravity force to particle migration are first studied and compared, proving that the convection flow and gravity force are mainly responsible for particle migration and deposition respectively. Then the systematic enriching experiments of 4-mum silica particles demonstrate that the particle migration velocity can be highly improved by the combined thermal-electrical field. Finally, the effective concentration of nanocopper particles and the assembly of oil-in-water/water-in-oil-in-water droplets indicate that this approach is capable of manipulating diverse granular samples. Therefore, this strategy can be attractive for lots of microfluidic-based applications because of its high efficiency and simplicity.

Zhang, K., et al. (2019). "Efficient Micro/Nanoparticle Concentration using Direct Current-Induced Thermal Buoyancy Convection for Multiple Liquid Media." Analytical Chemistry **91**(7): 4457-4465.

Thermal-based microparticle focusing has recently received increasing attention due to its noninvasive nature and simple manipulation mechanism. However, its further application is limited by current complicated fluid heating systems and low particle focusing velocity. Using simple indium tin oxide-made microheaters, herein we propose a flexible and novel approach for efficient particle focusing based on direct current-induced thermal buoyancy convection. Importantly, for avoiding possible electrochemical reactions on the electrode, the microheaters are isolated from the granular fluids of interest by a thin glass slide. The concentration performance of the designed chip was first demonstrated by statically focusing 4-mum silica particles, yeast cells, silica particles in insulating buffer, and 100-nm copper microspheres. Also the trapping of a mixture of 5-mum and 2-mum polystyrene microbeads indicated that the chip can either simultaneously concentrate two kinds of particles or selectively focus the heavier ones by adjusting the voltages. Then the different concentration patterns of microbeads exhibited that the microspheres can be flexibly manipulated by changing the configurations of microheaters. Furthermore, for the first time, we achieved thermal-based continuous particle focusing in both conducting and insulating solutions using buoyancy convection, demonstrating that this method can be utilized to achieve both static and continuous particle manipulations in multiple liquid media. Finally, the feasibility of this device in effective wear measurement of machines was demonstrated by conducting systematic experiments of focusing nanocopper particles in the hydraulic oil. Therefore, this presented approach would be promising for a broad range of on-chip applications.

Zhang, K., et al. (2018). "Microplastic pollution in China's inland water systems: A review of findings, methods, characteristics, effects, and management." Science of the Total Environment **630**: 1641-1653.

The pollution of marine environments and inland waters by plastic debris has raised increasing concerns worldwide in recent years. China is the world's largest developing country and the largest plastic producer. In this review, we gather available information on microplastic pollution in China's inland water systems. The results show that microplastics are ubiquitous in the investigated inland water systems, and high microplastic abundances were observed in developed areas. Although similar sampling and analytical methods were used for microplastic research in inland water and marine systems, methods of investigation should be standardized in the future. The characteristics of the detected microplastics suggest secondary sources as their major sources. The biological and ecological effects of microplastics have been demonstrated, but their risks are difficult to determine at this stage due to the discrepancy between the field-collected microplastics and microplastics used in ecotoxicological studies. Although many laws and regulations have already been established to manage and control plastic waste in China, the implementation of these laws and regulations has been ineffective and sometimes difficult. Several research priorities are identified, and we suggest that the Chinese government should be more proactive in tackling plastic pollution problems to protect the environment and fulfill international responsibilities. Copyright © 2018 Elsevier B.V.

Zhang, K., et al. (2017). "Occurrence and Characteristics of Microplastic Pollution in Xiangxi Bay of Three Gorges Reservoir, China." Environmental Science & Technology **51**(7): 3794-3801.

Microplastic pollution in inland waters is receiving growing attentions. Reservoirs are suspected to be particularly vulnerable to microplastic pollution. However, very limited information is currently available on pollution characteristics of microplastics in reservoir ecosystems. This work studied the distribution and characteristics of microplastics in the backwater area of Xiangxi River, a typical tributary of the Three Gorges Reservoir. Microplastics were detected in both surface water and sediment with concentrations ranging from 0.55 × 105 to 342 × 105 items km-2 and 80 to 864 items m-2, respectively. Polyethylene, polypropylene, and polystyrene were identified in surface water, whereas polyethylene, polypropylene, and polyethylene terephthalate, and pigments were observed in sediment. In addition, microplastics were also detected in the digestion tracts of 25.7% of fish samples, and polyethylene and nylon were identified. Redundancy analysis indicates a weak correlation between microplastics and water quality variables but a negative correlation with water level of the reservoir and Secchi depth. Results from this study confirm the presence of high abundance microplastics in reservoir impacted tributaries, and suggest that water level regulated hydrodynamic condition and input of nonpoint sources are important regulators for microplastic accumulation and distribution in the backwater area of reservoir tributaries. [ABSTRACT FROM AUTHOR]

Zhang, K., et al. (2010). "A microfluidic system with surface modified piezoelectric sensor for trapping and detection of cancer cells." Biosensors & Bioelectronics **26**(2): 935-939.

We present a microfluidic system with integrated surface modified piezoelectric sensor for trapping and label-free detection of target samples that can be used for cancer diagnosis. To introduce active magnetic force control to the piezoelectric sensor and obtain a fast regenerative system, a nickel pillar array was patterned onto the surface of quartz crystal microbalance. The functionalities of the system were tested by trapping suspended superparamagnetic micro-beads (SPMBs) in fluids onto the nickel pillar array with a manually controlled magnetic field and by detecting the accumulated mass from the resonant characterization of the piezoelectric sensor at the same time. The results showed the efficiency of the system in manipulating the SPMBs and the sensitivity of the device was of 5 Hz mm2/ng. With surface-functionalized SPMBs, the microfluidic system succeeded in trapping and detecting target cancer cells. A549 cancer cells were captured on the nickel pillar array with WGA protein-functionalized SPMBs and detected with a total mass of 90.6 ng. With its simplicity, low production cost and high efficiency, this new device configuration would be useful for the future point-of-care clinical applications.

Zhang, L., et al. (2016). "Polysaccharide-based micro/nanocarriers for oral colon-targeted drug delivery." Journal of Drug Targeting **24**(7): 579-589.

Oral colon-targeted drug delivery has attracted many researchers because of its distinct advantages of increasing the bioavailability of the drug at the target site and reducing the side effects. Polysaccharides that are precisely activated by the physiological environment of the colon hold greater promise for colon targeting. Considerable research efforts have been directed towards developing polysaccharide-based micro/nanocarriers. Types of polysaccharides for colon targeting and in vitro/in vivo assessments of polysaccharide-based carriers for oral colon-targeted drug delivery are summarised. Polysaccharide-based microspheres have gained increased importance not just for the delivery of the drugs for the treatment of local diseases associated with the colon (colon cancer, inflammatory bowel disease (IBD), amoebiasis and irritable bowel syndrome (IBS)), but also for it's potential for the delivery of anti-rheumatoid arthritis and anti-chronic stable angina drugs. Besides, Polysaccharide-based micro/nanocarriers such as microbeads, microcapsules, microparticles, nanoparticles, nanogels and nanospheres are also introduced in this review.

Zhang, L., et al. (2018). "Interaction of Lumbricus terrestris with macroscopic polyethylene and biodegradable plastic mulch." Science of the Total Environment **635**: 1600-1608.

Polyethylene mulch films used in agriculture are a major source of plastic pollution in soils. Biodegradable plastics have been introduced as alternative to commonly-used polyethylene. Here we studied the interaction of earthworms (Lumbricus terrestris) with polyethylene and biodegradable plastic mulches. The objective was to assess whether earthworms would select between different types of mulches when foraging for food, and whether they drag macroscopic plastic mulch into the soil. Laboratory experiments were carried out with earthworms in Petri dishes and mesocosms. The treatments were standard polyethylene mulch, four biodegradable plastic mulches (PLA/PHA [polylactic acid/polyhydroxy alkanoate], Organix, BioAgri, Naturecycle), a biodegradable paper mulch (WeedGuardPlus), and poplar litter, which served as control. Four and three replicates for the Petri dish and mesocosm experiments were used, respectively. Macroscopic plastic and paper mulch pieces (1.5 cm x 1.5 cm and 2 cm x 2 cm) were collected from an agricultural field after a growing season, after being buried in the soil for 6 and 12 months, and after being composted for 2 weeks. We found that earthworms did not ingest polyethylene. Field-weathered biodegradable plastic mulches were not ingested either, however, after soil burial and composting, some biodegradable plastics were eaten and could not be recovered from soil any longer. Earthworms, when foraging for food, dragged plastic mulch, including polyethylene and biodegradable plastic, and poplar leaves into their burrows. The burial of macroscopic plastic mulch underground led to a redistribution of plastics in the soil profile, and likely enhances the degradation of biodegradable mulches in soil, but also can lead to leaching of plastic fragments by macropore flow.

Zhang, L., et al. (2019). "The spatial distribution of microplastic in the sands of a coral reef island in the South China Sea: Comparisons of the fringing reef and atoll." Science of the Total Environment **688**: 780-786.

Microplastic pollution of coral reef ecosystems has received increasing attention since the discovery that several typical coral types have the ability to ingest (micro-) plastics. However, data on the distribution of microplastics in coral reef ecosystems are still very limited. The study reported here selected sands/sediments from coral reef islands located in the South China Sea as a representative study site. The abundance of microplastics was found to reach 90+/-5 items/kg and 530+/-7 items/kg at the Weizhou Island and Sanya Lu Hui Tou (LHT) sites (fringing reef), respectively. Each of these qualities are lower than the quantity of microplastics collected from the Xisha Islands (atoll) (60+/-3 to 610+/-11 items/kg), which experiences less human activity and pollution. Moreover, further investigation demonstrated that the differences in the microplastics in the sands of these atolls and fringing reefs were determined not only by their sources, but were also dependent on their water exchange rates. The primary type and color of the microplastics found in these four sampling zones was red polypropylene and there was a greater proportion of smaller size particles (<1mm) in the remote atolls of the Nansha and Xisha islands than in the other fringing reef sites. Additionally, there were no obvious differences found in the abundance of microplastics and the compositions/structures of coral sand in the Weizhou Island and Sanya LHT sites.

Zhang, M., et al. (2015). "T Cells Derived From Human Melanoma Draining Lymph Nodes Mediate Melanoma-specific Antitumor Responses In Vitro and In Vivo in Human Melanoma Xenograft Model." Journal of Immunotherapy **38**(6): 229-238.

It has been established in murine models that lymph nodes draining a progressively growing tumor contain antigen-specific T cells capable of mediating protective immune responses upon adoptive transfer. However, naturally occurring human tumor-draining lymph nodes (TDLNs) have yet to be fully investigated. In this study, we analyzed TDLNs from patients with stage III melanoma who were undergoing routine lymph node dissection. Following short-term (14 d) culture activation with anti-CD3/anti-CD28 microbeads and expansion in low concentrations of IL-2, the melanoma-draining lymph node (MDLN) cells were ~ 60% CD4-activated and ~ 40% CD8-activated T cells. The activated MDLN cells demonstrated reactivity in response to overlapping peptides spanning the sequence of 4 different known melanoma antigens MAGEA1, Melan-A/MART-1, NY-ESO-1, and Prame/OIP4, suggesting the presence of melanoma-specific T cells. Coculture of activated MDLN T cells with cancer cells in vitro resulted in preferential apoptosis of human cancer cell lines that were cocultured with T cells with high degree of MHC matching. Adoptive transfer of MDLN T cells with high degree of MHC matching to A375 to mice-bearing human A375 melanoma xenografts resulted in dose-dependent improvement in survival. Although prior human studies have demonstrated the immune responses within melanoma vaccine-draining lymph nodes, this study presents evidence for the first time that naturally occurring human MDLN samples contain melanoma-experienced CD4 and CD8 T cells that can be readily cultured and expanded to mediate protective immune responses both in vitro and in vivo in a human melanoma xenograft model.

Zhang, M., et al. (2019). "Microplastics from mulching film is a distinct habitat for bacteria in farmland soil." Science of the Total Environment **688**: 470-478.

Microplastics, as an emerging pollutant of global importance, have been well documented in

aquatic ecosystems. However, little is known about the effects of microplastics on agroecosystems, particularly for soil microbial communities. Herein, microplastics collected from cotton fields in Xinjiang, China, were analysed with a scanning electron microscope (SEM) and high-throughput sequencing to investigate the attached bacterial communities. Microplastic surfaces, especially pits and flakes, were colonized by various microorganisms, suggesting active hydrolysis of plastic debris. The bacterial communities colonizing microplastics were significantly different in structure from those in the surrounding soil, plant litter and macroplastics. In addition, statistical analysis of differentially abundant OTUs showed that microplastics serve as a "special microbial accumulator" in farmland soil, enriching some taxa that degrade polyethylene, such as Actinobacteria, Bacteroidetes and Proteobacteria. Co-occurrence network analysis revealed that the biotic interactions between microorganisms on microplastics are as complex as those in soil, and Acidobacteria, Chloroflexi, Gemmatimonadetes, and Bacteroidetes are considered keystone species in bacterial communities. Collectively, the findings imply that microplastics acted as a distinct habitat for bacteria in farmland soil, which increases our understanding of microplastic pollution.

Zhang, P., et al. (2012). "Fabrication of quantum dots-encoded microbeads with a simple capillary fluidic device and their application for biomolecule detection." Journal of Colloid and Interface Science **385**(1): 8-14.

Monodispersed quantum dots (QDs)-encoded polymer microbeads were generated using a simple capillary fluidic device (CFD). The polymer and QDs solution was emulsified into monodispersed microdroplets by the CFD and obtained droplets were solidified via solvent evaporation. Polymer microbeads can be fabricated in a range of different sizes through changing the flow rates of the two immiscible phases, and have a highly narrow size distribution and uniform shape. QDs-encoding capacity of the microbeads was investigated through adjusting the concentrations and ratios of QDs in the polymer solution. Mono-color encoded microbeads with five intensities and a dual-color QDs-encoded 5 x 5 microbeads array were obtained, and the spectral profiles of the microbeads were examined by a fluorescent microscope coupled with a spectral imaging system. QDs-tagged microbeads prepared with this method were more stable than the porous beads swollen with QDs in the buffer with various pH and crosslinking chemicals. Finally, the application of such microbeads for biomolecule detection was demonstrated by conjugation of rabbit IgG molecules on the surface of the microbeads via carboxyl groups, which were then detected by fluorophores-labeled goat-anti-rabbit IgG antibodies. © 2012 Elsevier Inc.

Zhang, P., et al. (2018). "The variations in major aroma compounds in 'Olinda' Valencia orange (Citrus sinensis) during storage." Journal of Fruit Science **35**(7): 859-869.

This paper presents the results of studies conducted to determine the variation patterns of the major aroma compounds in Valencia orange cv. Olinda during 3 months of storage treated with different preservatives, i.e. 5 g bellkute, 5 ml prochloraz and 1.0 g 2,4-D dissolved in 20 litres of tap water. It was shown that a degradation turning point of monoterpenes, such as d-limonene and beta -myrcene occurred at 63 days of storage in fruits treated by preservatives or under cold storage. Apart from this, a mixed treatment with different preservatives combined with nano-plastic bagging maintained the basic sensory quality of Olinda orange fruits during storage and significantly inhibited the variations in the major aroma compounds during the first month of storage.

Zhang, P., et al. (2019). "Single and combined effects of microplastics and roxithromycin on <i>Daphnia magna</i>." Environmental science and pollution research international **26**(17): 17010-17020.

There is a rising concern about the pollution of microplastics (plastic particles < 5 mm) in water due to their physicochemical properties, especially their interaction with organic contaminants; however, such knowledge is still limited. The mass production and consumption of medication for the treatment of infectious diseases in human and animals have led to the ubiquity of antibiotics in the environment. We studied the single and joint effects of microplastics (1-μm and 10-μm polystyrene particles, PS) and roxithromycin (ROX) on Daphnia magna through the acute and sublethal toxicity tests. The 48-h median effective concentration (EC50) of 1-μm and 10-μm PS to D. magna was 66.97 mg/L and 199.94 mg/L, respectively, while the value of ROX was 20.28 mg/L. Malondialdehyde (MDA) levels and the activities of four enzymatic biomarkers, including superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and glutathione S-transferase (GST), were further detected to assess the oxidative stress caused in D. magna caused. The results showed that 48-h exposure to PS (0.1 mg/L) or ROX (0.01 mg/L) alone activated the activities of CAT and GST and MDA levels. When compared with the ROX alone, the responses of GPx and MDA in D. magna co-exposed to 1-μm PS were significantly decreased, while co-exposure to 10-μm PS significantly decreased the responses of GST and MDA. Furthermore, the integrated biomarker response version 2 (IBRv2) analysis revealed that co-exposure to 1-μm PS and ROX led to the strongest biological responses in D. magna. Our findings underlined that microplastics should be a concern when they interact with the co-existence of pollutants in the aquatic environment.

Zhang, Q., et al. (2017). "A double-label time-resolved fluorescent strip for rapidly quantitative detection of carbofuran residues in agro-products." Food Chemistry **231**: 295-300.

A rapid and quantitative time-resolved fluorescent immunochromatographic assay (TRFICA) for detecting carbofuran residues in agro-products was reported in this paper. This assay was developed based on double-label immunoprobes, one of which was a carbofuran-specific antibody coupled with europium microbeads for the test (T) line signal while the other was mouse IgG coupled with europium microbeads for the control (C) line signal. Quantitative relationships between carbofuran concentrations and T/C ratios were established to determine the analyte concentration. To increase assay accuracy, four standard curves were established for the agro-products (green bean, cabbage, apple, and pear). The limits of detection (LODs) ranged from 0.04 to 0.76 mg L⁻¹. The spiked recoveries of carbofuran in the agro-products were in the range of 81-103%, which was in good agreement with a standard HPLC method. Therefore, we provided a new and reliable method for determination of N-methylcarbamate pesticide carbofuran residues in agro-products including vegetables and fruits. Copyright © 2017

Zhang, Q., et al. (2018). "The combined toxicity effect of nanoplastics and glyphosate on Microcystis aeruginosa growth." Environmental Pollution **243**: 1106-1112.

Waste plastics can be degraded to nanoplastics (NPs, diameter<1 μm) by natural forces. NPs not only directly affect aquatic organisms but also adsorb other pollutants, causing combined pollution. Glyphosate is one of the most widely used herbicides and is commonly monitored in freshwater systems. In this study, the effects of the combined toxicity of polystyrene cationic amino-modified nanoparticles (nPS-NH 2) and glyphosate on a blue-green alga, Microcystis aeruginosa , were investigated. Our results demonstrated that 5 mg/L glyphosate had a strong inhibitory effect on M. aeruginosa (the 96-h inhibitory rate was 27%), while 5 mg/L nPS-NH 2 had no apparent effect on the growth of M. aeruginosa. Interestingly, nPS-NH 2 combined with glyphosate showed antagonistic effects on the inhibition of algal growth because nPS-NH 2

displayed a strong adsorption capacity for glyphosate, which significantly alleviated the inhibitory effect of glyphosate on M. aeruginosa growth. However, the presence of glyphosate enhanced the stability of the dispersion system, which allowed more nPS-NH 2 to adsorb on the surface of M. aeruginosa and may result in greater enrichment of nPS-NH 2 in the food chain to show potential repercussions to human life. Our current study provides a new theoretical basis for the combined effects of NPs and pesticide pollution. Graphical abstract Image 1 Highlights • PS-NH 2 alleviated the inhibitory effect of glyphosate on M. aeruginosa growth. • PS-NH 2 displayed an excellent adsorption capacity for glyphosate. • Glyphosate induced more PS-NH 2 to adsorb on M. aeruginosa. [ABSTRACT FROM AUTHOR]

Zhang, Q., et al. (2019). "Concentrations and distribution of phthalate esters in the seamount area of the Tropical Western Pacific Ocean." Marine Pollution Bulletin **140**: 107-115.

A total of 14 phthalate esters (PAEs) were analysed by gas chromatography-mass spectrometry (GC-MS) to better understand its occurrence and distribution in seawater samples of M2 seamount in the Tropical Western Pacific Ocean (TWPO). The concentrations of SIGMAPAEs in the seawater ranged from 12.13ngL⁻¹ to 60.69ngL⁻¹ (av. 28.86ngL⁻¹), dominated by dibutyl phthalate (DBP), di(2-ethylhexyl) phthalate (DEHP) and diisobutyl phthalate (DiBP). SIGMAPAEs concentrations in the southwest of the seamount were lower than those in the northeast, with the minima appearing above the seamount summit. Current-seamount interaction was reckoned to be the principal driving factors in the distribution of PAEs. DEHP posed a medium risk in seawater, suggesting that marine plastic pollution has become an urgent environmental issue that calls for more attention and actions. Microplastics leaching and atmospheric deposition might be the potential sources of PAEs.

Zhang, R., et al. (2005). "Sequential injection chemiluminescence immunoassay for anionic surfactants using magnetic microbeads immobilized with an antibody." Talanta **68**(2): 231-238.

A rapid and sensitive immunoassay for the determination of linear alkylbenzene sulfonates (LAS) is described. The method involves a sequential injection analysis (SIA) system equipped with a chemiluminescence detector and a neodymium magnet. Magnetic beads, to which an anti-LAS monoclonal antibody was immobilized, were used as a solid support in an immunoassay. The introduction, trapping and release of the magnetic beads in the flow cell were controlled by means of a neodymium magnet and adjusting the flow of the carrier solution. The immunoassay was based on an indirect competitive immunoreaction of an anti-LAS monoclonal antibody on the magnetic beads and the LAS sample and horseradish peroxidase (HRP)-labeled LAS, and was based on the subsequent chemiluminscence reaction of HRP with hydrogen peroxide and p-iodophenol, in a luminol solution. The anti-LAS antibody was immobilized on the beads by coupling the antibody with the magnetic beads after activation of a carboxylate moiety on the surface of magnetic beads that had been coated with a polylactic acid film. The antibody immobilized magnetic beads were introduced, and trapped in the flow cell equipped with the neodymium magnet, an LAS solution containing HRP-labeled LAS at constant concentration and the luminol solution were sequentially introduced into the flow cell based on an SIA programmed sequence. Chemiluminescence emission was monitored by means of a photon counting unit located at the upper side of the flow cell by collecting the emitted light with a lens. A typical sigmoid calibration curve was obtained, when the logarithm of the concentration of LAS was plotted against the chemiluminescence intensity using various concentrations of standard LAS samples (0-500ppb) under optimum conditions. The time required for analysis is less than 15min.

Zhang, R., et al. (2007). "Sequential injection chemiluminescence immunoassay for nonionic surfactants by using magnetic microbeads." Analytica Chimica Acta **600**(1-2 SPEC. ISS.): 105-113.

A rapid and sensitive immunoassay based on a sequential injection analysis (SIA) using magnetic microbeads for the determination of alkylphenol polyethoxylates (APnEOs) is described. An SIA system was constructed from a syringe pump, a switching valve, a flow-through type immunoreaction cell equipped with a photon counting unit and a neodymium magnet. Magnetic beads, to which an anti-APnEOs monoclonal antibody was immobilized, were used as a solid support in an immunoassay. The introduction, trapping and release of the magnetic beads in and from the immunoreaction cell were controlled by means of a neodymium magnet and adjusting the flow of a carrier solution. The immunoassay was based on an indirect competitive immunoreaction of an anti-APnEOs monoclonal antibody immobilized on the magnetic beads with a sample APnEOs and a horseradish peroxidase (HRP)-labeled APnEOs in the same sample solution, and was based on the subsequent chemiluminscence reaction of HRP on the magnetic microbeads with a luminol solution containing hydrogen peroxide and p-iodophenol. The anti-APnEOs antibody was immobilized on the magnetic microbeads by coupling the antibody with the magnetic beads after activation of a carboxylate moiety on the surface of the magnetic beads that had been coated with a polylactic acid film. The antibody immobilized magnetic beads were introduced in the immunoreaction cell and trapped in it by the neodymium magnet, which was equipped beneath the immunoreaction cell. An APnEOs sample solution containing the HRP-labeled APnEOs at a constant concentration, and a luminol solution containing hydrogen peroxide and p-iodophenol were sequentially introduced into the immunoreaction cell, according to an SIA programmed sequence. Chemiluminescence emission was monitored by means of a photon counting unit located at the upper side of the immunoreaction cell by collecting the emitted light with a lens. A typical sigmoidal calibration curve was obtained, when the logarithm of the concentration of APnEOs was plotted against the chemiluminescence intensity as the number of photons in 100 ms using standard APnEOs sample solutions at various concentrations (0-1000 ppb) under optimum conditions. The lower detection limit defined as IC<inf>80</inf> is ca 10 ppb. The time required for analysis is less than 15 min per a sample. The present method was successfully applied to the determination of APnEOs in river water.

Zhang, S., et al. (2019). "Interactive effects of polystyrene microplastics and roxithromycin on bioaccumulation and biochemical status in the freshwater fish red tilapia (Oreochromis niloticus)." Science of the Total Environment **648**: 1431-1439.

There are hundreds of thousands metric tons of microplastics (MPs) present in aquatic environments. The MPs coexist with other pollutants in water bodies, such as pharmaceuticals, and may carry and transfer them into aquatic organisms, consequently causing unpredictable ecological risks. The purpose of the present study was to evaluate the effect of the presence of polystyrene microplastics (PS-MPs) on the distribution and bioaccumulation of roxithromycin (ROX) in freshwater fish red tilapia (Oreochromis niloticus) as well as their interactive biochemical effects in red tilapia. PS-MPs were found to enhance the bioaccumulation of ROX in fish tissues compared to ROX-alone exposure. In the treatment of PS-MPs (100 micro g L⁻¹) combined with ROX (50 micro g L⁻¹), the highest concentrations of ROX reached 39,672.9+or-6311.4, 1767.9+or-277.8, 2907.5+or-225.0, and 4307.1+or-186.5 micro g kg⁻¹ in gut, gills, brain, and liver, respectively. Furthermore, compared to the ROX alone, the neurotoxicity caused by ROX was alleviated due to the presence of MPs after 14 d of exposure. The activities of cytochrome P450 (CYP) enzymes [7-ethoxyresorufin O-deethylase (EROD) and 7-benzyloxy-4-trifluoromethyl-coumarin O-dibenzyloxylase (BFCOD)] in fish livers exposed to all co-exposure treatments exhibited great variability compared to ROX alone after 14 d of exposure, suggesting that the presence of MPs may affect the metabolism of ROX in tilapia. Compared with ROX alone, the superoxide dismutase (SOD) activity increased significantly, and malondialdehyde (MDA) contents decreased in the co-exposure treatments, showing that oxidative damage in situations of co-exposure to MPs and ROX was mitigated in fish livers after 14 d of exposure. Collectively, the presence of MPs could affect the fate and toxicity of other organic pollutants in fish. The results emphasize the importance to study the interactions between MPs and other organic pollutants in aquatic environments.

Zhang, S., et al. (2019). "Microplastics influence the adsorption and desorption characteristics of Cd in an agricultural soil." Journal of Hazardous Materials: 121775.

Microplastics (MPs) in terrestrial ecosystems particularly agroecosystem are attracting increasing attention worldwide. However, the influences of MPs on adsorption and desorption of contaminants in agricultural soils remain unknown. Here, batch experiments were conducted to study the effects of polyethylene MPs on Cd adsorption and desorption in a farmland soil under varying conditions. Both Cd adsorption and desorption in soils with or without MPs reached equilibrium within 120min. Cd adsorption kinetics followed the pseudo-second order model, and the adsorption isotherm fitted to the Langmuir model more precisely than the Freundlich model. Overall, addition of MPs decreased Cd adsorption but increased desorption, and the effects varied with MPs dose and particle size, and solution pH. MPs-induced decrease in Cd adsorption and increase in Cd desorption were more pronounced at higher MPs dose and larger particle size, but varied differently from solution pH. EDS analysis confirmed Cd adsorption on MPs surface. Both MPs before and after Cd adsorption showed similar XRD patterns, indicating MPs maintained a high crystallinity and no new crystalline phases formed. In conclusion, the input of MPs into soil might enhance the mobility of Cd via mitigating soil adsorbing capacity, thereby posing additional risks of Cd to agroecosystem.

Zhang, S., et al. (2019). "A novel fluorescent biosensor based on dendritic DNA nanostructure in combination with ligase reaction for ultrasensitive detection of DNA methylation." Journal of Nanobiotechnology **17**(1): 121.

BACKGROUND: DNA methylation detection is indispensable for the diagnosis and prognosis of various diseases including malignancies. Hence, it is crucial to develop a simple, sensitive, and specific detection strategy.

METHODS: A novel fluorescent biosensor was developed based on a simple dual signal amplification strategy using functional dendritic DNA nanostructure and signal-enriching polystyrene microbeads in combination with ligase detection reaction (LDR). Dendritic DNA self-assembled from Y-DNA and X-DNA through enzyme-free DNA catalysis of a hairpin structure, which was prevented from unwinding at high temperature by adding psoralen. Then dendritic DNA polymer labeled with fluorescent dye Cy5 was ligated with reporter probe into a conjugate. Avidin-labeled polystyrene microbeads were specifically bound to biotin-labeled capture probe, and hybridized with target sequence and dendritic DNA. LDR was triggered by adding Taq ligase.

When methylated cytosine existed, the capture probe and reporter probe labeled with fluorescent dye perfectly matched the target sequence, forming a stable duplex to generate a fluorescence signal. However, after bisulfite treatment, unmethylated cytosine was converted into uracil, resulting in a single base mismatch. No fluorescence signal was detected due to the absence of duplex.

RESULTS: The obtained dendritic DNA polymer had a large volume. This method was time-saving and low-cost. Under the optimal experimental conditions using avidin-labeled polystyrene microbeads, the fluorescence signal was amplified more obviously, and DNA methylation was quantified ultrasensitively and selectively. The detection range of this sensor was 10⁻¹⁵ to 10⁻⁷ M, and the limit of detection reached as low as 0.4 fM. The constructed biosensor was also successfully used to analyze actual samples.

CONCLUSION: This strategy has ultrasensitivity and high specificity for DNA methylation quantification, without requiring complex processes such as PCR and enzymatic digestion, which is thus of great value in tumor diagnosis and biomedical research.

Zhang, S., et al. (2020). "Distribution of low-density microplastics in the mollisol farmlands of northeast China." Science of the Total Environment **708**: 135091.

Plastic pollution, especially microplastic (MP), which is small in size (<5 mm) is one of the main environmental problems in global ecosystems and can cause harm to organisms. Low-density plastic has been widely used in farmlands, but the factors that influence Low-density microplastic (LDMP) distribution are still not clear. In this study, both field investigations at small and large scales and laboratory simulations, and both geostatistics and classical statistics were used to examine LDMP distributions and the main driving factors in farmland soils. The results showed the following. (1) Only polyethylene (PE) of LDMP was found in farmland. (2) The means of LDMP weight content (LDMP-W), LDMP abundance (LDMP-AB) and LDMP area content (LDMP-A) were 0.27 mg kg⁻¹, 107 N kg⁻¹ and 12.6 mm² kg⁻¹ in mollisol farmlands, respectively. (3) LDMPs were positively correlated with macroplastics (MAP) at the large scale, while any correlations were not obvious at small scales. (4) LDMPs were not only transported by surface soil-water loss (>96%) but were also transported by infiltration through soil pores (<4%). (5). LDMP loss increased with soil bulk density (BD) increasing, and low BD tends to increase LDMP loss by interflow. (6) LDMP distribution was not only influenced by water movement but also maybe influenced by microorganisms and crops. For LDMP pollution control, the focus on both surface soil-water loss and the infiltration processes is necessary, and a combination of the functions of microorganisms and crops probably accelerate LDMP decomposition in soils.

Zhang, S., et al. (2019). "Situation and harm of micro-nano plastic pollution in seafood." Journal of Food Safety and Quality **10**(9): 2689-2696.

In recent years, the pollution of plastics to the marine environment is increasing. Among them, the damage caused by micro-nano plastic fragments to the marine environment and animal and plant communities has become a research hotspot in the international scientific community. Many commercially important ingredients and marine foods, such as crustaceans, bivalves and fish, are often contaminated with micro-nano plastics, while micro-nano particles are often adsorbed with toxic chemicals or pathogenic microorganisms. These micro-nano particles and harmful substances can be enriched in the human body through the food chain, posing a potential threat to food safety and human health. This paper reviewed the research results of micro-nano plastic pollution and its hazards in marine products in recent years, and provided reference for future research and food safety management. The future research of micro-nano

plastic pollution should focus on 3 aspects: first, the research methods needed to be innovative and standardized; second, micro-nano plastics needed to conduct comprehensive and in-depth research on human health hazards; third, strengthening research on prevention and control measures for micro-nano plastics to endanger food safety.

Zhang, S., et al. (2018). "Effects of micro-plastics on sulfamethoxazole (SMZ) residues in tilapia (Oreochromis niloticus) muscle." Journal of Ecology and Rural Environment **34**(9): 857-864.

Micro-plastics are widely distributed pollutants in China's water environment. Sulfamethoxazole (SMZ) is frequently-used as antibiotics in aquaculture. However, the effect of micro-plastics on SMZ residues in tilapia muscle is unclear. The micro-plastics and sulfamethoxazole dosage in fishponds have been manipulated based on the ambient concentration, and the application of sulfonamides in aquaculture specified by SC/T 1084-2006. Three concentrations including: zero (NP), low (LP) and high (HP) micro-plastics in fishponds; and four doses of SMZ [zero (NS), low (LS), medium (MS) and high (HS)] in forages were fabricated. For understanding the effect of micro-plastics on SMZ residues in tilapia (Oreochromis niloticus) muscle, an 8-weeks breeding experiment was conducted. Tilapia was fed in the first four weeks on a SMZ diet, followed by non SMZ diet for the next four weeks. SMZ content in fish meat was determined during the fourth, sixth and eighth weeks. The fourth week's results of SMZ residue in fish meat reveal that environmental microplastics could significantly reduce the residual value of SMZ in fish-meat. Single factor analysis of variance for the residual value of SMZ in fish meat at the 4th, 6th and 8th weeks, reveal that after the 4th week, all micro-plastic exposure groups at different SMZ dosage diets were significantly lower than those in the non-micro-plastic groups (P<0.05), and there was no significant differences between the micro-plastic concentrations (P>0.05). After the 6th week, only HP and NP groups with MS diet had significant differences (P<0.05), and no significant difference was found in other SMZ feed groups of different micro-plastic treatments (P>0.05). Similarly, the results from the 8th week, show that there was no significant difference in all groups fed on SMZ diet for the different micro-plastics treatments (P>0.05). In conclusion, the findings indicate that the effect of micro-plastics on sulfamethoxazole residues in fish-meat is limited by sulfamethoxazole dosage.

Zhang, S., et al. (2019). "Microplastics in the environment: A review of analytical methods, distribution, and biological effects." TrAC - Trends in Analytical Chemistry **111**: 62-72.

Microplastics (MP) (<5 mm) are crucial pollution which are widely distributes in the environment. Recently, the studies of MP have increased rapidly due to increasing awareness of the potential and growing risks of biological effects during storage and disposal. However, due to limitations in analytical methods and the methods of environmental risk assessment, the distribution and biological effects of MP are still debatable issues. To clarify the potentially environmental and biological impacts of MP in the consecutive environment, (1) analytical methods to assess MP, (2) environmental transportation and distribution of MP and (3) the effects of MP on biota, including the additives and sorption-desorption of MP in both terrestrial ecosystem and aquatic ecosystems were summarized. Based on the reviewed publications, we propose considerations for addressing the insufficiencies of analytical methods, distribution and biological effects of MP in ecosystems so we can adequately safeguard global ecosystems. Copyright © 2018 Elsevier B.V.

Zhang, S., et al. (2018). "A simple method for the extraction and identification of light density microplastics from soil." Science of the Total Environment **616-617**: 1056-1065.

This article introduces a simple and cost-saving method developed to extract, distinguish and

quantify light density microplastics of polyethylene (PE) and polypropylene (PP) in soil. A floatation method using distilled water was used to extract the light density microplastics from soil samples. Microplastics and impurities were identified using a heating method (3-5s at 130degreeC). The number and size of particles were determined using a camera (Leica DFC 425) connected to a microscope (Leica wild M3C, Type S, simple light, 6.4x). Quantification of the microplastics was conducted using a developed model.

Zhang, W., et al. (2020). "Transcriptional response provides insights into the effect of chronic polystyrene nanoplastic exposure on Daphnia pulex." Chemosphere **238**: 124563.

Nanoplastic pollution is widespread and persistent across global water systems and can cause a negative effect on aquatic organisms, especially the zooplankter which is the keystone of the food chain. The present study uses RNA sequencing to assess the global change in gene expression caused by 21 days of exposure to 75nm polystyrene (PS) nanoplastics on Daphnia pulex, a model organism for ecotoxicity. With the threshold value at P value<0.05 and fold change >2, 244 differentially expressed genes were obtained. Combined with real-time PCR validation of several selected genes, our results indicated that a distinct expression profile of key genes, including downregulated trehalose transporter, trehalose 6-phosphate synthase/phosphatase, chitinase and cathepsin-L as well as upregulated doublesex 1 and doublesex and mab-3 related transcription factor-like protein, contributed to the toxic effects of chronic nanoplastic exposure on Daphnia, such as slowed growth, subdued reproductive ability and reproductive pattern shifting. Our study also showed that chronic exposure to nanoplastic changed the sex ratio of D. pulex neonates. By integrating the gene expression pattern in an important model organism, this study gained insight into the molecular mechanisms of the toxic effect of chronic PS nanoplastic exposure on D. pulex, which may also extend to other nanoplastics or aquatic animals.

Zhang, W., et al. (2015). "Persistent organic pollutants carried on plastic resin pellets from two beaches in China." Marine Pollution Bulletin **99**(1-2): 28-34.

Microplastics provide a mechanism for the long-range transport of hydrophobic chemical contaminants to remote coastal and marine locations. In this study, plastic resin pellets were collected from Zhengmingsi Beach and Dongshan Beach in China. The collected pellets were analyzed for PAHs, PCBs, HCHs, DDTs, chlordane, heptachlor, endosulfan, aldrin, dieldrin and endrin. The total concentration of PCBs ranged from 34.7-213.7 ng g(-1) and from 21.5-323.2 ng g(-1) in plastic resin pellets for Zhengmingsi Beach and Dongshan Beach respectively. The highest concentrations of PCBs were observed for congeners 44, 110, 138, 155 and 200. The total concentration of PAHs ranged from 136.3-1586.9 ng g(-1) and from 397.6-2384.2 ng g(-1) in the plastic pellets, whereas DDTs concentration ranged from 1.2-101.5 ng g(-1) and from 1.5-127.0 ng g(-1) for the two beaches. The elevated concentrations of pollutants appear to be related to extensive industrial development, agricultural activity and the use of coal in the area.

Zhang, W., et al. (2019). "The mechanism for adsorption of Cr(VI) ions by PE microplastics in ternary system of natural water environment." Environmental Pollution: 113440.

More attention was paid to the attachment between microplastics and environmental pollutants. The adsorption performance of Polyethylene (PE) beads (a typical type of microplastics) and Cr(VI) ions with the existence of sodium dodecyl benzene sulfonate (SDBS) was investigated in this paper. The adsorption experiments of Cr(VI) ions by PE microplastics were conducted at different conditions, i.e. PE doses, pH and SDBS concentrations, respectively. The adsorption capability of Cr(VI) ions was increased from 0.39 to 1.36mgg⁻¹

when the dosage of PE microplastics was increased from 2 to 14gL⁻¹ at pH of 5 with addition of SDBS, compared with increasing adsorption capability from 0.03 to 0.32mgg⁻¹ without addition of SDBS. The pH would influence the adsorption capability with and without the addition of SDBS. When the pH was less than 6, the adsorption capability of Cr(VI) would be promoted by the addition of SDBS; however, there was a contrast tendency when the pH was more than 6, which was attributed to that SDBS would compete with CrO₄²⁻ for occupying the adsorption sites of PE microplastic. The SDBS concentration would affect the adsorption performance of Cr(VI) ions onto PE microplastics. The peak of the adsorption capacity was at SDBS concentration between 1 and 1.5mM. This research would provide a basis for investigating the influence of SDBS on adsorption performance of heavy metal by PE microplastics to simulate the surface attachment model of those three kinds of pollutants.

Zhang, W., et al. (2017). "Microplastic pollution in the surface waters of the Bohai Sea, China." Environmental Pollution **231**(Pt 1): 541-548.

The ubiquitous presence and persistency of microplastics in aquatic environments is of particular concern because these pollutants represent an increasing threat to marine organisms and ecosystems. An identification of the patterns of microplastic distribution will help to understand the scale of their potential effect on the environment and on organisms. In this study, the occurrence and distribution of microplastics in the Bohai Sea are reported for the first time. We sampled floating microplastics at 11 stations in the Bohai Sea using a 330 mum trawling net in August 2016. The abundance, composition, size, shape and color of collected debris samples were analyzed after pretreatment. The average microplastic concentration was 0.33 +/- 0.34 particles/m³. Micro-Fourier transform infrared spectroscopy analysis showed that the main types of microplastics were polyethylene, polypropylene, and polystyrene. As the size of the plastics decreased, the percentage of polypropylene increased, whereas the percentages of polyethylene and polystyrene decreased. Plastic fragments, lines, and films accounted for most of the collected samples. Accumulation at some stations could be associated with transport and retention mechanisms that are linked to wind and the dynamics of the rim current, as well as different sources of the plastics.

Zhang, X., et al. (2018). "A system to monitor statin-induced myopathy in individual engineered skeletal muscle myobundles." Lab on a Chip **18**(18): 2787-2796.

Microphysiological tissue engineering models of human skeletal muscle (myobundles) provide a platform to investigate the mechanism of muscle diseases and to study the response to drugs and toxins in vitro. To examine the dynamic response to drugs, which often take several days to induce responses, we developed a system to monitor the contractile force of the same human skeletal muscle myobundles over time before and after treatment with drugs. Myobundles were formed in series with Ecoflex films (platinum-catalyzed silicones) with embedded microbeads. The displacement of the microbeads in Ecoflex exhibited a linear relation between muscle force production and Ecoflex film stretch. Forces measured with the microbeads embedded in Ecoflex agreed well with simultaneous measurements with a force transducer. Application of the Hill model for the myobundles showed that the Ecoflex affected the magnitude of the response, but not the kinetics. After continuous exposure to 100 nM cerivastatin, both active and passive forces were reduced relative to controls after 2-4 days. The decline in force was associated with a decline in the muscle myofiber organization. The inhibitory effect of cerivastatin was reduced when 0.1-1 mM mevalonate was added with cerivastatin. Although addition of co-enzyme Q10 with cerivastatin inhibited degradation of sarcomeric alpha-actinin (SAA) in myoblasts, the contractile force still declined, suggesting that statin-induced myopathy was related to mevalonate pathway but the addition of co-enzyme Q10 was insufficient to overcome the effect of statins on the mevalonate pathway. Thus, cerivastatin rapidly induces myopathy which can be reversds with mevalonate but not co-enzyme Q10.

Zhang, X., et al. (2015). "Rare Earth Ion Mediated Fluorescence Accumulation on a Single Microbead: An Ultrasensitive Strategy for the Detection of Protein Kinase Activity at the Single-Cell Level." Angewandte Chemie. International Ed. in English **54**(50): 15186-15190.

A single microbead-based fluorescence imaging (SBFI) strategy that enables detection of protein kinase activity from single cell lysates is reported. We systematically investigated the ability of various rare earth (RE) ions, immobilized on the microbead, for specific capturing of kinase-induced phosphopeptides, and Dy(3+) was found to be the most prominent one. Through the efficient concentration of kinase-induced fluorescent phosphopeptides on a Dy(3+) -functionalized single microbead, kinase activity can be detected and quantified by reading the fluorescence on the microbead with a confocal fluorescence microscope. Owing to the extremely specific recognition of Dy(3+) towards phosphopeptides and the highly-concentrated fluorescence accumulation on only one microbead, ultrahigh sensitivity has been achieved for the SBFI strategy which allows direct kinase analysis at the single-cell level.

Zhang, X., et al. (2019). "Rapid fingerprinting of source and environmental microplastics using direct analysis in real time-high resolution mass spectrometry." Analytica Chimica Acta.

Microplastics are ubiquitous in the aquatic and terrestrial environment. To prevent further contamination, methods to determine their sources are needed. Techniques to quantify and characterize microplastics in the environment are still evolving for polymers and the additives and leachable substances embedded therein, which constitute the "chemical fingerprint" of an environmental microplastic. There is a critical need for analytical methods that yield such diagnostic information on environmental microplastics that enables identification of their composition and sources of pollution. This study reports on a novel approach for rapid fingerprinting of environmental microplastics and the screening of additives using Direct Analysis in Real Time (DART)-high resolution mass spectrometry. A variety of plastic samples were investigated, including virgin pre-production pellets, microbeads from personal care products, microplastics found in the aquatic environment, and synthetic fibers. The resulting mass spectra display ~10,000 discrete peaks, corresponding to plastic additives released by thermal desorption and polymer degradation products generated by pyrolysis. These were used to characterize differences among plastic types, microplastic source materials, and environmental samples. Multivariate statistics and elemental composition analysis approaches were applied to analyze fingerprints from the mass spectra. This promising analytical approach is sensitive, (potentially) high-throughput, and can aid in the elucidation of possible sources of microplastics and perhaps eventually to the analysis of bulk environmental samples for plastics. Copyright © 2019

Zhang, X. and G. A. Truskey (2017). "In situ monitoring of engineering muscle to assess myopathy." Tissue Engineering - Part A **23 (Supplement 1)**: S117.

Tissue engineered human skeletal muscle provides a new platform to model muscle diseases and to study the muscle function in response to drugs and toxins in vitro [Stem Cell Research and Therapy, 4(1): S10 (2013)]. In this work, we developed a novel in situ system to monitor the muscle force with higher throughput and low cost. Myobundles were fabricated from human myoblasts using a hydrogel molding technique. PDMS molds with four seeding chamber were designed to fabricate multi-myobundles array. Each myobundle was independently bonded in series with an ecoflex (platinum-catalyzed silicone) film containing beads (53-63mm). Then force generation of myo-bundles in the frame was obtained from mapping the displacement of the beads and the measured elastic modulus of ecoflex membrane. Myobundle contractile forces measured with the microbeads em-bedded in ecoflex agreed well with simultaneous measurements with a force transducer. This novel system was tested through monitoring the force change of myobundles treated with doxorubicin and cer-ivastatin. For doxorubicin (1mg/ml), the contractile force generation of myobundles in all groups were maintained or increased in first three days after shifting to differentiation media (then doxorubicin was added) and this trend was maintained for another 5 days in control groups. In contrast, the tetanus force for myobundles treated with doxorubicin continuously dropped from 5 day onward. The force declines after day4 of continuous exposure to 100 nM cerivastatin and the inhibitory effect of cerivastatin could be eliminated by incubation with 0.3mM mevalonate. This method opens new possibilities for investigating the mechanical stresses of muscle.

Zhang, X., et al. (2015). "Graphene oxide caged in cellulose microbeads for removal of malachite green dye from aqueous solution." Journal of Colloid and Interface Science **437**: 277-282.

A simple sol-gel method using non-toxic and cost-effective precursors has been developed to prepare graphene oxide (GO)/cellulose bead (GOCB) composites for removal of dye pollutants. Taking advantage of the combined benefits of GO and cellulose, the prepared GOCB composites exhibit excellent removal efficiency towards malachite green (>96%) and can be reused for over 5 times through simple filtration method. The high-decontamination performance of the GOCB system is strongly dependent on encapsulation amount of GO, temperature and pH value. In addition, the adsorption behavior of this new adsorbent fits well with the Langmuir isotherm and pseudo-second-order kinetic model.

Zhang, X., et al. (2018). "Sorption of three synthetic musks by microplastics." Marine Pollution Bulletin **126**: 606-609.

Microplastics and synthetic musks (SMs) are two typical organic pollutants in the marine environment. In this study, the sorption of three SMs to microplastics in a simulated seawater environment was examined. Tonalide (AHTN), musk xylene (MX), and musk ketone (MK) were the musks investigated, while polypropylene (PP) was used as the microplastic. It was found that the equilibrium sorption time was about 10h and the adsorption kinetics model conformed to a Lagergren adsorption model. The adsorption capacity increased with decreasing particle size. Adsorption reached a peak at 25degreeC, and the adsorption capacity was not sensitive to the concentration of sodium chloride. There is a need for more research and monitoring of microplastics in the marine environment due to their strong ability to absorb organic pollutants.

Zhang, X., et al. (2019). "Sorption of 3,6-dibromocarbazole and 1,3,6,8-tetrabromocarbazole by microplastics." Marine Pollution Bulletin **138**: 458-463.

Microplastics and organic pollutants are typical contaminants in the marine environment. However, little is known about their interactions. In this study, the sorption of 3,6-Dibromocarbazole(3,6-BCZ) and 1,3,6,8-Tetrabromocarbazole (1,3,6,8-BCZ) by Polypropylene microplastic in simulated seawater was studied. Factors, including particle size, salinity and concentration, were investigated, and the experimental results were simulated using a mathematical model.

Zhang, X., et al. (2011). "Macrophages, rather than T and B cells are principal immunostimulatory target cells of Lycium barbarum L. polysaccharide LBPF4-OL. (Special Issue: Immunomodulators.)." Journal of Ethnopharmacology **136**(3): 465-472.

Aim of the study: Lycium barbarum L. is a renowned Yin strengthening agent in traditional Chinese medicine. Lycium barbarum L. polysaccharide-protein complex is well-known for its immunoregulatory and antitumor effects. LBPF4-OL is the glycan part of Lycium barbarum L. polysaccharide-protein complex fraction 4 (LBPF4). LBPF4-OL's active contribution in LBPF4 is still blank. In the study, we enrich the polysaccharide part of Lycium barbarum L. polysaccharide-protein complex, and investigate its immunostimulatory effects on mouse spleen cells, T cells, B cells and macrophages. Materials and methods: Balb/C mice were used in vitro and in vivo studies. In in vitro study, lymphocyte proliferations were analyzed with ³H-TdR incorporation method. Miltenyi MicroBeads were used in the purification of lymphocytes. Activation of T and B cells was analyzed by flow cytometry. In order to obtain the peritoneal macrophages, mice were injected i.p. with 1 mL of sodium thioglycollate 3 days prior to killing. Spleen cells were stimulated with LBPF4-OL and cytokine concentrations in the supernatants were determined by multiplex bead analysis. In in vivo study, mice were injected i.p. with 1 mL of normal saline or 100 micro g/mL LBPF4-OL daily for 6 days. Peritoneal macrophage functions were analyzed by enzyme-linked immunosorbent assay and flow cytometry assay.

Zhang, Y., et al. (2014). "A duplex recombinant viral nucleoprotein microbead immunoassay for simultaneous detection of seroresponses to human respiratory syncytial virus and metapneumovirus infections." Journal of Virological Methods **206**: 55-62.

Serologic diagnosis of human respiratory syncytial virus (hRSV) and human metapneumovirus (hMPV) infections has been shown to complement virus detection methods in epidemiologic studies. Enzyme immunoassays (EIAs) using cultured virus lysate antigens are often used to diagnose infection by demonstration of a >=4-fold rises in antibody titer between acute and convalescent serum pairs. In this study, hRSV and hMPV nucleocapsid (recN) proteins were expressed in a baculovirus system and their performance compared with virus culture lysate antigen in EIAs using paired serum specimens collected from symptomatic children. The recN proteins were also used to develop a duplex assay based on the Luminex microbead-based suspension array technology, where diagnostic rises in antibody levels could be determined simultaneously at a single serum dilution. Antibody levels measured by the recN and viral lysate EIAs correlated moderately (hRSV, r(2)=0.72; hMPV, r(2)=0.76); the recN EIAs identified correctly 35 of 37 (94.6%) and 48 of 50 (96%) serum pairs showing diagnostic antibody rises by viral lysate EIAs. Purified recN proteins were then coupled to microbeads and serum pairs were tested at a single dilution on a Luminex MAGPIX() analyzer. The duplex recN assay identified correctly 33 of 39 (85%) and 41 of 47 (86.7%) serum pairs showing diagnostic rises to hRSV and hMPV, respectively. The recN assay permits simultaneous testing for acute hRSV and hMPV infections and offers a platform for expanded multiplexing of other respiratory virus assays.

Zhang, Y., et al. (2019). "Importance of atmospheric transport for microplastics deposited in remote areas." Environmental Pollution **254**(Pt A): 112953.

Atmospheric transport is an important pathway for the deposition of micro- and nano-plastics in remote areas. However, the sources and fate of atmospheric microplastics remain poorly understood. A study on atmospheric transport and deposition in the Pyrenean Mountains highlights the movement of microplastics away from known sources (cities, agriculture, and industry) into remote areas. Following this first evidence of atmospheric microplastic deposition in a pristine location, it is necessary to reconsider previous studies on atmospheric microplastic

deposition and behavior in remote areas.

Zhang, Y. J., et al. (2017). "[Research on the negative immune regulation of NK cells in patients with primary immune thrombocytopenia]." Chung-Hua Hsueh Yeh Hsueh Tsa Chih: Chinese Journal of Hematology **38**(5): 399-403.

Objective: To investigate the levels of NK cells and their relevant cytokines (IL-10, TGF-beta and IFN-gamma) in patients with primary immune thrombocytopenia (ITP) . Methods: All samples were obtained from 42 patients (22 newly diagnosed and 20 in remission) and 20 healthy volunteers. The levels of IL-10 and IFN-gamma in blood serum were detected by enzyme-linked immunosorbent assay (ELISA) . The percentage of CD3(-) CD56(+) NK cell, CD3(-) CD56(bright) CD16(-) NK cell, CD3(-) CD56(dim) CD16(+) NK cell in peripheral blood lymphocyte were detected by flow cytometry. The NK cells were isolated by immunomagnetic microbeads. The mRNA expression levels of IL-10, TGF-beta, and IFN-gamma in NK cells were detected by real-time fluorescent quantitative PCR. Correlation between the above measured results was analyzed. Results: 1 The blood serum level of IFN-gamma in newly diagnosed ITP patients [(653.0+/-221.6) ng/L] was higher than that in remission ITP patients [(484.4+/-219.5) ng/L] and healthy control [(390.9+/-253.5) ng/L] (P=0.022, P=0.001) . The blood serum level of IL-10 in newly diagnosed ITP patients was lower than that in healthy control [(52.09+/-26.66) ng/L vs (79.44+/-38.43) ng/L, P=0.007]. 2The percentage of NK cell in newly diagnosed and remission ITP patients [(9.53+/-3.93) %, (9.03+/-3.78) %] were significantly lower than that in healthy control [(13.72+/-7.42) %] (P=0.013, P=0.007) . The ratio of CD3(-) CD56(bright) CD16(-) NK cell/total NK cells in newly diagnosed ITP patients was higher than that in healthy control [(6.85+/-4.43) % vs (4.05+/-2.81) %, P=0.032]. The ratio of CD3(-)CD56(dim) CD16(-) NK cell/total NK cells in newly diagnosed ITP patients was lower than that in healthy control [(93.14+/-4.43) % vs (95.94+/-2.81) %, P=0.032]. 3 There was no significant difference in the mRNA expression level of IFN-gamma in NK cells of ITP patients and healthy control (all P>0.05) . The mRNA expression levels of IL-10 and TGF-beta in NK cells in newly diagnosed ITP patients were significantly higher than that in healthy control (1.82+/-1.32 vs 1.02+/-1.03, P=0.023; 2.80+/-2.31 vs 1.46+/-1.37, P=0.028) . The ratio of CD3(-)CD56(bright) CD16(-) NK cell/total NK cells was positively correlated with the mRNA expression levels of IL-10, TGF-beta in NK cells (r=0.424, P=0.001; r=0.432, P<0.001) . Conclusion: NK cells may compensate for the deficiency of the number by enhancing the secretion of negative regulation cytokines, acting as "protective" roles in the disease.

Zhang, Y. X., et al. (2012). "Target cells and binding sites for immunomodulatory action of Lycium barbarum polysaccharides LBPF4-OL." Zhongguo Yaolixue yu Dulixue Zazhi - Chinese Journal of Pharmacology and Toxicology **26**(5): 715-716.

AIM Lycium barbarum L. is a renowned Yin strengthening agent in traditional Chinese medicine. Lycium barbarum L. polysaccharide-protein complex is well-known for its immunoregulatory and antitumor effects. LBPF4-OL is the glycan part of Lycium barbarum L. polysaccharide-protein complex fraction 4 (LBPF4). The purpose of this study was to identify the immune target cell and binding site of LBPF4-OL. METHODS Miltenyi MicroBeads were used to purify the lymphocyte. Lymphocyte proliferation was analyzed with [super(3)H] TdR incorporation method. Activation of T and B cells was analyzed by flow cytometry (FCM). Cytokine concentration was determined by multiplex bead analysis or ELISA. TLR4 gene mutation mice C3H/HeJ, antibody block and biolayer interferometry (BLI) were used to verify the binding sites. RESULTS Lymphocyte proliferation assay indicated that LBPF4-OL could not induce T and B lymphocytes proliferation spontaneously, but B cell proliferation could take place in the presence of activated macro-phages or LPS. FCM analysis found that LBPF4-OL could not activate T and B cells when co-cultured with splenocyte for 24 h in vitro. But it significantly prompted CD86 and MHC-II molecules expression on macrophage in vivo. ELISA assay showed that LBPF4-OL greatly increased the levels of TNF- alpha and IL-1 beta on macrophage supernatant. Multiplex bead analysis showed that LBPF4-OL induced IL-6, IL-8, IL-10 and TNF- alpha production in a concentration dependent manner, but had no effect on IL-2 and IL-13 production. The possible binding sits of CD19 on B lymphocyte, TLR4, TLR2 and CR3 on macrophages were studied, and TLR4 as the binding site of LBPF4-OL was further verified in C3H/HeJ mice. Results showed that LBPF4-OL obviously induced the proliferation of splenocyte and the secretion of TNF- alpha and IL-1 beta in macrophage from wildtype mice C3H/HeN. But the proliferation of splenocyte from mutation mice C3H/HeJ reduced significantly. BLI results showed that LBPF4-OL could bind directly with TLR4 in vitro. CONCLUSION Both B lymphocytes and macrophage are target cells of LBPF4-OL, and TLR4 is one of the binding sites on macrophage.

Zhang, Z. Y. and J. M. Wu (2007). "[Anti-tumor effects induced by fusion of interleukin-18 gene transfected NCI-H460 lung cancer cell line with dendritic cells]." Chung-Hua Chung Liu Tsa Chih [Chinese Journal of Oncology] **29**(1): 17-20.

OBJECTIVE: To explore the anti-tumor effects induced by fusion of interleukin (IL)-18 gene transfected lung cancer cell line NCI-H460 cells with dendritic cells (DC).

METHODS: (1) DC were induced from human monocytes and fused with IL-18 transfected NCI-H460 cells. Fusion was selected using MACS microbeads. (2) Four groups (group GT, group PT, group NT and group BC) were set up. T cells activated by IL-18 gene transfected fusion or pcDNA3. 1 + vector transfected fusion and non-transfected fusion were taken as effetor cells. No effector cells was in group BC. Lactic dehydrogenase (LDH) method was used to evaluate the antitumor effect in vitro. (3) Tumor-bearing nude mice were inoculated with effector cells mentioned above. The tumor size and weight in the 4 groups were compared.

RESULTS: The killing rate in vitro of 3 groups were 53. 14% ,30. 10% and 31.49% , respectively. The tumor size and weight in the 3 groups were lower than group BC, among which group GT was the lowest.

CONCLUSION: Fusion of IL-18 gene transfected NCI-H460 lung cancer cells with dendritic cells can effectively induce anti-tumor immunity in the host.

Zhao, C., et al. (2019). "No-tillage reduces competition and enhances compensatory growth of maize (Zea mays L.) intercropped with pea (Pisum sativum L.)." Field Crops Research **243**(107611).

Compensatory growth is a mechanism that explains the recovery in stature and yield of a subordinate crop after the dominant competitor is harvested from an intercropping system. This mechanism might be affected by agronomic practices, particularly those related to the crop water supply in arid regions. The objective of this study was to evaluate the effects of tillage and irrigation practices on competition and compensatory growth in pea-maize intercropping systems at Wuwei station in northwest China from 2014 to 2016. The field experiment included two forms of tillage with plastic film (no-tillage, NT; conventional tillage CT) and three irrigation levels (450 mm, I1; 495 mm, I2; 540 mm, I3). As pea was planted first, it was the dominant competitor and caused greater suppression of maize when crops were grown under I1 > I2 > I3 levels in NT than at the corresponding irrigation levels in CT. Compensatory growth of maize after pea harvest was, on average, 8 to 16% greater in the NT than CT. Growing the intercropped maize strip under NT with plastic mulch was as effective as CT with plastic mulch to achieve a favorable yield outcome. However, the intercropped pea yield was 20-29% greater, with 0-5% more maize yield under deficit irrigation level (I1) and the land equivalent ratio was 3-15%

greater in NT than CT plots during this study. Yield gains were related to improved water use efficiency, which was 8 to 18% greater in the intercropping system under NT than CT management. We recommend the NT with plastic mulch method as a water-saving strategy that can sustain the productivity of maize-pea intercropping systems while reducing plastic pollution from agricultural activities in arid regions.

Zhao, D., et al. (2016). "Preparation and characterization of Ganoderma lucidum spores-loaded alginate microspheres by electrospraying." Materials Science & Engineering. C, Materials for Biological Applications **62**: 835-842.

Ganoderma lucidum spores (GLSs), popular functional food in preventive medicine, are susceptible to oxidative and acidic degradation during processing, storage and oral administration, resulting in the loss of sensory and nutritional qualities. The main objective of the study was to encapsulate the GLS in order to fully preserve the bioactivity of the ingredients as well as providing controlled and targeted delivery. Electrospraying was applied to prepare GLS-Alginate (GLS/A) micro beads in the current study. The size of GLS/A beads can be tailored by varying the applied voltage and drying processes. pH responsive release profiles of GLS/A beads were revealed from in vitro study in a simulated gastrointestinal environment: no release of GLS encapsulated beads in the simulated gastric fluid (pH of 1.8) was observed; while a rapid, size dependent release was found in the simulated intestinal solution (pH of 7.5). The release from smaller beads (e.g. 600 mum) was 1.5 times faster than that of larger beads (e.g. 2000 mum). In addition, the GLS release from freeze dried beads was almost 3 times faster than those of air and vacuum dried beads in the first 90 min. The present results illustrate the potential to protect GLS by encapsulation using electrospraying to achieve the controlled release of GLS ingredients. This will pave the way to develop effective GLS products with desirable bioactive components for healthcare applications.

Zhao, G., et al. (2015). "Large-scale expansion of Wharton's jelly-derived mesenchymal stem cells on gelatin microbeads, with retention of self-renewal and multipotency characteristics and the capacity for enhancing skin wound healing." Stem Cell Research & Therapy **6**: 38.

INTRODUCTION: Successful stem cell therapy relies on large-scale generation of stem cells and their maintenance in a proliferative multipotent state. This study aimed to establish a three-dimension culture system for large-scale generation of hWJ-MSC and investigated the self-renewal activity, genomic stability and multi-lineage differentiation potential of such hWJ-MSC in enhancing skin wound healing.

METHODS: hWJ-MSC were seeded on gelatin microbeads and cultured in spinning bottles (3D). Cell proliferation, karyotype analysis, surface marker expression, multipotent differentiation (adipogenic, chondrogenic, and osteogenic potentials), and expression of core transcription factors (OCT4, SOX2, NANOG, and C-MYC), as well as their efficacy in accelerating skin wound healing, were investigated and compared with those of hWJ-MSC derived from plate cultres (2D), using in vivo and in vitro experiments.

RESULTS: hWJ-MSC attached to and proliferated on gelatin microbeads in 3D cultures reaching a maximum of 1.1-1.30x10(7) cells on 0.5 g of microbeads by days 8-14; in contrast, hWJ-MSC derived from 2D cultures reached a maximum of 6.5 -11.5x10(5) cells per well in a 24-well plate by days 6-10. hWJ-MSC derived by 3D culture incorporated significantly more EdU ($P<0.05$) and had a significantly higher proliferation index ($P<0.05$) than those derived from 2D culture. Immunofluorescence staining, real-time PCR, flow cytometry analysis, and multipotency assays showed that hWJ-MSC derived from 3D culture retained MSC surface markers and multipotency potential similar to 2D culture-derived cells. 3D culture-derived hWJ-MSC also retained the

expression of core transcription factors at levels comparable to their 2D culture counterparts. Direct injection of hWJ-MSC derived from 3D or 2D cultures into animals exhibited similar efficacy in enhancing skin wound healing.
CONCLUSIONS: Thus, hWJ-MSC can be expanded markedly in gelatin microbeads, while retaining MSC surface marker expression, multipotent differential potential, and expression of core transcription factors. These cells also efficiently enhanced skin wound healing in vivo, in a manner comparable to that of hWJ-MSC obtained from 2D culture.

Zhao, J., et al. (2007). "Synthesis of Zn(II) ion-imprinted solid-phase extraction material and its analytical application." Analytica Chimica Acta **603**(1): 87-92.

Zn(II) ion-imprinted polymer materials used for solid-phase extraction (SPE) column were prepared by the copolymerization of 8-acryloyloxyquinoline (8-AOQ) monomer and a crosslinker ethylene glycol dimethacrylate (EGDMA) in the presence of 2,2'-azobisisobutyronitrile (AIBN) as an initiator. After removing Zn(II) ion from the polymer, molecularly imprinted polymers (MIPs) capable of selectively rebinding Zn(II) ion were obtained. The maximum adsorption capacity of Zn(II) on MIPs beads was about 3.9 mg g(-1). The effect of pH and flow rate for quantitative enrichment was also investigated. The Zn(II)-imprinted microbeads have a greater affinity for Zn(II) with respect to Cu(II), Co(II) and Ni(II) ions. A detection limit of 0.65 microg L(-1)(3sigma) and a relative standard deviation (R.S.D., n=7) of 2.9% were obtained. The MIPs-SPE preconcentration procedure showed a linear calibration curve within concentration range from 0.65 to 130 microg L(-1). Zn(II) ion-imprinted beads enabled the selective extraction of zinc ions from a complex matrix, and after 20 times of adsorption and desorption cycle, the recovery of adsorption capacity of Zn(II) on MIPs beads was only decreased 3.2%. The results suggested that these MIPs can be used several times without considerable loss of adsorption capacity.

Zhao, J. and Z. You (2016). "Using binary optical elements (BOEs) to generate rectangular spots for illumination in micro flow cytometer." Biomicrofluidics **10**(5): 054111.

This work introduces three rectangular quasi-flat-top spots, which are provided by binary optical elements (BOEs) and utilized for the illumination in a microflow cytometer. The three spots contain, respectively, one, two, and three rectangles (R1, R2, and R3). To test the performance of this mechanism, a microflow cytometer is established by integrating the BOEs and a three-dimensional hydrodynamic focusing chip. Through the experiments of detecting fluorescence microbeads, the three spots present good fluorescence coefficients of variation in comparison with those derived from commercial instruments. Benefiting from a high spatial resolution, when using R1 spot, the micro flow cytometer can perform a throughput as high as 20 000 events per second (eps). Illuminated by R2 or R3 spot, one bead emits fluorescence twice or thrice, thus the velocity can be measured in real time. Besides, the R3 spot provides a long-time exposure, which is conducive to improving fluorescence intensity and the measurement stability. In brief, using the spots shaped and homogenized by BOEs for illumination can increase the performance and the functionality of a micro flow cytometer.

Zhao, L., et al. (2017). "Transgenerational toxicity of nanopolystyrene particles in the range of micro g L⁻¹ in the nematode Caenorhabditis elegans." Environmental Science: Nano **4**(12): 2356-2366.

The potential toxicity of nanoplastics to environmental organisms has gradually received great attention recently. We employed the in vivo assay system of Caenorhabditis elegans to investigate the possible transgenerational toxicity of nanopolystyrene particles and the underlying cellular mechanisms. After prolonged exposure, we observed the toxicity of

nanopolystyrene particles at concentrations higher than 10 micro g L⁻¹. The transgenerational toxicity was further detected in nematodes exposed to nanopolystyrene particles at concentrations higher than 100 micro g L⁻¹. This observed transgenerational toxicity of nanopolystyrene particles might be mainly due to the translocation of nanopolystyrene particles into reproductive organs such as the gonad, which potentially in turn led to the transfer of nanopolystyrene particles to the next generation. Leachates from nanopolystyrene particles at concentrations in the range of micro g L⁻¹ did not contribute to the development of this transgenerational toxicity. Enhancement of intestinal permeability and extension of defecation cycle length provide the explanation for the observed accumulation and translocation of nanopolystyrene particles in reproductive organs. Therefore, our results demonstrate the potential transgenerational toxicity of nanopolystyrene particles in the range of micro g L⁻¹ in environmental organisms.

Zhao, L., et al. (2020). "Exposure to polyamide 66 microplastic leads to effects performance and microbial community structure of aerobic granular sludge." Ecotoxicology & Environmental Safety **190**: 110070.

Microplastic polyamide 66 (PA66) was used to explore its mechanism of influence on the contaminants removal from aerobic granular sludge (AGS) and the corresponding change to the microbial community.

Zhao, L., et al. (2011). "Osteogenic media and rhBMP-2-induced differentiation of umbilical cord mesenchymal stem cells encapsulated in alginate microbeads and integrated in an injectable calcium phosphate-chitosan fibrous scaffold." Tissue engineering. Part A. **17**(7-8): 969-979.

The need for bone tissue engineering has increased as the world population ages. The objectives of this study were to (1) develop a novel human umbilical cord mesenchymal stem cell (hUCMSC)-encapsulating, fiber-reinforced injectable calcium phosphate cement (CPCF) scaffold, and (2) investigate the effects of osteogenic media delivery, preosteodifferentiation, and bone morphogenetic protein-2 (BMP-2) delivery on hUCMSC osteodifferentiation inside CPCF for the first time. CPCF was developed using calcium phosphate powders, chitosan, and absorbable fibers. Four types of hUCMSC-encapsulating constructs were fabricated: control media in alginate hydrogel microbeads in CPCF; osteogenic media in microbeads; preosteodifferentiation; and recombinant human BMP-2 (rhBMP-2) in microbeads. The hUCMSCs inside CPCF maintained good viability, successfully differentiated into the osteogenic lineage, and synthesized bone minerals. The preosteodifferentiation method yielded high gene expressions of alkaline phosphatase, osteocalcin, collagen, and osterix, as well as alkaline phosphatase protein synthesis. The mineralization for the preosteodifferentiation constructs exceeded those of the rhBMP-2 group at 1-7 days, and was slightly lower than the rhBMP-2 group at 21 days. Mineralization of the rhBMP-2 group was 12-fold that of the control constructs at 21 days. In conclusion, although the BMP-2 delivery promoted osteodifferentiation, the preosteodifferentiation method and the ostegenic media method with hUCMSCs in CPCF were also promising for bone regeneration. hUCMSCs may be an effective alternative to the gold-standard bone marrow MSCs, which require an invasive procedure to harvest. The novel injectable stem cell-CPCF construct may be useful in minimally invasive and other orthopedic surgeries.

Zhao, M., et al. (2016). "Immunofluorescence chromatographic assay of tumor cells in dried blood spot." Cancer Research. Conference: 107th Annual Meeting of the American Association for Cancer Research, AACR **76**(14 Supplement).

Blood droplet, when desiccated on a surface, forms a ring-like deposit, akin to the coffee ring left after a coffee spill. When blood, coffee, or other aqueous suspensions of the colloidal particles, evaporate with contract line pinned on the underlying hydrophilic surface, a capillary force is generated by the evaporative flux, which drags nearly all the particles to the edge. As the evaporation extends, the volume of the droplet decreases, and the solgel transition occurs. The gelation gradually moves inward from the edge to the center, eventually immobilizes all particles, and develops the ring effect. Because smaller sized particles diffuse much more quickly and efficiently than the larger ones, smaller particles tend to preferentially accumulate on the rim, forming multilayered self-assembly. Contrarily, the majority of the larger particles congregate in the central area. This natural phenomenon simply presents a size-dependent chromatography of variously sized particles in solution. Separation of normal blood cells or break-free tumor cells has been widely utilized for blood disease diagnosis and cancer prognosis. Traditional preparation via blood smear and advanced separation by the external driving forces, e.g. centrifugation and powered microfluidics, could be limited by the technical difficulty, assay complexity, and cell integrity. Coffee-ring based blood cell separation and detection, namely dried spot biopsy, is however a handfree, cellharmless, spontaneous process. To perform a dried spot biopsy, 3x1 inch microscope slides were first cleaned to remove surface impurities and residues. 200 uL of freshly collected, anti-coagulated whole blood, bearing fluorescent microbeads (1 and 10 um sized) or prestained breast tumor cells (MDAMB231, ~15 um sized), was dispensed onto the slide and allowed to dry statically or acceleratedly on a moving stage at controlled temperature and humidity. Three hydrophilic coatings and five surfactants were examined to balance the outward capillary flow with the inward Marangoni flow for optimal coffee ring effect. It is demonstrated that two sizes of microbeads formed separate rings, a few hundreds of microns in average apart from each other, while tumor cells, acting differently, concentrated in the central area with random dispersion, probably because of the diversified cell sizes. The dried spot biopsy could have a potential for detecting blood borne biomarkers in the form of dried blood specimens that poses longer shelf life, less biohazardous risk, and easier transportation protocol than the liquid form. Additionally, specific cells of interest from microscopic regions of dried blood film can be retrieved by laser microdissection for downstream analyses. Particularly, this method could be valuable for use in low-resourced regions and countries.

Zhao, R. J., et al. (2018). "Property of filler-loaded magnetic ferrite from plastic waste bottle used to treat municipal domestic sewage." Environmental Technology **39**(12): 1607-1613.

The present work investigates the properties of self-made magnetic filler from plastic waste bottle and explores a new technology approach of waste plastic resource utilization. The magnetic filler was prepared by air plasma modification and loading magnetic ferrite on the plastic strip from waste plastic bottle. The surface properties of magnetic filler were characterized by Atomic Force Microscope (AFM), contact angle system and Fourier Transform Infrared (FTIR). AFM images of original and modified plastic strip showed that low-temperature plasma treatment markedly increased the surface roughness of plastic strip. The mean roughness (Ra) of plastic strip rose from 1.116 to 5.024 nm. FTIR spectra indicated that a lot of polar oxygenic groups were introduced onto the surface of plastic by plasma modification. Modification by low-temperature plasma increased the hydrophilicity of plastic strip surface. When treatment time is 40 s, water contact angle of plastic strip surface reduced from 78.2degree of original plastic strip to 25.3degree. When used in bioreactor, magnetic filler had very favorable microenvironment for microorganism growth. Magnetic filler was more efficient for removing chemical oxygen demand (COD) and [Formula: see text] in sewage than

nonmagnetic filler. The resource utilization of plastic wastes will become reality if the magnetic filler is applied widely.

Zhao, S., et al. (2019). "Analysis of suspended microplastics in the Changjiang Estuary: Implications for riverine plastic load to the ocean." Water Research **161**: 560-569.

The role of rivers as a major transport pathway for all sizes of plastic debris into the ocean is widely recognized. Global modelling studies ranked the Changjiang River as the largest contributor of plastic waste to the marine environment, but these estimates were based on insufficient empirical data. To better understand the role of rivers in delivering terrestrial plastic debris to the ocean, the spatial and temporal patterns of microplastics (MP) in the Changjiang Estuary (CE) and the East China Sea (ECS) were studied based on surface water samples in February, May, and July 2017. A total of 3225 MP (60-5000 mum) were identified by Fourier-transform infrared (FTIR) spectrometry. MP abundance in July was higher than in February and May due to higher river discharge. Density stratification in CE significantly influenced the surface MP abundances. A temporal accumulation zone within the river-sea interface for plastics was indicated by stations with apparently higher abundances in the river plume. Fibers were the most common MP (>80%) over three months. Small MP (<1000 mum) composed 75.0% of the total plastics on average. The average mass of MP was 0.000033 g/particle, which was two orders of magnitude lower than the empirical mass in literature. Without considering tidal effects, we estimate 16-20 trillion MP particles, weighing 537.6-905.9 tons, entered the sea through the surface water layer of the Changjiang River in 2017. These findings of this study provide reliable information on MP waste in a large river, which should be considered in further studies for estimating the riverine plastic loads. Copyright © 2019 Elsevier Ltd

Zhao, S., et al. (2018). "Field-Based Evidence for Microplastic in Marine Aggregates and Mussels: Implications for Trophic Transfer." Environmental Science & Technology **52**(19): 11038.

Marine aggregates incorporate particles from the environment, including microplastic (MP). The characteristics of MP in aggregates and the role of aggregates in linking MP with marine organisms, however, are poorly understood. To address these issues, we collected aggregates and blue mussels, Mytulis edulis, at Avery Point, CT, and analyzed samples with microspectrometers. Results indicate that over 70% of aggregates sampled harbored MP (1290 ± 1510 particles/m3). Fifteen polymer types were identified, with polypropylene, polyester and synthetic-cellulose accounting for 44.7%, 21.2% and 10.6%, respectively, of the total MP count. Over 90% of MP in aggregates were ≤1000 μm, suggesting that aggregations are a sink for this size fraction. Although size, shape, and chemical type of MP captured by mussels were representative of those found in aggregates, differences in the sizes of MP in pseudofeces, feces and digestive gland/gut were found, suggesting size-dependent particle ingestion. Over 40% of the MP particles were either rejected in pseudofeces or egested in feces. Our results are the first to identify a connection between field-collected marine aggregates and bivalves, and indicate that aggregates may play an important role in removing MP from the ocean surface and facilitating their transfer to marine food webs.

Zhao, S., et al. (2015). "Microplastic in three urban estuaries, China." Environmental Pollution **206**: 597-604.

Estuarine Microplastics (MPs) are limited to know globally. By filtering subsurface water through 330 mum nets, MPs in Jiaojiang, Oujiang Estuaries were quantified, as well as that in Minjiang Estuary responding to Typhoon Soulik. Polymer matrix was analyzed by Raman spectroscopy.

MP (<5 mm) comprised more than 90% of total number plastics. The highest MPs density was found in Minjiang, following Jiaojiang and Oujiang. Fibers and granules were the primary shapes, with no pellets found. Colored MPs were the majority. The concentrations of suspended microplastics determine their bioavailability to low trophic organisms, and then possibly promoting the transfer of microplastic to higher trophic levels. Polypropylene and polyethylene were the prevalent types of MPs analyzed. Economic structures in urban estuaries influenced on MPs contamination levels. Typhoon didn't influence the suspended MP densities significantly. Our results provide basic information for better understanding suspended microplastics within urban estuaries and for managerial actions.

Zhao, S., et al. (2016). "Microscopic anthropogenic litter in terrestrial birds from Shanghai, China: not only plastics but also natural fibers." Science of the Total Environment **550**: 1110-1115.

The level of contamination by microscopic anthropogenic litter (0.5-5 mm) in terrestrial ecosystems is not well understood. After chemical digestion in 10% KOH, microscopic anthropogenic litter from the gastrointestinal tracts of 17 terrestrial birds was identified and categorized under a stereomicroscope based on its physical properties and melting tests. In total, 364 items from 16 birds were identified as microscopic anthropogenic litter, ranging in size from 0.5 to 8.5 mm. No relationship between plastic load and body condition was found. Natural fibers, plastic fibers and fragmented plastics represented, respectively, 37.4% (136 items), 54.9% (200 items) and 7.7% (28 items) of total litter items. Small sample sizes limited our ability to draw strong conclusions about the metabolism of natural fibers, but the decline in the proportion of natural fibers from the esophagus to stomach to intestine suggested that they may be digestible. Particles smaller than 5 mm represented more than 90% of the total number of pollutant items. Particles with colors in the mid-tones and fibrous shapes were overwhelmingly common particles. The results reflect pollution by microscopic anthropogenic litter in the terrestrial ecosystem of the study area. Microscopic natural fibers, which may disperse and adsorb chemical pollutants differently from microplastic and may pose an even greater risk, are in urgent need of further research.

Zhao, T., et al. (2019). "The interactions between micro polyvinyl chloride (mPVC) and marine dinoflagellate Karenia mikimotoi: The inhibition of growth, chlorophyll and photosynthetic efficiency." Environmental Pollution **247**: 883-889.

Microplastics pose a great threat to entire marine ecosystems, but little is known about their impacts on phytoplankton, especially for the harmful dinoflagellates. In this study, effects of micro polyvinyl chloride (mPVC) on the growth, chlorophyll content and photosynthetic efficiency of the dinoflagellate Karenia mikimotoi at different periods (0, 24, 48, 72 and 96 h) were assessed using gradient concentrations (0, 5, 25, 50 and 100 mg L−1) of mPVC with a size of 1 µm. PVC microplastics had dose-dependent adverse effects on K. mikimotoi growth, chlorophyll content and photosynthetic efficiency. The density of algal cell decreased with increasing mPVC concentrations and the highest inhibitory rate (IR) was 45.8% at 24 h under 100 mg L−1 of mPVC. The total chlorophyll content and chlorophyll content in a single algal cell decreased at 96 h and the ΦPSⅡ and Fv/Fm decreased 25.3% and 17.1%, respectively. The SEM images provided an intuitive visual method to observe the behaviors and interactions between microplastics and microalgae. It was found from the SEM images that microalgae was wrapped by microplastic beads. The physical blockage and aggregation were also responsible for the cytotoxicity of K. mikimotoi. Our study clarified that PVC microplastics can reduce algal growth, chlorophyll content and photosynthetic efficiency, and it is beneficial to evaluate the possible impact of plastics on aquatic ecosystems. Graphical abstract Image 104227 Highlights • The

interactions between mPVC and Karenia mikimotoi were investigated. • mPVC had toxic effects on Karenia mikimotoi. • The toxic effects depended on the exposure concentration and treatment time. • Physical blockage and aggregation were likely responsible for cytotoxicity. mPVC inhibited the growth, chlorophyll content and photosynthetic efficiency of the algae. The physical blockage and aggregation were responsible for the inhibition. [ABSTRACT FROM AUTHOR]

Zhao, W., et al. (2018). "Molecular distribution and compound-specific stable carbon isotopic composition of dicarboxylic acids, oxocarboxylic acids and α -dicarbonyls in PM 2.5 from Beijing, China." Atmospheric Chemistry and Physics **18**(4): 2749-2767.

This study investigates the seasonal variation, molecular distribution and stable carbon isotopic composition of diacids, oxocarboxylic acids and α-dicarbonyls to better understand the sources and formation processes of fine aerosols (PM2.5) in Beijing. The concentrations of total dicarboxylic acids varied from 110 to 2580 ng m^{-3}, whereas oxoacids (9.50–353 ng m^{-3}) and dicarbonyls (1.50–85.9 ng m^{-3}) were less abundant. Oxalic acid was found to be the most abundant individual species, followed by succinic acid or occasionally by terephthalic acid (tPh), a plastic waste burning tracer. Ambient concentrations of phthalic acid (37.9 ± 27.3 ng m^{-3}) and tPh (48.7 ± 51.1 ng m^{-3}) were larger in winter than in other seasons, illustrating that fossil fuel combustion and plastic waste incineration contribute more to wintertime aerosols. The year-round mass concentration ratios of malonic acid to succinic acid (C3 ⁄ C4) were relatively low by comparison with those in other urban aerosols and remote marine aerosols. The values were less than or equal to unity in Beijing, implying that the degree of photochemical formation of diacids in Beijing is insignificant. Moreover, strong correlation coefficients of major oxocarboxylic acids and α-dicarbonyls with nss-K+ suggest that biomass burning contributes significantly to these organic acids and related precursors. The mean δ13C value of succinic acid is the highest among all species, with values of −17.1 ± 3.9 ‰ (winter) and −17.1 ± 2.0 ‰ (spring), while malonic acid is more enriched in 13C than others in autumn (−17.6 ± 4.6 ‰) and summer (−18.7 ± 4.0 ‰). The δ13C values of major species in Beijing aerosols are generally lower than those in the western North Pacific atmosphere, the downwind region, which indicates that stable carbon isotopic compositions of diacids depend on their precursor sources in Beijing. Therefore, our study demonstrates that in addition to photochemical oxidation, high abundances of diacids, oxocarboxylic acids and α-dicarbonyls in Beijing are largely associated with anthropogenic primary emissions, such as biomass burning, fossil fuel combustion and plastic waste burning.

Zhao, W., et al. (2013). "An integrated microfluidic device for rapid serodiagnosis of amebiasis." Biomicrofluidics **7**(1): 11101.

A microfluidic device was successfully fabricated for the rapid serodiagnosis of amebiasis. A micro bead-based immunoassay was fabricated within integrated microfluidic chip to detect the antibody to Entamoeba histolytica in serum samples. In this assay, a recombinant fragment of C terminus of intermediate subunit of galactose and N-acetyl-D-galactosamine-inhibitable lectin of Entamoeba histolytica (C-Igl, aa 603-1088) has been utilized instead of the crude antigen. This

device was validated with serum samples from patients with amebiasis and showed great sensitivity. The serodiagnosis can be completed within 20 min with 2 mul sample consumption. The device can be applied for the rapid and cheap diagnosis of other infectious disease, especially for the developing countries with very limited medical facilities.

Zhao, X., et al. (2013). "The inhibitory effect of dendritic cell subsets from mice immunized with the soluble egg antigen of Schistosoma japonicum on asthma and levels of CCL-11 and IL-13Ra2 expression." Zhongguo Bingyuan Shengwuxue Zazhi / Journal of Pathogen Biology **8**(8): 680-685.

Objective: This paper sought to study the inhibitory effect of adoptive transfer of dendritic cell (DC) subsets from mice immunized with the soluble egg antigen (SEA) of Schistosoma japonicum on asthma and its mechanisms.

Zhao, X. Y., et al. (2015). "CCL3 serves as a potential plasma biomarker in knee degeneration (osteoarthritis)." Osteoarthritis & Cartilage **23**(8): 1405-1411.

OBJECTIVE: To explore the ability of chemokines in plasma to detect the presence of pre-X-rays defined knee degeneration and the extent (burden).

METHODS: A total of 181 subjects (75 control subjects, 47 pre-X-KD patients and 50 X-KOA patients) were included and subdivided into three subgroups. Articular cartilage loss in pre-X-KD patients were scored on the basis of the ICRS classification during the arthroscopy or documented on MRI with chondral WORMS. The severity of X-KOA was graded using the Kellgren-Lawrence classification through the posterior-anterior knee X-rays. The concentrations of the inflammatory cytokines and chemokines in plasma were quantified using Luminex microbead-based suspension array (SA) and were cross-validated by enzyme-linked immunosorbent assay (ELISA).

RESULTS: CCL3 in plasma showed the highest ability to discriminate pre-X-KD patients from the controls with an AUC of 0.799. At a cutoff value of 0.168 pg/ml, the sensitivity was 70.21%, the specificity was 96.00%, the positive predictive value was 91.67% and the negative predictive value was 83.72%. As to define disease burden, the plasma levels of resistin, IL6, IL8, CCL3 and CCL4 showed significant association with the severity of X-rays defined knee OA, with regard to the KL classification. Moreover, significant elevation of IL6, IL8, CCL3 and CCL4 levels in plasma were observed in severe knee OA patients (KL grade IV) compared with those with pre-X-KD (KL grade 0-I).

CONCLUSION: We firstly showed that the plasma CCL3 could be potential serum biomarker for knee OA with the capacity to detect pre-X-rays defined changes and stage the severity of damage in knee.

Zhao, Y., et al. (2019). "Polystyrene microplastic exposure disturbs hepatic glycolipid metabolism at the physiological, biochemical, and transcriptomic levels in adult zebrafish." Science of the Total Environment **710**: 136279.

Microplastics (MPs), which are new types of environmental pollutants, have recently received widespread attention worldwide. MPs can accumulate in the bodies of animals and in plants, and they can also enter the human body through the food chain. However, knowledge of the effects of MPs on the health of animals is still limited. In this experiment, adult male zebrafish were exposed to 20 or 100 mug/L of 5 mum polystyrene MP for 21 days in an attempt to determine the hepatic effects related to glycolipid metabolism at the biochemical and transcriptomic levels. It was found that body weight and condition factor decreased significantly in zebrafish after exposure to 20 and 100 mug/L polystyrene MP for 21 days. The transcription levels of major genes related to glycolipid metabolism decreased significantly in the liver.

Correspondingly, the levels of major biochemical parameters, including Glu, pyruvic acid, alpha-ketoglutaric acid and IDH, were also decreased in the livers of exposed zebrafish, especially those in the 100 mug/L polystyrene MP-treated group. Moreover, the data on the hepatic transcriptome also confirmed that some genes related to fatty acid metabolism, amino acid metabolism and carbon metabolism tended to be decreased in the livers of exposed zebrafish. Taken together, our data confirmed that polystyrene PS-MP can induce hepatic glycolipid metabolism disorder at the physiological, biochemical, and transcriptomic levels in adult zebrafish after 21 days of exposure.

Zhao, Y., et al. (2019). "Data on microplastics in the digestive tracts of 19 fish species from the Yellow Sea, China." Data in Brief **25**: 103989.

Microplastics (MPs) are the predominant form of marine plastic debris, and small enough to be ingested by marine organisms. Fish inhabiting coastal environments are susceptible to the ingestion of MPs. Presented data include the information of MPs level in the digestive tracts of 19 fish species which were caught from the Yellow Sea (31degree28'52.380"~38degree49'15.540 N, 120degree42'36.840"~124degree49'06.180E). For discussion and interpretation of the presented data, refer to the research article entitled "Characteristics and retention of microplastics in the digestive tracts of fish from the Yellow Sea" [1].

Zhao, Y. B., et al. (2017). "Laboratory simulations of the mixed solvent extraction recovery of dominate polymers in electronic waste." Waste Management **69**: 393-399.

The recovery of four dominant plastics from electronic waste (e-waste) using mixed solvent extraction was studied. The target plastics included polycarbonate (PC), polystyrene (PS), acrylonitrile butadiene styrene (ABS), and styrene acrylonitrile (SAN). The extraction procedure for multi-polymers at room temperature yielded PC, PS, ABS, and SAN in acceptable recovery rates (64%, 86%, 127%, and 143%, respectively, where recovery rate is defined as the mass ratio of the recovered plastic to the added standard polymer). Fourier transform infrared spectroscopy (FTIR) was used to verify the recovered plastics' purity using a similarity analysis. The similarities ranged from 0.98 to 0.99. Another similar process, which was denoted as an alternative method for plastic recovery, was examined as well. Nonetheless, the FTIR results showed degradation may occur over time. Additionally, the recovery cost estimation model of our method was established. The recovery cost estimation indicated that a certain range of proportion of plastics in e-waste, especially with a higher proportion of PC and PS, can achieve a lower cost than virgin polymer product. It also reduced 99.6%, 30.7% and 75.8% of energy consumptions and CO<inf>2</inf> emissions during the recovery of PC, PS and ABS, and reduced the amount of plastic waste disposal via landfill or incineration and associated environmental impacts. Copyright © 2017 Elsevier Ltd

Zhao, Y.-B., et al. (2019). "A Chemical Time Bomb: Future Risks of Microplastics." Water, Air & Soil Pollution **230**(11): N.PAG-N.PAG.

Despite the controversy, the ecological risk of microplastics research has increased sharply from only one in 1966 to 495 in 2018, according to Web of Science with microplastics as keyword. To date, an upward trend of global microplastics mass emission was confirmed by many environmental scientists. The ocean is the ultimate destination of land-based microplastics sources; therefore, most of efforts were concentrated on microplastics in aquatic environment. In this brief article, the global release of microplastics and flux into the ocean in the recent decade were estimated roughly. The plastics fragmentation in the marine environment only

accounted for 22% of total microplastics release (assuming defined emission rate per capita and fragmentation rate of plastics). Future research is needed for microplastics generation and retention in the terrestrial system, especially indoor environments. The accumulated microplastics over the environmental self-purification capacity certainly increases stress for the marine, freshwater and terrestrial ecosystem. [ABSTRACT FROM AUTHOR]
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Zhao, Y.-B., et al. (2018). "Solvent-based separation and recycling of waste plastics: A review." Chemosphere **209**: 707-720.
Since the creation of first man-made plastic, the global production and consumption of plastics have been continuously increasing. However, because plastic materials are durable and very slow to degrade, they become waste with high staying power. The over-consumption, disposal, and littering of plastics result in pollution, thus causing serious environmental consequences. To date, only a fraction of waste plastics is reused and recycled. In fact, recycling plastics remains a great challenge because of technical challenges and relatively insufficient profits, especially in mixed plastics. This review focuses on an environmentally friendly and potentially profitable method for plastics separation and recovery and solvents extraction. It includes the dissolution/reprecipitation method and supercritical fluid extraction, which produce high-quality recovered plastics comparable to virgin materials. These methods are summarized and discussed taking mass-produced plastics (PS, PC, Polyolefins, PET, ABS, and PVC) as examples. To exploit the method, the quality and efficiency of solvent extraction are elaborated. By eliminating these technical challenges, the solvent extraction method is becoming more promising and sustainable for plastic issues and polymer markets. [ABSTRACT FROM AUTHOR]
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Zheng, J., et al. (2018). "Heavy Exposure of Waste Collectors to Polycyclic Aromatic Hydrocarbons in a Poor Rural Area of Middle China." Environmental Science & Technology **52**(15): 8866-8875.
Manual collection and open-air incineration of waste materials is a common practice in rural regions of China and beyond. Low-temperature combustion of rubber and plastic waste generates high levels of airborne polycyclic aromatic hydrocarbons (PAHs). We investigated ten urinary hydroxylated PAH metabolites (OH-PAHs), the oxidative damage biomarker (8-hydroxy-deoxyguanosine, 8-OHdG), and four serum biomarkers including gamma-glutamyl transferase (GGT) and alanine aminotransferase (ALT) in 41 waste collectors and 122 control subjects residing in the same or a distant rural village in Henan Province. The level of PAH metabolites in urine (median: 17.24 mug/g Cre) was twice that of controls living in the same area without an occupational history involving waste collection (median: 8.16 mug/g Cre) and thrice that of controls living 30 km away (median: 6.07 mug/g Cre). The concentrations of OH-PAHs were positively associated with urinary 8-OHdG levels (beta = 0.283, $p < 0.05$). Serum

GGT and ALT were slightly increased in waste collectors. Urinary 8-OHdG levels were similar in one-year and longer-term workers, suggesting that rubber and plastic waste collection/incineration carries a high PAH exposure risk. These data provide solid baseline information, emphasizing the importance of monitoring the long-term health outcomes of waste collectors and changes in exposure patterns associated with rural development and regulation of waste disposal.

Zheng, J. M., et al. (2011). "Both secretions of interferon and expressions of phospho-IRF3 were decreased in murine liver dendritic cells after intervened by HBV." Hepatology International **5 (1)**: 152.

Objective: Study of the secretions of type I interferon and the expressions of phospho-IRF3 in murine liver dendritic cells after intervened by HBV. Method(s): The murine liver dendritic cells were isolated via anti- CD11c microbeads, and were co-incubated with GM-CSF and IL-4 for inducing the DCs generation and proliferation. HBV virions were isolated via ultracentrifugation, and were detected by quantitative Realtime-PCR. DCs were divided into two groups at day 5. One group was cultured with HBV virons in 24 h; the other group was cultured without HBV as a control group. Then, harvesting the cells and supernatants were detected the expressions of p-IRF3 by western blot and the concentration of IFN-beta by ELISA, after stimulated by poly I:C in different time. Result(s): IFN-beta concentration was 12.38 +/- 3.71 pg/ml at 0 h, 88.67 +/- 9.01 pg/ml at 6 h, 69.89 +/- 5.80 pg/ml at 24 h in supernatants of HBV group, and was 10.83 +/- 4.11 pg/ml at 0 h, 137.68 +/- 12.28 pg/ml at 6 h, 72.25 +/- 8.61 pg/ml at 24 h in supernatants of control group, respectively, in 24-well culture plates. There was no statistically significant difference at 0 h (t = 0.8398, P>0.05) and at 24 h (t = 0.6820, P>0.05) between two groups. But, there was statistically significant difference at 6 h (t = 9.653, P<0.01) between two groups. The expressions of phospho-IRF3 in HBV group were lower than those in control group, when multiplicity of infection is 25. Conclusion(s): Both the secretions of type I interferon and the expressions of phospho-IRF3 were decreased in murine liver dendritic cells after intervened by HBV.

Zheng, K., et al. (2019). "Occurrence and Species-Specific Distribution of Plastic Debris in Wild Freshwater Fish from the Pearl River Catchment, China." Environmental Toxicology & Chemistry **38**(7): 1504-1513.

Freshwater systems are an important source and vector of plastic debris found in oceans. However, plastic debris in freshwater organisms has not been well studied. The occurrence, characterization, polymer composition, and seasonal and spatial distribution of plastic debris were investigated in 9 species of wild freshwater fish from the Pearl River catchment, south China. Approximately 50% of the total fish (n = 279) belonging to 9 species were found to ingest plastic debris with an average abundance of 7.0 ± 23.8 items/individual, indicating wide plastic contamination in the Pearl River catchment. Plastic debris were predominantly transparent or white in color, fibers or fragments in shape, and polyethylene, polypropylene, ethylene–propylene copolymer (PE-PP), and polyethylene terephthalate (PET) in polymer composition. A species-specific distribution of the plastic debris was observed in terms of abundance, shape, and polymer composition. Redbelly tilapia had the highest (27.4 ± 54.0 items/individual), whereas common carp had the lowest (0.2 ± 0.4 items/individual) abundance of the plastic debris in their gastrointestinal tracts. Fibers of PET were predominant in the freshwater species except in barbel chubs, which had mostly PE-PP fragments. Omnivores and bottom-dwellers were more likely to ingest plastic debris. Seasonal variation was observed, with generally higher abundance of plastic debris in fish collected in the dry season than in the wet season. Environ Toxicol Chem 2019;38:1504–1513. © 2019 SETAC [ABSTRACT FROM AUTHOR]

Zheng, T., et al. (2019). "Molecular toxicity of nanoplastics involving in oxidative stress and desoxyribonucleic acid damage." Journal of Molecular Recognition **32**(11): e2804.

Microplastic pollution attracted extensive attention because of its global presence and adverse effects on ecosystem. However, it is insufficient to clear the effects of nanoplastics on organisms at the molecular level. Herein, a nanopolystyrene (50 nm) was used to examine molecular responses of superoxide dismutase (SOD) and desoxyribonucleic acid (DNA) using spectroscopy (UV-vis, circular dichroism spectra, and fluorescence measurements) and single cell gel electrophoresis methods.

Zheng, W., et al. (2001). "Miniaturization of a hepatitis C virus RNA polymerase assay using a -102 degrees C cooled CCD camera-based imaging system." Analytical Biochemistry **290**(2): 214-220.

Innovations in detection technologies have allowed us to develop a novel assay in 1536-well plate format and assess the advantages of screen miniaturization compared with conventional high-throughput compound screening in 96- or 384-well plates. An HCV RNA polymerase assay has been miniaturized in 1536-well plates by using a new detection technology known as LEADseeker homogeneous imaging system. It uses a -102 degrees C cooled charge-coupled device (CCD) camera and newly designed scintillation proximity microparticles. The miniaturized assay used europium-doped streptavidin-coated yttrium oxide (YO(x)) or polystyrene (PS) microspheres to capture biotin-labeled [(3)H]RNA product transcripts. Beads in proximity to the radioisotope convert the emitted beta(-) particles into photons having wavelengths in the red region of the visible spectrum, optimal for detection by the CCD camera. Because the camera collects light from all wells of the plate simultaneously, 1536-well plates are imaged as rapidly as 384-well plates, on the order of 10 min per plate. The assay has a signal to background of approximately 20-fold, satisfactory for high-throughput robotics screening. The enzyme kinetics and potency of a known inhibitor were similar to those obtained from the conventional assay using scintillation proximity assay (SPA) beads and a scintillation plate counter. Furthermore, the newly developed microbeads (emitting at 610 to 620 nm) are less prone to quenching effects caused by yellow-colored compounds, than conventional SPA beads or scintillation fluid (emitting at 400 to 480 nm region). Thus, the LEADseeker imaging system is a useful new tool for miniaturization of assays for high-throughput screening.

Zheng, X., et al. (2010). "Evaluation of the transforming growth factor-beta activity in normal and dry eye human tears by CCL-185 cell bioassay." Cornea **29**(9): 1048-1054.

PURPOSE: To develop a new bioassay method using human lung epithelial cells (CCL-185) to assess activity of transforming growth factor beta (TGF-beta) in human tear fluid from normal subjects and patients with dry eye.

METHODS: Two epithelial cell lines, mink lung cells (CCL-64) and human lung cells (CCL-185), were compared to detect the active form of TGF-beta by BrdU incorporation (quantitation of cell DNA synthesis) and WST assay (metabolic activity of viable cells). The effect of TGF-beta on the growth of CCL-185 cells was observed microscopically. Human tears from normal control subjects and patients with dry eye (DE) with and without Sjogren syndrome were evaluated for

TGF-beta concentration by Luminex microbead assay, and TGF-beta activity by the CCL-185 cell growth inhibition bioassay.
RESULTS: The metabolic activity of viable CCL-185 cells, measured by WST, was shown to be proportional to the TGF-beta1 concentration (R = 0.919) and confirmed by BrdU assay (R = 0.969). Compared with CCL-185, metabolic activity of viable cells and DNA synthesis, measured by WST and BrdU incorporation assays, were shown to be less proportional to the TGF-beta1 concentration in the CCL-64 line (R = 0.42 and 0.17, respectively). Coincubation with human anti-TGF-beta1 antibody (MAB-240) yielded a dose-dependent inhibition of TGF-beta1 (0.3 ng/mL) activity. CCL-185 cell growth observed microscopically was noted to decrease in response to increasing TGF-beta1 concentrations. Levels of immuodetectable TGF-beta1 and TGF-beta2 were similar in normal and DE tears. TGF-beta bioactivity in DE human tears measured by the CCL-185 cells assay was found to be higher (9777.5 +/- 10481.9 pg/mL) than those in normal controls (4129.3 +/- 1342.9 pg/mL) (P < 0.05). Among patients with DE, TGF-beta bioactivity was highest in those with Sjogren syndrome. Approximately, 79.1% of TGF-beta in DE tears and 37.6% TGF-beta in normal tears were found to be biologically active.
CONCLUSIONS: The CCL-185 cell assay was found to be a suitable tool for assessing TGF-beta activity in human tears. Tear TGF-beta bioactivity increases in DE, particularly in Sjogren syndrome, where elevated levels of TGF-beta1 transcripts in the conjunctival epithelium have been previously detected.

Zheng, X., et al. (2016). "Expression of TSLP and Downstream Molecules IL-4, IL-5, and IL-13 on the Eye Surface of Patients with Various Types of Allergic Conjunctivitis." Journal of Ophthalmology: 1-7.
Background. The pathogenesis of allergic conjunctivitis has not been clearly established. Moreover, previous studies fail to consider human models of allergic conjunctivitis. This study investigated the expression of thymic stromal lymphopoiet in TSLP and its downstream molecules in conjunctival scrappings and tear. Methods. This cross-sectional study compares patients with vernal keratoconjunctivitis (VKC), seasonal allergic conjunctivitis (SAC), and perennial allergic conjunctivitis (PAC) with normal controls. There are 80 people recorded in Shanxi Eye Hospital. Increasingly, 20 are with VKC, 20 are with SAC, 20 are with PAC, and the remaining 20 are normal controls. Conjunctiva were harvested for total RNA extraction and gene expression by real-time polymerase chain reaction. Epithelial cells were collected to make pathological sections for immunohistochemical staining. Human tears were evaluated by Luminex microbead assay. A P value less than 0.05 from Dunnett's post hoc test in SPSS means a statistical significant distinction. Results. Positive expression in conjunctival cells of patients with allergic conjunctivitis. The expression of TSLP and IL-4, IL-5, and IL-13 mRNA shows a statistically significant difference (P<0.05). TSLP and IL-4, IL-5, and IL-13 concentrations show a statistically significant difference (P<0.01). Conclusions. This study suggests that TSLP and downstream molecules are expressed in patients with various types of allergic conjunctivitis.

Zhong, S. and J. M. Pearce (2018). "Tightening the loop on the circular economy: Coupled distributed recycling and manufacturing with recyclebot and RepRap 3-D printing." Resources, Conservation and Recycling **128**: 48-58.
A promising method of enhancing the circular economy is distributed plastic recycling. In this study plastic waste is upcycled into 3-D printing filament with a recyclebot, which is an open source waste plastic extruder. The recyclebot is combined with an open source self-replicating rapid prototyper (RepRap) 3-D printer, to enable post-consumer ABS plastic filament from computer waste to be further upcycled into valuable consumer products pre-designed in the digital commons. The total electrical energy consumption for the combined process is

monitored and an economic evaluation is completed. The coupled distributed recycling and manufacturing method for complex products reduces embodied energy by half, while reducing the cost of consumer products to pennies. This economic benefit provides an incentive for consumers to both home recycle and home manufacture, which tightens the loop on the circular economy by eliminating waste associated from transportation and retail. It is clear from the results that waste plastic can be significantly upcycled at the individual level using this commons-based approach. This tightening of the loop of the circular economy benefits the environment and sustainability as well as the economic stability of consumers/prosumers. Copyright © 2017 Elsevier B.V.

Zhou, B., et al. (2019). "Microplastics in agricultural soils on the coastal plain of Hangzhou Bay, east China: Multiple sources other than plastic mulching film." Journal of Hazardous Materials: 121814.

Microplastic contamination in agroecosystems raises great concerns. Here, we investigated the impacts of mulching and irrigation on microplastic accumulation in cropped soils. Sixty soil samples covering mulching and no-mulching farmlands, and forty-five irrigation water samples were collected for analysis. Microplastics were obtained from the soils using continuous air flotation followed by density separation. Stereomicroscopy and micro-Fourier transform infrared spectroscopy (mu-FTIR) were used for identification. Mulching soils contained larger amounts of microplastics than non-mulching soils, with 571 pieces kg⁻¹ and 263 pieces kg⁻¹, respectively, on average. The abundances of films and fibers were significantly ($p < 0.05$) higher in the mulching soils. Microplastics in the soils and waters were dominated by fragments and fibers, respectively. The particle size of the microplastics in soils mostly ranged from 1 to 3 mm, and primarily from 90 mum to 1 mm in waters. Multiple polymers, e.g. polyethylene, polypropylene, polyester, rayon, acrylic and polyamide, and shapes found in the soil microplastics indicate contributions from irrigation and plastic waste residues other than plastic mulching. Future studies might include the long-term accumulation of microplastics in agroecosystems from multiple sources under intensively managed cropping systems.

Zhou, C., et al. (2014). "Characteristics and the recovery potential of plastic wastes obtained from landfill mining." Journal of Cleaner Production **80**: 80-86.

Plastics have been the most consumed materials of human societies in recent decades and, in the mean time, one of the major products obtained from landfill mining. Characteristics of the landfill mined plastic wastes and their recovery potential were the key points to determine the feasibility of landfill mining projects. We collected municipal solid waste samples of different storage years from the landfill and did mechanical screening and manual separating to sort out plastic wastes, and a typical old landfill, which is of 24 storage years and located in central China, was taken as our studied case. According to our research, plastic wastes accounted for 10.62 ± 5.12% of the total stored wastes in the old landfill, among which, 69.13% was plastic bags (white PE plastic bags accounted for 11.34%; colored PE plastic bags 29.77%; other plastic bags 28.02%), and 30.87% was other plastics (incl. PP, PVC, PS, etc.). The average moisture content in the plastic waste was 19.96 ± 4.65% and the average impurities content was 71.02 ± 6.31% before manual washing and cleaning. The VS, ash, fixed carbon and calorific value of manually cleaned plastic wastes were 87.09 ± 0.55%, 10.84 ± 1.19%, 2.07 ± 0.85% and 43.18 ± 1.49 MJ kg-1, respectively. Elements testing (C, N, O, S, Cl, Si, Al) and surface images analysis under scanning electron microscope showed that normal cleaning techniques had a difficulty in thoroughly getting rid of all the impurities on the surface of plastic bags excavated from old landfill, which will impede plastic wastes from being mechanical recycled as renewable materials or being chemically recycled by either pyrolysis, gasification, hydrogenation. Incineration or treating as residue derived fuels (RDFs) for recovering energy was the most practical way to process landfill mining plastic wastes under the normal cleaning techniques. © 2014 Elsevier Ltd. All rights reserved.

Zhou, H. and H. H. Xu (2011). "The fast release of stem cells from alginate-fibrin microbeads in injectable scaffolds for bone tissue engineering." Biomaterials **32**(30): 7503-7513.

Stem cell-encapsulating hydrogel microbeads of several hundred microns in size suitable for injection, that could quickly degrade to release the cells, are currently unavailable. The objectives of this study were to: (1) develop oxidized alginate-fibrin microbeads encapsulating human umbilical cord mesenchymal stem cells (hUCMSCs); (2) investigate microbead degradation, cell release, and osteogenic differentiation of the released cells for the first time. Three types of microbeads were fabricated to encapsulate hUCMSCs: (1) Alginate microbeads; (2) oxidized alginate microbeads; (3) oxidized alginate-fibrin microbeads. Microbeads with sizes of about 100-500 mum were fabricated with 1 x 10(6) hUCMSCs/mL of alginate. For the alginate group, there was little microbead degradation, with very few cells released at 21 d. For oxidized alginate, the microbeads started to slightly degrade at 14 d. In contrast, the oxidized alginate-fibrin microbeads started to degrade at 4 d and released the cells. At 7 d, the number of released cells greatly increased and showed a healthy polygonal morphology. At 21 d, the oxidized alginate-fibrin group had a live cell density that was 4-fold that of the oxidized alginate group, and 15-fold that of the alginate group. The released cells had osteodifferentiation, exhibiting highly elevated bone marker gene expressions of ALP, OC, collagen I, and Runx2. Alizarin staining confirmed the synthesis of bone minerals by hUCMSCs, with the mineral concentration at 21 d being 10-fold that at 7 d. In conclusion, fast-degradable alginate-fibrin microbeads with hUCMSC encapsulation were developed that could start to degrade and release the cells at 4 d. The released hUCMSCs had excellent proliferation, osteodifferentiation, and bone mineral synthesis. The alginate-fibrin microbeads are promising to deliver stem cells inside injectable scaffolds to promote tissue regeneration.

Zhou, H., et al. (2019). "The spin-coating-based immobilization of ZnTPP-dyed cation exchange resin microbeads for reversible ammonia detection." Analytical Methods **11**(16): 2155-2162.

During the fabrication of a microfluidic chip for reversible ammonia detection, we applied a spin-coating-based method to immobilize cation exchange resin microbeads on which zinc tetraphenylporphyrin was dyed as an indicator material. The 4-layered microfluidic chip and a portable spectrometer constituted the core part of the integrated system. The results obtained for various wavelengths were compared, and the spectral intensity change at 450 nm was selected. The PDMS films at 2000–5000 rpm were investigated at ammonia concentrations ranging from 0.5 to 50 mg L−1. The reversibility of zinc tetraphenylporphyrin was assessed by the results obtained after each cycle. After conducting the tests 75 times for various microfluidic chips, the stability of the method was confirmed with the maximal relative deviation being less than 10%. The introduced method exhibited significant potential for the detection of ammonia.

Zhou, L., et al. (2018). "Flexible Assembly of an Enzyme Cascade on a DNA Triangle Prism Nanostructure for the Controlled Biomimetic Generation of Nitric Oxide." Chembiochem **19**(19): 2099-2106.

Spatial organization of multiple enzymes at specific positions for a controlled reaction cascade has attracted wide attention in recent years. Here, we report the construction of a biomimetic enzyme cascade organized on DNA triangle prism (TP) nanostructures to enable the efficient catalytic production of nitric oxide (NO) on a single microbead. Two enzymes, glucose oxidase

(GOx) and horseradish peroxidase (HRP), were assembled at adjacent locations on a DNA TP nanostructure by using DNA-binding protein adaptors with small interenzyme distances. In the cascade, the first enzyme, GOx, converts glucose into gluconic acid in the presence of oxygen. The produced H₂ O₂ intermediate is rapidly transported to the second enzyme, HRP, which oxides hydroxyurea into NO and other nitroxyl species. The pH near the surface of the negatively charged DNA nanostructures is believed to be lower than that in the bulk solution; this creates an optimal pH environment for the anchored enzymes, which results in higher yields of the NO product. Furthermore, the multienzyme system was immobilized on a microbead mediated by a DNA adaptor, and this enabled the efficient catalytic generation of gas molecules in the microreactor. Therefore, this work provides an alternative route for the biomimetic generation of NO through enzyme cascades. In particular, the dynamic binding capability of the DNA sequence enabled the positions of the protein enzyme and the DNA nanostructure to be reversed, which allowed the cascade catalysis to be modulated.

Zhou, L., et al. (2012). "Impact of human granulocyte and monocyte isolation procedures on functional studies." Clinical & Vaccine Immunology: CVI **19**(7): 1065-1074.

One of the first lines of defense against infection is the activation of the innate immune system. It is becoming clear that autoimmune diseases, such as rheumatoid arthritis and Crohn's disease, may be caused by disturbed innate immunity, and relating granulocyte and monocyte functions to the patient genotype has become an important part of contemporary research. Although it is essential to move this field forward, a systematic study comparing the efficacy and suitability for functional studies of the various available protocols for the isolation of these immune cells has not been performed. Here, we compare human granulocyte functionality under three enrichment protocols: (i) Ficoll density gradient centrifugation, (ii) anti-CD15 antibody-conjugated microbeads (positive selection), and (iii) Polymorphoprep. Primary monocytes were isolated in parallel using (i) anti-CD14 magnetic microbeads, (ii) non-monocyte depletion by antibody-conjugated magnetic microbeads (negative selection), (iii) RosetteSep antibody cocktail, and (iv) the classical adherence protocol. The best results in terms of purity and cell functionality were obtained with positive selection by magnetic microbeads for both human granulocytes and monocytes. Whereas phagocytosis of Escherichia coli bacteria was identical in all isolation procedures tested, the granulocyte respiratory burst was higher in positively selected cells. In addition, different granulocyte enrichment procedures affect cell surface receptor expression to different extents. In toto, we propose that positive selection of granulocytes and monocytes be adopted as the procedure of choice for studies of human granulocyte and monocyte functions but caution investigators to be aware of possible alterations in cell phenotypes with different isolation procedures.

Zhou, Q., et al. (2020). "Characteristics and distribution of microplastics in the coastal mangrove sediments of China." Science of the Total Environment **703**: N.PAG-N.PAG.

• First comprehensive study on MPs in mangrove sediments along the coast of China. • The MPs abundance in mangrove sediments was up to 8.5 times higher than in mangrove free sediments. • The sandy sediments were dominated by foams, and the muddy sediments by fibers and fragments. Mangroves are a unique and important type of coastal wetlands in the tropical and subtropical zones worldwide. The abundance and spatial distribution of microplastics in the mangrove sediments however are still poorly understood. The present study aimed to illustrate the characteristics, abundance and spatial distribution of microplastics in different mangrove sediments along the south-eastern coastal zones of China. Microplastic samples (roughly 10–20 kg fresh sediments at each site) taken from 21 sampling sites showed various shapes, colors,

composition, sizes, surface morphology, abundance and strong spatial heterogeneity. Five different shapes of microplastics with a variety of colors were detected in the mangrove sediments, among which foams (74.6%) and fibers (14.0%) were the dominant types. The polymer composition of the microplastics identified based on the FT-IR and μ-FTIR covered polystyrene (75.2%), polypropylene (11.7%), rayon (4.6%), polyester (3.4%), polyethylene (2.8%) and acrylic (2.4%). The observed microplastics with a size range of less than 2 mm made up 58.6% of the total microplastic particles. The microplastics had various surface morphologies, exhibiting complicated weathered surfaces. The abundance of microplastics showed a substantial variation among the sampling sites, ranging from 8.3 to 5738.3 items kg−1 (dry sediment). Altogether, our study provides a better understanding of microplastic pollution status and prevention policy-making of mangrove habitats in China. [ABSTRACT FROM AUTHOR]

Zhou, Q., et al. (2018). "The distribution and morphology of microplastics in coastal soils adjacent to the Bohai Sea and the Yellow Sea. (Special section on coastal wetland soils.)." Geoderma **322**: 201-208.

Microplastics (<5 mm) are considered to be emerging pollutants of global concern. Investigations on microplastics pollution in coastal and marine environments have increased recently but knowledge gaps still exist regarding microplastics in coastal beach soils with high-intensity human activities. In the present study a total of 120 soil samples were taken from 53 sites along >3000 km of coastline in Shandong province, east China, adjacent to both the Bohai Sea and the Yellow Sea coastlines under different land use management. Microplastics were separated from the soil samples using a continuous flow and floating separation apparatus. The shape type, size, abundance, spatial distribution, polymer composition and surface morphology of the microplastics were identified by a range of advanced microscopic and micro-analytical methods. The analytical results show that seven shape types, namely foams, pellets, fragments, flakes, fibers, films and sponges, were present in the beach soils. The polymer composition of the microplastics included polyethylene, polypropylene, polystyrene, polyether urethane and a polymer blend of both polyethylene and polypropylene. Approximately 60% of the observed microplastics had a size range <1 mm. Microplastic abundance varied greatly among the soils, ranging from 1.3 to 14,712.5 N kg⁻¹ (dry weight) as influenced by high-intensity human activities such as mariculture, tourism, and port construction. The seven shape types of microplastics from the coastal environment had different weathering surface morphologies, showing scratches, creases, micropores, cracks, either concave or convex, and of various shapes and sizes, possibly due to physical friction, photochemical oxidation and/or animal attack. Algae or crude oil was observed on the surface of some microplastics. The weathered surfaces of microplastics might act as a high-capacity carrier with adhering microorganisms and chemicals. Further studies are required on the weathering processes, sorption capacity and transport of microplastics especially in smaller size (<1 mm) under coastal conditions.

Zhou, Q. Z., et al. (2008). "Multi-stage premix membrane emulsification for preparation of agarose microbeads with uniform size." Journal of Membrane Science **322**(1): 98-104.

Uniform-sized agarose beads with diameters less than 10 mum and agarose content as high as

14 wt% were prepared by premix membrane emulsification. Agarose aqueous solution was used as the water phase. A mixture of liquid paraffin and petroleum ether containing hexaglycerin penta ester (PO-500) was used as the oil phase. The water phase was mixed with the oil phase at 60 degreeC and a coarse W/O emulsion was produced in a homogenizer. Then, the coarse emulsion was extruded through a hydrophobic membrane under high pressure to form an emulsion, which was slowly cooled under gentle agitation to form gel beads. The effects of preparation conditions on emulsification resultswere investigated and it showed that the pressure, number of passes, petroleum ether/liquid paraffin (v/v) in the oil phase, the concentration of PO-500 and concentration of agarose in the water phase, all affected the size and uniformity; coarse emulsion did not affect the emulsification results. The coefficient variation (C.V.) of agarose beads under optimal preparation conditions was 9.8%. This method realized microbeads with both uniform sizes and high agarose contents that are difficult to be prepared by conventional emulsion methods. © 2008 Elsevier B.V. All rights reserved.

Zhou, X., et al. (2009). "A convenient method for synthesis of glyco-nanoparticles/ beads for glycan function analysis." Glycoconjugate Journal **26 (7)**: 887.

Carbohydrate functionalized nanoparticles, i.e., the glyconanoparticles, have wide application ranging from studies of carbohydrate-protein interactions, in vivo cell imaging, biolabeling, etc. We report a simple and versatile method for preparing glyconanoparticles and microbeads. This method is based on the utilization of Clean and convenient microwave irradiation energy for one-step, site-specific conjugation of unmodified carbohydrates onto hydrazide-functionalized nanoparticle/beads surface. A gold nanoparticle-based colorimetric assay that utilizes the ensemble of Concanavalin A (ConA) and gold glyconanoparticle was also presented. This feasible assay system was developed to analyze multivalent interactions and to determine the dissociation constant (Kd) for carbohydrate derivatives coated with mannose binding lectins. Shifts in UV-Vis absorption wavelength as a function of ConA-carbohydrate derivatives molar ratios were plotted and the dissociation constants were determined based on nonlinear curve fitting. The dissociation constant for mannosecoated gold nanoparticles was determined at 4.4nM, while the maltose-coated gold nanoparticles suppress the binding by increasing the dissociation constant. Fluorescent glyconanoparticles and magnetic glyconanoparticles are also synthesized for glycan extraction and function analysis.

Zhou, X., et al. (2019). "Natural killer cells regulate Th17/Treg cell immune response through modulating the function of dendritic cells during chlamydial lung infection." Shan Dong Da Xue Xue Bao. Yi Xue Ban = Journal of Shandong University. Health Sciences **57**(4): 15.

Objective To explore the mechanism of natural killer(NK)cells in regulating of Th17/Treg cell responses during chlamydia muridarum(Cm)lung infection. Methods A pulmonary infection model of Cm was established. The spleen dendritic cells(DCs)from Cm-infected mice with or without NK cells depletion were obtained by application of CD11c+ MicroBeads. The naïve mice were given intravenous injection of DCs from different groups of mice, and divided into NK-DCs recipients group(n=13)and NK+DCs recipients group(n=13). After adoptive transfer, the same infection method was used to recipient mice with Cm. The degree of disease was compared between the two groups. Flow cytometry was used to detect the changes of Th17 and Treg cells in the spleen and lung of mice. Results Compared with NK+DCs recipients, NK-DCs recipients exhibited aggravated disease, higher weight loss and severe lung injury. Immunological analysis showed the proportion of Th17 cells in spleen and lung was reduced while the proportion of Treg cell response was enhanced, which contributed to imbalance of Th17/Treg response in NK-DCs recipients. 山 东 大 学 学 报 (医 学 版)57卷4期 -周小青,等.自然杀伤细胞通过

树突状细胞调控衣原体肺部感染中Th17/Treg免疫应答平衡 \=- Conclusion NK cells can effectively initiate Th17 cells response and inhibit Treg cell response by modulating DCs and thus play an important role in controlling chlamydial infection.

Zhou, X., et al. (2014). "Synthesis, labeling and bioanalytical applications of a tris(2,2'-bipyridyl)ruthenium(II)-based electrochemiluminescence probe." Nature Protocols **9**(5): 1146-1159.

Assays using probes labeled with electrochemiluminescent moieties are extremely powerful analytical tools that are used in fields such as medical diagnostics, environmental analysis and food safety monitoring, in which sensitive, reliable and reproducible detection of biomolecules is a requirement. The most efficient electrochemiluminescence (ECL) reaction to date is based on tris(2,2'-bipyridyl)ruthenium(II) (Ru(bpy) 3²⁺) with tripropylamine (TPrA) as the co-reactant. Here we present a detailed protocol for preparing Ru(bpy) 3²⁺ probes and their bioanalytical applications. This protocol includes (i) the synthesis of a biologically active Ru(bpy) 3 ²⁺ -N-hydroxysuccinimide (NHS) ester, (ii) its covalent labeling with both antibodies and DNA probes and (iii) the detection and quantification of ECL in a microfluidic system with a paramagnetic microbead solid support. In our magnetic bead-based ECL system, two probes are required: a capture probe (labeled with biotin to be captured by a streptavidin-coated magnetic bead) and a detector probe (labeled with Ru(bpy) 3²⁺). The complex consisting of the analyte, the capture probe, the detector probe and the magnetic bead is brought into contact with the electrode by using a magnetic field. The Ru(bpy) 3²⁺ reacts with TPrA in solution to generate the ECL signal. The full protocol, including the synthesis and labeling of the bioactive Ru(bpy) 3 ²⁺, requires 5-6 d to complete. ECL immunoassays or nucleic acid tests only require 1.5-2 h, including the sample preparation time. © 2014 Nature America, Inc.

Zhou, X. X., et al. (2019). "Cloud-Point Extraction Combined with Thermal Degradation for Nanoplastic Analysis Using Pyrolysis Gas Chromatography-Mass Spectrometry." Analytical Chemistry **91**(3): 1785-1790.

The contamination of micro- and nanoplastics in marine systems and freshwater is a global issue. Determination of micro- and nanoplastics in the aqueous environment is of high priority to fully assess the risk that plastic particles will pose. Although microplastics have been detected in a variety of aquatic ecosystems, the analysis of nanoplastics remains an unsolved challenge. Herein, for the first time, a Triton X-45 (TX-45)-based cloud-point extraction (CPE) was proposed to preconcentrate trace nanoplastics in environmental waters. Under the optimum extraction conditions, an enrichment factor of 500 was obtained for two types of nanoplastics with different compositions, polystyrene (PS) and poly(methyl methacrylate) (PMMA), without disturbing their original morphology and sizes. Additionally, following thermal treatment at 190 degreeC for 3 h, the CPE-obtained extract could be submitted to pyrolysis gas chromatography-mass spectrometry (Py-GC/MS) analysis for mass quantification of nanoplastics. Taking 66.2 nm PS nanoplastics and 86.2 nm PMMA nanoplastics as examples, the proposed method showed excellent reproducibility, and high sensitivity with respective detection limits of 11.5 and 2.5 fM. Feasibility of the proposed approach was verified by application of the optimized procedure to four real water samples. Recoveries of 84.6-96.6% at a spiked level of 88.6 fM for PS nanoplastics and 76.5-96.6% at a spiked level of 50.4 fM for PMMA nanoplastics were obtained. Consequently, this work provides an efficient approach for nanoplastic analysis in environmental waters.

Zhou, X.-x., et al. (2019). "Cloud-Point Extraction Combined with Thermal Degradation for Nanoplastic Analysis Using Pyrolysis Gas Chromatography–Mass Spectrometry." Analytical Chemistry **91**(3): 1785.

The contamination of micro- and nanoplastics in marine systems and freshwater is a global issue. Determination of micro- and nanoplastics in the aqueous environment is of high priority to fully assess the risk that plastic particles will pose. Although microplastics have been detected in a variety of aquatic ecosystems, the analysis of nanoplastics remains an unsolved challenge. Herein, for the first time, a Triton X-45 (TX-45)-based cloud-point extraction (CPE) was proposed to preconcentrate trace nanoplastics in environmental waters. Under the optimum extraction conditions, an enrichment factor of 500 was obtained for two types of nanoplastics with different compositions, polystyrene (PS) and poly(methyl methacrylate) (PMMA), without disturbing their original morphology and sizes. Additionally, following thermal treatment at 190 °C for 3 h, the CPE-obtained extract could be submitted to pyrolysis gas chromatography–mass spectrometry (Py-GC/MS) analysis for mass quantification of nanoplastics. Taking 66.2 nm PS nanoplastics and 86.2 nm PMMA nanoplastics as examples, the proposed method showed excellent reproducibility, and high sensitivity with respective detection limits of 11.5 and 2.5 fM. Feasibility of the proposed approach was verified by application of the optimized procedure to four real water samples. Recoveries of 84.6–96.6% at a spiked level of 88.6 fM for PS nanoplastics and 76.5–96.6% at a spiked level of 50.4 fM for PMMA nanoplastics were obtained. Consequently, this work provides an efficient approach for nanoplastic analysis in environmental waters.

Zhou, Y., et al. (2019). "Characterization of microplastics and the association of heavy metals with microplastics in suburban soil of central China." Science of the Total Environment **694**: 133798.

Microplastics (MPs) are ubiquitous in the aquatic and terrestrial environment and can absorb other kinds of pollutants on surfaces due to strong hydrophobicity and higher specific surface area. This study investigated the occurrence and distribution of MPs and the interaction of MPs and heavy metals in three different land types of central China.

Zhou, Y., et al. (2018). "Rapid Regeneration and Reuse of Silica Columns from PCR Purification and Gel Extraction Kits." Scientific Reports **8**(1): 12870.

Silica columns from PCR purification and gel extraction kits are widely used in laboratories worldwide to assist in gene cloning. However, the use of these columns can generate plastic waste that has an environmental impact due to their one-off design and massive consumption. Thus, it is important to develop a novel method that can reduce the utilization of silica columns but not affect research efficiency. In this study, various chemical and nonchemical reagents were used to eliminate residual DNA within used columns from PCR purification and gel extraction kits. We show that phosphoric acid is the most effective reagent among those tested to remove DNA contamination from used columns. Columns regenerated using 1 M phosphoric acid have a DNA purification capability that is comparable to that of fresh columns. We demonstrate that silica columns can be regenerated and reused a minimum of five times. The lab-made buffers are compatible with the regenerated columns for DNA purification, and DNA that is prepared with the regenerated columns can be used for gene cloning without affecting the gene cloning efficiency. Thus, the use of this novel method greatly reduces the production of laboratory waste and benefits numerous laboratories worldwide.

Zhu, B., et al. (2018). "Exposure to nanoplastics disturbs the gut microbiome in the soil oligochaete Enchytraeus crypticus." Environmental Pollution **239**: 408-415.

Microplastics are emerging pollutants that have recently aroused considerable concern but most toxicological studies have focused on marine biota, with little investigation of the influence of microplastics on terrestrial ecosystems. Here, we fed the soil oligochaete Enchytraeus crypticus with oatmeal containing 0, 0.025, 0.5, and 10% (dry weight basis) nano-polystyrene (0.05-0.1 micro m particle size) to elucidate the impact of microplastics on the growth and gut microbiome of Enchytraeus crypticus. We observed a significant reduction of weight in the animals fed 10% polystyrene and an increase in the reproduction of those fed 0.025%. More importantly, using 16S rRNA amplification and high-throughput sequencing we found a significant shift in the microbiome of those fed 10% microplastics with significant decreases in the relative abundance of the families Rhizobiaceae, Xanthobacteraceae and Isosphaeraceae. These families contain key microbes that contribute to nitrogen cycling and organic matter decomposition.

Zhu, B., et al. (2015). "Ultra-high-throughput screening of an in vitro-synthesized horseradish peroxidase displayed on microbeads using cell sorter." PLoS ONE **10 (5) (no pagination)**(e0127479).

The C1a isoenzyme of horseradish peroxidase (HRP) is an industrially important hemecontaining enzyme that utilizes hydrogen peroxide to oxidize a wide variety of inorganic and organic compounds for practical applications, including synthesis of fine chemicals, medical diagnostics, and bioremediation. To develop a ultra-high-throughput screening system for HRP, we successfully produced active HRP in an Escherichia coli cell-free protein synthesis system, by adding disulfide bond isomerase DsbC and optimizing the concentrations of hemin and calcium ions and the temperature. The biosynthesized HRP was fused with a single-chain Cro (scCro) DNA-binding tag at its N-terminal and C-terminal sites. The addition of the scCro-tag at both ends increased the solubility of the protein. Next, HRP and its fusion proteins were successfully synthesized in a water droplet emulsion by using hexadecane as the oil phase and SunSoft No. 818SK as the surfactant. HRP fusion proteins were displayed on microbeads attached with double-stranded DNA (containing the scCro binding sequence) via scCro-DNA interactions. The activities of the immobilized HRP fusion proteins were detected with a tyramide-based fluorogenic assay using flow cytometry. Moreover, a model microbead library containing wild type hrp (WT) and inactive mutant (MUT) genes was screened using fluorescence-activated cell-sorting, thus efficiently enriching the WT gene from the 1:100 (WT:MUT) library. The technique described here could serve as a novel platform for the ultra-high-throughput discovery of more useful HRP mutants and other heme-containing peroxidases. Copyright © 2015 Zhu et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Zhu, C., et al. (2019). "Plastic debris in marine birds from an island located in the South China Sea." Marine Pollution Bulletin **149**: 1.

Plastic debris has become one of the most serious issues in the marine environment, but little information is available on the occurrence of plastic debris in marine birds from China. In this study, one seabird species and two shorebird species were collected from Yongxing Island of South China Sea to investigate the accumulation of plastic debris. A total of 56 items of plastic debris were observed in 4 of 9 birds, with size ranging from 0.67 to 8.64 mm. Microplastics (<5 mm, 52 items) accounted for 92.9% of the total items. The main color of plastic debris in marine birds was blue (91.1%), followed by dark (5.4%) and white (3.6%). The primary shape of plastic debris was thread (89.2%), followed by sheet (8.9%) and foam (1.8%). Plastic fragments were predominated by polypropylene-polyethylene copolymer (83.9%). This study highlighted that marine birds can mistake plastic debris as food items.

Zhu, D., et al. (2018). "Trophic predator-prey relationships promote transport of microplastics compared with the single Hypoaspis aculeifer and Folsomia candida." Environmental Pollution **235**: 150-154.
Although the roles of earthworms and soil collembolans in the transport of microplastics have been studied previously, the effects of the soil biota at different trophic levels and interspecific relationships remain poorly understood. Here, we examine three soil microarthropod species to explore their effects on the transport of microplastics. The selected Folsomia candida and Hypoaspis aculeifer are extensively used model organisms, and Damaeus exspinosus is a common and abundant indigenous species in China. A model food chain (prey-collembolan and predator-mite) was structured to test the role of the predator-prey relationship in the transport of microplastics. Commercial Polyvinyl chloride (PVC) particles (Diameter: 80-250 micro m) were selected as the test microplastics, because large amounts of PVC have persisted and accumulated in the environment. Synchronized soil microarthropods were held in plates for seven days to determine the movement of microplastics. The 5000 microplastic particles were carefully placed in the center of each plate prior to the introduction of the animals. Our results clearly show that all three microarthropod species moved and dispersed the microplastics in the plates. The 0.54%, 1.8% and 4.6% of the added microplastic particles were moved by collembolan, predatory mite and oribatid mite, respectively. Soil microarthropods (<0.2 cm) transported microplastic particles up to 9 cm. The avoidance behavior was observed in the collembolans in respect of the microplastics. The predatory -prey relationship did promote the transport of microplastics in the plates, increasing transport by 40% compared with the effects of adding single species (P<.05). Soil microarthropods commonly occur in surface soils (0-5 cm) and, due to their small body size, they can enter soil pores. Our results therefore suggest that the movement of microplastics by soil microarthropods may influence the exposure of other soil biota to microplastics and change the physical properties of soils.

Zhu, D., et al. (2018). "Exposure of soil collembolans to microplastics perturbs their gut microbiota and alters their isotopic composition." Soil Biology & Biochemistry **116**: 302-310.
Effects of microplastics on aquatic organisms have been widely studied in recent years but effects on soil biota, and especially on the gut microbiota of soil animals, remain poorly understood. An experiment was therefore conducted using the common soil collembolan Folsomia candida exposed to microplastics for 56 days to investigate the effects of plastics on gut microbiota, growth, reproduction and isotopic turnover of collembolans in the soil ecosystem. A diverse microbial community was observed in the collembolan gut, consisting of (at phylum level) Actinobacteria (~44%), Bacteroidetes (~30%), Proteobacteria (~12%) and Firmicutes (~11%). Distinctly different bacterial communities and lower microbial diversity were found in the collembolan gut compared with the surrounding soil. We also found that exposure to microplastics significantly enhanced bacterial diversity and altered the microbiota in the collembolan gut. Moreover, collembolan growth and reproduction were significantly inhibited (by 16.8 and 28.8%, respectively) and higher delta ¹⁵N and delta ¹³C values were observed in the tissues after exposure to microplastics. These results indicate that exposure to microplastics may impact non-target species via changes in their microbiota leading to alteration of isotopic and elemental incorporation, growth and reproduction. The collembolan gut microbial data acquired fill a gap in our knowledge of the ecotoxicity of microplastics.

Zhu, F., et al. (2018). "Closed-system manufacturing of CD19 and dual-targeted CD20/19 chimeric antigen receptor T cells using the CliniMACS Prodigy device at an academic medical center." Cytotherapy

20(3): 394-406.

BACKGROUND AIMS: Multiple steps are required to produce chimeric antigen receptor (CAR)-T cells, involving subset enrichment or depletion, activation, gene transduction and expansion. Open processing steps that increase risk of contamination and production failure are required. This complex process requires skilled personnel and costly clean-room facilities and infrastructure. Simplified, reproducible CAR-T-cell manufacturing with reduced labor intensity within a closed-system is highly desirable for increased availability for patients.

METHODS: The CliniMACS Prodigy with TCT process software and the TS520 tubing set that allows closed-system processing for cell enrichment, transduction, washing and expansion was used. We used MACS-CD4 and CD8-MicroBeads for enrichment, TransAct CD3/CD28 reagent for activation, lentiviral CD8 TM-41BB-CD3 zeta-cfrag vectors expressing scFv for CD19 or CD20/CD19 antigens for transduction, TexMACS medium-3%-HS-IL2 for culture and phosphate-buffered saline/ethylenediaminetetraacetic acid buffer for washing. Processing time was 13 days.

RESULTS: Enrichment (N = 7) resulted in CD4/CD8 purity of 98 +/- 4.0%, 55 +/- 6% recovery and CD3⁺ T-cell purity of 89 +/- 10%. Vectors at multiplicity of infection 5-10 resulted in transduction averaging 37%. An average 30-fold expansion of 10⁸ CD4/CD8-enriched cells resulted in sufficient transduced T cells for clinical use. CAR-T cells were 82-100% CD3⁺ with a mix of CD4⁺ and CD8⁺ cells that primarily expressed an effector-memory or central-memory phenotype. Functional testing demonstrated recognition of B-cells and for the CAR-20/19 T cells, CD19 and CD20 single transfectants were recognized in cytotoxic T lymphocyte and interferon-gamma production assays.

DISCUSSION: The CliniMACS Prodigy device, tubing set TS520 and TCT software allow CAR-T cells to be manufactured in a closed system at the treatment site without need for clean-room facilities and related infrastructure.

Zhu, F., et al. (2013). "Identification of a protein interacting with the spore wall protein SWP26 of Nosema bombycis in a cultured BmN cell line of silkworm." Infection, Genetics and Evolution **17**: 38-45.

Nosema bombycis is a silkworm parasite that causes severe economic damage to sericulture worldwide. It is the first microsporidia to be described in the literature, and to date, very little molecular information is available regarding microsporidian physiology and their relationships with their hosts. Therefore, the interaction between the microsporidia N. bombycis and its host silkworm, Bombyx mori, was analyzed in this study. The microsporidian spore wall proteins (SWPs) play a specific role in spore adherence to host cells and recognition by the host during invasion. In this study, SWP26 fused with enhanced green fluorescence protein (EGFP) was expressed in BmN cells by using a Bac-to-Bac expression system. Subsequently, the turtle-like protein of B. mori (BmTLP) was determined to interact with SWP26 via the use of anti-EGFP microbeads. This interaction was then confirmed by yeast two-hybrid analysis. The BmTLP cDNA encodes a polypeptide of 447 amino acids that includes a putative signal peptide of 27 amino acid residues. In addition, the BmTLP protein contains 2 immunoglobulin (IG) domains and 2 IGc2-type domains, which is the typical domain structure of IG proteins. The results of this study indicated that SWP26 interacts with the IG-like protein BmTLP, which contributes to the infectivity of N. bombycis to its host silkworm.

Zhu, F., et al. (2019). "Occurrence and ecological impacts of microplastics in soil systems: a review." Bulletin of environmental contamination and toxicology **102**(6): 741-749.

Microplastics, as a group of emerging contaminants, are receiving growing attention. During the

last decade, their occurrence and toxicity in aquatic ecosystems have been intensively studied and reviewed, but less attention has been paid on soil ecosystems. Given the importance of soil ecosystems and the call for increasing research on soil from scientific communities, it is predicted that relevant studies will boom in the following years. The present review intends to provide a comprehensive overview of current knowledge on microplastic pollution in soil environments. We critically summarize the source, contamination level and fate of microplastics in (industrial and arable) soils. Then, we thoroughly describe what effects have been observed on soil microbes, animals and plants, and analyze what insights we can get from available information. Finally, we identify knowledge gaps that need to be filled and give suggestions for future research.

Zhu, H., et al. (2003). "Determination of thiamine in pharmaceutical preparations by sequential injection renewable surface solid-phase spectrofluorometry." Analytical Sciences **19**(2): 289-294.
Fluorometric determination of thiamine requires the conversion of the analyte to fluorescent thiochrome by hexacyanoferrate(III) oxidation in alkaline solution and the isolation of the produced thiochrome from the reaction medium by solvent extraction. It was observed that thiochrome could be concentrated and separated from the reaction medium by solid-phase extraction. The thiochrome sorpted on the surface of octadecyl-alklylated poly[styrene/divinylbenzene] (C18-PS/DP) microbeads emitted strong fluorescence upon excitation, the maximum excitation and emission wavelengths being 385 nm and 433 nm, respectively. Based on this observation, a sequential injection renewable surface solid-phase spectrofluorometry was developed for the determination of thiamine. A sequential injection system on-line coupled to a chip-based flow-through cell was employed to handle the chemical reaction, bead injection and discharging, and adsorption of thiochrome. Solid-phase fluorometric detection was realized by coupling the chip-based flow-through cell to a spectrofluorometer with a multistrand bifurcated optical fiber. Under the optimized condition, a detection limit of 0.03 microg ml(-1) was achieved at the sample throughput of 30 h(-1) and consumption of 1 mg C18-PS/DP microbeads for each run. Eleven runs of a 2 microg ml(-1) thiamine standard solution gave a relative standard deviation of 1.0%. The developed approach was successfully applied for the determination of thiamine contents in pharmaceutical preparations.

Zhu, H., et al. (2011). "Wide-field fluorescent microscopy on a cell-phone." Conference Proceedings: ... Annual International Conference of the IEEE Engineering in Medicine & Biology Society **2011**: 6801-6804.
We demonstrate wide-field fluorescent imaging on a cell-phone, using compact and cost-effective optical components that are mechanically attached to the existing camera unit of the cell-phone. Battery powered light-emitting diodes (LEDs) are used to side-pump the sample of interest using butt-coupling. The pump light is guided within the sample cuvette to excite the specimen uniformly. The fluorescent emission from the sample is then imaged with an additional lens that is put in front of the existing lens of the cell-phone camera. Because the excitation occurs through guided waves that propagate perpendicular to the detection path, an inexpensive plastic color filter is sufficient to create the dark-field background needed for fluorescent imaging. The imaging performance of this light-weight platform (~28 grams) is characterized with red and green fluorescent microbeads, achieving an imaging field-of-view of ~81 mm(2) and a spatial resolution of ~10 mum, which is enhanced through digital processing of the captured cell-phone images using compressive sampling based sparse signal recovery. We demonstrate the performance of this cell-phone fluorescent microscope by imaging labeled white-blood cells separated from whole blood samples as well as water-borne pathogenic

protozoan parasites such as Giardia Lamblia cysts.

Zhu, J., et al. (2019). "Cetaceans and microplastics: first report of microplastic ingestion by a coastal delphinid, Sousa chinensis." Science of the Total Environment **659**: 649-654.

In the Anthropocene, marine microplastic debris has been rapidly increasing and interacting with wildlife. As apex predators, cetaceans have been proven to be ideal sentinel species to indicate ecosystem changes and umbrella and flagship species to help develop environmental management strategies. Here, we report the presence of microplastics in the intestines of Sousa chinensis for the first time, which highlights the potential impacts of microplastic pollution in coastal environments. Microplastics were detected in the intestinal contents of both adult and calf individuals, indicating that consumption of prey and unintentional ingestion are the potential pathways for microplastic accumulation in Sousa chinensis. The properties of the microplastics indicated that fibers, white and blue items, 1-5 mm items, and polyester were the predominant shapes, colors, sizes and plastic materials, respectively. More microplastics were detected in the foreguts and midguts than in the hindguts, which may be correlated with the specific intestinal structure of Sousa. This study indicates that coastal delphinids might suffer from microplastic pollution, even young calves. The sample size in this study is limited, whereas it's a starting point for assessing microplastics in the endangered coastal delphinid, Sousa. We suggest that assessments of the risks of microplastic consumption by cetaceans and the presence of microplastics in their habitats should be conducted at a global scale. Moreover, further works should be done to look for evidence of adverse effects of microplastics pollution on cetaceans.

Zhu, J., et al. (2019). "Microplastic pollution in the Maowei Sea, a typical mariculture bay of China." Science of the Total Environment **658**: 62-68.

The ingestion of microplastics by organisms presents a potential exposure route for humans via seafood consumption. Although mariculture has become an essential source of seafood worldwide, the content of microplastics in the mariculture zone has received less scrutiny than in the wild environment. The Maowei Sea is a semi-closed bay that is rich in fishery resources. The specific levels of microplastics in the Maowei Sea and its fishery products remain undetermined. In this paper, we detail the distributions and characteristics of microplastics in the aquaculture water and biota of the Maowei Sea. Microplastics were detected in the range of 1.2-10.1particles/L in Maowei Sea surface water, with high microplastic content in estuarine oyster nursery (10.1particles/L) and Qinzhou harbor (8.8-9.5 particles/L) sites. In water samples from the three inflowing rivers, the abundances ranged from 2.9 to 4.5particles/L, which is comparable to that in Maowei Sea surface water. Of 66 collected fish belonging to 12 species, microplastics were observed in all of the gastrointestinal tracts (GITs) and in the gills of 40 individuals. In the GIT and gill tests, the abundances of microplastics ranged from 2.0 to 14.0 and from 0.0 to 8.5 particles/individual, respectively. The enhanced particles/individual figures in the GIT relative to the gill are particularly noteworthy. Demersal species showed significantly higher abundances of microplastics than pelagic species ($p<0.05$). Microplastics were also detected in the soft tissues of all oyster samples, with abundances ranging from 3.2 to 8.6 particles/individual. The microplastic composition was dominated by rayon and polyester and tended to be white in color and fibrous in shape. Altogether, these results correspond to high levels of microplastics in the Maowei Sea. As the study region is a mariculture bay, the observed microplastics contamination in its fishery products presents a route for human exposure. CAPSULE ABSTRACT: Microplastics are widespread in the aquaculture water and biota in the Maowei Sea, a mariculture bay.

Zhu, K., et al. (2019). "Formation of Environmentally Persistent Free Radicals on Microplastics under Light Irradiation." Environmental Science and Technology **53**(14): 8177-8186.

Microplastics (MPs) are presumed to be inert during aging under ambient conditions. In this study, four types of virgin MPs, including polystyrene (PS), phenol-formaldehyde resin (PF), polyethylene (PE), and polyvinyl chloride (PVC), were aged under simulated solar light irradiation. Surprisingly, several environmentally persistent free radicals (EPFRs), which are considered to be a type of emerging contaminant, were detected on the irradiated PS and PF, rather than PE and PVC, by electron paramagnetic resonance (EPR) spectroscopy. Depending on the photoaging duration time, the characteristic g-factors of the EPFRs produced on PS and PF were 2.0044-2.0049 and 2.0043-2.0044, respectively. The generated EPFRs on PS and PF decayed rapidly at the initial stage and then slowly disappeared with the elapsed aging time. Analyses by attenuated total reflectance-Fourier transform infrared spectroscopy (ATR-FTIR), X-ray photoelectron spectroscopy (XPS), nuclear magnetic resonance (NMR), and gel permeation chromatography (GPC) suggested that MPs might experience chemical chain scission, O<inf>2</inf>/H<inf>2</inf>O addition, and EPFR formation under the light irradiation. Accompanying with the formation of EPFRs, reactive oxygen species, such as O<inf>2</inf>^{*-} and *OH, were also observed. The findings provide a novel insight to evaluate the potential hazards of MPs to organisms and ecosystems. Copyright © 2019 American Chemical Society.

Zhu, L., et al. (2018). "Microplastic pollution in North Yellow Sea, China: observations on occurrence, distribution and identification." Science of the Total Environment **636**: 20-29.

Microplastics are emerging contaminants and have attracted widespread environmental concerns about their negative effects on the marine ecosystems. In this study, we investigated the abundances, distributions and characteristics of microplastics in surface seawater and sediments from the North Yellow Sea. The results showed that the abundance of microplastics was 545+or-282 items/m³ in surface seawater and 37.1+or-42.7 items/kg dry weight in sediments, representing a medium microplastic pollution level compared with other sea areas. Small microplastics (<1 mm) made up >70% of the total microplastic numbers. Films and fibers were the dominant shapes of microplastics in both the surface seawater and sediments. Transparent microplastics were generally more common than microplastics of other colors. Based on the identification by a Fourier transform infrared microscope, polyethylene (PE) was the dominant composition of microplastics in surface seawater, while polypropylene (PP) was the most common polymer type in sediments. These results will improve our understanding of the environmental risks posed by microplastics to marine ecosystems.

Zhu, L., et al. (2017). "Exosomes Derived From Natural Killer Cells Exert Therapeutic Effect in Melanoma." Theranostics **7**(10): 2732-2745.

Objective: Exosomes are nanovesicles that are released from normal and tumor cells and are detectable in cell culture supernatant and human biological fluids. Although previous studies have explored exosomes released from cancer cells, little is understood regarding the functions of exosomes released by normal cells. Natural killer (NK) cells display rapid immunity to metastatic or hematological malignancies, and efforts have been undertaken to clinically exploit the antitumor properties of NK cells. However, the characteristics and functions of exosomes derived from NK cells remain unknown. In this study, we explored NK cell-derived exosome-mediated antitumor effects against aggressive melanoma in vitro and in vivo. Methods: B16F10 cells were transfected with enhanced firefly luciferase (effluc) and thy1.1

genes, and thy1.1-positive cells were immunoselected using microbeads. The resulting B16F10/effluc cells were characterized using reverse transcriptase polymerase chain reaction (RT-PCR), western blotting, and luciferase activity assays. Exosomes derived from NK-92MI cells (NK-92 Exo) were isolated by ultracentrifugation and density gradient ultracentrifugation. NK-92 Exo were characterized by transmission electron microscopy and western blotting. We also performed an enzyme-linked immunosorbent assay to measure cytokines retained in NK-92 Exo cells. The in vitro cytotoxicity of NK-92 Exo against the cancer cells was determined using a bioluminescence imaging system (BLI) and CCK-8 assays. To investigate the possible side effects of NK-92 Exo on healthy cells, we also performed the BLI and CCK-8 assays using the human kidney PhoenixTM-Ampho cell line. Flow cytometry and western blotting confirmed that NK-92 Exo induced apoptosis in the B16F10/effluc cells. In vivo, we used a B16F10/effluc cell xenograft model to detect the immunotherapeutic effect of NK-92 Exo. We injected NK-92 Exo into tumors, and tumor growth progression was monitored using the IVIS Lumina imaging system and ultrasound imaging. Tumor mass was monitored after in vivo experiments. Results: RT-PCR and western blotting confirmed effluc gene expression and protein levels in B16F10/effluc cells. B16F10/effluc activity was found to increase with increasing cell numbers, using BLI assay. For NK-92 Exo characterization, western blotting was performed on both ultracentrifuged and density gradient-isolated exosomes. The results confirmed that NK cell-derived exosomes express two typical exosome proteins, namely CD63 and ALIX. We demonstrated by western blot analysis that NK-92 Exo presented two functional NK proteins, namely perforin and FasL. Moreover, we confirmed the membrane expression of FasL. The enzyme-linked immunosorbent assay results indicated that NK-92 Exo can secrete tumor necrosis factor (TNF)-alpha, which affected the cell proliferation signaling pathway. The antitumor effect of NK-92 Exo against B16F10/effluc cells in vitro was confirmed by BLI ($p < 0.001$) and CCK-8 assays ($p < 0.001$). Furthermore, in normal healthy cells, even after 24 h of co-culture, NK-92 Exo did not exhibit significant side effects. In the in vivo experiments, tumors in the vehicle control group were significantly increased, compared with those in the NK-92 Exo-treated group ($p < 0.05$). Conclusion: The results of the current study suggest that exosomes derived from NK cells exert cytotoxic effects on melanoma cells and thus warrant further development as a potential immunotherapeutic strategy for cancer.

Zhu, L., et al. (2019). "Microplastic ingestion in deep-sea fish from the South China Sea." Science of the Total Environment **677**: 493-501.

Monitoring the ingestion of microplastics by fish in the environment is crucial to understanding the risks posed by microplastics in the marine ecosystem. In this study, we investigated the ingestion of microplastics in deep-sea fish from the northern continental slope of the South China Sea. All fish samples were contaminated by microplastics, reflecting a high level of microplastic pollution in this region. The average abundance of microplastics in the stomachs of sampled fish was 1.96+or-1.12 items/individual and 1.53+or-1.08 items/g, and levels in the intestines of sampled fish were 1.77+or-0.73 items/individual and 4.82+or-4.74 items/g. Fish were collected from depths of 200 to 209 m and 453 to 478 m, and no significant difference in the quantity of microplastics ingested was detected among different depths in this range. The microplastics ingested by fish were dominated by plastics that were <1 mm in size, film-like in shape, transparent in color and composed of cellophane. Our results suggest that the ingestion of microplastics by fish is closely related with the microplastic pollution in the marine environment.

Zhu, L., et al. (2020). "Photochemical dissolution of buoyant microplastics to dissolved organic carbon:

Rates and microbial impacts." Journal of Hazardous Materials **383**: 121065.

Trillions of plastic fragments are afloat at sea, yet they represent only 1-2% of the plastics entering the ocean annually. The fate of the missing plastic and its impact on marine life remains largely unknown. To address these unknowns, we irradiated post-consumer microplastics (polyethylene, PE; polypropylene, PP; and expanded polystyrene, EPS), standard PE, and plastic-fragments collected from the surface waters of the North Pacific Gyre under a solar simulator. We report that simulated sunlight can remove plastics from the sea surface. Simulated sunlight also fragmented, oxidized, and altered the color of the irradiated polymers. Dissolved organic carbon (DOC) is identified as a major byproduct of sunlight-driven plastic photodegradation. Rates of removal depended upon polymer chemistry with EPS degrading more rapidly than PP, and PE being the most photo-resistant polymer studied. The DOC released as most plastics photodegraded was readily utilized by marine bacteria. However, one sample of PE microplastics released organics or co-leachates that inhibited microbial growth. Thus, although sunlight may remove plastics from the ocean's surface, leachates formed during plastic photodegradation may have mixed impacts on ocean microbes and the food webs they support.

Zhu, M., et al. (2019). "Chronic dietary exposure to polystyrene microplastics in maturing Japanese medaka (Oryzias latipes)." Aquatic Toxicology **220**: 105396.

Fish studies report consumption of microplastics (MPs) in the field, and concern exists over associated risks. However, laboratory studies with adult fish are scarce. In this study, outbred and see-through Japanese medaka (Oryzias latipes) were fed diets amended with 500, 1000, or 2000 mug/g 10 mum fluorescent spherical polystyrene microplastics (MPs) for 10 weeks during their maturation from juveniles to spawning adults. No behavioral changes, growth differences, or mortalities occurred. In vivo examinations and histologic sections showed no evidence of translocation of MPs from the gut to other internal organs. Mature females experienced dose-dependent decreases in egg number. Scanning electron microscopic examination of gills and gut revealed MPs in both areas. Swollen enterocytes were observed on apices of gut folds only in exposed fish. These were particularly apparent in foreguts of the high exposure group. Enterocytes with eroded brush borders were found in foregut of high and medium exposure groups. Increased mucus production, in long strands and sheets, was seen over primary and secondary lamellae of gills. Histological analysis showed alteration in buccal cavity, kidney, and spleen. Thickening and roughening of epithelium in headgut and pharynx and cellular alterations in spleen occurred. Head kidney was the primary site of alteration. Glomerulopathy and nephrogenesis were observed in exposed fish, increasing in severity with exposure level.

Zhu, Q. and D. Trau (2012). "Multiplex detection platform for tumor markers and glucose in serum based on a microfluidic microparticle array." Analytica Chimica Acta **751**: 146-154.

We present a multiplex detection platform based on a microfluidic microparticle array to detect proteins and glucose in serum simultaneously. Multiplex detection of proteins and glucose was performed using biofunctionalized microparticles arrayed on gel-based microstructures integrated in microfluidics. The microparticles immobilized on these microstructures showed high stability under microfluidic flow conditions. With arrays of antibody-coated microbeads, microfluidic quantitative immunoassays for two protein tumor markers, human chorionic gonadotropin (hCG) and prostate specific antigen (PSA) were performed in serum samples with detection limits bellow the cut-off values for cancer diagnosis. Parallel to the immunoassays, quantitative enzymatic assays for glucose in the physiological concentration range were performed. Multiplex detection was achieved by using a spatially encoded microarray. By patterning antibody-coated microbeads and enzyme-containing microparticles on a novel mixed

structure array, we successfully demonstrated simultaneous immunoassays (binding based assay) for proteins and an enzymatic assay (reaction kinetic based assay) for glucose. Our microparticle arrays could be potentially used for the detection of multiple categories of biomolecules (proteins, small metabolites and DNA) for clinical diagnostics and other biological applications.

Zhu, X. (2015). "Optimization of elutriation device for filtration of microplastic particles from sediment." Marine Pollution Bulletin **92**(1-2): 69-72.

The increasing presence of plastic pollution in marine ecosystems has become a major concern. In the environment, plastics break down into smaller and smaller pieces of microplastics. Methods of microplastic recovery are needed to reduce the dangers they can pose to a variety of organisms. An elutriation device was manufactured and optimized to achieve maximum microplastic recovery. The parameters flow rate and diameter of elutriation column were varied and their domain of variation was determined. A composite factorial experimental design was generated using MODDE 10.1 and was undergone. The optimal values of flow rate and column diameter were determined to be 385Lh⁻¹ and 5.06cm respectively, under constraints, to achieve a maximum feasible microplastics recovery percentage of 50.2%. The elutriation process can be improved through further testing, and can be tested in the field to compare its efficiency to that of manual microplastics filtration. Copyright © 2015 Elsevier Ltd.

Zhu, X., et al. (2007). "Simultaneous monitoring of PCDD/Fs and PCBs in contaminated air with semipermeable membrane devices and fresh spruce needles." Chemosphere **68**(9): 1623-1629.

The contaminated air with burning plastic floor and electronic scrap was monitored with semipermeable membrane devices (SPMDs) and fresh unpolluted spruce needles at the same time for polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/Fs) and polychlorinated biphenyls (PCBs). It was found that there were more polychlorinated dibenzofurans (PCDFs) than polychlorinated dibenzo-p-dioxins (PCDDs) collected from contaminated air. The total amounts of PCBs were much higher than that of PCDD/Fs, but the contribution of them to the WHO-TEQ was less than that of PCDD/Fs. Triolein-containing SPMDs can absorb much more PCDD/Fs and PCBs than spruce needles when they were exposed in contaminated air simultaneously. The logarithm of the concentrations of PCDD/Fs and PCBs in SPMDs and in spruce needles at the same sampling time exhibited a significant linear correlation, the correlation coefficients were larger than 0.86 for PCDD/Fs and 0.92 for PCBs. SPMDs and spruce needles are effective passive air sampler for PCDD/Fs and PCBs. SPMDs and spruce needles can complement each other in passive air sampling. [Copyright &y& Elsevier]

Zhu, X. T., et al. (2018). "[Distribution and Settlement of Microplastics in the Surface Sediment of Yangtze Estuary]." Huanjing Kexue/Environmental Science **39**(5): 2067-2074.

This study is designed to understand the microplastic contamination in the coastal area of Yangtze estuary. The abundance and distribution profiles of microplastics in the surface sediment of six sampling sites along the Yangtze estuary were examined throughout one year. The detected average concentration of microplastic, including fibers and fragments, in the

surface sediment of Yangtze estuary was (3.42+/-1.31) items .g⁻¹ (DW). Sampling during four seasons, in the months of January, April, July, and November, indicated that the highest abundance of microplastics in Yangtze estuary surface sediment occurred in January. A re-suspension experiment showed that microplastics tend to settle in the surface sediment after re-suspension. The distribution and settlement of microplastics along the coastal area has a high concordance with the dynamic erosion-accretion process of the Yangtze estuary. Microplastics tend to settle in accretion sites rather than in erosion sites.

Zhu, Y., et al. (2019). "Impacts of (micro) plastics on soil ecosystem: progress and perspective." Journal of Agro Environment Science **38**(1): 1-6.

Plastics and their derived products are widely used in modern society, hence they are becoming indispensable. However, their wide and intensive use has caused global environmental contamination of plastics. In recent years, soil pollution with microplastics has also received increasing attention. This paper aims to provide a review on recent developments in understanding the impacts of microplastic pollution on soil ecosystem, and it will cover: (1) effects of microplastics on soil physiochemical properties; (2) effects of microplastics on soil microbial communities; and (3) the interactions between microplastics and soil fauna. Finally, future research directions are discussed.

Zhu, Z. L., et al. (2019). "Joint toxicity of microplastics with triclosan to marine microalgae Skeletonema costatum." Environmental Pollution **246**: 509-517.

Toxicity of single microplastics on organisms has been reported widely, however, their joint toxicity with other contaminants on phytoplankton is rarely investigated. Here, we studied the toxicity of triclosan (TCS) with four kinds of microplastics namely polyethylene (PE, 74 mum), polystyrene (PS, 74 mum), polyvinyl chloride (PVC, 74 mum), and PVC800 (1 mum) on microalgae Skeletonema costatum. Both growth inhibition and oxidative stress including superoxide dismutase (SOD) and malondialdehyde (MDA) were determined. We found that TCS had obvious inhibition effect on microalgae growth within the test concentrations, and single microplastics also had significant inhibition effect which followed the order of PVC800 > PVC > PS > PE. However, the joint toxicity of PVC and PVC800 in combination with TCS decreased more than that of PE and PS. The higher adsorption capacity of TCS on PVC and PVC800 was one possible reason for the greater reduction of their toxicity. The joint toxicity of PVC800 was still most significant (PE < PVC < PS < PVC800) because of the minimum particle size. According to the independent action model, the joint toxicity systems were all antagonism. Moreover, the reduction of SOD was higher than MDA which revealed that the physical damage was more serious than intracellular damage. SEM images revealed that the aggregation of microplastics and physical damage on algae was obvious. Collectively, the present research provides evidences that the existence of organic pollutants is capable of influencing the effects of microplastics, and the further research on the joint toxicity of microplastics with different pollutants is urgent. Joint toxicity effect of microplastics and triclosan on microalgae was antagonism. Copyright © 2018 Elsevier Ltd

Zhuang, J., et al. (2017). "Propulsion and Chemotaxis in Bacteria-Driven Microswimmers." Advanced science **4**(9): 1700109.

Despite the large body of experimental work recently on biohybrid microsystems, few studies have focused on theoretical modeling of such systems, which is essential to understand their underlying functioning mechanisms and hence design them optimally for a given application task. Therefore, this study focuses on developing a mathematical model to describe the 3D

motion and chemotaxis of a type of widely studied biohybrid microswimmer, where spherical microbeads are driven by multiple attached bacteria. The model is developed based on the biophysical observations of the experimental system and is validated by comparing the model simulation with experimental 3D swimming trajectories and other motility characteristics, including mean squared displacement, speed, diffusivity, and turn angle. The chemotaxis modeling results of the microswimmers also agree well with the experiments, where a collective chemotactic behavior among multiple bacteria is observed. The simulation result implies that such collective chemotaxis behavior is due to a synchronized signaling pathway across the bacteria attached to the same microswimmer. Furthermore, the dependencies of the motility and chemotaxis of the microswimmers on certain system parameters, such as the chemoattractant concentration gradient, swimmer body size, and number of attached bacteria, toward an optimized design of such biohybrid system are studied. The optimized microswimmers would be used in targeted cargo, e.g., drug, imaging agent, gene, and RNA, transport and delivery inside the stagnant or low-velocity fluids of the human body as one of their potential biomedical applications.

Ziady, A. G., et al. (2012). "Combinatorial transcriptomic, proteomic, and metabolomic analyses reveal dysregulation of glycolysis in primary CF airway epithelia and neutrophils." Pediatric Pulmonology **35)**: 311-312.

We conducted a multimodal analysis of primary CF and nonCF airway epithelia grown in normal glucose at an air-liquid interface (HBE), and neutrophils collected from the blood (PMN) of CF and nonCF subjects. To better understand the link between the dysfunction of CFTR and secondary defects like inflammation and the dysregulation of redox balance, we treated primary nonCF airway epithelia from 6 donors with the CFTR-inh-172 (20 muM) for 72 hr to inhibit CFTR. We then used mass spectrometry to analyze differences in metabolites and proteins to determine which pathways were significantly impacted by CFTR inhibition. In this initial discovery phase we found a significant change in a number of pathways, but the most pronounced change was an increase in glycolysis and glucose metabolism. Given the link between altered glycolysis and abnormalities in redox balance and inflammatory signaling, we designed a study using gene array and proteomic analyses to examine differences in CF HBE and PMN. The purpose of this study was to evaluate whether CFTR dysfunction results in abnormalities in glycolysis in the two cell types most implicated in inflammatory signaling and lung deterioration in CF. First, we studied the expression profile of PMN from CF subjects and from healthy controls aged 16 to 40 years. PMN were separated by Ficoll method and selected by CD16+ magnetic microbeads. RNA was immediately extracted and Illumina HT12 microarray platform used for analysis. We studied 11 healthy controls and 26 CF patients. Genes, enriched for glucose and carbohydrate metabolism were differentially expressed in CF vs. nonCF, which is characteristic of a metabolic shift to a glycolytic phenotype. In addition, CF PMN exhibited higher levels of two glucose transporters (GLUT1 and GLUT3). These data indicate a previously undescribed abnormality in the metabolism of CF PMN. Follow up proteomic studies in PMN and HBE cells also revealed the increased expression of glycolytic enzymes in CF vs. nonCF controls. The similarities in the regulation of glycolysis in CFTR inhibited (pharmacological model) and CF primary PMN and HBE cells suggest that the metabolic shift toward a glycolytic phenotype is due to CFTR dysfunction and may be a basic defect in CF cells. The data on a metabolic shift toward glycolysis in CF primary cells, using transcriptomic, proteomic, and metabolomic analyses were also confirmed by biochemical measures that indicated an upregulation in phosphoenolpyruvate and pyruvate. We conclude that the upregulation of glycolysis is related to CFTR dysfunction as evidenced by the impact of CFTR inhibition in nonCF primary cells, and independent studies conducted in 2 different primary cell types in 2 different labs. The implication of these results is that CFTR dysfunction is linked to a glycolytic metabolism, which in nonCF related studies has been extensively shown to promote redox imbalance and inflammatory signaling.

Ziajahromi, S., et al. (2019). "Effects of polyethylene microplastics on the acute toxicity of a synthetic pyrethroid to midge larvae (Chironomus tepperi) in synthetic and river water." Science of the Total Environment **671**: 971-975.

Microplastics are ubiquitous pollutants in the aquatic environment. However, our understanding of the interaction of chemicals, particularly synthetic pyrethroids, with microplastics and the potential toxic effects of sorbed contaminants on aquatic organisms under realistic conditions is still extremely limited. In this study, we examined whether the presence of polyethylene (PE) microplastics can affect the acute toxicity of the synthetic pyrethroid bifenthrin to an invertebrate Chironomus tepperi in both synthetic and river water. Bifenthrin alone was, as expected, acutely toxic to exposed larvae (LC₅₀ of 0.5 micro g/L after 48 h exposure). The addition of microplastics to synthetic water significantly reduced the toxicity of bifenthrin (apparent LC₅₀=1.3 micro g/L), most likely because sorption of bifenthrin to microplastics reduced its bioavailability to the exposed larvae. A sorption capacity experiment showed that >92% of bifenthrin was sorbed to microplastics. In river water containing 9.6 mg/L organic carbon, bifenthrin alone was less toxic (LC₅₀=1.3 micro g/L) than in synthetic water. Strikingly, the addition of microplastics to river water did not mitigate bifenthrin toxicity (apparent LC₅₀=1.4 micro g/L), most likely due to greater interaction of bifenthrin with organic carbon than with microplastics. While PE microplastics reduced the negative effects of bifenthrin in synthetic water, the presence of organic carbon in river water without microplastics also reduced toxicity. This suggests that while sorption of contaminants to microplastics does occur, it may not be as relevant under environmentally realistic conditions with mg/L concentrations of organic matter.

Ziajahromi, S., et al. (2019). "Microplastic pollution in a stormwater floating treatment wetland: Detection of tyre particles in sediment." Science of the Total Environment **713**: 136356.

Synthetic rubber particles released from car tyres are expected to be an important type of microplastics in the environment, with road runoff and stormwater likely to transport tyre particles to the aquatic environment. Stormwater treatment wetlands are one of the key methods for treating road runoff and stormwater, but the presence and concentration of synthetic rubber microplastics from tyre particles in wetlands are largely unknown. In addition, constructed floating wetlands can be built using recycled PET plastic bottles, raising concerns about potential release of microplastics to the environment. In this study, we measured the concentrations of microplastics in water and sediment from the inlet and outlet of a stormwater floating treatment wetland on Queensland's Gold Coast. An average of 0.9 +/- 0.3 and 4.0 +/- 2.4 microplastic particles/L were detected in the water phase in the inlet and outlet samples, respectively. The sediment contained an average of 595 +/- 120 and 320 +/- 42 microplastic particles/kg dry sediment in inlet and outlet sediments, respectively. Between 15 and 38% of microplastics in the sediment were identified by FTIR as synthetic rubber-carbon filled particles, most likely derived from car tyres. The presence of synthetic rubber microplastics confirms that tyres can contribute to microplastic pollution in stormwater, with road runoff likely to be an important pathway. No microplastics with the same characteristics and polymer composition as the floating wetland construction material were detected in the water and sediment samples, indicating that the microplastics in the water and sediment detected here did not originate from

the floating wetland's material. However, further investigation of older treatment wetlands is required to better understand the potential role of floating treatment wetlands as a source of microplastics.

Ziajahromi, S., et al. (2017). "Impact of Microplastic Beads and Fibers on Waterflea (Ceriodaphnia dubia) Survival, Growth, and Reproduction: Implications of Single and Mixture Exposures." Environmental Science & Technology **51**(22): 13397-13406.

There is limited knowledge regarding the adverse effects of wastewater-derived microplastics, particularly fibers, on aquatic biota. In this study, we examined the acute (48 h) and chronic (8 d) effects of microplastic polyester fibers and polyethylene (PE) beads on freshwater zooplankton Ceriodaphnia dubia. We also assessed the acute response of C. dubia to a binary mixture of microplastic beads and fibers for the first time. Acute exposure to fibers and PE beads both showed a dose-dependent effect on survival. An equitoxic binary mixture of beads and fibers resulted in a toxic unit of 1.85 indicating less than additive effects. Chronic exposure to lower concentrations did not significantly affect survival of C. dubia, but a dose-dependent effect on growth and reproduction was observed. Fibers showed greater adverse effects than PE beads. While ingestion of fibers was not observed, scanning electron microscopy showed carapace and antenna deformities after exposure to fibers, with no deformities observed after exposure to PE beads. While much of the current research has focused on microplastic beads, our study shows that microplastic fibers pose a greater risk to C. dubia, with reduced reproductive output observed at concentrations within an order of magnitude of reported environmental levels. [ABSTRACT FROM AUTHOR]

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Ziajahromi, S., et al. (2016). "Wastewater treatment plant effluent as a source of microplastics: review of the fate, chemical interactions and potential risks to aquatic organisms." Water Science and Technology **74**(10): 2253-2269.

Wastewater treatment plant (WWTP) effluent has been identified as a potential source of microplastics in the aquatic environment. Microplastics have recently been detected in wastewater effluent in Western Europe, Russia and the USA. As there are only a handful of studies on microplastics in wastewater, it is difficult to accurately determine the contribution of wastewater effluent as a source of microplastics. However, even the small amounts of microplastics detected in wastewater effluent may be a remarkable source given the large volumes of wastewater treatment effluent discharged to the aquatic environment annually. Further, there is strong evidence that microplastics can interact with wastewater-associated contaminants, which has the potential to transport chemicals to aquatic organisms after exposure to contaminated microplastics. In this review we apply lessons learned from the literature on microplastics in the aquatic environment and knowledge on current wastewater treatment technologies, with the aim of identifying the research gaps in terms of (i) the fate of microplastics in WWTPs, (ii) the potential interaction of wastewater-based microplastics with trace organic contaminants and metals, and (iii) the risk for aquatic organisms. Copyright © IWA Publishing 2016.

Ziajahromi, S., et al. (2017). "Wastewater treatment plants as a pathway for microplastics: Development of a new approach to sample wastewater-based microplastics." Water Research **112**: 93-99.

Wastewater effluent is expected to be a pathway for microplastics to enter the aquatic environment, with microbeads from cosmetic products and polymer fibres from clothes likely to enter wastewater treatment plants (WWTP). To date, few studies have quantified microplastics in wastewater. Moreover, the lack of a standardized and applicable method to identify microplastics in complex samples, such as wastewater, has limited the accurate assessment of microplastics and may lead to an incorrect estimation. This study aimed to develop a validated method to sample and process microplastics from wastewater effluent and to apply the developed method to quantify and characterise wastewater-based microplastics in effluent from three WWTPs that use primary, secondary and tertiary treatment processes. We applied a high-volume sampling device that fractionated microplastics in situ and an efficient sample processing procedure to improve the sampling of microplastics in wastewater and to minimize the false detection of non-plastic particles. The sampling device captured between 92% and 99% of polystyrene microplastics using 25 mum-500 mum mesh screens in laboratory tests. Microplastic type, size and suspected origin in all studied WWTPs, along with the removal efficiency during the secondary and tertiary treatment stages, was investigated. Suspected microplastics were characterised using Fourier Transform Infrared spectroscopy, with between 22 and 90% of the suspected microplastics found to be non-plastic particles. An average of 0.28, 0.48 and 1.54 microplastics per litre of final effluent was found in tertiary, secondary and primary treated effluent, respectively. This study suggests that although low concentrations of microplastics are detected in wastewater effluent, WWTPs still have the potential to act as a pathway to release microplastics given the large volumes of effluent discharged to the aquatic environment. This study focused on a single sampling campaign, with long-term monitoring recommended to further characterise microplastics in wastewater.

Ziccardi, L. M., et al. (2016). "Microplastics as vectors for bioaccumulation of hydrophobic organic chemicals in the marine environment: A state-of-the-science review." Environmental Toxicology & Chemistry **35**(7): 1667-1676.

A state-of-the-science review was conducted to examine the potential for microplastics to sorb hydrophobic organic chemicals (HOCs) from the marine environment, for aquatic organisms to take up these HOCs from the microplastics, and for this exposure to result in adverse effects to ecological and human health. Despite concentrations of HOCs associated with microplastics that can be orders of magnitude greater than surrounding seawater, the relative importance of microplastics as a route of exposure is difficult to quantify because aquatic organisms are typically exposed to HOCs from various compartments, including water, sediment, and food.

Zieba, Z. (2017). "Influence of soil particle shape on saturated hydraulic conductivity." Journal of Hydrology and Hydromechanics; Vodohospodarsky Casopis **65**(1): 80.

The aim of this paper is to define the correlation between the geometry of grains and saturated hydraulic conductivity of soils. The particle shape characteristics were described by the ZC index (Parylak, 2000), which expresses the variability of several shape properties, such as sphericity, angularity and roughness. The analysis was performed on samples of four soils, which were characterised by the same grain size distribution and extremely different particle structure. The shape characteristics varied from ideally spherical, smooth grains (glass microbeads GM) to highly irregular and rough particles (fly ash FA). For each soil, laboratory tests of saturated hydraulic conductivity (constant head test CHT and falling head test FHT) were performed. Additionally, an empirical analysis of effective pore diameter was conducted with use of the

analytical models developed by Pavchich (Wolski, 1987) and Indraratna and Vafai (1997). The models were modified by introducing the Z0C index. Experiments have shown that saturated hydraulic conductivity depends on grains shape and surface roughness. This parameter decreases with the increase in the irregularity of soil particles. Moreover, it was proven that the Z0C reflects the relationship between effective pore diameter and grain shape characteristics.

Zilberberg, J., et al. (2018). "An ex vivo 3D bone metastasis model for prostate cancer." Cancer Research. Conference **78**(13 Supplement 1).

Introduction: Bone is the preferred site for prostate cancer (PCa) metastases and there is virtually no cure once the tumor is established within this niche. The development of therapeutic strategies against metastatic PCa has been limited by the lack of an all-human preclinical model to: (1) study PCa-bone interactions under physiologically relevant three dimensional (3D) microenvironments, (2) understand how these interactions result in the development of drug resistance, and (3) explore paradigm-changing precision medicine concepts. Method(s): Conditionally reprogrammed primary PCa cells (CR-PCa, derived from a lymph node metastatic site) were integrated with our ex vivo human 3D bone tissue platform, as a transformative approach for modeling tumor behavior at the bone niche. The 3D bone tissue was engineered using primary osteoblastic (OSB) cells from human bone samples. These cells were biomimetically assembly with biphasic calcium phosphate microbeads (BCPm) in perfusion microfluidic culture devices. BCPm were used to replicate the 3D cellular network of OSTs in human bone. This 3D tissue model was successfully used to support the osteocytic differentiation of primary human OSB cells within the BCPm structure, while maintaining a single cell layer of osteoblasts on the surface of the 3D tissue resembling the bone endosteum. Result(s): Integration of the 3D bone tissue with CR-PCa cells resulted in a compromised endosteal layer after only 4 days of coculture, with more apoptotic OSTs in the tissues with CR-PCa vs. no PCa cells controls (P<0.01). For functional analysis, we stained 5 mum sections of the 3D tissues for alkaline phosphatase (ALP, an OSB marker) and sclerostin, an osteocytic marker and major signaling molecule released by embedded OSTs that suppresses osteoblastogenesis. Quantification of immunofluorescence staining revealed that ALP was significantly increased (P<0.05), whereas sclerostin significantly decreased (P<0.01) with the introduction of CR-PCa cells. This OSB phenotype, induced by PCa-bone interactions ex vivo, is entirely consistent with the OSB prostate cancer-bone metastasis niche seen in patients with advanced disease. Conclusion(s): Our model recapitulates: (1) an OSB monolayer closely resembling the endosteum at the bone/ bone marrow interface, (2) the complex microphysiological features and functions of 3D-networked OSTs, and (3) the interactions of primary PCa cells with osteoblasts and OSTs.

Zilberman, Y. and S. R. Sonkusale (2015). "Microfluidic optoelectronic sensor for salivary diagnostics of stomach cancer." Biosensors & Bioelectronics **67**: 465-471.

We present a microfluidic optoelectronic sensor for saliva diagnostics with a potential application for non-invasive early diagnosis of stomach cancer. Stomach cancer is the second most common cause of cancer-related deaths in the world. The primary identified cause is infection by a gram-negative bacterium Helicobacter pylori. These bacteria secrete the enzyme urease that converts urea into carbon dioxide (CO_2) and ammonia (NH_3), leading to their elevated levels in breath and body fluids. The proposed optoelectronic sensor will detect clinically relevant levels of CO_2 and NH_3 in saliva that can potentially be used for early diagnosis of stomach cancer. The sensor is composed of the embedded in a microfluidic device array of microwells filled with ion-exchange polymer microbeads doped with various organic dyes. The

optical response of this unique highly diverse sensor is monitored over a broad spectrum, which provides a platform for cross-reactive sensitivity and allows detection of CO_2 and NH_3 in saliva at ppm levels.

Zima, P., et al. (2017). THE STUDY OF WATER POLLUTION OF THE LOWER VISTULA RIVER BY PLASTIC PARTICLES. Sofia, Surveying Geology & Mining Ecology Management (SGEM). **17:** 729-736.

Since the beginning of widespread use of plastic its consumption and production has been constantly increasing. As a result of human activity part of waste ends up in our environment and is deposited in each of the elements of the biosphere. These impurities can be in the form of large elements, small particles fragmented to macroscopic level (pellets, facial scrub grains) and the microparticles visible under a microscope. Particularly harmful for the environment are microplastic particles, which can be deposited in living organisms. Impurities get into surface waters, and then through rivers into the seas and oceans, as the final reservoir. Currently greater attention is paid to rivers. In rivers plastic can undergo further fragmentation and be transported along with water and bed sediment. The article describes the trial attempt to determine the content of plastic in the water of the lower Vistula- the largest river flowing into the Baltic Sea. The material extraction for the research was done in the Tczew gauge profile (Km 33+080). During this process the hydrometric measurements and the velocity distribution and flow rate using ADCP device was completed. For sampling were used plankton nets - the first with the mesh size of 0.5 mm and the inlet dimensions of 0.2x0.4 m and second with the 0.2 mm and 0.2x0.3 m. 0.5 mm nets were placed in the mainstream (velocity of approx. 1m/s) at the surface and at a depth of 0.5 m. 0.2 mm net was put at the bottom and left for sampling. After filtration of approx. 100 m3 of water, nets with samples were preserved and transported to the laboratory. The resulting catch at the surface and at a depth of 0.5 m contained plant parts and wood fragments, and the mesh placed at the bottom caught sand, wood fragments and shells. Then the samples were dried at room temperature. In order to reduce the organic matter, the dry samples were placed in a 20% solution of H_2O_2 and then in a 20% solution of HCl. The acquired portion of bed sediment (705g dry weight) after etching was subjected to flotation in a 40% $ZnCl_2$ solution (solution density approx. 1.4 g/cm3). After the sand sedimentation, the solution was filtered. The samples were examined microscopically. During the investigation, some plastic particles were found plastic (size of 1-2 mm or more). While examining under a microscope at 60 times magnification were noticed single plastic fibers. The study helped to identify the presence of forms of plastic on the macroscopic and microscopic level. Various forms of plastic were found both in water and bed sediment. Due to the size of the mesh, smaller particles have not been studied.

Zink, L. and G. G. Pyle (2019). "Contrary to Marine Environments, Common Microplastics in Freshwater Systems May Not Emit Dimethyl Sulfide: An Important Infochemical." Bulletin of Environmental Contamination & Toxicology **103**(6): 766-769.

The ingestion of microplastics by marine species has been at least partially attributed to plastics emitting a dimethyl sulfide signature when exposed to marine conditions. Dimethyl sulfide, a member of the volatile organic sulfur compounds group, is an infochemical that many species rely on to locate and identify prey while foraging. Microplastic ingestion is also observed in freshwater systems; however, this study shows that the same dimethyl sulfide signature is not obtained by three common types of plastic (high-density polyethylene, low-density polyethylene, and polystyrene) in freshwater systems, suggesting that there may be an alternate mechanism driving plastic ingestion by freshwater species.

Zitko, V. and M. Hanlon (1991). "Another Source of Pollution by Plastics: Skin Cleaners with Plastic Scrubbers." Marine Pollution Bulletin MPNBAZ, Vol. 22, No. 1, p 41-42, January 1991. 1 fig, 13 ref.

Skin cleaners containing plastic scrubber particles (polyethylene, polypropylene, or polystyrene, 40-200 mesh) were patented in the United States many years ago, but the extent, volume, and pattern of their use are unknown. Meanwhile, polystyrene spherules, presumably derived from the manufacture and disposal of plastics, have been found in the environment. The effect of these spherules in unknown. The possibility of intestinal blockage in smaller fish exists. The spherules might also adsorb and accumulate toxic hydrophobic organic compounds and deliver them to the biota. Two commercially available cleaners containing plastic scrubbers were examined. A water-based formulation was dispersed in water and the plastic particles left to settle. The particles were irregular in shape and about 0.1-0.2 mm in the largest dimension. Infrared analysis confirmed their identity as polystyrene. A hydrocarbon-based cleaner was extracted with acetone and hexane, yielding a liquid, presumably the C11-C13 isoparaffins declared on the label. A gelatinous residue was obtained from the acetone phase. The plastic particles were best seen on a smear of the original formulation; their concentration in the formulation is quite small. Given their persistence in the environment, accumulation could occur if these plastic scrubber-containing cleaner become more widely used in the marketplace. (Doria-PTT)

Zizka, J. and J. Weiser (1993). "Effect of beauvericin, a toxic metabolite of Beauveria bassiana, on the ultrastructure of Culex pipiens autogenicus larvae." Cytobios **300**: 13-19.

Larvae of C. pipiens exposed to 0.1 mg ml⁻¹ beauvericin on silica gel microbeads had a mortality of 44% after 48 h. Symptoms of intoxication with intensive vacuolization were evident in all specimens. The toxic effect was concentrated in the mitochondria which were inflated and appeared as spherical vacuoles with vestigial cristae. The chromatin in the nuclei was concentrated in large granules mainly on the nuclear membrane. Most affected was the epithelium of the midgut where the basal membrane was ruptured and the labyrinth heavily dissolved. In the fat body and the muscles intensive vacuolization had affected the compact tissues. The cytoplasm was vacuous, without endoplasmic reticulum, and ribosomes were dissolved.

Zlatkov, D., et al. (2012). Recycling of construction waste. 12th International Multidisciplinary Scientific GeoConference and EXPO, SGEM 2012, June 17, 2012 - June 23, 2012, Varna, Bulgaria, International Multidisciplinary Scientific Geoconference and EXPO.

This paper deals with recycling of construction waste, i.e. process of collecting and treating waste to be re-used as raw material in the creation of an identical or similar products. The paper advocates the sustainable development that meets the needs of present generations without compromising the rights of future generations to meet their needs. Natural resources are general and common good and their use should be planned and directed and purpose controlled. The rapid technological development in recent decades has necessitated serious human addressing the issues related to management of waste generated in various technological operations, and as a final waste in the use of final products. Recycling Technology of CWM (Construction Waste Material) resulting from construction, and more frequently from demolition of various types of buildings. CWM usually consists of: waste wood, various metals, concrete, bricks, blocks, tiles, glass, asphalt, etc. There are also several types of devices and procedures for the recycling of CWM. CWM recycling process includes: demolition of old or damaged structures, development of towns and villages, various destructions, earthquakes, floods, etc. Construction waste is the second largest waste type, immediately after the

municipal solid waste. Construction waste is divided into rubble, soil, waste from the reconstruction of roads, and waste from the construction sites. The rubble itself can be dangerous because it may contain asbestos, which is very harmful to human health, or acids, paints, varnishes, thinners, means for removing rust, paint or varnish, wood coatings, oil filters, mineral oils and others. Glass is one of the building materials that can be fully recycled. To reduce the amount of plastic waste, which is not selfdegradable, it must be recycled. The first center for recycling of construction waste started operation in Kragujevac (Serbia) where the waste will be disposed of and processed for reuse. SGEM2012 All Rights Reserved by the International Multidisciplinary Scientific GeoConference SGEM.

Zobkov, M. and E. Esiukova (2017). "Microplastics in Baltic bottom sediments: Quantification procedures and first results." Marine Pollution Bulletin **114**(2): 724-732.

Microplastics in the marine environment are known as a global ecological problem but there are still no standardized analysis procedures for their quantification. The first breakthrough in this direction was the NOAA Laboratory

Zobkov, M. B., et al. (2019). "Microplastic content variation in water column: The observations employing a novel sampling tool in stratified Baltic Sea." Marine Pollution Bulletin **138**: 193-205.

A new tool was developed for microplastics (MPs) investigation in the water column. It can collect several cubic meters of water from predefined water layers down to 100 m. The tool was tested in the Baltic Sea during the period of spring thermocline formation. Strong MPs stratification was observed at all of the sampled stations. On coastal stations (~30 m deep), stratification with high fibers content was associated with the proximity of terrestrial sources and estuarine discharges, while on off-shore stations the variability of MPs was related to vertical thermohaline structure. Mean MPs content was the 32.2 (SD 50.4) pcs/m³. Elevated MPs concentrations were observed in subsurface, near-bottom and thermohaline layers compared with intermediate layers. The heterogeneity of MPs distribution suggests that MPs particles can be retained above the density-gradient layers in coastal seas and the World Ocean. Copyright © 2018 Elsevier Ltd

Zocchi, M. and R. Sommaruga (2019). "Microplastics modify the toxicity of glyphosate on Daphnia magna." Science of the Total Environment **697**: N.PAG-N.PAG.

Plastic contamination is an environmental problem spreading to even the most remote aquatic and terrestrial habitats and in particular, microplastics represent an uncertain threat for organisms. Microplastics can have a direct negative effect, but they can also potentially modify the toxicity and bioavailability of pollutants. Here, we tested over 1 week the combined effect of three different glyphosate chemical formulations (glyphosate acid, glyphosate-monoisopropylamine salt, and Roundup Gran) and two types of microplastics (polyethylene (PE) microbeads and polyethylene terephthalate/polyamide (PET/PA) fibers), on Daphnia magna. Glyphosate-monoisopropylamine salt caused the highest mortality after 1 week exposure (23.3%), whereas glyphosate acid the lowest (12.5%), when tested in the absence of microplastics. These results were inverted, however, when the individuals were exposed in combination with the PE microbeads (glyphosate acid: 53.3% and glyphosate-monoisopropylamine salt: 18.3%) or the PET/PA fibers (glyphosate acid: 30.0% and glyphosate-monoisopropylamine salt: 8.3%). The mortality in the Roundup Gran formulation also increased when combined with the two microplastics, though the effect was less pronounced. In all experiments, the effect of the treatments and time was significant, though there was no significant interaction between them. In most treatments, negative effects were

not observed after 48 h or later. The change in toxicity of the glyphosate formulations caused by microplastics can be linked to the different sorption properties of the glyphosate-based chemicals formulations. The outcome of this study highlights that beside the potential direct negative effects of microplastics, they can modify the toxicity of pollutants, such as herbicides. Unlabelled Image • Microplastics modified the toxicity of glyphosate on Daphnia magna. • Two different types of microplastics elicited similar changes in toxicity. • Additive effects depended on glyphosate's chemical formulation. [ABSTRACT FROM AUTHOR]

Zuccarello, P., et al. (2019). "Exposure to microplastics (<10 micro M) associated to plastic bottles mineral water consumption: the first quantitative study." Water Research **157**: 365-371.

The uncontrolled introduction into the environment of plastic polymers have caused the dispersion of plastic fragments, known as Microplastics (MPs), that represent an important topic for public health. This study was the first to investigate the cause of the release of MPs in mineral waters and to estimate the concentration of MPs smaller than 10 micro m both in number of particles and in mass unit. This study was carried out using a patent method regarding the extraction and analysis of MPs in more kind of matrix. Therefore, aims of this study were (a) to assess the number of MPs with diameters of between 0.5 and 10 micro m in mineral waters contained in plastic bottles, (b) to evaluate if the physical-chemical properties of mineral waters and bottle quality could influence the release of MPs and, finally, (c) to estimate the human daily exposure to MPs due to mineral water consumption. The Mps were found in every sample. The main concentration of MPs was 656.8 micro g/L+or-632.9 or 5.42E+07 p/L+or-1.95E+07. The main diameter of detected MPs was 2.44 micro m+or-0.66 (where p/L, where p was the number of MPs). The Estimated Daily Intake (EDI) for adults and children were 1,531,524 p/kg/body-weight/day corresponding to 40.1 micro g/kg/body-weight/day and 3,350,208 p/kg/body-weight/day corresponding to 87.8 micro g/kg/body-weight/day, respectively. The number of MPs contamination in bottled mineral waters was strongly correlated to the pH of waters and to plastic density of bottle. Otherwise, micrograms of MPs per liter and the MPs diameters were strongly affected by plastic thickness. The most mineral water brand contaminated by MPs was the one whose bottles were made from poor quality plastic. In absence of reference values, it was no possible carried out a risk assessment for MPs exposure. It is fundamental to establish the reference method of analysis to monitoring every source of human intake.

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Zulkifley, M. A., et al. (2014). "Robust identification of polyethylene terephthalate (PET) plastics through Bayesian decision." PLoS ONE [Electronic Resource] **9**(12): e114518.

Recycling is one of the most efficient methods for environmental friendly waste management. Among municipal wastes, plastics are the most common material that can be easily recycled and polyethylene terephthalate (PET) is one of its major types. PET material is used in consumer goods packaging such as drinking bottles, toiletry containers, food packaging and many more. Usually, a recycling process is tailored to a specific material for optimal purification and decontamination to obtain high grade recyclable material. The quantity and quality of the sorting process are limited by the capacity of human workers that suffer from fatigue and boredom. Several automated sorting systems have been proposed in the literature that include using chemical, proximity and vision sensors. The main advantages of vision based sensors are its environmentally friendly approach, non-intrusive detection and capability of high throughput. However, the existing methods rely heavily on deterministic approaches that make them less accurate as the variations in PET plastic waste appearance are too high. We proposed a probabilistic approach of modeling the PET material by analyzing the reflection region and its surrounding. Three parameters are modeled by Gaussian and exponential distributions: color, size and distance of the reflection region. The final classification is made through a supervised training method of likelihood ratio test. The main novelty of the proposed method is the probabilistic approach in integrating various PET material signatures that are contaminated by stains under constant lighting changes. The system is evaluated by using four performance metrics: precision, recall, accuracy and error. Our system performed the best in all evaluation metrics compared to the benchmark methods. The system can be further improved by fusing all neighborhood information in decision making and by implementing the system in a graphics processing unit for faster processing speed.

Zuo, L.-Z., et al. (2019). "Sorption and desorption of phenanthrene on biodegradable poly(butylene adipate co-terephtalate) microplastics." Chemosphere **215**: 25-32.

Biodegradable plastics, as alternatives to conventional plastics, are increasingly used, but their interactions with organic pollutants are still unknown. In this study, the sorption and desorption behaviors on a type of biodegradable plastic−poly(butylene adipate co-terephtalate) (PBAT) were investigated, and at the same time two types of conventional plastics−polyethylene (PE c and PE v) and polystyrene (PS) were used for comparison. Phenanthrene (PHEN) was chosen as one of representative organic pollutants. Results indicated that the sorption and desorption capacities of PBAT were not only higher than those of the other types of microplastics, but also higher than those of carbonaceous geosorbents. The surface area normalized results illustrated that sorption and desorption of the microplastics were positively correlated with their abundance of rubbery subfraction. The sorption kinetic results showed that the sorption rates of PBAT and PE c were higher than PE v and PS. The effects of water chemistry factors including salinity, dissolved organic matter and Cu2+ ion on the sorption process displayed the same trend, but the degrees of influence on the four microplastics differed. The degrees of influence were mainly dependent on the abundance of rubbery subfraction for microplastics. These findings indicate that the biodegradable poly(butylene adipate co-terephtalate) microplastics are actually stronger vectors than the conventional microplastics, and crystallization characteristics of the microplastics have great influences on the vector effect. Graphical abstract Image 1 Highlights • Biodegradable microplastics sorbed/desorbed more PHEN than conventional ones. • Sorption/desorption capacities depended on the content of rubbery subfraction. • Plastic additives didn't alter the microplastics adsorption process. • High salinity and low DOM strengthen the sorption of PHEN onto microplastics. [ABSTRACT FROM AUTHOR]

Zuza, M. G., et al. (2017). "Design and characterization of alcalase-chitosan conjugates as potential biocatalysts." Bioprocess & Biosystems Engineering **40**(11): 1713-1723.

In this study, alcalase (protease from Bacillus licheniformis) immobilization by adsorption, enzyme crosslinking and covalent enzyme binding to activated chitosan microbeads were examined. The biocatalysts highest activity was obtained by covalent immobilization of alcalase onto a solid support. The alcalase covalent immobilization onto different types of chitosan beads obtained by inverse emulsion technique and electrostatic extrusion was studied. Parameters examined under different conditions were beads diameter, enzyme loading, enzyme capacity yield, and biocatalyst activity. The highest activity and enzyme loading of 23.6 IU/mg protein and 340.2 mg/g, respectively, were achieved by the enzyme immobilized onto chitosan microbeads obtained by the electrostatic extrusion technique. FT-IR analysis was used to confirm formation of alcalase-chitosan conjugates. The activity of optimally produced alcalase-chitosan microbeads was then verified in the industrially feasible reaction systems of egg white and soy protein hydrolysis. The high degree of hydrolysis of 29.85 +/- 0.967% after 180 min and five successive reuses obtained under real conditions (50 degreeC, pH 8) verified the covalently bound alcalase to chitosan beads a promising candidate for use in industrial egg white protein hydrolysis process.

Zwissler, B., et al. (1995). "Effects of inhaled prostacyclin as compared with inhaled nitric oxide in a canine model of pulmonary microembolism and oleic acid edema." Journal of Cardiothoracic and Vascular Anesthesia **9**(6): 634-640.

Objective: Recently, it has been shown that the inhalation of nitric oxide (NO) and of prostacyclin (PGI<inf>2</inf>) elicits selective pulmonary vasodilation in a canine model of pulmonary hypertension induced by hypoxic pulmonary vasoconstriction. The present study was designed to investigate whether inhaled NO or PGI<inf>2</inf>-aerosol, respectively, is also effective in decreasing pulmonary artery pressure in a canine model of acute pulmonary

microembolism and oleic acid edema. Design(s): Prospective, randomized, cross-over design. Setting(s): University animal research laboratory. Participant(s): Eight anesthetized, mechanically ventilated dogs (28 +/- 1 kg). Intervention(s): Acute pulmonary microembolization (PME) was induced using glass microbeads (mean diameter: 100 mum) and 0.01 mL/kg of oleic acid. Subsequently, inhaled PGI<inf>2</inf> (concentration: 10 mug/mL) or NO (50 ppm), respectively, was randomly administered for 15 minutes each and then withdrawn. Measurements and Main Results: Central hemodynamics (heart rate [HR], cardiac output [CO], stroke volume [SV], mean arterial pressure [MAP], systemic vascular resistance [SVR], mean pulmonary artery pressure [PAP], pulmonary vascular resistance [PVR]) and gas exchange (PaO<inf>2</inf>/F<inf>1</inf>O<inf>2</inf> ratio, intrapulmonary shunt [Qs/Qt], alveolar-arterial oxygen difference, [AaDO<inf>2</inf>]) were assessed. Measurements were performed at control, after PME, and during administration of PGI<inf>2</inf> and NO, respectively. PME induced a significant increase ($p < 0.001$) of MAP (+9%), PAP (+68%), and PVR (+163%), whereas HR, CO, and SV remained unchanged and lung function deteriorated. Inhalation of NO slightly decreased PAP (- 10%; $p<0.05$) and PVR (-26%; $p<0.01$) and improved AaDO<inf>2</inf> and PaO<inf>2</inf>/F<inf>1</inf>O<inf>2</inf>. In contrast, inhalation of PGI<inf>2</inf> had no consistent effect on pulmonary vascular tone or gas exchange. Conclusion(s): The data demonstrate that inhaled NO may elicit selective pulmonary vasodilation and improve gas exchange in a canine model of pulmonary microembolism and respiratory insufficiency. However, the degree of these effects was relatively small. The aerosolization of PGI<inf>2</inf> under conditions of positive-pressure ventilation did not exert a significant vasodilatory effect on pulmonary vessels and did not improve pulmonary gas exchange in this model.